

Multi-Parameter animal Monitor

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Disclaimer Statement

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

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The company is responsible for the reliability, security and performance of the equipment only in the cases of the followings that: assembly, expansion, readjustment, performance improvement and maintenance are performed by authorized personnel or unit by our company; the electrical equipments are in compliance with the state relevant standards; operation of this equipment is followed this manual.

The company reserves the right to make change of the content of this manual without further notice.



This instrument is not used in the family.



In order to use this equipment safely continuous, must follow the instructions listed. This manual instructions listed can not replace the medical procedure has been in implementing.

- **Don't just rely on the audible alarm system monitoring animals, when care animals, such as the volume of small or completely shut off could lead to the animal's evil. Keep in mind that the most reliable animal monitoring method is the correct use of monitoring equipment and the animal's individual monitoring closely together.**

- This equipment is intended to only by trained health care professionals use in health care institutions.
- In order to reduce the risk of electric shock, do not open the equipment. If necessary, please maintenance qualified personnel.
- The device may interfere with the ultrasonic imaging system is on the ultrasonic screen jamming signal. The place of the distance between the two devices increasingly far better.
- Connect the electrical contact or device exposed to saline or other liquid and conductive adhesive is dangerous. Electrical contact and connection, such as cable connector, power supply, and the parameters of the module is inserted into the connector, the chassis connectors must be kept clean and dry. If they are liquid pollution, must be thoroughly dry. If you need further to pollution, please contact with your bio-medical department or the company.



This product is not therapy equipment.

Such as the use of this instrument is responsible for the hospitals or medical institutions cannot achieve a satisfactory maintenance plan, can cause equipment failure, and may endanger human health.

Quality assurance:

- Free service scope :
- All conform to the scope of the company warranty service regulations equipment all can enjoy free services.
- Charge service scope :

- (1) All beyond the scope of the company warranty service regulations of equipment, the company will be charge for the service ;
- (2) Even during the warranty period, due to the following reasons products require maintenance :
 - A. Artificial damage ;
 - B. Power grid voltage is beyond the scope equipment regulations ;
 - C. Irresistible natural disasters.

Attention

- The company for the following (including but not limited to) the direct, indirect or eventually damage caused by the delay and irresponsible :
 - a. Component is tear open outfit, stretching, readjusted ;
 - b. Replacement without the consent of the company's parts or repair the machine by the company authorized personnel.

Returning the machine

Procedures of returning the goods :

If goods returning is needed, please follow the following steps:

- 1 . Acquiring return permit: Contact with the After-sales Service Department of our company to offer the serial number of the product. If the serial number is not clear enough, goods returning will be refused. Please give clear indication of product model, serial number and a brief statement for reasons of returning the goods.
- 2 . Freight: Users have to bear the freight (including customs charge) if product servicing is needed to be performed at our company.

Preface

This manual introduces the monitor performance, operation method and other security information, etc. This is new users start to use the best starting point for the monitor.

This manual is too familiar with all kinds of measurement, and experienced personnel in the use of monitoring equipment aspect of reading.



Our monitor is a portable multi-parameter monitor, can be used in/on the day of surgery, surgery anesthesia recovery, supervising big animal, children, vital signs of the newborn.



This monitor can be made of the built-in battery or ac power supply. With carrying handle, convenient to carry.

Scope of application:

The monitor is suitable for use in hospital for animals with heart rate, pulse frequency, noninvasive blood pressure (systolic pressure, diastolic pressure and mean pressure), respiratory rate, ECG, blood oxygen saturation and temperature monitoring and measurement of vital signs, etc.

The following some important symbol, the user should be attention :

 **Attention**  Users should know how to avoid injuries of animals and medical staff information.

 **Attention**  Users should know how to avoid the equipment damage information.

 **Attention** 

Emphasize important information.

Taboo occasions and warning :

- This equipment is not treatment equipment, cannot be used in the family.
- This equipment if there is no fixed, may drop, resulting in personnel injury or equipment damage. In order to prevent personnel injury or equipment damage, please install the

equipment to a fixed position.

- This equipment is not in a magnetic resonance imaging (MRI) equipment situations, or induced current will cause burn animal.
- When this equipment is not in anesthesia with combustible gas or other gas work situations.
- When this equipment cannot be used in places that have requirements of electromagnetic radiation, such as: mobile phone use.
- In order to avoid injuries, in addition to qualified technical personnel, the others cannot be carried out on the equipment maintenance.

 **Attention** 

- Before using, verify the calibration and ensure correct this equipment is working properly.
- Low pay attention to the placement of the power cord, catheters, and all cables, lest cause strangled animals or in danger of tripping over other personnel.
- This equipment back it is forbidden to jam, in order to send out quantity of heat.
- If the liquid falls to the device inside the casing, please power off immediately, immediately contact the maintenance personnel.

Chapter One General Introduction to Product

- Please read through the content of animal 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

- Portable multi-parameter animal monitor is used for clinical monitoring. Only doctors and nurses are allowed to use it.
- Do not open the case of the equipment to avoid electrical shock. Only the maintenance personnel trained and authorized by are allowed to perform the maintenance and upgrade of the equipment.
- Keep use of the equipment away from the place with flammable substances like anesthetic to avoid explosion.
- Users are required to check if the equipment and the components work normally before use.
- To avoid delay in medical treatment, please set proper alarm according to each animal and make alarm sound available with the alarm.

- To avoid delay in medical treatment, please set proper alarm according to each animal and make alarm sound available with the alarm.
- Keep away from animal, table and equipment during defibrillation.
- The equipment connected to the animal monitor must be formed to be an equipotential body (protective and effective connection).
- While using this equipment together with electrical surgical equipments, users (doctors or nurses) should ensure the monitored animal safe.
- Control the packing material according to the valid waste control standard, and keep the packing material beyond the touch of children.

Attention

- It is a must to control the product and the components in this manual according to the relevant standard when they are to expire. Please contact its representatives for detailed information.
- In case of the perfection and arrangement of the external earthing of the equipment are doubtful, it is a must to operate it using the internal battery.

1.1 General introduction to animal monitor

7 inch & 8 inch portable multi-parameter monitor is a new structure, small volume, ac/dc equipment, its measurement module function of the parameter, display and record the output is integrated into an organic whole, constitute a compact, portable monitor. With his hands and built-in battery, convenient animal transfer.

1.1.1 Intended use

The intended use of the monitor is to monitoring and measuring heart rate, pulse frequency, noninvasive blood pressure (systolic pressure, diastolic pressure and mean pressure), respiratory rate, ECG, blood oxygen saturation and temperature. It is suitable for s, children and newborn animals. It can be used in the day of surgery and other occasions.

1.1.2 Contraindications:

not found

1.1.3 Product Features

- “7”、“8” screen with true color, wide viewing angle, high brightness LCD display.
- Simple and friendly operating display interface.
- Internal chargeable large capacity battery provides convenience for animals' moving.
- Playback and browse function for long term waveform and monitor data record.
- Optional printing output function, alarm triggers printing.
- Auto double alarm with audible and visible signals.
- Anti-defibrillation, anti-interference from high frequency electric knife.

1.1.4 Working environment

Temperature:

Working temperature 0°C - 40 °C

Transportation and storage temperature -20 °C - 60 °C

Humidity:

Working humidity $\geq 85\%$

Transportation and storage humidity \equiv 93 %

Altitude:

Working altitude	-500 - 4,600m(-1,600 - 15,000feet)
------------------	------------------------------------

Transportation and storage altitude	-500-13,100m(-1,600 - 43,000feet)
-------------------------------------	-----------------------------------

Supply voltage

100 - 240V AC, 50/60Hz

Pmax=24VA

FUSE T 2.0A



Warning


Don't prescribed by the manufacturer, outside the scope of temperature and humidity of the use of the monitor, otherwise will not be able to achieve in the appendix II said that the performance specifications.



1.1. 5 External Interfaces of the animal Monitor

7 inch and 8 inch enjoy a large range of multi-parameter monitor functions (as shown in picture 1-1). Users may choose different measuring parameter configuration according to different need.

It integrates parameter measuring module function with output display and recording to contribute to an impact and portable animal monitor. The internal battery provides the animal with an easy moving. 4 waveforms and all monitoring parameter data are displayed on the display interface with high resolution.

1.1.5.1 7 inch Multi-parameter animal monitor

Power switch “” of the equipment locates on the left side of front window (As shown in picture 1-1 ①) .

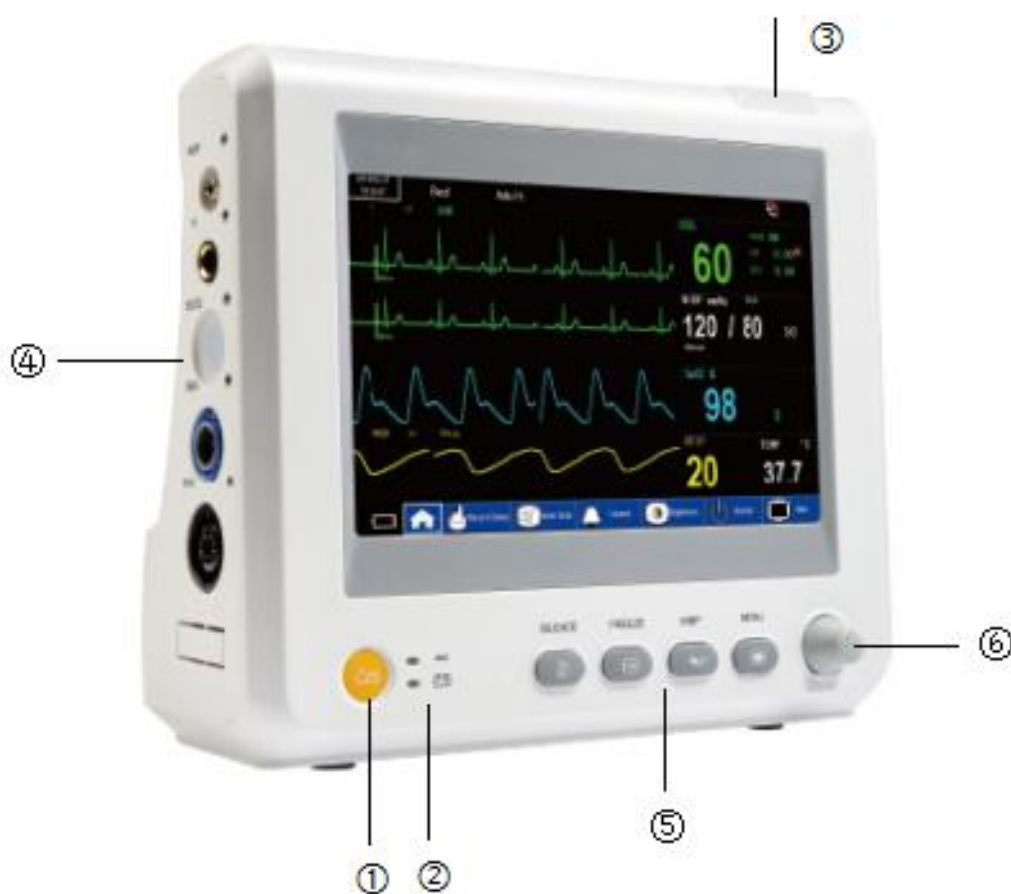
AC indicator“”locates at the right side of the power switch. When AC power is supplied, this indicator lights up in green. Charge indicator“POWER” locates under the AC indicator“”.When the equipment is power supplied by internal battery, it keeps lightening in green. (As shown in picture 1-1 ②).

Alarm indicator ALARM locates at the top right part of the set. When an alarm is given, this

indicator flashes (As shown in picture 1-1③).

Sensor jack locates at bottom left side of the front window I (As shown in picture 1-1④) ,Other jacks and power socket locate at the back window. , As shown in picture 1-4.

It has a friendly operation interface. All operations can be achieved by keys and knobs on the front window (As shown in picture 1-1⑤⑥) , Please refer to the content of Functional Keys for detailed information 1.3.



Pic 1-1 7 inches Multi-parameter monitor



Pic 1-2 8 inches multi-parameter monitor

1.1. 5.2 8 inch Multi-parameter animal monitor

Power switch “ \odot/\ominus ” of the equipment locates on the left side of front window (As shown in picture 1-2 ①).

AC indicator“ \sim ”locates at the right side of the power switch. When AC power is supplied, this indicator lights up in green. Charge indicator“POWER” locates under the AC indicator“ \sim ”.When the equipment is power supplied by internal battery, it keeps lightening in green. (As shown in picture 1-2 ②).

Alarm indicator ALARM locates at the top right part of the set. When an alarm is given, this indicator flashes (As shown in picture 1-2③).

Sensor jack locates at bottom left side of the front window I (As shown in picture 1-2④) ,Other

jacks and power socket locate at the back window. , As shown in picture 1-4.

It has a friendly operation interface. All operations can be achieved by keys and knobs on the front window (As shown in picture 1-2⑤⑥) , Please refer to the content of Functional Keys for detailed information 1.3.

 **Warning** 

7 inch and 8 inch are with same parameter function and keystrokes function

Definition abbreviation :

Items	Definition, abbreviation
ECG	Electrocardiogram
RESP	Respiration
TEMP	Temperature
NIBP	Non-Invasive Blood Pressure
SPO2	Blood oxygen saturation
HR	Heart Rate
RR	Respiration Rate
PR	Pulse Rate
CO ₂	Capnography

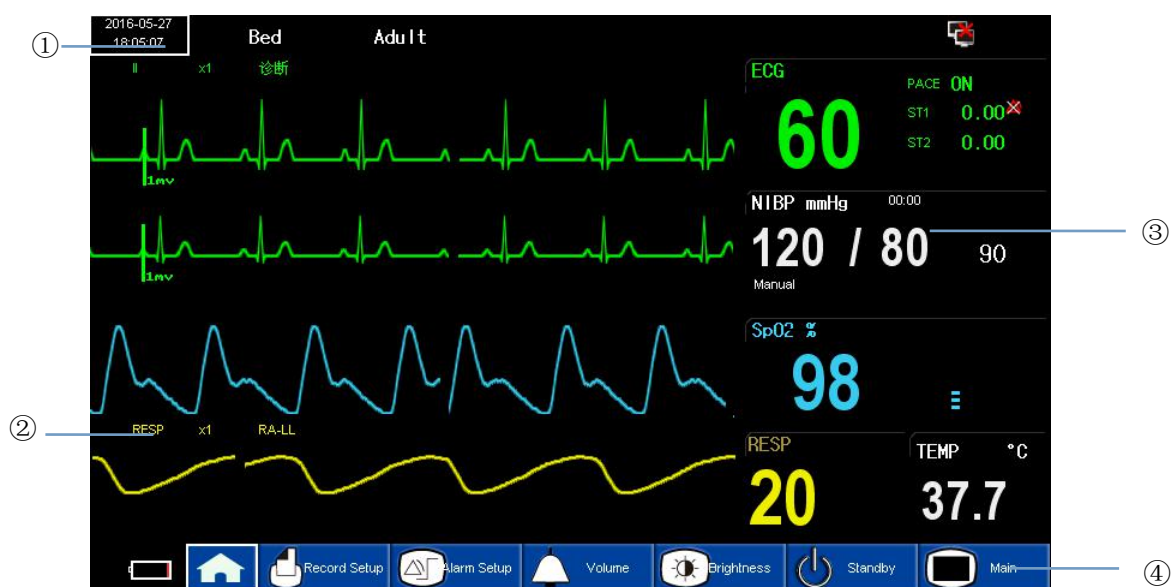
1.2 Display Interface

This equipment is equipped with a color LCD capable of displaying animals' parameter, waveform parameter collected and alarm information, sickbed No., state of the animal monitor,

time, and other prompts provided by the animal monitor at the same time.

Main screen is divided into 3 areas (Take 8 inch as an example,As shown in picture 1-3 ,) :

- 1)Information area①
- 2)Waveform area②
- 3)Parameter area③
- 4)Display menu area④



Pic 1-3 main menu

Information Area(①) :

Information area locates at the upper part of the screen displaying the state of the animal monitor and the animal. Meaning of the information area content is specified as below :

“Sickbed No.” : Sickbed No. of the animal being monitored.

“Big animal” : Type of animal being monitored.

“2007-3-13” : Current date.

“10 : 23 : 45” : Current time.

Other prompts of the information area are displayed and disappearance together with displayed state. According to contents, they are sorted as:

- Prompt of the animal monitor displays the state of the animal monitor or sensor appeared always after the area of "big animal";
- Alarm information of the animal monitor (Refer to chapter of Alarm for detailed setup method.) ;



Is mute sign. Press the "SILENCE" when this flag, said all the voice has been closed.


Until the operator to press the "SILENCE" key again lift mute state, or there is a new alarm system event, to restore the voice prompt.



Alarm volume is closed. Said warning voice prompt function has been artificially permanently shut down. Cancel the alarm volume closed set until the operator.



Warning

When  symbols is available , System will not be able to give warning voice prompt, so the operator be especially careful to use this feature.

- When screen waveform is frozen, the corresponding prompt "frozen" window appears at the bottom of the monitor screen.
- animal parameter alarm information, fixed in the right area.

Waveform Area(②) :

4 waveforms are displayed in the waveform area. Display sequence of the waveform is adjustable. With the largest configuration, the system may display 2 ECG waveforms, SpO2 plethysmography waveform, and respiration waveform in the waveform area.

Name of waveform is displayed at top left of each waveform. Cardioelectric lead may be

selected according to actual need. Increase of the channel and filtering method of ECG will be displayed on each waveform. There is a 1mv scale at the left side of the ECG waveform. As long as the menu is displayed, it is displayed at the fixed position of center of the waveform area covering part of the waveform temporarily. The original interface will be resumed when exiting from the menu.

Waveform will be refreshed at the set rate. Please refer to setup of parameters for adjustment of waveform refreshing rate.

Parameter Area (③) :

Parameter area locates at the right side of the waveform area nearly opposite to waveform.

Parameters displayed in the parameter area include :

ECG

- HR or PR (unit: beat/min.)
- ST segment analysis result ST1, ST2 for P1 and P2(unit: mV)

SpO2

- Blood oxygen saturation (Unit : %)
- PR (unit: beat/min.) (when “Simultaneity” option is chosen for source of HR)

NIBP

- In sequence from left to right lie systolic blood pressure, mean blood pressure and diastolic blood pressure; (unit: mmHg or kPa)

TEMP

- Temperature (unit: °C or °F)

RESP

Respiration rate (unit : times/min.)






















Warning

Rotary control buttons of the cursor on a certain parameter hotkeys, can press the knob, the interface will pop up this parameter setup menu.

Screen menu area is introduced (④):

Intelligent hotkey is monitor the home screen below shows some of the graphics hotkey, it lets you quick and easy access to certain functions.



This monitor can show the following smart hotkey :

	Paging		mute
	print		information retrospection
	Waveform frozen		Measure automatically
	Non-invasive blood pressure		Print setup
	Alarm setup		Sound setup
	Screen brightness		System standby
	Main menu		drug concentration
	trend table display		trend chart display
	NIBP retrospection		Waveform retrospection
	animal management		

1.3 Key features and basic operation

On the monitor of operation can be done through the buttons and knobs(as pic 1-1) :

- **SILENCE**

Push down this button, you can block all sound (such as alarm sound, heartbeat, pulse, the keyboard sound). And " " in information area, push down this button again and recover all voice and cancel the " ".

Warning

If the alarm suspend/mute state of a new alarm occurs, will automatically remove alarm suspend/mute. Details see the alarm section.

- **FREEZE**

Press this button system into the frozen (picture temporarily rest, at this time can get a better look), waveform area flicker "waveforms freeze" prompt, press this button again, the system, continue to measure.

- **NIBP**

Press this button, start as the cuff is inflated, blood pressure measurement. In the process of measurement, push down this button may suspend, measure and deflated.

- **MENU**

Press this button, popup menu "" system, the user can set the system information in the system menu, and perform review operations.

- **Knob**

The user can turn the knob, select a menu item and modify the setup. Knob clockwise or counterclockwise rotation, also can undertake press operation. By the user turn the knob to complete the home screen, the system menu, parameter menu of all operations.

Operation method by using the knob on the screen :

Along with the turn knob and move on the screen of the rectangular symbol called a

cursor. Where the cursor can stay can operate. When the cursor is in the wave zone, the user can modify the current setup. When the cursor is in a parameter region, the user can open the related parameters menu, and set the parameters of the relevant information.

Operation method as follows :

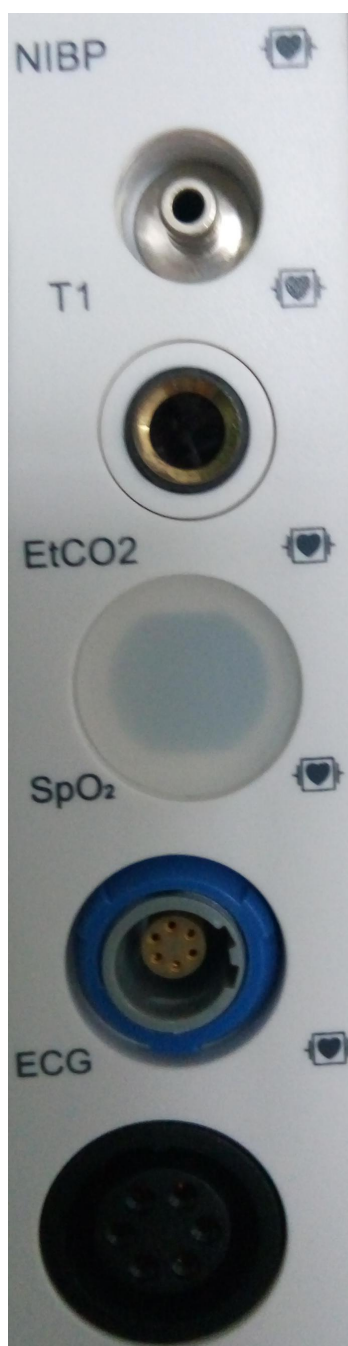
- Move the cursor to the item to operate.
- Press the button.
- System will be one of the following four conditions :
 - The popup menu on the screen or measurement window, or the original replaced by a new menu menu.
 - With the base of the cursor into box without background, the contents of the said frame can change with the rotation of the knob.
 - Appear mark “√” in this area , means choose this item.
 - Run some function immediately.

1.4 External Interfaces of the animal Monitor

For operation convenience, different interfaces are designed at the different positions.

animal' s cable and sensor jack are at bottom left, as shown in picture 1-4 :

ECG: ECG cable jack
 SP02: Spo2 sensor jack
 NIBP: NIBP jack
 T1: TEMP1 probe jack
 EtCO2: ETCO2 jack (optional)



Pic 1-4 Sensor Jack



This sign indicate “Attention”. Refer to the attached document (this manual).

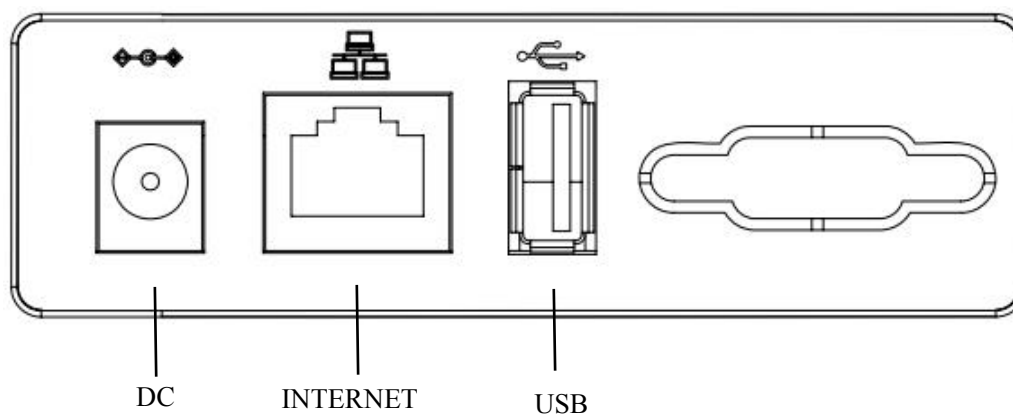


This sign means the applicable component is classified as type of CF. The design is equipped with special protection of anti-electroconvulsive shock (it is equipped with a F type ground

disconnecting device particularly in the allowable currency outleakage.) Meanwhile, it is suitable for use during defibrillation.

Other signs are specified in the chapter of animals' Safety.

Jacks on back window are shown in picture 1 - 5 :



PIC 1 - 5 back panel

Warning

All the simulation and digital equipments connected with the animal monitor must be the product having passed appointed IEC standard certification (e.g. IEC 60950 Data Processing Equipment Standard and IEC 60601-1 Medical Device Standard). Moreover, all the configurations must be followed the valid IEC 60601-1-1 system standard. The personnel who are in charge of connecting optional equipments with input/output signal port are to configure the medical system, and are responsible for system's compliance with IEC 60601-1-1 standard. In case of any questions, please contact with the supplier.

1.5 Internal Chargeable Battery

Portable multi-parameter animal monitor is equipped with an internal chargeable battery. When AC power is supplied, the battery will automatically be charged and charging will not stop until it is charged full.

When the monitor is power supplied by the battery, alarm will be given at low battery. For dead

battery, top grade of alarm will be triggered giving continuous sound of toot, and “very low battery” will be displayed in information area. At the time, AC power is required for charging the battery. If the monitor is further power supplied by the battery, automatic shut-off of the monitor will be given before the battery goes dead (about 5 minute after alarming).

Chapter Two animal Monitor Installation



To guarantee the normal work of the monitor, before use, please read this chapter and the relevant contents of animal safety section, and install in accordance with requirements.

2.1 Unpacking Inspection

Carefully take out the animal monitor and the accessories from the packing box. Keep properly the packing material for future transportation and storage. Check the accessories according to the packing list.

- Check if any mechanical damage caused.
- Check all exposed leads, insert part of the accessories.

When installing, set aside at least two inches (five centimeters) space around the monitor to ensure the circulation of air. The operation environment should be reasonably avoid vibration, dust, corrosive or explosive gas, extreme temperature and humidity, and so on.

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

2.2 Electric Connection

AC power cord connecting steps:

- Make sure that AC power meets the specification of : 100-250VAC , 50 / 60Hz
- Use the attached power cord with the animal monitor. Insert the power cord into the power interface of the animal monitor and connect the other end of the power cord with 3-core

power socket earthed.

 **Warning** 

To avoid accidentally shut down power supply, please do not use by installing the switch to control the outlet on the wall.

 **Warning** 

Plug the power cord connected to the hospital dedicated outlet. In a battery configuration, the instrument after transport or storage, the batteries must be recharged. It is not directly connected to AC power and turn, may be due to insufficient battery power, the instrument does not work properly. AC power, whether or not to open the monitor can charge the battery.

2.3 Power On

When powering on, the system will enter into the main monitoring screen after successful self-test about 5 seconds later. At the time, users may perform operation.

 **Warning** 

If it is found that the monitor function for signs of damage or errors occur, do not use this monitor to monitor animals, and please contact with the hospital biomedical engineer or maintenance engineer to contact the company.

 **Warning** 

If vital error is found during self-test, the system will give alarm.

Check all the monitoring functions available to ensure normal function of the animal monitor.

If there is a battery configured, battery charging is required after each time of use to ensure sufficient battery reserve.

Restart the equipment for minimum 1 minute after shut-down of it.

2.4 Connection of Sensor

Connect the required sensor with the animal monitor and the animal to be monitored.

 **Warning** 

Please refer to the related chapters for correct connection and requirements of the sensor.

0

Chapter Three System Menu

The animal monitor enjoys a flexible configuration. Content of monitoring and waveform scanning speed can be configured according to users' need. After pressing MENU key on the front window, menu as shown in picture 3-1 will be popped up, and the following operations can be performed :



Pic 3-1 main menu

3.1 animals' Information Management

Select "animals' information management" in system menu, the menu as shown in picture 3-2 will be popped up:



Pic 3-2 animals' Information Management

Bed	1-200 optional
Sex	Sex of the animal
Type	Type of animal (small animal , medium-sized animal, large animal)
Pace	The animal is with a pacemaker or not. If yes, please select on. (If yes, there will be a row of dots displayed in the ECG waveform area.

Refreshing animal Monitor a new animal, but will not delete the monitoring data of the previous animal.

In this menu, users may also select the option of “Refreshing animal” to enter into a dialog box of “Confirm refreshing animal” to determine if to clear data. As shown in picture 3-3:



Picture 3-3 Confirm Refreshing animals' Data

Select “Yes” to delete all the information of the animal being monitored and exit menu.

Select “No” to save the information of the animal and exit menu.

3.2 Alarm setup

Refer to chapter 6.6

3.3 Retrospection

Press “retrospection” in menu , then refer to 3-4 :



Pic 3-4 information retrospection

3.3.1 NIBP retrospection

Press “NIBP retrospection”, then refer to 3-5

The screenshot shows the 'NIBP Review' screen with a close button (X) in the top right corner. It contains a table with the following data:

	SYS	MAP	DIA	Interval Time
1	120	90	80	06-17-2015 15:57:24
2	120	90	80	06-17-2015 15:54:54
3	120	90	80	06-17-2015 14:28:19

At the bottom left, it says 'Number 3'. At the bottom right, there are three buttons: a left arrow, a right arrow, and a 'Record' button.

Pic 3-5 NIBP measurement retrospection

The animal monitor can display the latest 400 NIBP measurement data in NIBP retrospection. Data is arranged in chronological order. Each screen can display 10 times the

measured data, choose “▲”, “▼” to watch the data of earlier or later. The measurement results can show a maximum of 400 times. When measuring more than 400 shows the recent 400 data.

3.3.2 Retrospection of alarm event :

Press “Retrospection of alarm event” , then refer to 3-6

Alarm Recall Condition

Alarm Recall Time

Start 2015 - 6 - 17 15 : 54

End 2015 - 6 - 17 17 : 23

Alarm Event Review >>

Pic 3-6 alarm retrospection menu

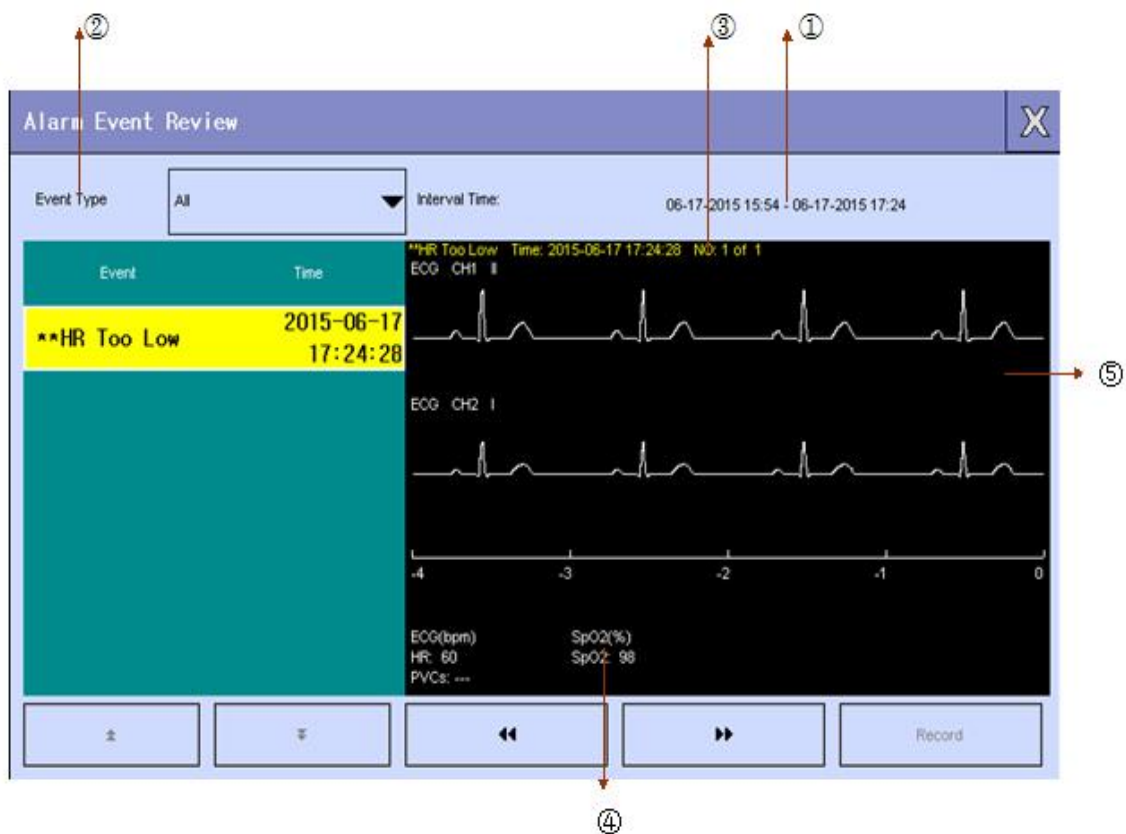
In this menu, the user can set the alarm to review conditions, contains the following items :

1) alarm retrospection time choosing

Users can set in the item "start time" to review the beginning of time, in the "end time" of the termination time set in the review. End time can be set to the current time.

2) alarm event retrospection

Press “alarm event retrospection”, then refer to pic 3-7



Pic 3-7alarm event retrospection

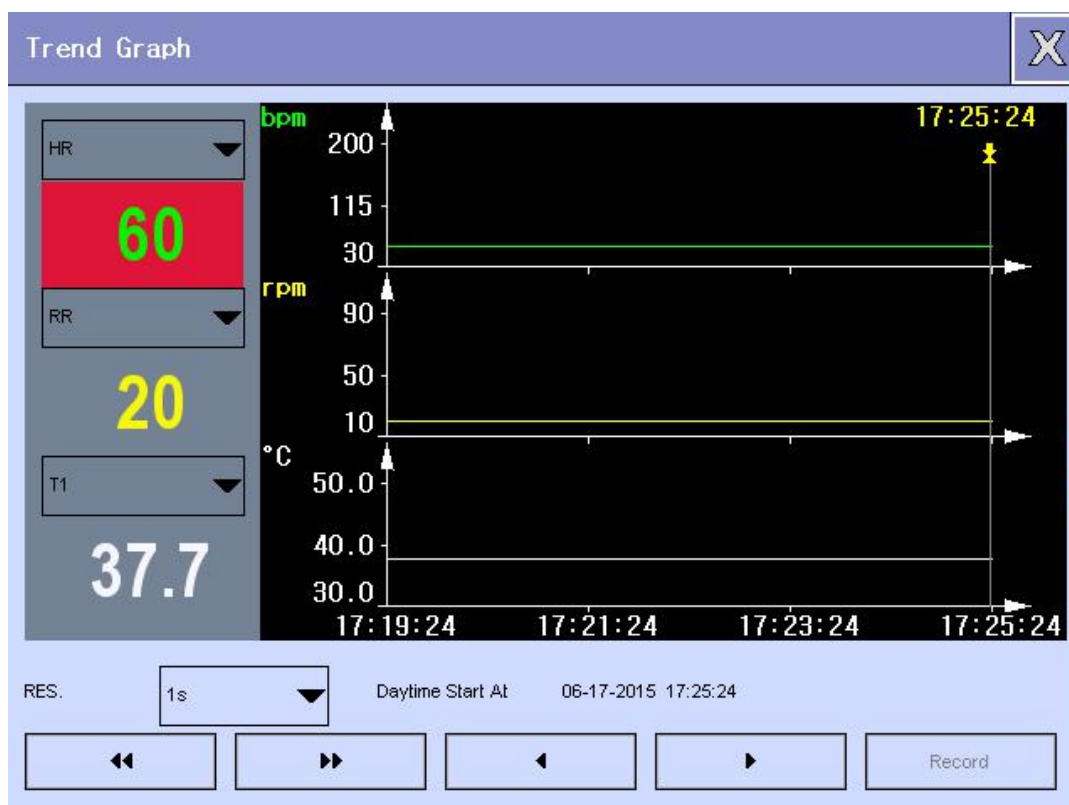
Alarm event review menu shows the following information :

- ①Alarm review time interval (Format: year - month - day: minutes to the year - month - day: minutes) ;
- ②Event type: click on the drop-down box, option "all" (all parameters of alarm events)ECG , SPO2 , NIBP , TEMP , RESP , HR_H>180 , HR_L<60 , SPO2<90% , RR_H>40,RR_L<10,TEMP_H>40°C,TEMP_L<34°C.H (High) means upper limit , L(Low)means lower limit.
- ③code (NO : 1of1) ;
- ④Alarm time parameter values ;
- ⑤two waveform ;

Click on the "flip" before and after the item, you can view event later or earlier

3.3.3 Retrospection of trend plot:

Press "Retrospection of trend plot", then refer to 3-8



Pic 3-8 trend plot menu

Vertical ordinate indicates the measuring value, while the horizontal ordinate indicates the measuring time.

On the left side of the area as the parameter value, use the cursor to select the drop-down box (T1、T2、SpO2、PR、SYS、MAP、DIA、RR、HR、PVCs) , user can set the parameters according to his need , the corresponding parameter value is displayed in the drop-down boxes below.

The measuring value of the position indicated by “↓” will be displayed at the lower part of the trend plot, and the corresponding time will be displayed at the upper part of the trend plot.

Adjust the time by minute, but it can't control high brightness line around mobile, Adjust the time by second, it can control high brightness line moving. By clicking on the four buttons, can further observation time or more recent trend curve and its corresponding parameter values

Use cursor "resolution" option , choose 1 seconds or 5 seconds for 1 hour trend observation, choose 1 minute, 5 minutes, or 10 minutes for 96 hours' trend observation.

3.3.4 Retrospection of trend table

Press “Retrospection of trend table” , then refer to 3-9

Trend Table							X
Time	Event	HR bpm	PVCs /min	ST1 mV	ST2 mV	SpO2 %	
(17)17:24		60	---	0.00	0.00	98	
(17)17:23		60	---	0.00	0.00	98	
(17)17:22		60	---	0.00	0.00	98	
(17)17:21		60	---	0.00	0.00	98	
(17)17:20		60	---	0.00	0.00	98	
(17)17:19		60	---	0.00	0.00	98	
(17)17:18		60	---	0.00	0.00	98	
(17)17:17		60	---	0.00	0.00	98	
(17)17:16		60	---	0.00	0.00	98	
(17)17:15		60	---	0.00	0.00	98	
(17)17:14		60	---	0.00	0.00	98	
(17)17:13		60	---	0.00	0.00	98	

RES.

1min
▼

▲
▼
◀
▶

Record


Pic 3-9 Retrospection of trend table

The trend table data of the last 96-hour can be displayed at the resolution of: 1 minute, 5 minutes, 10 minutes, 30 minutes, 60 minutes.

The corresponding time for each group of trend data will be displayed at the left-most line. Those in the bracket are dates. Those listed under Event are marked events corresponding to the time of mark events. Parameters in trend table can be sorted into 10 groups :

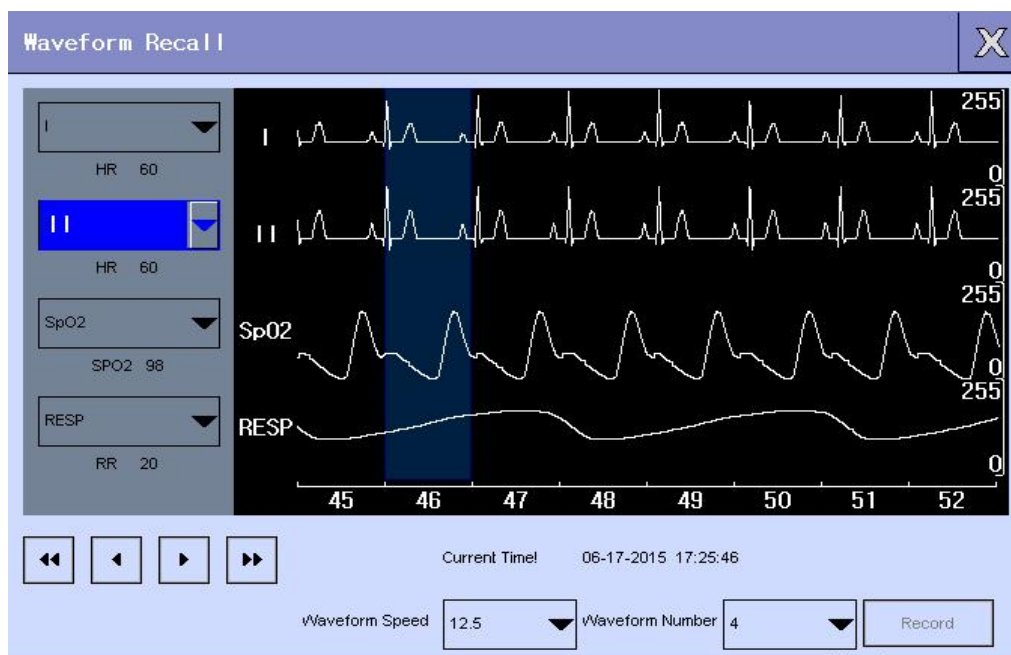
T1、T2、SpO2、PR、SYS、MAP、DIA、RR、HR、PVCs



Control time flip back and forth, to help the user to observe the early or late measurement data ,  Control parameters or so pages, to help users at different moments of parameter values.

3.3.5 Waveform retrospection

Press “**waveform retrospection**” , then refer to 3-10

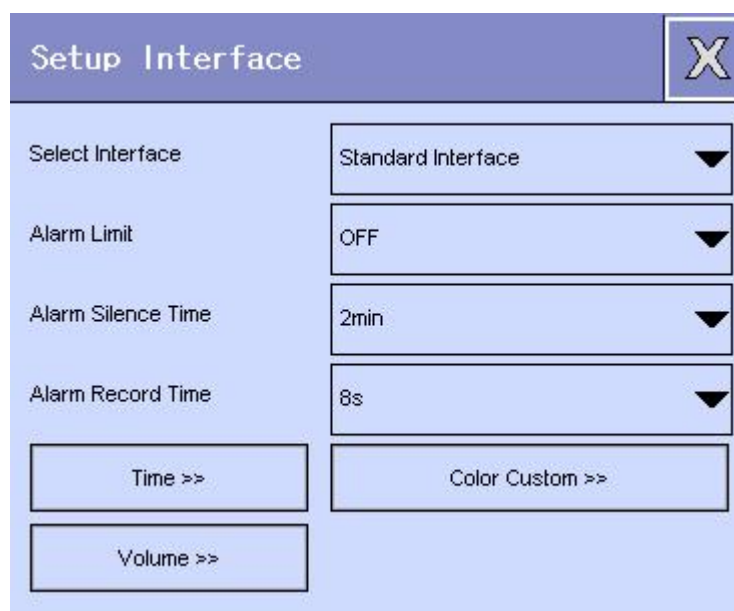


Pic 3-10 waveform retrospection

Page to review : “◀”, “▶” View the waveform of playback per second. “◀◀” and “▶▶” is to look at the waveform of playback Per minute.

3.4 Interface setup

Click “interface setup” in the "main menu" " option , then refer to 3-11



Pic 3-11 interface setup

In the "setup" interface menu, the user can make the following setup of the project :

3.4.1 Working interface choosing

In the "interface setup" menu select "work interface choice", you can see the current option is a standard interface. You can also choose other interface, in order to meet the needs of different departments.

3.4.2 Alarm limit display

In the "interface setup" menu select "alarm limit shows" item, you can choose to "off" and "open" two kinds of state, when choose "on", is in the parameter according to the area, will display the alarm on the lower limit value. Conversely, when choose "off" state, it does not show the alarm.

3.4.3 Alarm mute time

In the "interface setup" menu select "alarm" quiet time, turn the knob to set alarm mute. In the period of muting the alarm sound. Select alarm hang time has "a minute", "2 minutes"

3.4.4 Alarm record time

The monitor does not support this function.

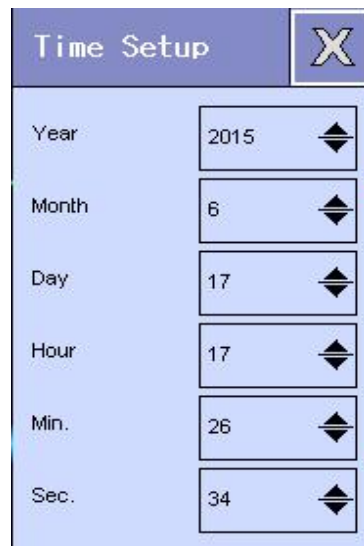


After setup the system alarm mute, if there is alarm occurs, the monitor can't send out alarm in time. As a result, the operator should be careful to use this feature.

If in silence or alarm suspended state, select the alarm volume for the "close", then the system will automatically end mute or alarm suspend state.

3.4.5 Time setup

In "interface setup" choose "time setup", then refer to 3-12 :



The 'Time Setup' dialog box has a title bar with 'Time Setup' and a close button (X). It contains six rows of time settings, each with a label, a text input field, and a spin button:

Label	Value
Year	2015
Month	6
Day	17
Hour	17
Min.	26
Sec.	34

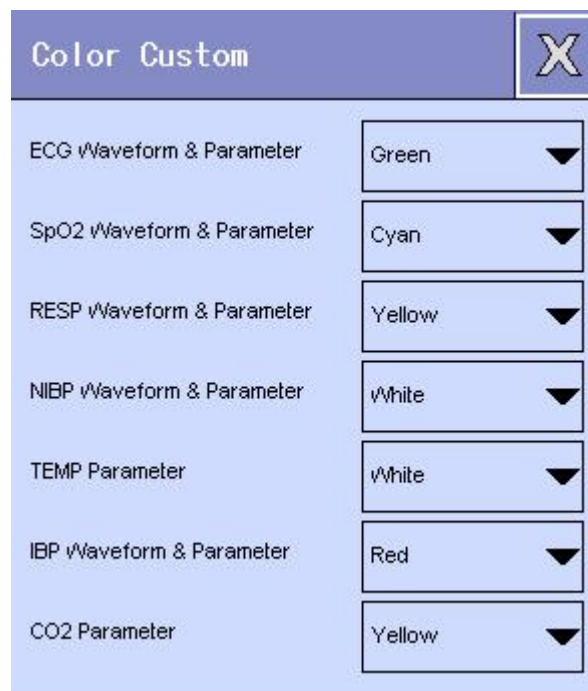
Pic 3-12 system time setup



- System time setup should be chosen to be the time when switched on, if users need to set up, and otherwise has time message content in the review, will likely provide information is not the right time.

3.4.6 Custom color

In the "interface setup" to choose "custom color" item, this is to define the display colors of waveform and parameters on screen, then refer to 3-13.



The 'Color Custom' dialog box has a title bar with 'Color Custom' and a close button (X). It contains seven rows of color settings, each with a label, a text input field, and a dropdown arrow:

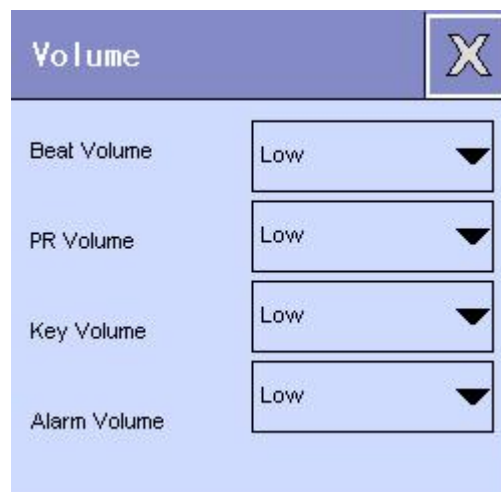
Label	Color
ECG Waveform & Parameter	Green
SpO2 Waveform & Parameter	Cyan
RESP Waveform & Parameter	Yellow
NIBP Waveform & Parameter	White
TEMP Parameter	White
IBP Waveform & Parameter	Red
CO2 Parameter	Yellow

Pic 3-13 custom color

3.4.7 Sound setup

In "interface setup" choose "sound setup", then refer to 3-14.

Can change the "volume" heartbeat, "pulse" volume ", "the keyboard volume" and "alarm volume", optional items are "high", "in", "low" and "off".



Pic 3-14 sound setup

Warning

When the system set the alarm volume is turned off, if has the physiological alarm occurs, the monitor can't send out alarm in time. As a result, the operator should be careful to use this feature. Except the technical report

3.5 Recording setup

(The monitor does not support this function)

3.6 Events setup

Press "main menu" "event setup", then refer to 3-15

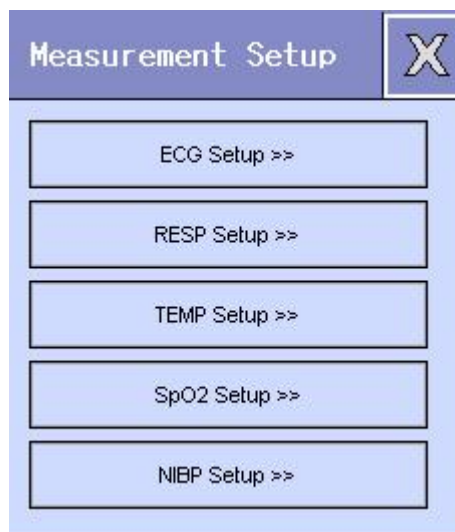


Pic 3-15 Events setup

Users can customize the four events, namely the events A, B, C and D, and in this menu, click on the corresponding event. For the clicked event, in the event will appear "@" sign in the box, click again to cancel the tag. The meaning of the event tag is to define and animals on the impact of monitoring parameters, situations, such as, injecting drugs, and various kinds of treatment, and the time displayed on the trend on the table/graph, to assist in analysis of incident moment animal parameters.

3.7 Measurement setup

In "main setup"press "measurement setup", then refer to 3-16



Pic 3-16 Measurement setup

Each of the parameters set specific content, please refer to respective sections.

3.8 Drug concentration calculate

Click on the "main menu" and "computing" dialog box, in the dialog box, click on the "drug concentration calculation" , then refer to Pic 3-17.

Pic 3-17drug concentration

1)Choose drug name, can choose from one of the 15 kinds of drug need drugs. Among them

A, B, C, D, E name can be defined by the user.

♦ drug A、 B、 C、 D、 E

♦ AMINOPHYLLINE

♦ISUPERL`

♦ DOBUTAMINE

♦LIDOCAINE

♦ DOPAMINE

♦NIPRIDE

♦ EPINEPHRINE

♦NITROGLYCERIN

♦ HEPARIN

♦PITOCIN

2) Is presented in this paper, the system will automatically enter the animal weight a set of

default values, these data do not as calculation results, and must according to the doctor's instructions input is known, the correct parameter value.

3) Input the correct parameter values

4) Confirm the correctness of the calculation results

3.9 Maintenance of animal monitor

Choose "maintenance" in the "main menu" item, the pop-up "maintenance" dialog box, as shown in figure 3-18. Password is only the company's designated repair personnel open.

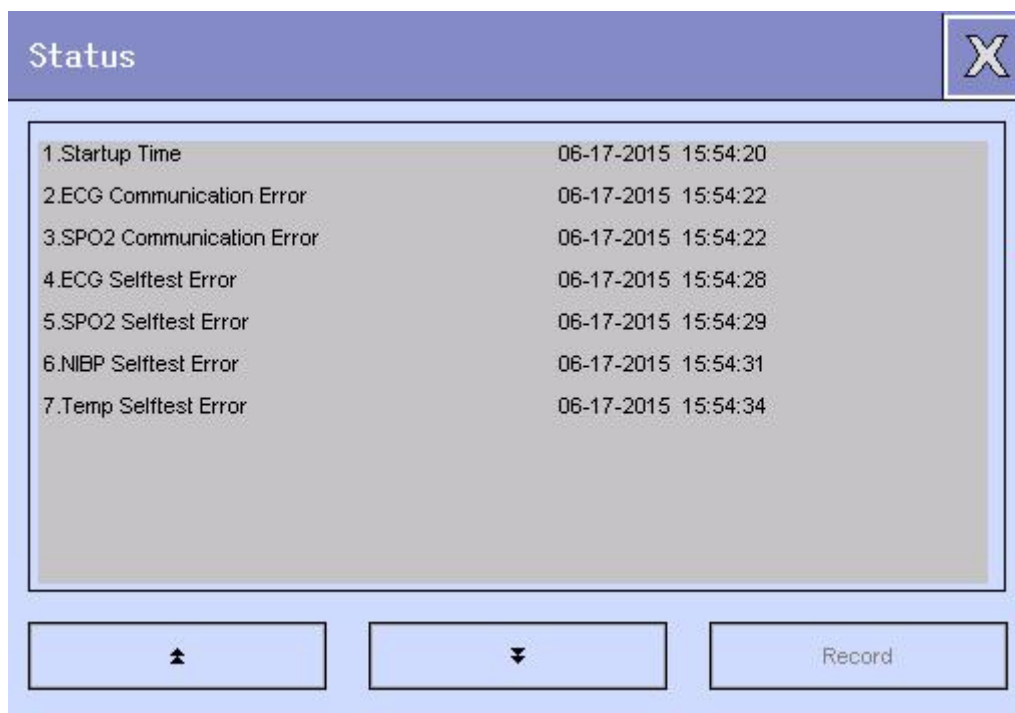


Pic3-18 Input maintenance code

3.9.1 Custom color

With the same "interface setup" as in "custom color" in the content.

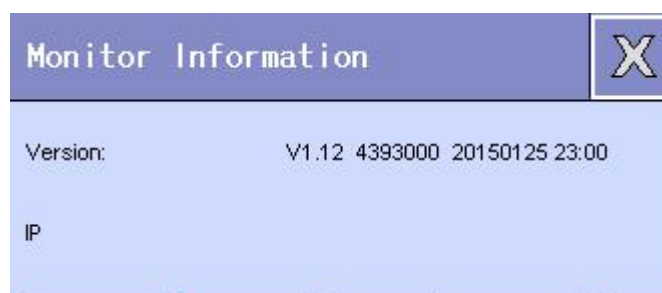
3.9.2 Machine State



Pic 3-19 System events

The user can through the system event to check the monitoring work.

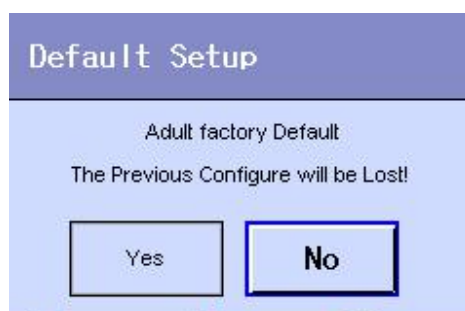
3.9.3 About



Pic 3-20 monitor information

Through the "monitor information" to view this configuration of the machine.

3.9.4 Default setup



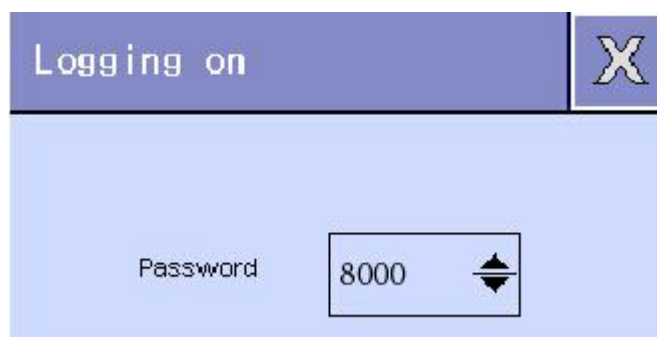
Pic3-21 Default setup

Select "yes" to save all types of current animal on figuration for the user to the default configuration.

Select "no", give up the current operation, the system is still keeping the original configuration content remains the same.

3.9.5 Demonstration function

In the "main menu", choose "demonstration function" items in a pop-up "input password demonstration" dialog box. After input the correct password, the system into the demo waveform condition. Demo waveform is manufacturer to show the machine performance, help users only simulation training and demo waveform. In the actual clinical use, forbidden demo waveform function, because it may make medical staff think it is monitoring waveforms and parameters, and it may affect animal care, delayed diagnosis and treatment of disease. This setup is with passwords, please refer to Pic 3-22.



Pic3-22 demonstration function

Chapter Four animals' Safety

The design of the portable animal 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.



This sign indicates that the component is an IEC 60601-1 type CF equipment. Its design is of special anti-shock protection (It is equipped with F type ground disconnecting isolation device particularly in allowable currency leakage.) and is suitable for use during defibrillation.



Keep away from animal, sickbed pr equipment during defibrillation.

Environment:

For ensuring the safety of the electric installation, please follow the following guidance's. Use environment of the portable animal monitor should reasonably be free of vibration, dust, corrosive or explosive gas, extreme temperature and humidity, etc. When installed in a cabinet, enough room should be kept at front for convenience of operation. When the door of the cabinet is opened, there should be kept enough room at back for maintenance. Good ventilation should be kept in the cabinet.

Monitoring system may satisfy technical index under the environmental temperature ranging

0°C ~ 40°C. If environmental temperature exceeds such a range, it may affect the accuracy of the equipment or component or circuit damage caused in. Min. 2 inches (5 centimeter) of interspaces should be kept around the equipment for good ventilation.

Requirement for power supply

Please refer to the chapter of Product Specification.

Condensation :

During working, the equipment must be kept free of condensation. When the equipment is moved from one room to another, condensation may be caused in. It is because the equipment has been exposed to humidity air and different temperatures.



Using in the place with inflammable anesthetic risks explosion.

◆ Interpretation for the signs used on animal monitor



Be careful. Refer to the attached document (this manual).



This sign indicates the application component belongs CF type design has a special anti-electric shock device, and is resistant to the defibrillator.



This mark shows that the application part BF type genus, the design of a special anti-electric shock devices.



This sign indicates the application components belongs to type B..



Power On/Off

Chapter Five Maintenance and Cleaning

5.1 Maintenance and Test

Before using this equipment, it is required to test:

- mechanical damage;
- all the exposed lead, insert and accessories;
- all equipment functions used to monitor animal, and ensure the equipment in working condition.

In case of any evidence found to indicate the damage of the equipment function, it is prohibited to use this equipment to monitor animal. Please contact the hospital biomedical engineer or maintenance technicians of our company.

Comprehensive functional test including security test must be performed once for every 6-12 months by qualified personnel and after each maintenance.



If hospital or medical units using the equipment have not a satisfied maintenance scheme available, failure of the equipment may be caused in and that may endanger health.

5.2 General cleaning

Caution: It is required to power off and disconnect power supply before cleaning this equipment and sensor.

This equipment must be placed in dust-free environment.

It is recommended to clean the casing surface and screen of display. Use non-corrosive cleanser, such as soap and purified water.

- Do not use strong solvent, like acetone.
- Be careful not to damage the animal monitor.

- Only after dilution can most of the cleansers be used. Please follow manufacturer's instruction to dilute the cleansers.
- Wear materials are strictly prohibited (for example, steel wool or silver polishing agent).
- Prevent any kind of liquid from entering into the casing. Immersion in liquid of any part of the system is strictly prohibited.
- Do not remain any cleaning liquid on surface of the equipment.

5.3 Application of Cleanser

Except the solutions listed under "Caution", any solutions classified as the product with following properties can be used as cleanser:

- Diluted ammonia
- diluted Sodium Hypochlorite (bleaching powder for washing)

Concentration range is from about 500ppm (1:100 diluted home use bleaching powder) sodium hypochlorite to 5000ppm (1:10 diluted home use bleaching powder), which is very effective.

The amount of ppm depends on the amount of organic matter (blood, animal and plant mucilage) on the surface to be cleaned and disinfected.

- Diluted formaldehyde 35 ~ 37%
- Hydrogen Peroxide 3%
- ethanol
- Isopropyl alcohol

Surface of the animal monitor and sensor may be cleaned with medical alcohol and dry it by natural wind or with clean and dry cloth.

Our company undertakes no liability for the effectiveness of the chemical products used for controlling infectious diseases.

Please consult your hospital infection control principal or experts on infectious disease.

5.4 Disinfection and Sterilization

For avoiding long term damage against the equipment, product sterilization is recommended to be performed only when it is necessary in the hospital maintenance scheme. Cleaning is also recommended for the product to be sterilized.

Recommended sterilization materials: ethanol, aldehyde.

Warning

- Follow manufacturer's instruction for dilution or adopt the lowest concentration possible.
- Keep liquid away from entering into the casing.
- Immersion of any part of the system is strictly prohibited.
- During sterilization, do not pour the liquid onto the system.
- Do not remain germicide on surface of the equipment. Please use a wet cloth to clean the leftover (if any).

5.5 Disinfection

For avoiding long term damage against the equipment, product sterilization is recommended to be performed only when it is necessary in the hospital maintenance scheme. Cleaning is also recommended for the product to be sterilized.

As for ECG lead, SpO2 sensor, blood pressure cuff, temperature probe, please refer to the content in related chapters.

Warning

Be careful not to damage the animal monitor. Do not disinfect the animal monitor with EtO or formaldehyde.

Chapter Six Alarm

- This chapter will introduce the general information concerning alarm and measures to be taken in case of alarm.
- Refer to the contents in related chapters involving parameter setup for the information of each parameter alarm and prompt.

6.1 General Introduction to alarm

The so-called alarm indicates the prompt sent by the animal monitor to the user when changes of vital signs of the animal being monitored are so important to arouse attention or failing in animal monitoring due to faults of the equipment.

6.2 Alarm Property

6.2.1 Type of Alarm

There are two types of alarm: If the alarm is caused by the changes of animal's vital signs, namely the physiological parameters of the animal being monitored exceeds the specified range or the animal is with physiological abnormality unable to be measured by overrun of a single physiological parameter, the alarm is named as physiological alarm; if the alarm is caused by the equipment, namely the alarm is caused by technical obstacles in using the animal monitor or failure of the equipment causing inaccurate monitor on the animal, the alarm is named as technical alarm.

Description	Type of alarm
The measured HR of animal is at 114BPM, which exceeds HR alarm range set by user.	Physiological alarm
Ventricular fibrillation is found on animal.	Physiological alarm
ECG measurement module detects fail of ECG lead.	Technical alarm
SpO2 measurement module is out of order.	Technical alarm

6.2.1.1 Classification of Physiological Alarms

There are two kinds of physiological alarms. One of them is that physiological parameters of the animal being monitored exceeds the specified range, while the other is that physiological abnormality of the animal is unable to be measured by overrun of a single physiological parameter.

The latter belongs to the alarm which can screen the former. They are:

Too weak of the ECG signal;

cardiac arrest; ventricular fibrillation/ventricular tachycardia ;

No pulse found;

RESP cardiac interference;

RESP asphyxia ;

Others belong to the former kind.

6.2.1.2 Alarm Level

Both technical alarm and physiological alarm have a level characteristic. The higher alarm level, the more watchful way of the alarm prompt given by the system. All technical alarm levels can not

be changed by users. Some of the physiological alarm levels can be set by users, while some of them are not permitted to changes after being designated by the system.

6.2.1.3 Removable Sound and Light

“Sound and light removable” indicates some technical alarms are changed to the prompt way of prompt, if operation pause is performed, no matter in timeout state or resumed to normal alarm state, the details are as below:

1. The capability driving sound and light alarm is removed, namely, no sound and light alarm performed.
1. The capability driving character is removed, namely, the color of under color will be changed to the same color as title under color.
2. After normal alarm state resumed, when this alarm is triggered, alarm is notified in way of normal alarm.

This kind of technical alarm is caused mainly by errors of lead fail in technical alarm, other errors beyond NIBP parameter alarm limit and normal use obstacle of the recorder.

6.2.1.4 Removing All

Removing all: press SILENCE key for pause state, this alarm may be removed, that is no more alarm prompt given; in pause state, this alarm will not be performed; when pause is terminated, alarm will not be performed until this alarm is re-triggered. Mainly are the communication errors in technical alarm and errors of module initialization.

6.2 Alarm Prompt Method

In case of alarm, sound and light, character prompts will be given.

6.3.1 Sound and Light Property

6-2 Sound and light properties for different levels of alarm

Alarm Level	Alarm Sound Properties	Alarm Light Properties
High	Mode: toot-toot-toot-----toot-toot, toot-toot-toot-----toot-toot; the alarm sound is given once for every 11 seconds (Interval counts from the beginning of this time to the beginning of next time.)	Alarm indicator flashes in red color and high frequency.
Middle	Mode: toot-toot-toot; the alarm sound is given once for every 25 seconds (Interval counts from the beginning of this time to the beginning of next time.)	Alarm indicator flashes in yellow color and low frequency.
Low	Mode: toot-; the alarm sound is given once for every 25 seconds (Interval counts from the beginning of this time to the beginning of next time.)	Alarm indicator keeps lighting in yellow.

6.3.2 Character property

Under color: red color is for high level of alarm, yellow color is for middle and low level of alarms.

Color of character string: Except prompt area of NIBP technical alarm, without reference to alarm level, is always black. Character string color displayed in NIBP technical alarm prompt area has

nothing to do with level of alarm. High alarm is displayed in red color, middle and low level of alarms are displayed on yellow. When physiological alarm is caused by alarm exceedance of measuring parameter, the parameter value will trigger the alarm flashes. Sing of “***” displayed in the information area at top right of the screen indicates the occurrence of alarm, its color is red. If it is a technical alarm, there is no prompt sign of “*” displayed in the information area.

6.3.3 Others

If various levels of alarm occur at the same time, sound and light prompt will be given by the highest level of the current alarms.

6.4 Alarm State

6.4.1 General Introduction to Alarm State

Each alarm has two states: triggering state and removing state. Only one state is available for the same period of time.

Triggering state: state of alarm existence

Removing state: state of alarm inexistence

At the beginning of work, all possible alarms are in the removing state. Afterwards, when alarm conditions are to be satisfied, alarm enters into triggering state.

The whole alarm system (all alarms) has the following states:

1. Normal state: alarm is in triggering state and able to give all prompts (including sound, light and character).
2. Alarm timeout state: alarm is in triggering state, but temporarily gives no sound, light and character prompt.
3. Alarm mute state: alarm is in triggering state giving light and character prompt, but gives no

sound prompt.

4. Alarm sound closedown state: alarm volume is at 0.

Only one state is available for the whole alarm system at the same period of time.

6.4.2 Alarm Mute State

Alarm mute state means that all sounds (including sounds of alarm, key and pulse) of the animal monitor are closed down.

6.4.3 Alarm Sound Closedown State

Alarm sound closedown state means that all other sounds are not closed down with the exception of sound of alarm prompt.

6.4.4 Alarm Pause State

During alarm pause, the followings may be dealt with:

Forbid sound and light prompts for all alarms.

Forbid character prompt for all physiological alarms.

The left time for alarm pause is displayed in physiological alarm description area.

Changing alarm prompt of sound and light removable alarm to prompt.

Removing alarm prompt of complete removable alarm.

6.4.5 State Switch-over

In normal state:

1. Short press SILENCE key ($< 2s$) to enter into alarm timeout state; long press

PAUSE/SILENCE key ($\geq 2s$) to enter into alarm mute state.

In alarm timeout state:

2. Short press SILENCE key (< 2s) to enter into normal state; long press SILENCE key (≥ 2s) to enter into alarm mute state.
3. If no pressing key during timeout, enters into normal state.
4. During timeout, if there are new alarms, alarm timeout state will be ended, enters into normal state.
5. During timeout, if there are new physiological alarms, the system will be still in alarm timeout state.

In alarm mute state:

1. The current alarm mute state will be ended to enter into normal state in case of occurrence of either new technical alarms or new physiological alarms.
2. Short press SILENCE key (< 2s) to enter into timeout state; long press SILENCE key (≥ 2s) to enter into normal state.

In any states:

1. In user setup, setup alarm sound to Off, the system enters into alarm off state.
2. In user setup, setup alarm sound to On, the system enters into alarm on state.

6.3 Alarm Method

6.5.1 General Introduction

There are two alarm methods: latch-up and latch-out.

Latch-up: when alarm conditions are inexistent, the property that the system still gives this alarm prompt is called latch-up method. Only after resetup the alarm system can inexistent alarm not be notified.

Latch-out: when alarm conditions are inexistent, the property that the system gives no alarm prompt is called latch-out method.

6.5.2 Scope of Application

All physiological alarms may work in latch-up method.

All technical alarms can work only in latch-out method.

6.5.3 Latch-up Alarm Prompt

When an alarm is latched up (meaning that this alarm happened, but the alarm was not in triggering state), prompt methods of this alarm will have the following changes:

1. Measuring parameters and relevant alarm limit stop flashing.
2. After prompt lemma of alarm description, there is the system time for entering last time triggering state.

6.5.4 Removing Latch-up Method

Removing latch-up method is also names as alarm reset. Users may use alarm timeout function to reset alarm. When alarm latch-up is removed, the alarms those happened and with inexistent alarm conditions due to latch-up method yet give still alarm prompts will be removed.

When it is working under latch-out method, alarm timeout key on keyboard module has only timeout function but without function of reset.


6.6 Alarm setup

In main menu, once enter the alarm setup button; there will be one menu as PIC 6-1.



Pic 6-1 Alarm setup

Each parameter alarm setup is in the corresponding menu, and USER can set the limit and the status.

When a certain parameter alarm is closed down, there will be a prompt sign of “” displayed in parameter display area. Alarm On/Off for each parameter can be set separately.

As for set alarm parameter, when a certain parameter or couples of parameters exceed alarm limit, the animal monitor will automatically give alarm and deals with the followings:

- 1) Appearing prompt on screen, the method is as mentioned in alarm method;
- 2) If alarm volume is set, the alarm sound will be given according to the set alarm level and alarm volume;
- 3) Alarm indicator flashes (if available);

6.6.1 ECG alarm setup

Selecting ECG alarm setup will appear:

ECG Alarm Setup				
Parameter	ON/OFF	Alarm HI	Alarm LO	Level
HR	ON ▼	120 ▲▼	50 ▲▼	Medium ▼
ST	OFF ▼	0.20 ▲▼	-0.20 ▲▼	Medium ▼
PVCs	OFF ▼	10 ▲▼		Medium ▼

PIC 6-2 ECG alarm setup

1) "HR" setup :

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF, the alarm voice and the alarm display will turn off .But technical alarm unrestricted.
- Alarm upper limit: used to set HR alarm upper limit.
- Alarm lower limit: used to set HR alarm lower limit.
- Alarm level: "High", "Middle" and "Low" are available for option. "High" means the most dangerous alarm.

2) "ST" setup :

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF, the ST alarm voice and the ST alarm display will turn off .But technical alarm unrestricted.
- Alarm upper limit: used to set ST alarm upper limit.
- Alarm lower limit: used to set ST alarm lower limit.
- Alarm level: "High", "Middle" and "Low" are available for option. "High" means the most dangerous alarm.

3) "PVCs" setup :

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF, the PVCs alarm voice and the PVCs alarm display will turn off .But technical alarm unrestricted.

- Alarm upper limit: used to set PVCs alarm upper limit.
- Alarm lower limit: used to set PVCs alarm lower limit.
- Alarm level: “High”, “Middle” and “Low” are available for option. “High” means the most dangerous alarm.

6.6.2 SPO2 alarm setup

Selecting ECG alarm setup, pop-up:

Parameter	ON/OFF	Alarm HI	Alarm LO	Level
SpO2	ON ▼	100 ▲▼	90 ▲▼	Medium ▼
PR	ON ▼	120 ▲▼	50 ▲▼	Medium ▼

Pic 6-3 SpO2 Alarm Setup

1) “SPO2”setup :

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF ,the SPO2 alarm voice and the SPO2 alarm display will turn off .But technical alarm unrestricted.
- Alarm upper limit: used to set SPO2 alarm upper limit.
- Alarm lower limit: used to set SPO2 alarm lower limit.
- Alarm level: “High”, “Middle” and “Low” are available for option. “High” means the most dangerous alarm.

2) “PR”setup

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF, the PR alarm voice and the PR alarm display will turn off .But technical alarm unrestricted.
- Alarm upper limit: used to set PR alarm upper limit.
- Alarm lower limit: used to set PR alarm lower limit.

- Alarm level: “High”, “Middle” and “Low” are available for option. “High” means the most serious alarm.

6.6.3 TEMP alarm setup

Selecting TEMP alarm setup, pop-up:

Parameter	ON/OFF	Alarm HI	Alarm LO	Level
T1	ON	39.0	36.0	Medium

Pic 6-4 TEMP Alarm setup

1) “T1”setup

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF ,the T1 alarm voice and the T1 alarm display will turn off .But technical alarm unrestricted.
- Alarm upper limit: used to set T1 alarm upper limit.
- Alarm lower limit: used to set T1 alarm lower limit.
- Alarm level: “High”, “Middle” and “Low” are available for option. “High” means the most dangerous alarm

2) “TD”setup

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF, the TD alarm voice and the TD alarm display will turn off .But technical alarm unrestricted.
- Alarm upper limit: used to set TD alarm upper limit.
- Alarm lower limit: used to set TD alarm lower limit.
- Alarm level: “High”, “Middle” and “Low” are available for option. “High” means the most

dangerous alarm.

6.6.4 NIBP alarm setup

Selecting NIBP alarm setup, pop-up:

Parameter	ON/OFF	Alarm HI	Alarm LO	Level
SYS	ON ▼	160 ▲▼	90 ▲▼	Medium ▼
DIA	ON ▼	90 ▲▼	50 ▲▼	Medium ▼
MAP	ON ▼	110 ▲▼	60 ▲▼	Medium ▼

Pic 6-5 NIBP alarm setup

1) “SYS”systolic pressure setup :

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF, the SYS alarm voice and the SYSalarm display will turn off .But technical alarm unrestricted.
- Alarm upper limit: used to set SYS alarm upper limit.
- Alarm lower limit: used to set SYS alarm lower limit.
- Alarm level: “High”, “Middle” and “Low” are available for option. “High” means the most dangerous alarm

2) “DIA” diastolic pressure setup :

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF ,the DIA alarm voice and the DIA alarm display will turn off .But technical alarm unrestricted.
- Alarm upper limit: used to set DIA alarm upper limit.
- Alarm lower limit: used to set DIA alarm lower limit.
- Alarm level: “High”, “Middle” and “Low” are available for option. “High” means the most

dangerous alarm

3) “MAP”mean blood pressure setup:

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF, the MAP alarm voice and the MAP alarm display will turn off .But technical alarm unrestricted.
- Alarm upper limit: used to set TD alarm upper limit.
- Alarm lower limit: used to set TD alarm lower limit.
- Alarm level: “High”, “Middle” and “Low” are available for option. “High” means the most dangerous alarm.

6.6.5 RESP alarm setup

Selecting“RESP alarm setup” , pop-up:



Parameter	ON/OFF	Alarm HI	Alarm LO	Level
RR	ON ▼	30 ▲▼	8 ▲▼	Medium ▼

Pic 6-6 RESP alarm setup

“RESP”setup :

- Alarm Switch : User can choose turn on /off this parameter alarm .If selecting OFF ,the RESP alarm voice and the RESP alarm display will turn off .But technical alarm unrestricted.
- Alarm upper limit: used to set RESP alarm upper limit.
- Alarm lower limit: used to set RESP alarm lower limit.
- Alarm level: “High”, “Middle” and “Low” are available for option. “High” means the most dangerous alarm

6.7 Power-on Lead fail

At power-on, if parameter module opened has not lead connection, the followings will be dealt with:

1. As for ECG or SPO2 module, change alarm prompt of lead fail to prompt (that is sound and light are automatically removed), and then notify the user.
2. For other modules, there is no lead fail alarm given.

6.8 Measures Taken in Case of Alarm



When a certain alarm occurs, animal's status is to be firstly checked.

Alarm information is displayed in system information area or system alarm information area. This alarm is required to be recognized and corresponding measures should be taken according to alarm reasons.

- 1) Check status of the animal;
- 2) Recognize which parameter is giving alarm or which kind of alarm is happening;
- 3) Recognize alarm reason;
- 4) Alarm is mute if needed;
- 5) After alarm status is released, check if alarm is removed.

Refer to chapters of parameter monitoring for alarm information and prompt of the parameter.

Chapter Seven Electrocardiogram and Respiration

(ECG/RESP)

7.1 ECG Monitoring Instruction

7.1.1 Definition of ECG Monitoring

ECG monitoring produces continuous waveform of the animal's ECG activity. It is used for evaluating physiological state of the animal accurately at that time. Ensure normal connection of ECG cable for correct measuring value. In normal working state, the portable animal monitor displays two ECG waveforms at the same time.

- Use 5-lead device for monitoring. ECG may acquire two kinds of waveform from the two different leads.
- Parameters displayed by the animal monitor include HR, ST segment measuring value and arrhythmia (optional)
- All the above mentioned parameters can be served as alarm parameters.

7.1.2 Precautions for ECG Monitoring

 **Warning** 

During defibrillation, keep it away from animal, table or equipment.

 **Warning** 

It is a must to use ECG cable provided by our company for ECG signal monitoring with the portable animal monitor.

 **Warning** 

When connecting pole or cable, ensure that they do not contact with other conductive parts or

ground. Particularly, endure that all ECG poles including neutral pole adhere closely to animal to prevent them from contacting with conductive parts or ground.

 **Warning** 

ECG cable with no resistance can not be used for defibrillation on the animal monitor; it is also can not be used for defibrillation on other animal monitors if it is not equipped with a current-limiting resistance defibrillation.

 **Warning** 

Interference from the unearthed instruments near the animal and ESU may cause problems to the waveform.

If under rule EN60601-1-2 to operate (anti-radiation capacity is 3 v/m), if more than 1 v/m of the electric field intensity may cause measurement errors in various frequencies. Therefore, we suggest that don't using electricity radiation equipment near the electrocardiogram (ECG)/breathing measurements.

7.2 Operation Methods of ECG Monitoring

7.2.1 Preparation

- 1) Make skin preparation of the animal before placing poles;
- Skin is a poor conductor. Therefore, animal's skin preparation is very important for a good contact between the poles and skin.
 - If necessary, give a shaving for placing the poles.
 - Clean the skin with soap and water (Aether and pure alcohol are prohibited, because they will increase skin impedance).

- Rub the skin dryly to increase tissue's blood stream of the capillary vessels, and remove the skin scale and lipid.

2) Install pinchcock or snappers before placing the poles.

3) If poles without conductive paste, apply conductive paste onto the poles before placing them on the animal.

4) Connect pole lead with animal cable.

5) Make sure that the power is on.

 **Warning** 

Check whether the ECG pole stimulate skin or not every day. If there is an allergic evidence found, replace the pole or change their position once every 24 hours.

 **Warning** 

It is necessary to check if the leads are normal before monitoring. After plugging out the ECG cable, "Sensor failing" will be displayed on the screen and sound alarm will be triggered.

 **Attention** 

In order to protect the environment, the used pole must be reclaimed or properly disposed.

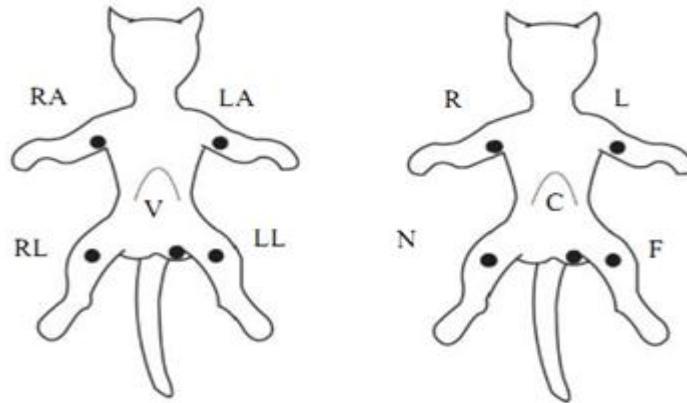
7.2.2 Installation of ECG Lead

Position of ECG Monitoring Poles

The way to place n5-lead device pole is shown in picture 7-1.

- Red (right arm) pole - place under clavicle close to right shoulder.
- Yellow (left arm) pole - place under clavicle close to left shoulder. Place onto chest as shown in the following picture.

- Black (right leg) pole — place at lower right abdomen.
- Green (left leg) pole — place at lower left abdomen.
- White (Chest) pole — place onto chest as shown in picture 7-1.



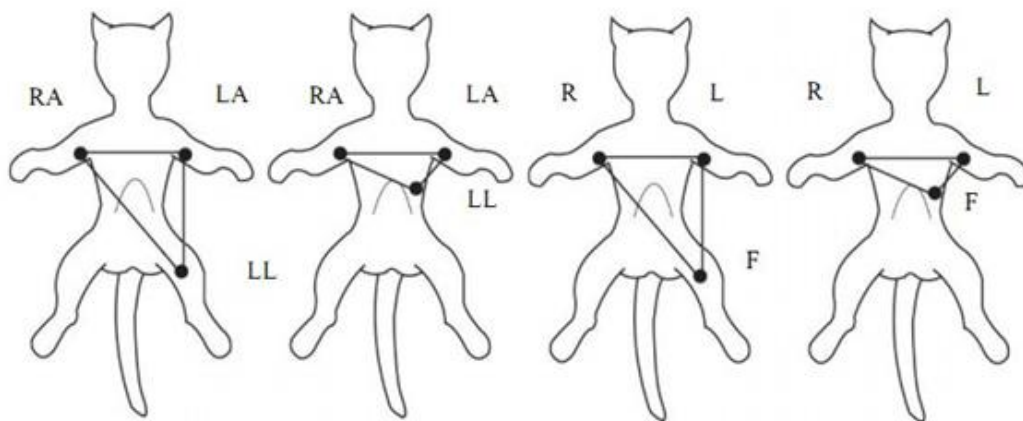
Pic 7-1 Position of 5-lead Pole

RA:white; LA:black; V:brown; RL: green; LL: red

Picture 8-1 Position of 5-lead Pole

RA:white; LA:black; V:brown; RL: green; LL: red

Picture 8-2 Position of 3-lead Pole



Pic 7-2 Position of 3-lead Pole



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

- As for 5-lead configuration, place chest (v) lead pole onto one of the following positions, as

shown in picture 8-2:

- V1 is at the fourth right ICS.
- V2 is at the fourth left ICS.
- V3 is at middle position between V2 and V4.
- V4 is at fifth left clavicle midline.
- V5 is at left front axillary line, being on a horizontal plane as V4.
- V6 is at midaxillary line, being on a horizontal plane as V4.
- V3R-V7R is at right thoracic wall corresponding to the left.
- VE is at apophysis of processes xiphoideus. As for back “V” lead placement, it is required to place “V” pole onto one of the following positions.
- V7 is at back the fifth left posterior line.
- V7R is at back the fifth right posterior line.



Lead names of USA standard and European standard are listed in the following table (R, L, N, F, C denote lead in European standard, while in USA standard, RA, LA, RL, LL, V are used instead.)

USA		Europe	
Name of lead	Color	Name of lead	Color
RA	white	R	red
LA	black	L	yellow
LL	red	F	green
RL	green	N	black
V	brown	C	white

ECG Lead Connection Recommended to Surgical animal



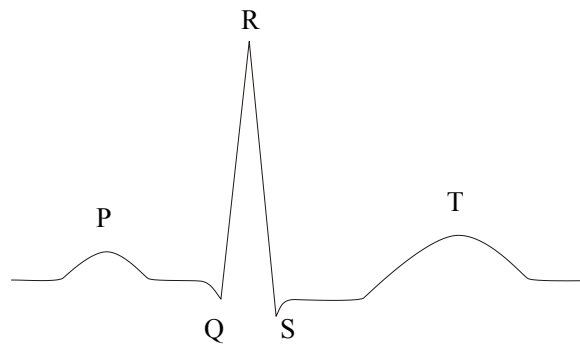
When using ES equipments, place ECG pole at the middle position between ES earth-plate and ES knife to avoid burn. Cables of ES equipments and ECG can not be intertwined.

Placement of ECG lead depends on the type of operation. For example: for thoracotomy, poles may be placed at thorax lateral or dorsal. In operation room, because ES knife is used, sometimes fake difference may affect ECG waveform. For reducing fake difference, the pole may be placed at left and right shoulder, close to left and right side of abdomen. Axillary lead may be placed at left side of axillary center. Do not place the pole onto the upper arm, otherwise, ECG waveform may be very small.

A good signal characteristics :

- Tall narrow without notch.
- R wave height, completely located above or below the baseline
- Pacemaker is not greater than the height of the R wave signal
- T wave less than 1/3 of the R wave height.
- P wave should be much smaller than T wave

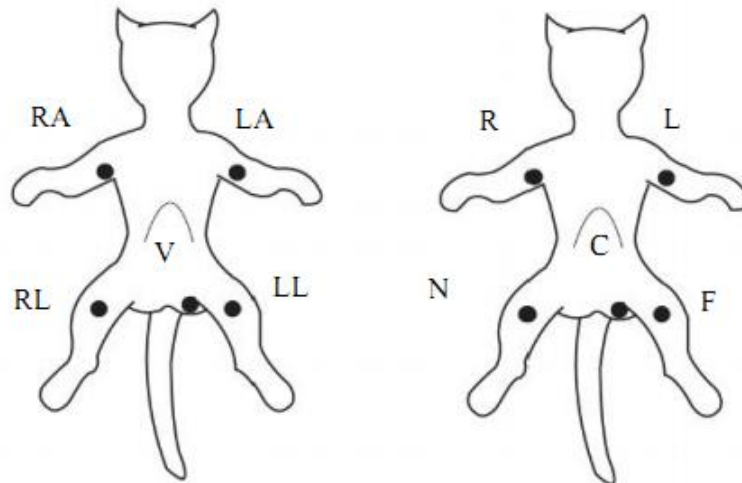
In order to obtain 1 calibration of millivolt ECG wave, should carry on the ECG calibration, this moment the screen show “calibration not care the animal”.



Pic 7-3 Standard ECG waveform

Using 5-lead ECG Device

Users may arrange lead on P1 and P2 according to their own need. The names of lead on the two channels are displayed at left side of the corresponding waveforms, which can be changed in ECG menu. Proper lead can be selected among I, II, III, AVR, AVL, AVF, V through P1 and P2 respectively as shown in picture 8-3. When user selects the same lead, the animal monitor automatically changes it to different lead.



Pic 7-4 ECG leads



If the pole is stacked correctly, but ECG waveform is incorrect, replacing lead is required.



Interference from unearthed instruments near the animal and ESU may cause in problems to

waveform.

7.3 ECG Menu

7.3.1 Setup Menu

“Main Menu”→“ Meas Setup”→“ECG Setup”,as shown in picture 7-5

- Alarm recording: The monitor does not support this function.
- ECG 1 : you can choose “I、 II、 III、 aVR、 AVL、 aVF and V”
- ECG 2 : you can choose“I、 II、 III、 aVR、 AVL、 aVF and V”
- ECG1 Gain : Can choose to calculate channel gain , gain include $\times 0.25$ $\times 0.5$ 、 $\times 1$ 、 $\times 2$ 、 automatic.
- ECG2 Gain : Can choose to calculate channel gain , gain include $\times 0.25$ $\times 0.5$ 、 $\times 1$ 、 $\times 2$ 、 automatic.



If too strong of the input signal, cutoff peak of wave crest is possible. At the time, user may change ECG waveform increase level manually according to actual waveform to avoid incomplete waveform provided.

ECG Setup			
Alarm Record	OFF	Waveform Speed	25.0
ECG 1	II	Filter	Diagnosis
ECG 2	I		
ECG1 Gain	x1		
ECG2 Gain	x1	ST Analysis >>	
HR Source	ECG		
HR Channel	Channel1	Other Setup >>	
Lead Type	5 Leads	Alarm Setup >>	

Pic 7-5 ECG setup

■ Source of HR

ECG, SOP2 may be selected freely to test HR; if selecting “Automatic”, the animal monitor will decide the source of HR according to the quality of signal; if selecting “Simultaneity”, the animal monitor will display HR and PR at the same time . If provided by SPO2, PULSE will be notified and PR sound available.

When SPO2 is selected for the source of HR, HR alarm judgment will not be performed, but PR alarm judgment performed.

When selecting the option of “Select all”, PR measurement value will be displayed at right of main screen SPO2; HR and PR alarms are given at the same time. Heart beating sound is subject to HR.

If HR is with data, there will be with sound prompt. If there are no HR data, there will be sound prompt for PR.

■ Channel: “P1”means to calculate HR with waveform data of the first ECG waveform.

- Type of lead: 5-lead and 3-lead are optional.
 - Waveform speed : Three options of ECG scanning speed of 12.5 , 25.0 and 50.0mm / s are available.
 - Filtering type : More clean and precise waveform can be acquired through filtering.
- Three filtering methods are available for option. Under diagnosis mode, unfiltered ECG waveform will be displayed; monitoring method will filtered fake difference possibly causing fake alarm; in operation room, operation method can reduce fake difference and interference from ES equipments.
- ST Segment analysis : This switch is used to set the state of ST segment analysis, when switch on, ST segment analysis can proceed.
 - Other setup: ECG monitoring type、Heart beating volume and Pacing analysis ref to picture 7-9
 - Alarm setup : the "main menu" in the "set alarm" , Picture 6.6.1

Attention

Set alarm upper and lower limit according to the clinical status of each animal.

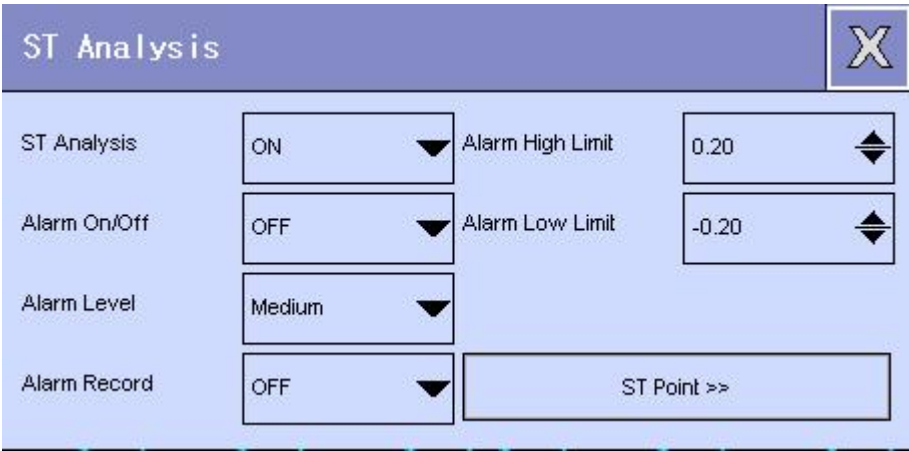
Upper limit of HR alarm is very important for monitoring. The upper limit should not be set to the extreme high. Taking change into consideration, do not set HR alarm upper limit 20 beats/minute higher than HR of the animal.

7.3.1.1 ST segment analysis


Attention

When opening ST segment analysis, the animal monitor is in a “Diagnosis” method. User may change it to “Monitoring” or “Operation” method according to need, but at this period of time ST segment value is seriously distorted. The system can only provide the basic situation of the ECG, for ST segment analysis it will have great influence. Under the mode of operation, ARR analysis

results may also have some influence. When the disturbance is small, adopts the model of diagnosis for animal care.



Pic 7-6 ST segment analysis

- ST segment analysis: This switch is used to set the state of ST segment analysis. Only the switch on can perform ST segment analysis.
- ST alarm: if selecting “On”, alarm prompt and storing will be performed in case of ST analysis result alarm; while, if selecting “Off”, there will be no alarm given and prompt of “” will be displayed by ST2 in the screen parameter area.
- Alarm level: used to set ST alarm level. Three options of “High”, “Middle” and “Low” are available.
- Alarm recording: The monitor does not support this function.
- Alarm upper limit: used to set ST segment alarm upper limit. The max. Limit is 2.0, while the min. limit value must be 0.2 higher than the value set.
- Alarm lower limit: used to set ST segment alarm lower limit. The min. limit value is -0.2, while the max. Limit value must be 0.2 lower than upper limit set.

Adjustment range of alarm upper limit and lower limit:

	Max. upper limit	Min. lower limit	single time adjustment
ST	2.0mv	-2.0mv	0.1 mv



Attention

During making ST segment analysis, abnormal QRS wave group has not been taken into consideration.

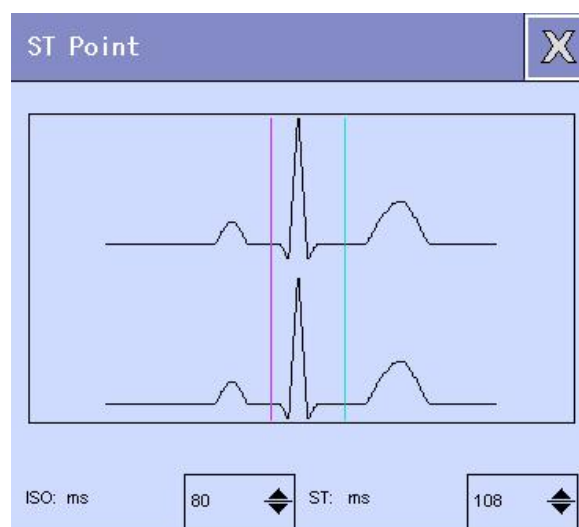
- ST segment measuring position :Select this option to enter into “Decide ST segment analysis point” window to set the values of ISO and ST as shown in picture 7-8

1) ISO (base point) : Set baseline point. Power-on setup: 80 milliseconds

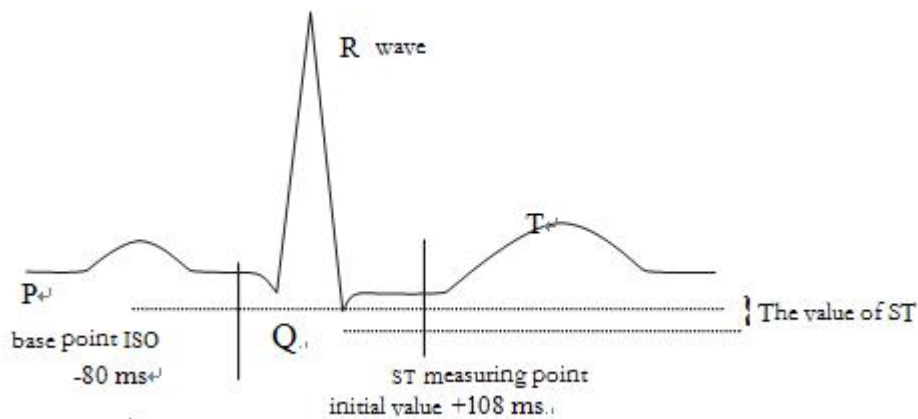
2) ST (start point) : Set measuring point. Power-on setup: 108 milliseconds

ISO, ST is ST segment two measurement points, the two measurement point can be adjusted.

Sets the reference point of R wave point of the ST measurement point (as shown in Picture 7-7):



Pic 7-7 ST segment measuring position



Pic 7-8 ST analysis points.

⚠Attention⚠

If HR or ECG waveform of the animal has obvious changes, ST measuring point is required to make adjustment. The method is as below:

- **Method for ISO and ST adjustment**

Adjust the value through turning the knob.

When setup ST segment measuring point, open the window of “Decide analysis point”, at the time, QRS wave group module is displayed in the window (if the channel is not opened, notify “ST analysis switch off”), position of high brightness line in the window is adjustable, select ISO or ST firstly, then turn the knob in direction of left and right to move the brightness line in parallel to decide base point or measuring point.

- **ST segment analysis of alarm and tips information**

Tables below describe the possible physiological alarms, technical alarms and prompt messages occurring during ST measurement.

Physiological alarms:

Message	Cause	Alarm Level
ST TOO HIGH	ST measuring value is above upper alarm limit.	User-selectable
ST TOO LOW	ST measuring value is below lower alarm limit.	User-selectable

Technical Alarm :

Message	Cause	Alarm Level	Remedy
ST ALM LMT ERR	Functional Safety Trouble	HIGH	If necessary, re-start the monitor. If failure persists, stop using measuring function of ST segment, notify biomedical engineer or Our service staff.

Prompt message:(Concluding common alarming message) :

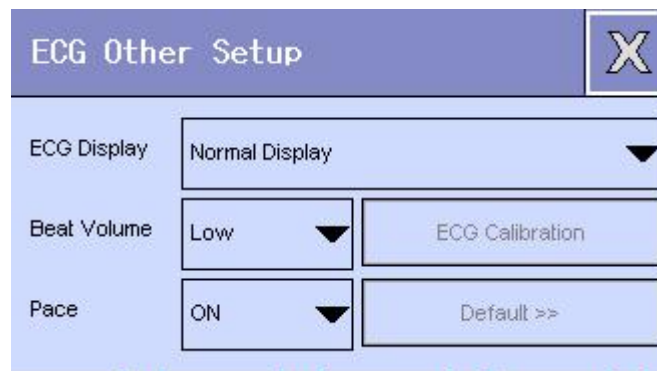
Message	Cause	Alarm Level
ST LMT ERR	ST measuring value is beyond the limit	HIGH



- When alarm limits of two ST measurement values are the same, alarm limit for each channel is not able to be set separately.

Among physiological alarms, those belonging to the type that the parameter has exceeded the limits may activate the recorder to automatically output the parameters and related measured waveforms when the alarms occur on the condition that the alarm record switch in the related menu is On.

7.3.1.2 ECG Other setup



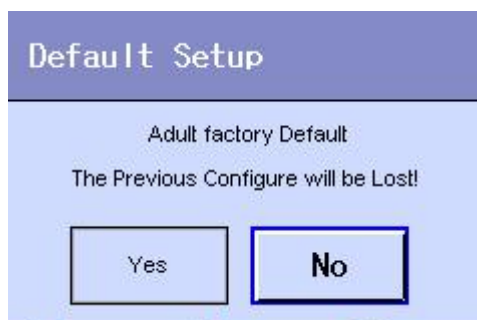
Pic 7-9 ECG other setup

There are the following functions in sub-menu:

- ECG monitoring type: if selecting “Normal display”, two ECG waveforms in 5-lead will be displayed. If selecting “full screen multi-lead display”, six ECG waveforms will be displayed in the screen waveform area.
- Heart beating volume: Volume level of "low" and "in" and "high" are optional.
- Pacing analysis: when selecting “On”, a row of small dots will be displayed in ECG waveform area. ; “Off”: It will close the pacemaker analysis function.
- ECG calibration: When selecting this option, ECG waveform will be automatically calibrated.

- Default configuration: Select this option to enter into ECG default configuration dialog box.

System default configuration can be selected. As shown in the picture :



Pic 7-10 Default setup

Selecting“YES” , save all present animal configuration as the default configuration.

Selecting“NO” , cancel correct operation , system default configuration will stay still

7.4 ECG alarm Information

Alarm Information

During ECG measuring, possible alarms are divided into physiological alarm and technical alarm.

Meanwhile, various kinds of prompt may be produced during ECG measuring. When these alarm and prompt occur, refer to the relevant descriptions in alarm function chapter for visual and aural representations of the animal monitor. On the display, physiological alarm and general prompt (general alarm) are displayed in alarm area, while, technical alarm and the prompt of alarm unable to be triggered are displayed in the information area of the animal monitor.

Tables below describe the possible physiological alarms, technical alarms and prompt messages occurring during ECG measurement.

Physiological alarms

Message	Cause	Alarm Level
---------	-------	-------------

ECG SIGNAL LOW	animal's ECG Signal can't be detected	HIGH
HR TOO HIGH	HR measuring value is above the upper limit	User-selectable
HR TOO LOW	HR measuring value is below lower alarm limit.	User-selectable

Technical alarms :

Message	Cause	Alarm Level	Remedy
ECG SENSOR OFF	ECG sensor, lead or pole is not properly connected or has fallen off.	Low	Make sure that ECG sensor, leads and poles are properly connected.
ECG LL Lead off or ECG F lead off			
ECG LA Lead off or ECG L Lead off			
ECG RA Lead off or ECG R Lead off			
ECG INT RAM ERR	ECG measuring module	HIGH	If necessary,

ECG INT RAM ERR 1	technical failure		re-start the monitor. If failure persists, stop using measuring function of module, notify biomedical engineer or Our service staff.
ECG INT RAM ERR 2			
ECG INT RAM ERR 3			
ECG INT RAM ERR 4			
ECG INT RAM ERR 5			
ECG INT RAM ERR 6			
ECG INT RAM ERR 7			
ECG INT RAM ERR8			
ECG COMM STOP	ECG module communication failure	HIGH	Same as above
ECG COMM ERR	Accidental communication Failure	HIGH	Same as above
HR ALM LMT ERR	Functional safety failure	HIGH	Same as above

ECG SIGNAL NOISY	ECG measuring value is disturbed too much	LOW	Keep animal calm , Ensure poles fit close and ground line is working completely .
------------------	---	-----	---

Prompt message:(Concluding common alarming message) :

Message	Cause	Alarm Level
HR limit err	HR measuring value is beyond the limit	HIGH

7.5 Respirometry

How to measure respiration?

The animal monitor measures respiration from the thorax impedance value of the two poles. The impedance changes (caused by activity of thorax) of the two poles will produce a respiration wave on the screen.

Setup Respiration Monitoring

No more poles are needed to monitor respiration, but placement of poles is very important. Because of clinical status of part of the animals, lateral expansion of their thoraxes cause in negative thorax internal pressure. Under such circumstances, it is better to place the two respiration poles onto midaxillary line and the max. Movement area in case of thorax left respiration to acquired the best respiration wave.



Respiration monitoring is not suitable for the very large movement range animal, because it may cause in false alarm.

RESP monitoring inspection:

- 1) Make animal's skin preparation before placing poles.
- 2) Mount pinchcock or snapper onto the pole, and place the poles onto the animal according to the method as shown in the following picture.

Placing poles for respiration measurement



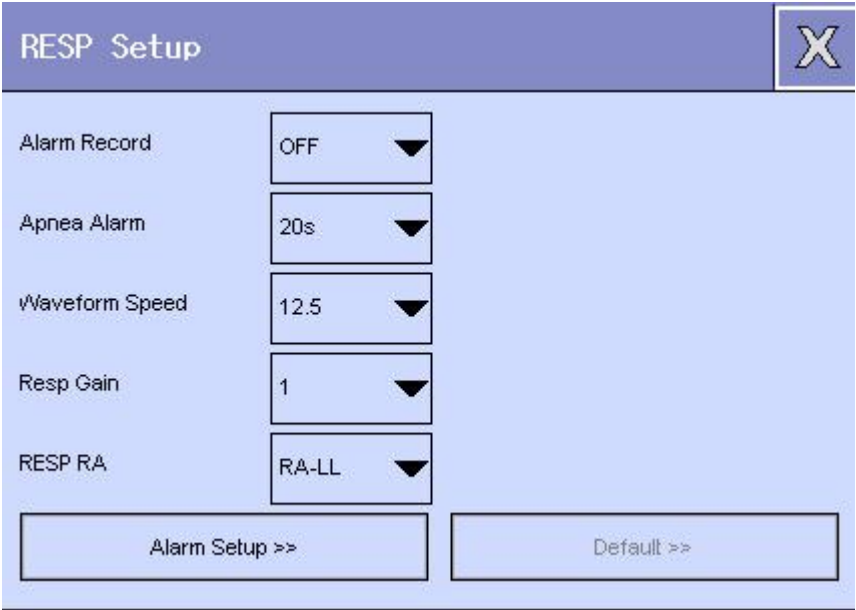
Placing white and red poles diagonally is to acquire the best respiration wave. Liver and ventricle should not be on respiration pole line. In this way, fake difference caused by heart covering or palatial blood flow is avoided. This is very important for neonatal baby.

7.6 RESP setup Menu

In main menu ,select Measurement Setup ,and select RESP setup,Ref to pic 7-12.

- Alarm Record :The monitor does not support this function.
- Apnea Alarm: Set judging asphyxia time of animal, ranging 10 seconds ~ 40 seconds, each turn of the knob will increase/reduce 5 seconds.
- Waveform speed: RESP waveform speed of 6.25mm/s , 12.5mm/s , 25.0mm/s are optional.
- Resp Gain :""*0.25 ,* 0.5, *1, *2 and *4" are optional
- RESP RA :“RA-LL”and“RA-LA” are optional in setup
- Alarming setup : Same with “Alarming setup” in “Main Menu”, please refer to **6.6.5**.

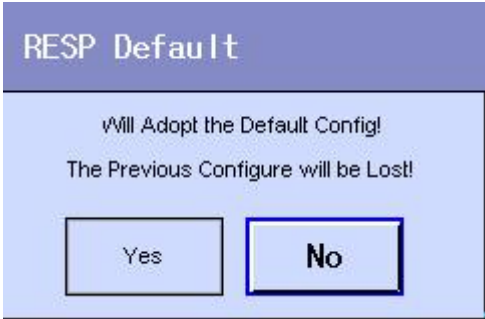
- Default configuration: Ref to Pic 7-13



Pic 7-12 RESP setup

Adjustment range for RESP alarm upper limit and lower limit:

	Max. upper limit	Min. lower limit	Single time adjustment
● RR large animal	120	0	1
● RR medium-sized animal/ small animal	150	0	1



Pic 7-13 RESP Default

Selecting“YES” , save all present animal configuration as the default configuration.

Selecting“NO” , cancel correct operation , system default configuration will stay still

7.7 RESP Alarm information

During RESP measuring, possible alarms are divided into physiological alarm and technical alarm. Meanwhile, various kinds of prompt may be produced during ECG measuring. When these alarm and prompt occur, refer to the relevant descriptions in alarm function chapter for visual and aural representations of the animal monitor. On the display, physiological alarm and general prompt (general alarm) are displayed in alarm area, while, technical alarm and the prompt of alarm unable to be triggered are displayed in the information area of the animal monitor.

Tables below describe the possible physiological alarms, technical alarms and prompt messages occurring during RESP measurement.

Physiological alarms:

:

Message	Cause	Alarm Level
RR TOO HIGH	RESP measuring value is above upper alarm limit.	User-selectable
RR TOO LOW	RESP measuring value is below lower alarm limit.	User-selectable
RESP Apnea	Respiration can not be measured within a specific time interval	High

Technical Alarm :

Message	Cause	Alarm Level	Remedy
RESP Alarm ERR	Functional Safety Trouble	HIGH	Stop RESP alarm function , inform biomedical engineer or our service personnel

Prompt message:(Concluding common alarming message) :

Message	Cause	Alarm Level
RESP LMT ERR	RESP measuring value is beyond the limit	HIGH

7.8 Maintenance and Cleaning

Maintenance and Cleaning



Warning

It is a must to power off and disconnect AC power before cleaning the animal monitor or sensor.

If there is the representation of ECG cable damage or aging, substitution with a new cable is required.

Cleaning

The surface of animal monitor and sensor may be cleaned with medical alcohol. Dry them by natural wind or

With clean and dry cloth.

Sterilization

To avoid long term damage against the product, it is recommended to perform sterilization in case

of necessity according to regulations of the hospital. Cleaning the product before sterilization is also recommended.

Sterilization materials recommended for animal monitor:

Ethanol: 70% alcohol, 70% ethyl alcohol

Aldehyde

Disinfection

To avoid long term damage against the product, it is recommended to perform disinfection in case of necessity according to regulations of the hospital. Cleaning the product before sterilization is also recommended.

Chapter Eight Blood Oxygen Saturation (SpO₂)

8.1 SpO₂ Monitoring Instruction

Definition of SpO₂ monitoring

SpO₂ plethysmography parameter measures arterial SpO₂, namely the percentage of the HbO₂. For example: in arterial blood erythrocytes, if hemoglobin counting for 97% of the total combines with oxygen, the blood is at a 97% SpO₂, and the reading of SpO₂ value on the animal monitor is 97%. SpO₂ value displays the percentage of Oxygen-carrying hemoglobin forming HbO₂. SpO₂ plethysmography parameter also provides PR signal and plethysmography wave.

SpO2 plethysmography parameter measurement principle

- SpO2 is measured with pulse dosimeter. This is a continuous non-invasive measuring method for hemoglobin oxygen saturation. What it measures is the quantity of ray penetrating through the tissues of animal (e.g. finger or ear) emitted from sensor light source and reached the receiver at the other side.

Wave length measured by sensor is generally 660nm for red LED, 940nm for infrared LED. The optional of Max. Output power for LED is 4mW.

- The penetrating ray quantity depends on various factors, and most of them are constant. But one of the factors, namely arterial blood stream, changes as time goes by, because it is pulsant. Through measuring absorbed ray in pulsant period, SpO2 of the arterial blood can be acquired. Testing pulse may give a “plethysmography” waveform and PR signal.
- “SpO2” value and “plethysmography” waveform can be displayed on the main screen.
- SPO2 in this manual means physiological function blood oxygen saturation measured through non-invasive method.



If exists COHb, MHB or dyeing dilution chemicals, there will be windage for SpO2 value.

SpO₂ plethysmography parameter measurement

- “SpO2” value and plethysmography waveform can be displayed on the main screen.

- SP02 in this manual means physiological function blood oxygen saturation measured through non-invasive method.

 **Warning** 

- If exists COHb, MHB or dyeing dilution chemicals, there will be windage for SpO2 value. SpO2/pulse monitoring
- Cables of ES equipments and ECG can not be intertwined.
- Do no place sensor onto the part of body with arterial conduct or intravenous conduct.

 **Attention** 

Do not place blood oxygen probe onto as same part of body with blood pressure cuff on. This causes blood obstruction during measuring blood pressure may affect the reading of SpO2 .

 **Attention** 

- Ensure to shut out light with nail.
- Probe cable should be placed onto the back of the hand.
- Sp02 value is always displayed at the fixed position.
- PR is displayed only under the following circumstances:
 - 1) "Source of HR" is set to "SP0₂" or "Select all" in ECG menu.
 - 2) "Source of HR" is set to "Automatic", and there is no ECG signal at that time. Sp0₂

waveform and pulse volume are out of proportion.

 **Warning** 

- Before monitoring, check whether the sensor cable is normal. When plugging Sp0₂ sensor

cable out, “Sensor failing” will be displayed on the screen and sound alarm is triggered at the same time.

- If there is the evidence of damage on sensor packing or sensor, do not use this SpO₂ sensor and return it to the factory.
- Continuous and long term monitoring may increase the risk of skin property changes, such as abnormal allergy, redden, blistering or compression necrosis. They occur more frequently on neonatal baby or animals with perfusion obstacle and metabolic or immature skin pose chart. According to quality changes of the skin, it should be paid more attention to check the placement of sensor by correct light route aiming and adhering method. It is required to regularly check the adhering position of sensor and change the adhering position if skin quality decreased. Because of the different status of the animals, more frequent checks may be required for some of the animals.

8.2 Operating method of SpO₂ monitoring

During operating, the following factors may influence the accuracy of SpO₂ measurement:

- High frequency electric interference, like interference generated by the main unit or ES equipments connecting with the system.
- During MRI, do not use oximeter, blood oxygen sensor. Inductive current may lead to burn.
- Intravenous dye.
- Excessive movement of the patient.
- Outside light radiation.
- Improper installation of the sensor or improper contacting position with the object.
- Temperature of the sensor (the most suitable temperature range: 28°C~42°C)
- Place sensor onto part of the body with blood pressure cuff, arterial conduct or line in cavity.
- Concentration of non-functional hemoglobin like COHb and MetHb.
- Excessive low SpO₂.
- Poor circulation perfusion of the measured part.
- Shock, anaemia, low temperature and vasoconstrictor may lower the arterial blood stream to the level at which measurement can not be performed.
- Measurement also depends on absorption of the oxygenated hemoglobin and reduced hemoglobin for special wave length ray. If there are other substances absorbing the same wave length existing, they cause in fake or low SpO₂ value of the measurement. E.g. COHb, MetHb, Methylene Blue, Indigo Carmine.

- SpO2 sensor.

Attention


Inaccurate readings may be caused by movement of the patient or weak signals, especially for cat-type patients. Observe the following guidelines when monitoring cat-type patients:

- A six-second uninterrupted non-artifact SpO2 waveform should be displayed.
- A stable SpO2 value should remain for at least six seconds.

Warning

Setting SpO2 alarm upper limit to 100% means disconnecting alarm upper limit. High-oxygen water may cause small animals ill with crystal post fiber tissue diseases. Therefore, alarm upper limit of SpO2 must be carefully set according to recognized clinical practice.

SpO2 Alarm Setting

- Alarm switch: when selecting “On”, alarm prompt and storing will be performed in case of SpO2 alarm; when selecting “Off”, there will be no alarm given, and the prompt of “” will be displayed by SpO2 in screen parameter area.
- Alarm recording: when selecting “On”, record output will be performed in case of SpO2 alarm.
- Alarm level: “High”, “Middle” and “Low” are optional. “High” means the most dangerous alarm.
- SpO2 alarm upper and lower limit: used to set SpO2 alarm limit. Alarm is given in case of SpO2 measured value exceeds the set limit.
- PR alarm upper and lower limit: according to the set upper and lower limit, alarm will be given in case of PR measured value exceeds the set limit.

SpO2 and PR Alarm Range:

Parameter	Max. upper limit	Min. lower limit	Single time adjustment
SpO2	100	0	1
PR	254	0	1

SpO2 and PR Default Alarm Range under Default Configuration:

Parameter		Max. upper limit	Min. lower limit
SpO2	large animals	100	90
	Medium-sized animals	100	90
	Small animals	95	85
PR	large animals	120	50

	Medium-sized animals	160	75
	Small animals	200	100

- **Waveform speed**
12.5 and 25.0mm/s are optional for SpO2 plethysmography speed.
- **Pulse volume:** 0、1、2、3、4 levels of pulse volume are optional.
- **Calculation sensitivity:** Select average time for calculating SpO2 value. Selection of “High”, “Middle” and “Low” means the average value of 4 seconds, 8 seconds and 16 seconds.
- **Default configuration:** Select this option to enter into the dialog box of SPO2 default configuration. System default configuration may be selected.

Attention

- If measures part and probe can not be positioned accurately, it may cause in inaccurate reading of SpO2, even pulse wave can not be searched for monitoring blood oxygen, then repositioning is required.
- Excessive moving of the measured part may cause in inaccurate measurement. At the time, the animal should have been calmed or place onto a new position to reduce influences to measurement by excessive moving.

Warning

- During the course of long term and continuous monitoring, peripheral circulation status and skin status should be checked once every 2 hours. If bad changes found, measuring position should be changed timely.
- During the course of long term and continuous monitoring, it is required to regularly check the position of the probe to prevent moving of the probe from influencing the accuracy of measurement.

8.3 Measurement Limit of SpO₂ Monitoring

During operating, the following factors may influence the accuracy of SpO₂ measurement:

- High frequency electric interference, like interference generated by the main unit or ES equipments connecting with the system.
- During MRI, do not use oximeter, blood oxygen sensor. Inductive current may cause in burn.
- Intravenous dye.
- Excessive moving the animal.
- Outside light radiation.
- Improper installation of the sensor or improper contacting position with the object.
- Temperature of the sensor (the most suitable temperature range: 28°C ~ 42°C)
- Place sensor onto part of the body with blood pressure cuff, arterial conduct or line in cavity.
- Concentration of non-functional hemoglobin like COHb and MetHb.
- Excessive low SpO₂.
- Poor circulation perfusion of the measured part.
- Shock, anaemia, low temperature and vasoconstrictor may lower the arterial blood stream to the level at which measurement can not be performed.
- Measurement also depends on absorption of the oxygenated hemoglobin and reduced hemoglobin for special wave length ray. If there are other substances absorbing the same wave length existing, they cause in fake or low SP0₂ value of the measurement. E.g. COHb, MetHb, Methylene Blue, Indigo Carmine.
- We suggest using SpO₂ sensor of the attachment.

8.4 SpO₂ Menu

8.4.1 SpO₂ setup Menu

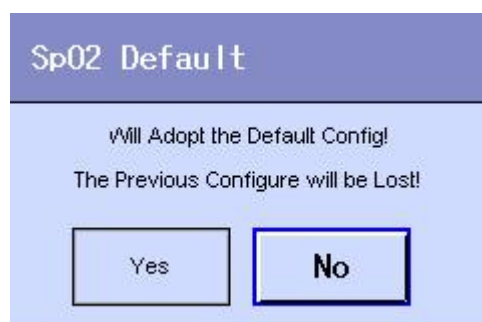
"Main menu"→ "Measurement Setup"→"SP02 setup", to enter the "SP02 setup" menu, as shown in picture 8-5.

- Alarm Records: The monitor does not support this function.
- Waveform Speed: The scanning speed of SpO₂ plethysmography have 12.5mm/s and 25.0mm/s for option.
- PR Volume: "High", "Middle" , "Low" and "Off" are available for option.



Pic 8 - 5 SP0₂ setup Menu

- Sensitive: Select the "High", "Middle" or "Low", take the SPO2 average of four seconds, 8 seconds or 16 seconds.
- Default setup: Select this option into the SPO2 default configuration dialog. Select the default system configuration. As shown in picture 8-6.



Picture 8 - 6 SP0₂ Default setup

- SpO2 Alarm setup: The same as “alarm setup” of main menu, refer to 6.2.2.

SpO2 and PR alarm range:

Parameter	Max. upper limit	Min. lower limit	Single time adjustment
SpO2	100	0	1
PR	254	0	1

SpO2 and PR default alarm range under default configuration:

Parameter		Max. upper limit	Min. lower limit
SpO2	large animal	100	90
	medium-sized animal	100	90
	small animal,	95	85
PR	large animal	120	50

	medium-sized animal	160	75
	small animal	200	100



Warning

Setup SpO₂ alarm upper limit to 100% means disconnecting alarm upper limit. High-oxygen water may cause premature ill with crystal post fiber tissue diseases. Therefore, alarm upper limit of SpO₂ must be carefully set according to recognized clinical practice.

8.5 SpO₂ Alarm Information

SpO₂ alarm information

When alarm recording switch in the menu is switched on, those physiological alarms caused by parameters' overrun of alarm limit will trigger the recorder to automatically output alarm parameter value and related measured waveforms.

Possible physiological alarms, technical alarms and prompt occurring during SPO₂ measurement are to be shown in following tables.

The alarm of physiological:

Notice	Reason	Alarm information
SPO ₂ overtop	SpO ₂ measurement value is higher than the alarm limit.	User-selectable
SpO ₂ too low	SpO ₂ measurement value is lower than the alarm limit.	User-selectable

PR overtop	PR measurement value is higher than the alarm limit.	User-selectable
PR too low	PR measurement value is lower than the alarm limit.	User-selectable

The alarm of technology:

Notice	Reason	Alarm information	Remedy
SPO2 sensor failing	SpO2 sensor failing from animal or morning	low	To ensure that the sensor mounted on the animal fingers or other parts, and monitor and cable connection is normal.
SPO2 module initialization error	SpO2 module error	High	Stop using the SpO2 measurement module function to notify biomedical engineer or the company's customer service.
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			
SPO2communication module to stop	The module of SPO2 is error or communication is error	High	Stop using the SpO2 measurement module function to notify biomedical engineer or the company's customer service.

SPO2 Alarm limit fault	Safety function failure	High	Stop using the SpO2 measurement module function to notify biomedical engineer or the company's customer service.
PR Alarm limit fault	Safety function failure	High	Stop using the SpO2 measurement module function to notify biomedical engineer or the company's customer service.

Notice (Including the general warning) :

Notice	Reason	Alarm information
SPO2 Measurement over range	SpO ₂ Measurement over range	High
PR Measurement over range	PR Measurement over range	High
Search the pulse	SpO ₂ Module is searching the pulse	No alarm
No pulse	SpO ₂ Module can ' t detect Spo2	High

	signals for a long time	
--	-------------------------	--

8.6 Maintenance and Cleaning

Maintenance



Warning

It is must to power off and disconnect power supply before cleaning the animal monitor or sensor.



Caution

- Do not have the sensor sterilized with high pressure.
- Don't dip the sensor into liquid.
- They are prohibited to use in case of evidence of damage or degeneration of the sensor or cable.

Cleaning :

- Surface of the sensor may be wiped with cotton balls or soft cloth dipped medical alcohol , and then dry it with dry cloth. Emitting light tube and receiver of the sensor may be cleaned in the same method.
- Cable may be disinfected with 3% Hydrogen Peroxide or 70% isopropyl alcohol. Active agent is also effective. Joint can't be dipped in solution.

Chapter Nine Temperature (TEMP)

9.1 TEMP Monitoring Instruction

Portable animal monitor may use two temperature probes at the same time. Two temperature data and temperature-difference will be displayed in the parameter area.

TEMP Measurement setup

- If the disposable temperature probe is being used, temperature cable must be inserted into the faucet and then the probe and cable are to be connected. You may insert the repeatable temperature probe directly into the faucet.
- Adhere temperature probe securely onto the animal.
- Connect through to system power supply.

Warning

- Before monitoring, it is required to check if probe cable is normal. Plug out temperature probe cable of P1 out the faucet, “T1 sensor failing” will be displayed on the screen and sound alarm will be given. Other channels are similar to P1.
- Temperature probe and cable are being handled with care, probe and cable should be holding loosening ring formation when they are not in use. If the wire pulled too tight that may lead to machine damage.
- It is must be doing calibration of temperature measurement instrument once per two years (or as the hospital require).

Attention

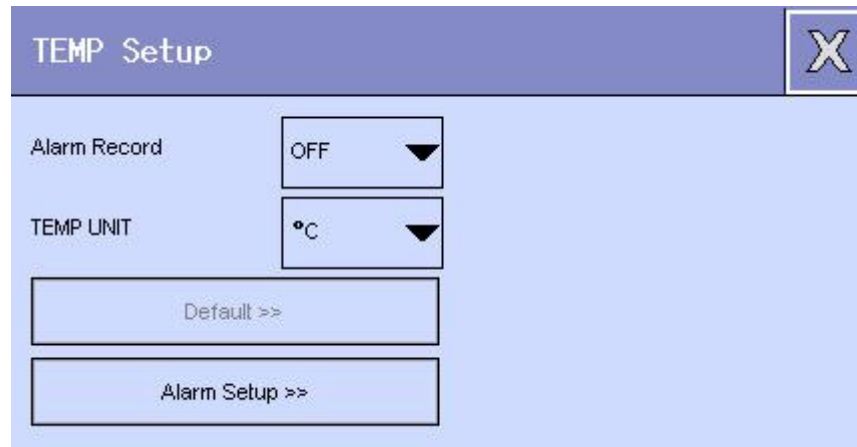
- Disposable temperature probe can be used for only one time.
- During monitoring, temperature measuring meter will automatically make self-test once an hour.

Self-test will last for 2 seconds and it will not affect the normal operation of the temperature

monitor.

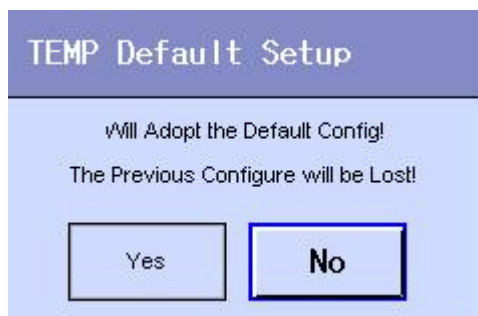
9.2 TEMP Menu

User may move the cursor to TEMP hot key in parameter area on the main screen through the knob, press the knob to enter into the menu of “TEMP SETUP”, as shown in picture 9-1.



Pic 9 - 1 TEMP setup Menu

- Alarm recording: The monitor does not support this function.
- Temperature unit: °C or °F
- Default setup: as shown in picture 9-2.



Picture 9 - 2 Default setup

Select this option into the SPO2 default configuration dialog. Select the default system configuration.

- Alarm setup: The same as “alarm setup” of main menu, see 6.2.3.

Adjustment range of TEMP alarm upper and lower limit :

Parameter	Max. upper limit	Min. lower limit	Single time adjustment
T1	50	0	0.1

9.3 TEMP Alarm Information and Prompt Information

When alarm recording switch in relevant menu is at On, those physiological alarms caused by parameter overrun of alarm limit will trigger the recorder to output alarm parameter and related measuring waveform automatically.

TEMP measurement possible physiological alarm, technology alarm and Notice as follows:

The physiological alarm :

Notice	Cause	Alarm level
T1 , overtop	TEMP value is higher than the alarm limit.	user-selectable
T1 , low over	TEMP value is lower than the alarm limit.	user-selectable

The technology alarm :

Notice	Cause	Alarm level	Policy
TEMP sensor failing	TEMP cable failing from monitor	Low	Make sure cable connections.
TEMP alarm limited is wrong	Safety function failure	High	Stop using the TEMP alarm, notify the

			biomedical engineer or maintenance personnel of the company.
--	--	--	--

Notice :

Notice	Cause	Alarm level
TEMP measure over range	TEMP measure value is over the range	High

9.4 Maintenance and Cleaning



Warning

It is required to power off and disconnect power supply before cleaning this equipment and sensor.

Repeatable temperature probe :

- 1) Temperature probe cannot be heated over 100°C(212°F). It can only bear the temperature of 80°C(176°F)~100°C(212°F) within a short period of time.
- 2) Do not have the probe disinfected with steam.
- 3) Use only the scour with alcohol for disinfection.
- 4) When using normal probe, try to hitch it with protective rubber.

- 5) For washing the probe, one hand holds the probe, the other rub the probe with a wet lint free cloth downward to the connector.

 **Attention** 

- It is prohibited to re-disinfect or repeatedly use the disposable temperature probe.
- For protection of environment, disposable temperature probe should be reclaimed or properly managed.

Chapter Ten Non-invasive Blood Pressure (NIBP)

10.1 NIBP Monitoring Instruction

- NIBP is measured with oscillometry;
- Apply to small animal medium-sized animal large animal;
- Measurement mode: manual, automatic and continuous. Systolic, mean and diastolic blood pressure will be display in each mode.

☐ “Manual” mode measure only once.

☐ “Automatic” mode measure repeatedly.

Time interval may be set to 1/2/3/4/5/10/15/30/60/90/120/180/240/480 minutes.

☐ “Continuous” mode measures continuously in 5 minutes.



Warning

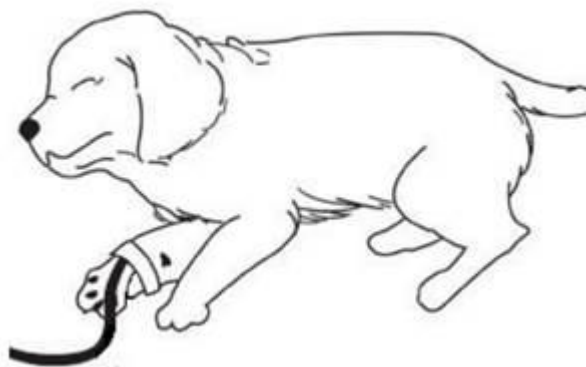
- NIBP measurement can not be performed onto the animals who are ill with sickle-cell disease and any skin damage or foreseen damage.
- For the animals troubled with serious coagulation mechanism obstacle, automatic blood pressure measurement is determined by clinical evaluation. This is because the place where the part of body contacting the cuff risks hematoma.
- When used onto children and neonatal baby, it should be guaranteed that correct mode setup has been selected (Refer to animal's information menu setup.) Using incorrect animal's mode may endanger the animal. This is because the higher animal blood pressure level is unsuitable for children and neonatal baby.

10.2 Operating method for NIBP Monitoring

10.2.1 NIBP Measurement

Charge tube connecting cuff with the animal monitor should be kept free of obstacle and entwisting.

- 1) Insert charge tube into cuff joint, power on the equipment.
- 2) In the following way, tie the cuff on upper arm or thigh of the animal, as shown in picture 10-1



Pic 10-1 Use of cuff

- ◆ Make sure that the cuff is absolutely deflated.
- ◆ Use the suitable size cuff to ensure mark towel locating right on the proper artery. Ensure the cuff is not enlaced excessively tight the part of body, otherwise color change of even ischemia of far end of body may be caused in.



Width of the cuff should be 40% of body perimeter. (50% for neonatal baby), or 2/3 of the upper arm in length. Length of charged part of the cuff should be enough to entwist 50 ~ 80% of the body. Unsuitable size cuff may give incorrect reading. If there is problem with the cuff size, substitute with a larger one to reduce errors.

Type of animal	Perimeter of body	Cuff width	Length of charge tube
small animal	10 ~ 19cm	8cm	
medium-sized animal	18 ~ 26cm	10.6cm	1.5m
large animal1	25 ~ 35cm	14cm	3m
large animal2	33 ~ 47cm	17cm	
leg	46 ~ 66cm	21cm	

Disposable small /medium-sized / large animals

Size	Perimeter of body	Cuff width	Length of charge tube
1	3.1 ~ 5.7cm	2.5cm	
2	4.3 ~ 8.0cm	3.2cm	1.5m or 3m
3	5.8 ~ 10.9cm	4.3 cm	
4	7.1 ~ 13.1cm	5.1cm	

- ◆ Cuff edge locates in the area marked with <->. If not, substitute with a larger or smaller cuff.

3) Connect cuff with charge tube. Body to be measured should be at the same level with heart.

If impossible, adopt the following methods to correct the measurement result:

- ◆ If cuff is higher than level of heart, plus 0.75mmHg(0.10kPa) to the displayed value for very centimeter difference.
- ◆ If cuff is lower than level of heart, minus 0.75mmHg(0.10kPa) to the displayed value for very centimeter difference.

4) Make sure if monitoring method is correct (monitoring method is displayed in animal monitor information area at right side of sickbed number.). If changing monitoring method is needed, please enter into “animal’s information setup” in “system menu” to change “Type of animal”.

5) Select measurement method in NIBP menu. Refer to the “Operation prompt” below for

details.

- 6) Press “START” key on the front panel to begin measurement pressure.

Operation Prompt

- 1) Make automatic measurement

Enter into “NIBP setup” menu, select the option of “Time interval”. User may select time interval value for automatic measurement. Then, press START key on the front panel, the system will automatically charge for measurement according to the set time interval.



If NIBP in automatic mode lasts excessively long, purpuric, ischemic and nervous and nerve damage may be caused in onto the place where the cuff contacts the body. During monitoring, it is required to regularly check the color, warm degree and sensitivity of body far end. If abnormality found, place the cuff onto another place or stop measurement.

- 2) Stop automatic measurement

Press START key at any time during automatic measurement to stop automatic measurement.

- 3) Make manual measurement

- ◆ Enter into “NIBP setup” menu, select “Time interval”, set the value to “Manual”, then press

START key on the front panel to begin a manual measurement.

- ◆ At an idle moment during automatic measurement, press START key to begin a manual measurement. If press START key again at that time, manual measurement will be stopped, but to execute automatic measurement.

- 4) Make manual measurement during automatic measurement

Press START key on the front control panel.

5 . Stop one manual measurement on midway

Press again the START key on the front control panel.

6) Continuous measurement

Enter into “ NIBP setup ” menu, select “ Continuous measurement ” to begin continuous measurement. The course lasts 5 minutes.



If NIBP in continuous mode lasts excessively long, purpuric, ischemic and neverous and nerve damage may be caused in onto the place where the cuff contacts the body. During monitoring, it is required to regularly check the color, warm degree and sensitivity of body far end. If abnormality found, place the cuff onto another place or stop measurement.

7) Stop continuous measurement on midway

Press START key at any time during continuous measurement to stop continuous measurement.



If doubting about the accuracy of the reading, check animal's vital signs with possible methods before checking the function of the animal monitor.



If liquid splashes the equipment or accessories, particularly when the liquid is possible to enter into conduct or the animal monitor, please contact hospital maintenance department.

Measuring limit.

According to status of the animal, measuring with oscillometry is with limitation. What this measuring seeks for is the regular pulse wave generated by arterial pressure. If this measuring becomes very difficult due to the animal, the measuring value is unreliable, and measuring time is increased. User should know that the following circumstances will interfere with measuring method making pressure

measuring unreliable or pressure measuring time longer. Under the circumstances as follows, NIBP measuring cannot be done smoothly.

- animals' movement

If the animal is moving, trembling, or in convulsion, measuring will be unreliable or even impossible to be finished. This is because such circumstances may interfere with checking of arterial pressure pulse, and lengthen the blood measuring time

- Arrhythmia

If the animal's irregular heart rate is caused by arrhythmia, measuring will be unreliable or even cannot be performed, and measuring time will be longer.

- Heart-lung machine

If the animal is connected with artificial heart-lung machine, measuring cannot be performed.

- Changes of pressure

If in a certain period of time when arterial pressure pulse is being analyzed to acquire measuring value, blood pressure of the animal changes rapidly, and at this moment measuring will be unreliable or even cannot be performed.

- Serious shock

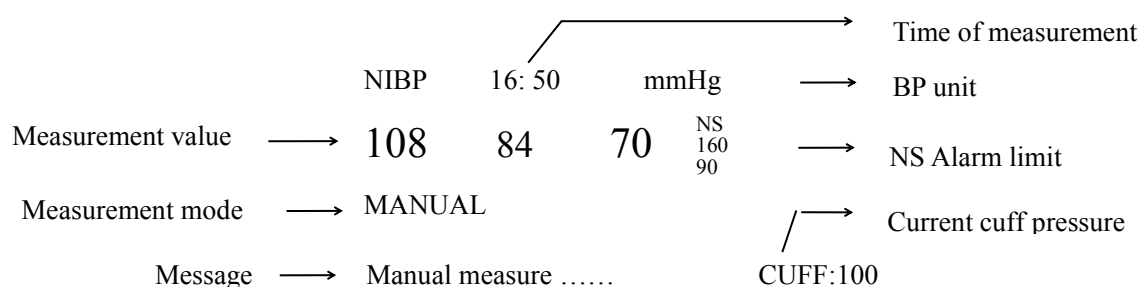
If the animal is with serious shock or excessive low TEMP, measuring will be unreliable, because increasement of the blood stream peripherally flowing may lower arterial pulse.

- Ultimate heart rate

Blood pressure measuring cannot be performed if HR is lower than 40bpm(beat/minute) or higher than 240bpm(beat/minute).

10.2.2 NIBP Parameter setup and adjustment

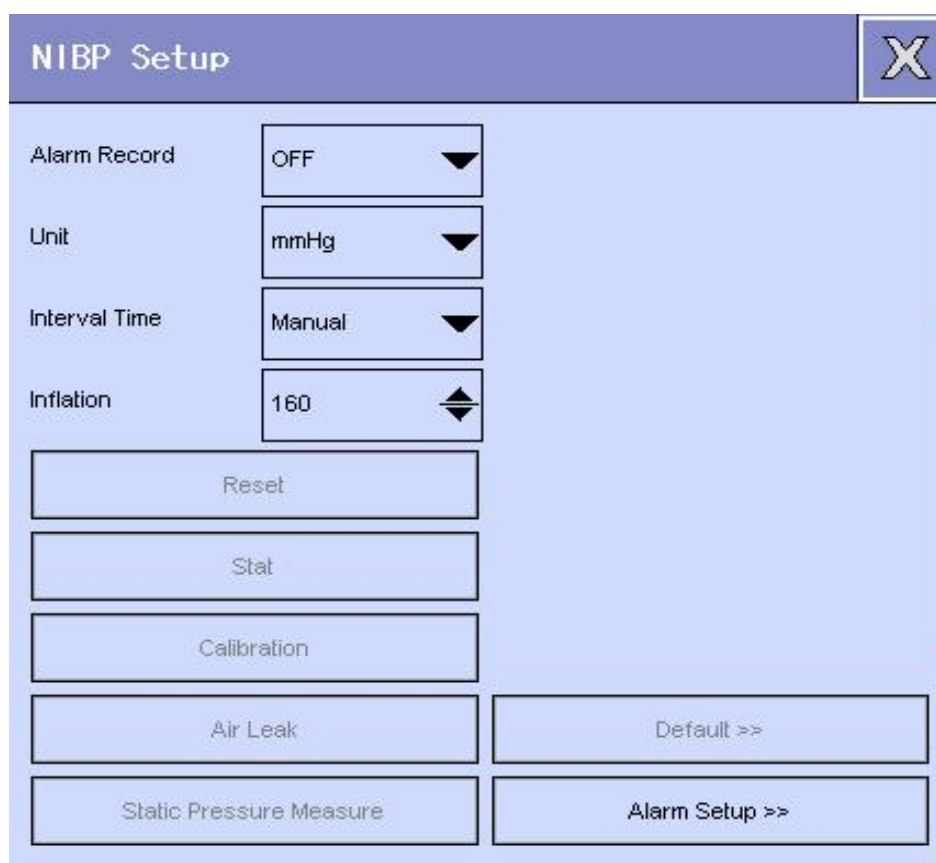
Display layout of NIBP measuring result and corresponding information on screen:



10.3 NIBP setup

10.3.1 NIBP Menu

Turn the knob, move the cursor to NIBP hot key in parameter area of the screen, press the knob to enter into the menu of “NIBP setup”, as shown in the picture 10-2.



Pic 10 - 2 NIBP setup Menu

- Alarm recording : The monitor does not support this function.
- Unit : MmHg or kPa are optional.
- Interval Time : Automatically measure time interval (unit: minute). Options of 1 , 2 , 3 , 4 , 5 , 10 , 15 , 30 , 60 , 90 , 120 , 180 , 240 , 480 minutes are available. After selecting the interval, a prompt of “Press “start” key” will be displayed in the NIBP prompt area. At the time, press START key to start charging for the first time automatic measuring. To stop automatic measuring, it is required to select “Manual” to turn back to manual mode at measuring interval.
- Inflation: press this button to select the initial pressure value for next time when inflating cuffs, there are different inflatable value selection ranges under different default configurations, as shown in the table below:

Default configuration	default inflated values (mmHg/kPa)	Selectable inflated values in NIBP menu (mmHg/kPa)
Default factory animal configuration	160	80/90/100/110/120/130/140/150/160/170 180/190/200/210/220/230/240
Default factory pediatric configuration	120	80/90/100/110/120/130/140/150/160/170/180/190/200
Default configuration	70	60/70/80/90/100/110/120

After pressing "menu" button on the front shell, then enter the “default configuration” menu of

"system menu", return to the main interface to select NIBP parameters of NIBP menu hot key after confirming the default configuration and enter "NIBP setup". You can notice the the initial value of "inflation value" is the same as corresponding initial pressure value of selected default configuration, as shown in the table above. Move the cursor to "inflation value" option and press, you can see select scope of inflation values for manual regulation is as shown in the table above.

 **Attention** 

- This option "inflation value" is to help users to select cuff inflation pressure for next time, but inflation value of later measurement is based on the last systolic blood pressure measurement of the same animal. The numerical system memory can shorten the measuring time of the same animal and increase the accuracy of measurement.
- When a user only set "animal type" in "animal information setup" without any choice in the "default configuration", the system will carry out initial setup on related modules parameters in accordance with the "animal type". And setup changes of default types in "default configuration" will change "animal type" in "animal information setup" at the same time.
- **Reset:** Measure state of blood pump reset.

Press this key to have charge value of the blood pump be back to the initial setup. When blood pump is with abnormal work and the animal gives no prompt fro the problem, this key is recommended to use. This is because it will make the blood pump perform self-test and automatically recover if the abnormality is caused by accidental reasons.

- **Continuous mode:** It will last 5 minutes. It would stop when you press the "NIBP" button on the control panel at any time during continuous mode.

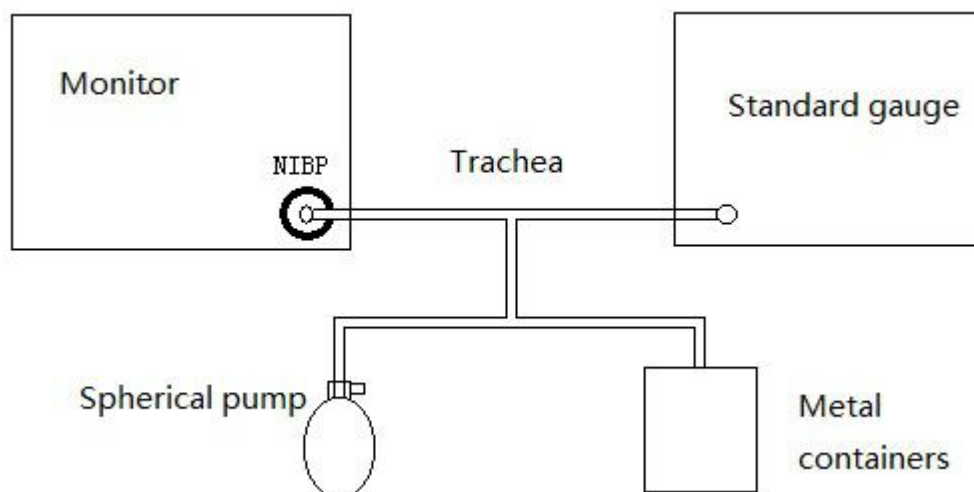
 **Warning** 

- If continuous measurement mode is used repeatedly, friction between cuff and body may cause purpura, ischemia and nerve damage.

- Pressure calibration: It is recommended to use manometer with a precision over 1 mmHg (Mercurial Blood-Pressure Meter). Select “Calibration” to start calibrating. Meanwhile this option will become “Stop calibration”. If press this key at this moment, the system will stop calibration.

Calibrating steps for pressure sensor:

Substitute the cuff with a 500ml \pm 5% metal container. Insert a calibrated standard manometer with a max. Tolerance of 0.8mmHg, an air pump with T-shape interface and a charge tube into the NIBP jacks on the module. Set the animal monitor to “Standard”, increase the pressure in the metal container to 0, 50 and 200 mmHg with air pump. At the time, the difference between the value of standard manometer and the pressure demonstrated on the animal monitor should be less than 3 mmHg. Otherwise, contact maintenance technicians of our company.



Pic 10-3 NIBP calibration connection diagram



- Calibration of NIBP measuring should be made once every two years (or follow your maintenance regulation). Check its performance according to the following steps

■ Leak test

It is used to test leak of NIBP measuring pump. When connecting through with the cuff, use this key to start NIBP charge to check if the enclosed air route is normal. If passed the leak test, the system gives no prompt; if failed, there will be error prompt displayed in NIBP information area.

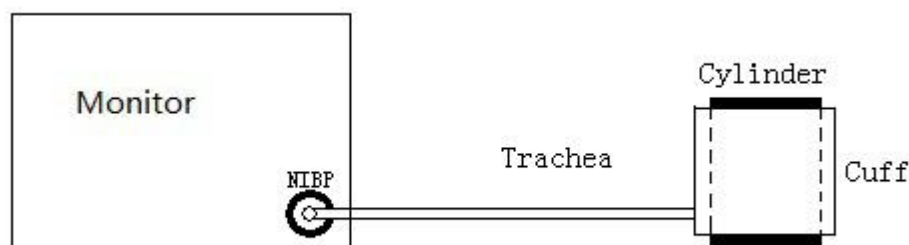
Warning

- The leak test is different from the content in EN 1060-1 Standard. It is only used by users to do simple leak tests. If NIBP leak is displayed by the system, please contact the maintenance technicians of our company.

Steps for leak test:

- 1) Connect the cuff with NIBP air hole of the animal monitor firmly.
- 2) Interwine the cuff onto a column with proper size.
- 3) Enter into “NIBP Setup” menu.
- 1) Turn the knob, move the cursor to option of “Leak test” , press the knob. At the time, on lower part of the NIBP parameter area on the screen will notify “Leak testing...” , indicating that the system starts leak test.
- 2) The system automatically charge to the pressure 180mmHg.
- 3) Roughly 20 seconds later, the system automatically opens the air valve to deflate, marks leak test completed.

- 4) If there is no prompt displayed in NIBP parameter area, it means no leak on the system. If “Pump leak...” is displayed, it means that there is possible leak in air route. At the time, the operator should check if the all joints are secure. If yes, make a leak test once more. If still with failure prompt, please contact the manufacturer for servicing.
- 5) The system will be automatically inflated to the pressure of 180mmHg.
- 6) After about 20 seconds, the system will automatically open the air valve to deflate, and mark the leak test is completed.
- 7) If there is no prompt displayed in NIBP parameter area, it means no leak on the system. If “Pump leak...” is displayed, it means that there maybe a leak in air route. At this moment, the operator should check if the all joints are secure. If they are all secure, make a leak test once more. If failure prompt still exists, please contact the manufacturer for servicing.



Pic 10-4 NIBP leak test **connection** diagram

- Default configuration: Select this option to enter into NIBP default configuration dialog box.

System default configuration may be selected.

- Alarm setup : In accordance with “warning setup” in “main menu” ,

Please refer to chapter **6.6.3**

Adjustment range of alarm upper and lower limit :

large animal

Systolic blood pressure: 40 ~ 270 mmHg

Diastolic blood pressure: 10 ~ 215 mmHg

Mean blood pressure: 20 ~ 235 mmHg

medium-sized animal

Systolic blood pressure: 40 ~ 200 mmHg

Diastolic blood pressure: 10 ~ 150 mmHg

Mean blood pressure: 20 ~ 165 mmHg

small animal

Systolic blood pressure: 40 ~ 135 mmHg

Diastolic blood pressure: 10 ~ 100 mmHg

Mean blood pressure: 20 ~ 110 mmHg

10.4 NIBP Warning information and prompt

When the alarm recording switch is on, those physiological alarms which caused by parameters exceeding the alarm limit will trigger the recorder to automatically output the parameters and related measured waveforms.

Possible physiological alarms, technical alarms and prompt occurring during NIBP measurement are to be shown in following tables.

Physiological alarm :

Prompts	Causes	Alarm Level
NS too high	NIBP systolic blood pressure value exceeds given warning maximum limit	User-selectable

NS too low	NIBP systolic blood pressure value under given warning minimum limit	User-selectable
ND too high	NIBP diastolic blood pressure value exceeds given warning maximum limit	User-selectable
ND too low	NIBP diastolic blood pressure value under given warning maximum limit	User-selectable
NM too high	NIBP mean blood pressure value exceeds given warning maximum limit	User-selectable
NM too low	NIBP mean blood pressure value under given warning maximum limit	User-selectable

Technical alarm 1 (displayed in monitor information area) :

Prompts	Causes	Alarm Level	Solution
NS ALM LMT ERR	Functional safety failure	High	Stop using measuring function of NIBP, notify biomedical engineer or our service staff.
NM ALM LMT ERR	Functional safety failure	High	Stop using measuring function of NIBP, notify biomedical engineer or our service staff.

ND ALM LMT ERR	Functional safety failure	High	Stop using measuring function of NIBP, notify biomedical engineer or our service staff.
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Technical alarm 2 (displayed in prompt area below NIBP values) :

Prompts	Causes	Alarm Level	Solution
NIBP Self-test Err	NIBP measurement sensor or other hardware error	High	Stop using measuring function of NIBP, notify biomedical engineer or our service staff.
NIBP Communication Err	Failure communication with NIBP measurement module	High	Stop using measuring function of NIBP, notify biomedical engineer or our service staff if the error lasts long.
Cuff is loose or not being connected	Cuff is not tied up or no cuff	Low	Tie up the cuff
Cuff inflation tube leakage	Cuff, rubber tube or connector damage	Low	Check and change leakage spare, notify biomedical engineer or our service staff if need.
Air Pressure Err	Cannot get stable pressure value, eg,	Low	Check whether rubber tubes entangle, notify biomedical engineer or our

	rubber tubes entangle		service staff if error lasts
Signal is too weak	Cuff is loose or pulse rate of animal is too weak	Low	Use other blood pressure measuring mode
Pressure value exceed given scope	Measurement scope exceeds given maximum limit	High	Reset NIBP measuring module , stop using measuring function of NIBP if error lasts and notify biomedical engineer or our service staff.
Arm Movement	Affected by arm movement, signal noise id too loud or pulse rate is irregular	Low	Keep the animal quiet without moving
Over Current Protection	Pressure exceeds safety limit	High	Measure again, stop using measuring function of NIBP if error lasts, notify biomedical engineer or our service staff.
Signal Saturate	Gross Movement	Low	Stop movement
Pump Leak	Leak tests found leaking	Low	Check and change leakage spare, notify biomedical engineer or our service staff if need.
NIBP System	NIBP pump running fault	High	Stop using measuring function of NIBP,

Failure			notify biomedical engineer or our service staff.
Cuff Type Err	Cuff type unmatched	Low	Use proper NUIBP cuff
Measurement overtime	Measurement time is over 120 second(animal)or 90 second(neonate)	High	Remeasure or use other blood pressure measurement mode
NIBP Restoration Err	Module reset is not normal	High	Reuse restoration
Measurement Err	The system cannot perform measurement analysis or calculation during measurement	High	Check cuff, take another measurement and keep the animal motionless

Prompts (displayed in prompt area below NIBP values) :

Prompts	Causes	Alarm Level
Manual Measurement	Manual Measurement Process	No alarm
Continuous Measurement	Continuous Measurement Process	

Automatic Measurement	Automatic Measurement Process	
Press Start Key	After selecting measurement interval	
Measurement End	Press the start key to stop measurement in the measurement process	
Calibration	Calibration Process	
Calibration End	Calibration is over	
Leakage Test	Leakage Test ongoing	
Leakage Test End	Leakage Test Terminated	
Module Restoration	NIBP module loading restoration process	
Manual Restoration	NIBP Reset (triggered by user) Process	
Restoration Failure	Reset Failure	

10.5 Maintenance and Cleaning



Warning



- Do not press the rubber tube of the cuff.
- Prevent water or wash solution from entering connector socket on front of the animal monitor.
- When cleaning the animal monitor, wipe the surface of the connector socket, but not the inside of it.
- When the repeatable cuff is not connected with the animal monitor or being cleaned, the lid should always be on the rubber tube to prevent liquid from entering the rubber tube and being absorbed by the module.

Repeatable cuff

The cuff can be sterilized with high pressure in regular hot air oven, or disinfected with gas or radiation, or sterilized by dipping into detergent solution. Do remember to take down the rubber bag if this method adopted. Dry-cleaning of the cuff is prohibited. The cuff can be washed with machine or hand. Hand wash will prolong its lifespan. Before washing, take out the rubber bag. After washing and when the cuff is dried absolutely, mount back the rubber bag.



- In order to protect the environment, the disposable blood pressure cuff must be reclaimed or disposed properly.

Chapter Eleven Carbon Dioxide (CO2)

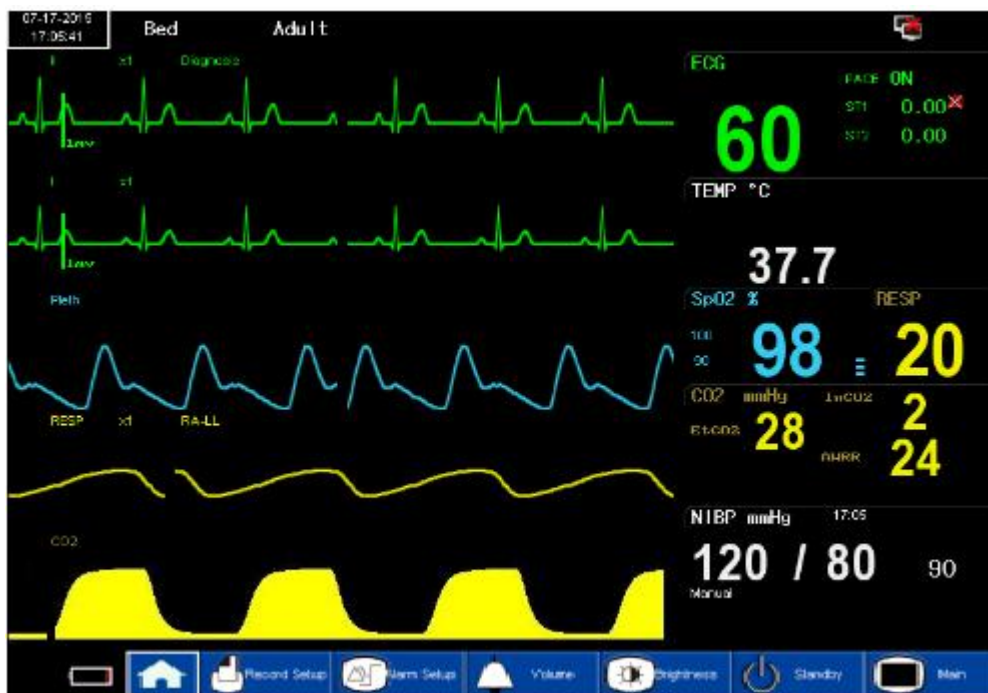
11.1 General

This instrument is capable of measuring disease Popularity road pressure of CO₂ (carbon dioxide), the content available to end-tidal carbon dioxide (EtCO₂), carbon dioxide least intake volume (Inspired Minimum CO₂: InsCO₂) and airway respiratory rate (Air Way Respiration Rate: AWRR), and CO₂ pressure waveform. Parameters displayed on the screen label conventions are as follows:

CO₂ : EtCO₂

Fico₂: least intake volume CO₂ .

AWRR: Air Way Respiration (AwRR)(Resp. times/MIN)



Pic 11-1 CO₂ interface

The following factors may affect the accuracy of measurement: :

- Leakage or internal sample gas leak
- Mechanical shock

- Cyclic pressure higher than 10 kPa(100cmH₂O)
- Other source of interference (if any)

 **Warning** 

CO₂ module shall be avoided from crash and vibration.

 **Attention** 

Don't use the device in the environment with flammable anesthetic gas.

The device can only be operated by personnel having taken professional training and familiar with this manual.

11.2 Measuring principle

CO₂ measurement principle is based on the CO₂ absorption wavelength for 4.3um infrared characteristics carried. The measuring method of the CO₂ gas supplied to the measuring chamber side with the infrared irradiation, and the other side with a sensor measuring the acceptable degree of attenuation of infrared rays, the degree of attenuation is proportional to the concentration of CO₂.

CO₂ partial pressure and CO₂ concentration conversion relationship:

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

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

Of CO₂ Mainstream and CO₂ Sidestream modules, whichever is selected by the user, Autorun measuring mode is adopted. Rate for waveform sampling is 31 sec/time. The operating series for the two modules are respectively:

A. Mainstream work sequence: After the system is powered on, CO₂ module automatically begins warming-up for about 45S to 90S. Then the sensor motor is activated. After 5S to 10S, the light

source of infrared ray is opened. After 10S, the system enters the normal measuring status.

B. Sidestream work sequence: Except the procedures that after being powered on, the system needs not warming-up and the air pump should be activated, other procedures are the same as those in Mainstream sequence.

11.3 The method of operation of carbon dioxide

CO2 measurement setups

1) Connect the sampling tube or adapter with the connector, please refer the following pic

11-2

2) in the menu, choose "CO2 setup ", change the "operating mode" to "measurement," on the screen, it will appear "Co2 module is running".

3) after start, in the screen it will appear "Co2 module is warming up", then the module is in precision measurement state.

4) After warming up, the module will come into the full precision measurement state

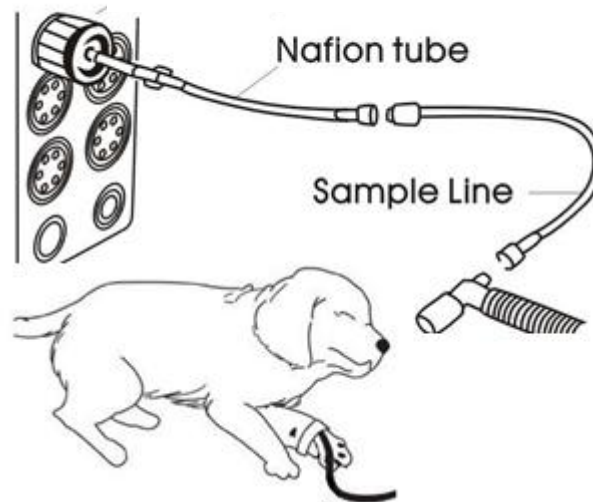
When the instrument is turned on, the CO2 module's default mode of operation "to" standby ", the user breath" operating mode "is set to" measure "to start the CO2 module. Instrument restarts, will remain before the last shutdown "mode of operation, that if the shutdown is selected measurement, the next time you turn on the CO2 module will automatically enter the measurement mode. More information, see "mode of operation" Other setup section 11.4 of carbon dioxide menu chapter.



2 If the packaging has been opened or damaged parts, internal, please do not use this

accessory, and returned to the supplier

- “CO2 WARM UP” or “CO2 SENSOR START UP” displayed on the screen indicates that the sensor is in warm-up or starting-up. When the module is warming-up, the module can measure the co2 value, but it is not standard value. After the information disappears from the screen, the standard measurement can then be generated.
- The sampling tube is disposable on the sidestream module, it can not be re-used.



Pic 11-2 CO2 connecting pics

11.4 CO2 Menu


11.4.1 Parameter Setup and Adjustment

From the "System Menu" to enter the parameter menu select CO2 hotkey, and the CO2 set, as shown in Pic 11-3

CO2 Setup				X
Alarm On/Off	ON ▼	EtCO2 High Limit	50	◆
Alarm Level	Medium ▼	EtCO2 Low Limit	15	◆
Alarm Record	OFF ▼	INS High Limit	4	◆
Waveform Speed	12.5 ▼	AwRR High Limit	30	◆
Unit	mmHg ▼	AwRR Low Limit	8	◆
Work Mode	Measurement ▼	Other Setup >>		

Pic 11-3 CO2 setup

The following sequentially describes the role of each menu item in the "CO2 setup" menu.

Alarm switch: select "ON" to enable and store alarm prompt when CO2 parameters have alarms. Select "OFF" to disable alarm. It will display  beside CO2.

- ALM LEV: select from HIGH, MED and Low Change in "ALM LEV" can only affect the physiological alarm levels of CO2 parameters including EtCO2 upper limit, EtCO2 lower limit, InsCO2 upper limit, AwRR upper limit and AwRR lower limit.
- Alarm record : The monitor does not support this function.
- SWEEP: to adjust the display rate of CO2 waveform with "6.25 mm/s", "12.5 mm/s", or "25.0 mm/s" selectable.
- UNIT: to change the display units of CO2 and InsCO2 parameters. "mmHg" and "kPa" are available for selection.
- WAVE GAIN : to adjust full scale size of CO2 waveform display area with "LOW" or "HIGH" selectable.
- WORK MODE: to change the work mode of CO2 with "MEASURE" mode or "STANDBY"

mode selectable.

- CO2 ALM HI: to adjust the upper alarm limit of EtCO2.
- CO2 ALM LO: to adjust the lower alarm limit of EtCO2.
- INS ALM HI: to adjust the upper alarm limit of InsCO2.
- AWRR ALM HI: to adjust the upper alarm limit of AwRR.
- AWRR ALM LO: to adjust the lower alarm limit of AwRR.

OTHER SETUP: Select this option into "CO2 setup menu.as shown in Pic 11-4.

11.4.2 CO2 other setup

CO2 Settings		X
Balance Gas	Room Air ▼	Anesthesia Gas 0.0 ▲▼
ETCO2 Period	Per. Breath ▼	Currently Barometric 760 ▲▼
Humidity Compensation		
O2 Compensation	16 ▲▼	Default >>

Pic 11-4 CO2 other setup menu

Introduced in turn "CO2 setup menu menu item below :

- BALANCE GAS: ROOM AIR, N2O, oxygen.
- ETCO2 Period: The period to calculate the ETCO2, Per breath, 10s, 20s
- CO2 COMPEN : Oxygen could result in measuring the value of CO2 is lower than the actual value, the use of this option can be used for compensating the existence of oxygen. You can choose from "0-100"

- Anaesthesia Agent: The intensity of the Anaesthesia Agent, you can choose from “0.0~20.0”
- Barometric: Current Atmospheric Pressure, you can choose from “400~850”
- CO2default setup : Choose this setup, you can choose the system default setup.

11.5 CO2 alarm information and suggestions

11.5.1 Alarm Information and Prompt

parameter	MAX ALM HI	MIN ALM LO	step
CO2	100	0	1
INS	100	/	1
AwRR	150	0	1

The default alarm limit

parameter	The type of animal	ALM HI	ALM LO
CO2	large animals	50	15
	Medium-sized animals	50	20
	Small animals	45	30
INS	large animals	4	/
	Medium-sized animals	4	/
	Small animals	4	/
AwRR	large animals	30	8
	Medium-sized animals	30	8
	Small animals	100	30



Warning

When multiple alarms occur simultaneously, the screen will display the highest level of alarm information.

Do not use CO₂ monitoring function, it is best not to take the sink, and the measurement mode is selected as the "standby" mode.

11.5.2 Alarm information

During the measurement, please refer to the following forms.

Physiological alarms:

Message	Cause	Alarm Level
CO ₂ TOO HIGH	EtCO ₂ measuring value is above upper alarm limit.	User-selectable
CO ₂ TOO LOW	EtCO ₂ measuring value is below lower alarm limit.	User-selectable
INS TOO HIGH	InsCO ₂ measuring value is above alarm limits.	User-selectable
AWRR TOO HIGH	AwRR measuring value is above upper alarm limit.	User-selectable
AWRR TOO LOW	AwRR measuring value is below lower alarm limit.	User-selectable

Technical alarms:

Message	Cause	Alarm	Remedy
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		Level	
CO2 SENSOR OFF	Mainstream sensor is not properly connected or has fallen off.	LOW	Make sure that mainstream sensor is properly connected.
CO2 CHECK ADAPTER	no adapter or been damaged	LOW	make sure the adapter is normal
CO2 CHECK THE SAMPLING TUBE	the sampling tube is plugged	LOW	replace the sampling tube
CO2 SIGNAL LOW	Measuring module technical failure	LOW	If necessary, re-start the monitor. If failure persists, stop using measuring function of CO2 module, notify bio-medical engineer or Our service staff.
CO2 SIGNAL TOO LOW		LOW	
CO2 BAROMETRIC TOO LARGE		MED	
CO2 PNEUMATIC LEAK		MED	
CO2 SIGNAL NOISY		LOW	
CO2 SIGNAL SATURATE		LOW	
CO2 CALCULATION ERR		HIGH	
CO2 SENSOR FAULT		HIGH	

CO2 SENSOR TEMP HIGH		HIGH	
CO2 SENSOR TEMP LOW		HIGH	
CO2 WATCHDOG TIMEOUT		HIGH	
CO2 INT COMM ERR		HIGH	
CO2 SYSTEM ROM ERR		HIGH	
CO2 PUMP FAULT		HIGH	
CO2 REVERSE FLOW		HIGH	
CO2 FORWARD FLOW		HIGH	
CO2 MALFUNCTION		HIGH	
CO2 BAROMETRIC HIGH		HIGH	
CO2 BAROMETRIC LOW		HIGH	
CO2 COMM ERR	CO2 module communication failure	HIGH	Stop using measuring function

			of CO2 module, notify bio-medical engineer or Our service staff.
CO2 INIT ERR	CO2 module is not properly connected or failed.	HIGH	Stop using measuring function
CO2 COMM STOP	Measuring module failure or communication failure.	HIGH	of CO2 module, notify bio-medical engineer or Our service staff.
CO2 ALM LMT ERR	Functional safety failure	HIGH	Stop using
INS ALM LMT ERR	Functional safety failure	HIGH	measuring function
AWRR ALM LMT ERR	Functional safety failure	HIGH	of CO2 module, notify bio-medical engineer or Our service staff.
CO2 STANDBY STATUS	Turn from measuring mode to standby mode, making the module in energy-saving status.	No alarm	
CO2 WARM UP	Shows that the sensor is in warming-up stage.	No alarm	
CO2 SENSOR	Shows that the sensor has	No alarm	

START UP	just entering start-up stage.	
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11.6 Maintenance and Cleaning

1. Sample line is for one-off use in SideStream module. Do not sterilize or clean for reuse on another animal.
2. Airway adapter is for one-off use in Mainstream module. Do not sterilize or clean for reuse on another animal.
3. When the sample system of Sidestream module occurring occlusion, first check kinks for sampling line. If no kinks are found, then check water trap after disconnecting sample line from the Watertrap. If the occlusion message on the screen disappears, the sampling line must be replaced. If the occlusion message on the screen remains, the Watertrap must be replaced.
4. No routine calibration required in both Mainstream and Sidestream CO2 module.

Appendix I: Accessory Specification



Warning

Manufacture specified accessories are listed as follows. Using unspecified accessories would damage the animal monitor.

● I.1 ECG Accessories

Name	Specification	Model
Integrated 5-lead (American standard)	Plug: 6 Pin plug of AMP style cable line: animals' cable: 5-core shielded line animals' cable: 1-core shielded line Electrode connector: 4.0 button type	98ME01AA039
Large animal ECG electrodes	Glue solution, Ag/AgCL sensor Press button type, a foam backing, $\phi 55\text{MM}$	YA55
Small animal ECG electrodes	Glue solution, Ag/AgCL sensor Press button type, a foam backing, $\phi 30\text{MM}$	YD30-5

I.2 SpO2 Accessories

Name	Specification	Model
Fingertip blood oxygen probe	Adopt high-precision sensors, and non-toxic TPU medical.	L6077 / L6141
	Two normal optional specification: Large animal	
Soft finger case blood oxygen probe	Adopt high-precision sensors, and non-toxic TPU medical.	L6077 / L6141
	Four normal optional specification: Small animal, Medium-sized animal, large animal	

L6143

Model

ZX-F0002

Precision: $\pm 0.1^{\circ}\text{C}$, when Temp reaches 30~45 $^{\circ}\text{C}$

ZX -F0001

Precision: $\pm 0.1^{\circ}\text{C}$, when Temp reaches 30~45 $^{\circ}\text{C}$

Repeatable cuff

Type of animal	Perimeter of body	Cuff width	Length of charge tube
Small animal	10 ~ 19 cm	8 cm	
Medium-sized animal	18 ~ 26 cm	10.6 cm	

large animal1	25 ~ 35 cm	14 cm	1.5m ~ 3m
large animal2	33 ~ 47 cm	17 cm	
Leg	46 ~ 66 cm	21 cm	

Disposable cuff

Size	Perimeter of body	Cuff width	Length of charge tube
1	3.1 ~ 5.7 cm	2.5 cm	1.5m ~ 3m
2	4.3 ~ 8.0 cm	3.2 cm	
3	5.8 ~ 10.9 cm	4.3 cm	
4	7.1 ~ 13.1 cm	5.1 cm	

Appendix II: Product Specification

II.1 Classification of the animal Monitor

Standard electric shock resistance class: I class electric shock resistance equipment

EMC class A class

Standard degree of resistance to shock ECG(RESP) is CF type :TEMP,SpO2、NIBP are BF type

Degree of preventing from liquid in Normal hermetically-sealed instrument
without the function of preventing from liquid in

sterilization/Disinfection method detailed information refer to chapter 5

Working mode continuous working

Duration of use 5 years

II.2 Specification of the animal Monitor

II.2.1 Size and weight of the animal monitor

size 210mm×100mm×185mm

weight 1.38(kg)

II.2.2 Working environment

Temperature:

Working temperature 0 - 40 °C

Transportation and storage temperature -20 - 60 °C

Humidity:

Working humidity \leq 85 %

Transportation and storage humidity \leq 93 %

Altitude:

Working altitude -500 - 4,600m(-1,600 - 15,000feet)

Transportation and storage altitude -500-13,100m(-1,600 - 43,000feet)

Voltage:

100 - 240 (V)AC, 50/60 (Hz)

12V, 2 A, Pmax=24W

FUSE T 2.0A

II.2.3 Display information

At most 6 waveform display

One alarm indicator(yellow/red)

One working indicator(green)

One battery charge state indicator(yellow)

Three modes in accordance with the alarm state

II.2.4 Battery

2200mA 7.4V lithium battery

Up to 100min working capability

When the low power indicator gives an alarm for the first time, the animal monitor can still work for 5 minutes.

Maximum rechargeable time of battery should not over 12 hours.

II.2.5 Recall

Trend recall

short trend 1 hour, resolution: 1s/5s

Long trend 160hour,resolution: 1min/5min/10min

NIBP recall 400 groups of NIBP data in storage for recall

II.3 ECG Specification

II.3.1 Lead configuration

Standard 3-lead or 5-lead

3-lead RA、LA、LL , Lead method : I , II , III

5-lead RA、LA、LL、RL、V , Lead method : I , II , III , aVR , aVL , aVF , V

I.1.3.2 Gain

×0.25 , ×0.5 , ×1 , ×2,automatic

II.3.3 HR

Range

Large animal 15 ~ 300bpm (beat/minute)

Small animal, Medium-sized animal, 15 ~ 350 bpm(beat/minute)

Precision ±1% or ±1bpm , the larger prevails

Resolution 1 bpm(beat/minute)

II.3.4 Sensitivity

> 200 uV (Peak-to-peak value)

II.3.5 Input Impedance

> 5 (megohm)

II.3.6 Bandwidth

Diagnostic mode	0.05 ~ 130Hz
Monitoring Mode	0.5 ~ 40Hz
Operation mode	1 ~ 20Hz

II.3.7 Common Mode rejection Ratio

Diagnostic mode	> 90 dB
Monitoring Mode	> 100 dB
Operation mode	> 100 dB

II.3.8 Pole Polarization Voltage Range

±300mV

II.3.9 Pacing Pulse Test

Test pacing pulse in accordance with the following conditions:

Amplitude:	±2 mV ~ ±700mV
Width:	0.1ms ~ 2ms
Risetime:	10us ~ 100μs

II.3.10 Pacing pulse inhibition

When pacing analysis switch is on, pacing pulse in accordance with the following conditions are restrained, but affection against HR calculation.

Amplitude:	±2 mV ~ ±700mV
Width:	0.1ms ~ 2ms
Risetime:	10us ~ 100μs

II.3.11 Baseline Recovering Time

After defibrillation< 3 seconds

II.3.12 Signal Range

±8 mV (Peak-to-peak value)

II.3.13 Calibrating Signal

1mV(Peak-to-peak value) , precision ±5%

II.4 RESP Specification

II.4.1 Measuring Method

RA-LL impedance

II.4.2 Respiratory impedance detection range

0.3 ~ 3Ω

II.4.3 Base Impedance Range

200 ~ 4000Ω

II.4.4 Bandwidth

0.1 ~ 2.5Hz

II.4.5 RESP Rate

Range

large animal 7 ~ 120BrPM

Small animal, Medium-sized animal 7 ~ 150 BPM

Resolution 1 BPM

Precision ±2 BPM

II.4.6 Asphyxia Alarm

10 ~ 40 seconds, no alarm

II.5 SpO2 Specification

II.5.1 SpO2

Range 0 ~ 100%

Resolution	1%
Precision	70 ~ 100% : ± 2 DIGIT
	0% ~ 69% : no given definition

II.5.2 PR

Range	20 ~ 300bpm
Resolution	1bpm
Precision	± 3 bpm

II.6 TEMP Specification

II.6.1 suitable for temperature sensor

YSI series , CYF series

II.6.2 Measuring

Range	0 ~ 50°C
Resolution	0.1°C
Precision	± 0.1 °C (excluding sensor error)

II.7 NIBP Specification

II.7.1 Measuring Method

Pulse wave oscillometry

II.7.2 Work Mode

Manual/Automatic/STAT

II.7.3 Measuring Interval of Automatic Measuring Mode

1,2,3,4,5,10,15,30,60,90,120,180,240,480 minute(s)

II.7.4 Measuring Time of STAT Mode

5 minutes

II.7.5 PR range

40 - 240 bpm

II.7.6 Measuring Range and Precision

Range

large animal	Systolic blood pressure	40 ~ 270mmHg
	Diastolic blood pressure	10 ~ 215mmHg
	Mean blood pressure	20 ~ 235mmHg
Medium-sized animal	Systolic blood pressure	40 ~ 200mmHg
	Diastolic blood pressure	10 ~ 150mmHg
	Mean blood pressure	20 ~ 165mmHg
Small animal	Systolic blood pressure	40 ~ 135mmHg
	Diastolic blood pressure	10 ~ 100mmHg
	Mean blood pressure	20 ~ 110mmHg

Static pressure range 0 ~ 300mmHg

Static pressure precision ± 3 mmHg

Pressure precision: Max. average error: ± 5 mmHg ; Max. standard deviation: ± 8 mmHg

II.7.7 Over voltage protection

large animal	mode	300 mmHg ± 10 mmHg
Medium-sized animal	mode	240 mmHg ± 10 mmHg
Small animal	mode	150 mmHg ± 10 mmHg

II.8 CO2 Specification

Side stream:

II.8.1 Measurement Method

Infrared radiation absorption technique

II.8.2 Measurement Range

0 ~ 99mmHg

II.8.3 Precision*

0 ~ 40mmHg: ± 2 mmHg

41 ~ 76mmHg: $\pm 5\%$

77~99mmHg: $\pm 10\%$

II.8.4 Resolution

1mmHg

II.8.5 Drift

To meet the requirement of accuracy within 6 hours

II.8.6 Pumping Rate

70ml/min, 100ml/min

II.8.7 Pumping Rate Control Accuracy

15% or 15ml/min big

II.8.8 Module Start Time

The < 1min, enter the precision measurement of the state

After entering 1min, the accuracy of measuring state

II.8.9 AWRR Measuring Range

0 ~ 120BrPM: ± 2

II.8.10 Precision

0 ~ 70BrPM: ± 2 BrPM

>70BrPM: $\pm\pm 5\text{BrPM}$

II.8.11 Response Time

The use of neonatal sink, 2.5m long neonatal sampling tube:

< 3.5s @ 100ml/min

< 4s @ 70ml/min

The use of large animal sink, 2.5m long animal sampling tube:

< @ 5.5s 100ml/min

< @ 7s 70ml/min

II.8.12 Delay Time

The use of small animal sink, 2.5m long small animal sampling tube:

< @ 3s 100ml/min

< @ 3.5s 70ml/min

The use of sink, 2.5m long large animal sampling tube:

< @ 5s 100ml/min

< @ 6.5s 70ml/min

II.8.13 Asphyxia Alarm Delay

AwRR:10 ~ 40s