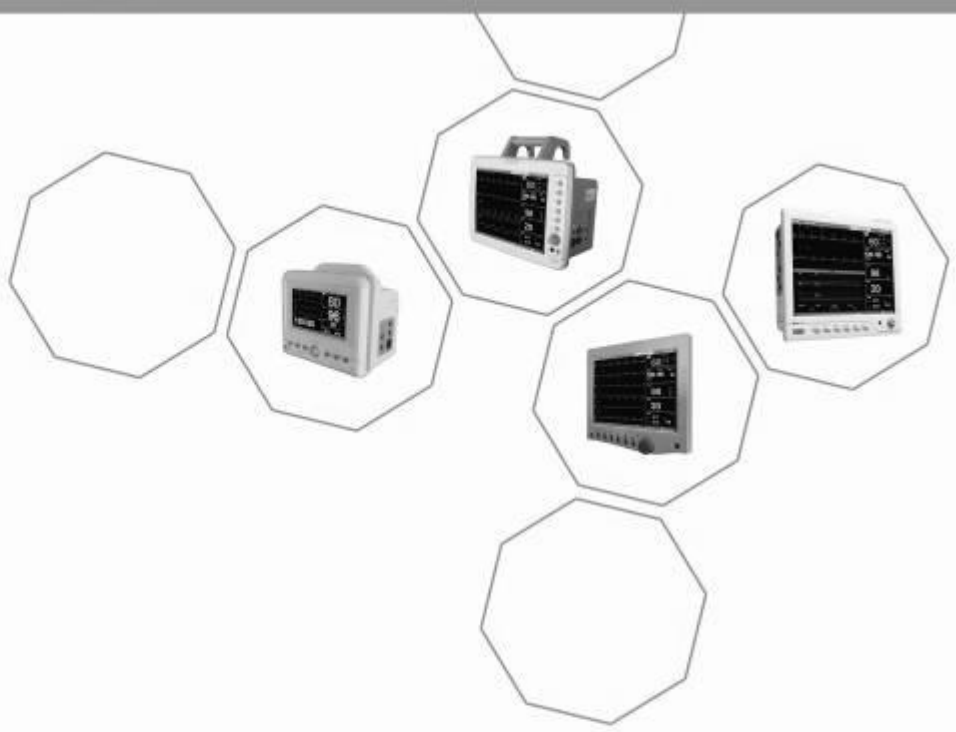
Please read the introduction before use

Patient Monitor

User's Manual



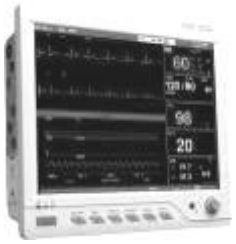
This manual is applicable to many types Patient Monitor Products!

900K-6. 1-02-050212.

Product Information

This manual applies to system of the workbench kind of model parameters monitor. This series of products is basically the same style of the basic operation and interface, by the universal buttons, knob definition. The model of the parameters slightly different configuration of the functional configuration parameters, detailed see "model function" and chapters table the detailed description of!

Apply the product model in the list below

			
12.1 inch portable	**12.l inch slim type**	**7 inch portable**	**15 inch slim type**

Model function of comparisons table:

Related parameters project		**12.1 inch portable**	**15 inch slim type**	**12.l inch slim type**	**7 inch portable**
Function parameters configuration	ECG	√	√	√	√
	TEMP(T1/T2)	√(T1/T2)	√(T1/T2)	√T1	√T1
	RESP	√	√	√	√
	NIBP	√	√	√	√
	SpO2	√	√	√	√
	PR	√	√	√	√
	EtCO2	□	□	×	×
	IBP（1/2）（Optional）	□	□	×	×
	Battery	√	√	√	√
	Recorder	√	□	×	√
	LED alarm indicator	√	√	×	√
	Remote Control	√	√	√	×
	Bracket（Optional）	□W/D	√ W/D	√ W	□W/D
	Networking	√	√	√	√
Model describing difference	Display size	12.1”	15”	12.1”	7”
	Display Resolution	800*600	1024*768	800*600	800*480
	Battery size	11.1V/4.4Ah	11.1V/4.4Ah	11.1V/4.4Ah	14.8V/2.2Ah
	LED Battery indicator	Peculiar	Peculiar	Peculiar	Peculiar
	Display Interface	Standard	Standard	Standard	Peculiar
	Touch screen	×	√	×	×

Standard：√ Optional：□ Don't support：× W：wall D:desktop

Contents

Safety Instruction

Any operator must read the following text carefully before using the monitor. This text will tell operator the operation steps. Incorrect operation may cause malfunction and danger that may harm the monitors or persons. Any malfunction or harm to the persons or monitors is caused by wrong operation that can be avoided absolutely if according to the instruction indicated in this text, manufacturer would be not responsible for the safety, reliability and performance assurance. The manufacturer would not support free maintenance to this kind of malfunctions.

1. To secure circuit work well and insure the ECG signal high quality, the monitor must be grounded correctly.
2. Adult mode is forbidden to use to measure the blood pressure of kids, or it would cause harm because of over inflation, and even could cause severe hurt to kids..
3. Using this monitor on the patient with serious hemorrhage tendency may cause local hemorrhage; patients with sickle cell anemia should be cautiously used on. .
4. Blood pressure could not be measured on the limb that is in drip-feed and intubation or blood pressure cuff must not be bound to the patient whose skin is damaged locally.
5. Continuous use of finger-nipped SpO_2 sensor would cause discomfort or pain, especially for the patient with microcirculation barrier. Operator had better not nip the sensor on the same finger over two hours.
6. Some special patients need to be taken more careful check on the part of SpO2 sensor measuring. Do not nip the sensor to the edema or vulnerable tissues.

Chapter 1 Introduction

Applicable scope

This series patient monitor be bsed to Detection of patients ECG/ HR、TEMP、RESP、NIBP、SPO2、EtCO2 and IBP.

Different types of products related functional description:

Function / Model	ECG/HR	TEMP(T1/T2)	RESP	NIBP/PR	SpO2/PR	$EtCO_2$	IBP(I1/I2)
12.1 inch portable	√	√	√	√	√	□	□
15 inch slim type	√	√	√	√	√	□	□
12.l inch slim type	√	√(T1)	√	√	√	—	—
7 inch portable	√	√(T1)	√	√	√	—	—

1.1 Working conditions

Temperature

Working temperature ：5℃～40℃

Humidity

Working humidity：≤85%

Atmospheric pressure

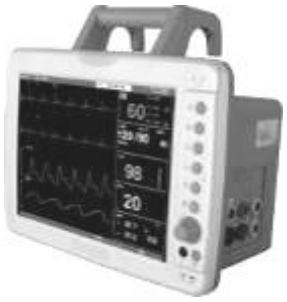
Working pressure ：86kPa - 106kPa

Power supply ：AC 100 -240V 50/60Hz

Fuse ：F2A L 250V φ5×20 （**Peculiar：12.1" + 7"+15"slim type**）

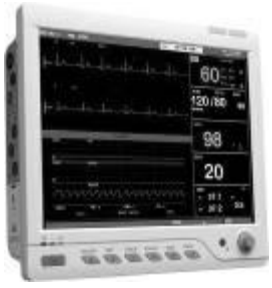
Match fitness：output DC 15V 3.3A （**Peculiar：12.1"slim type+15""slim type**）

1.2 Exterior picture of the patient monitor



12.1" portable

12.1 slim type

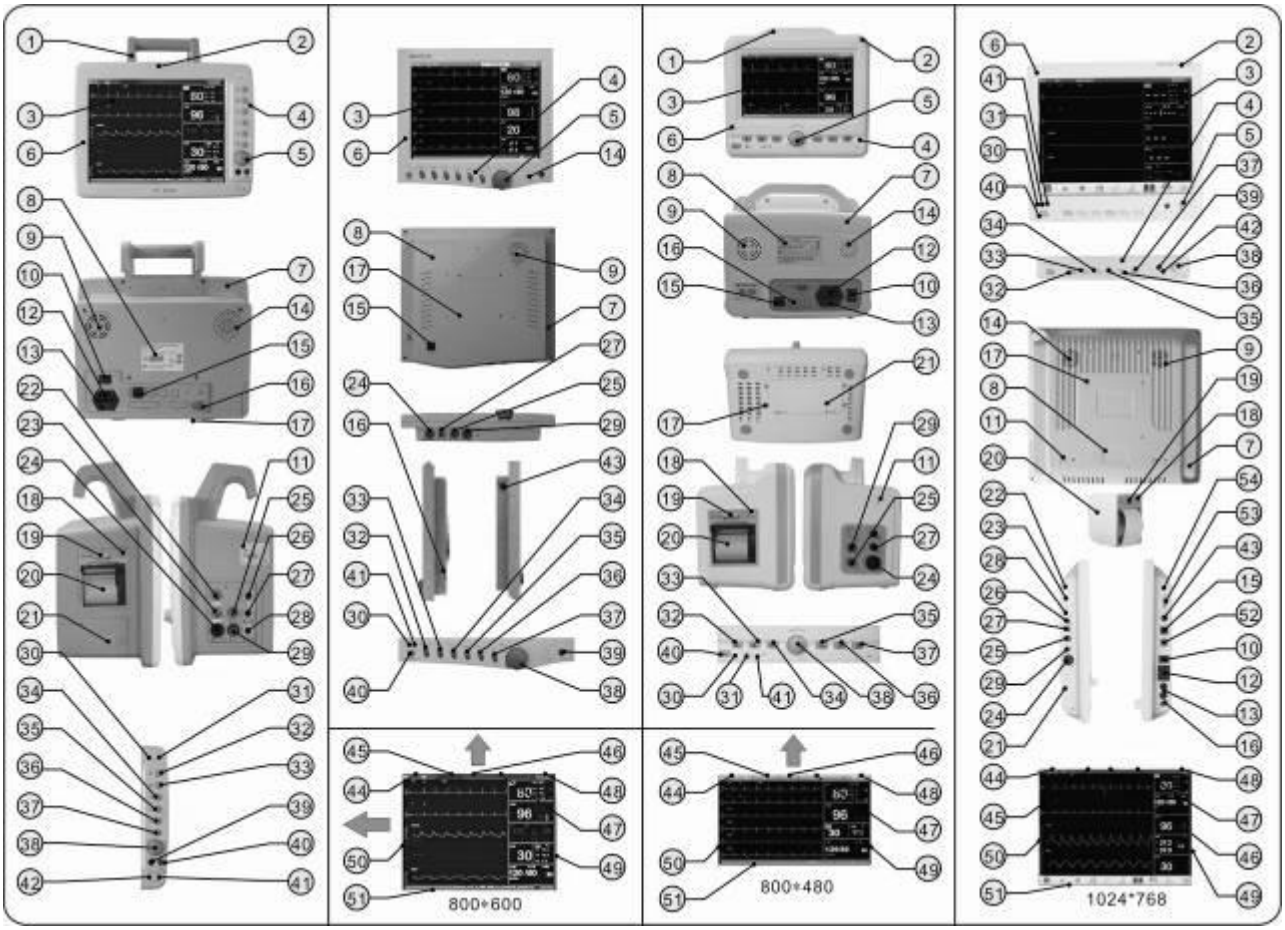


15 slim type

7" portable

Multi-parameter patient monitor

1.2.1 Product control



Attention

◆ **Because of the different product model and some module is optional configuration, so you purchase the monitor may be not have certain functions or the corresponding interface, please see the models of the corresponding description.**

(1) handle (2) independent lights (3) display (4) control view (5) shuttle key (6) front view (7) back view (8) product nameplate (9) fan outlet (10) AC power switch (11) expansion module fixed holes (12) AC input jack (13) fuse box (14) speakers (15) network interface (16) grounding terminals (17) breaket fixed hole (18) recorder state indicator light (19) recorder paper warehouse switch (20) recorder (21) battery warehouse cover (22) IBP2 interface (23) IBP1 interface (24) ECG interface (25) SpO2 interface (26) TEMP2 interface (27) TEMP1 interface (28) EtCO2 interface (29) NIBP interface (30)AC indicator light (31) DC indicator light (32) mute key (33) Alarm suspend key (34) frozen key (35) pressure measuring key (36) print key (37) menu button (38) shuttle key (39) remote control knob received through the window (40) system switch (41) battery status indicator (42) remote control receiving indicator light (43) DC power socket (44) patient information area (45) demo tip information area (46) technology alarm information area (47) physiological alarm information area (48) system time instructions area (49) parameter information (50)

waveform instructions area display (51) tip information area （52）USB socket（53）Signal output interface（54）Antenna interface

1.3 Control view

Attention

◆ **The product has many cabinet symbols, this symbol tips please be careful operation, which see random material and product specifications in the description and requirements.**

Control panel is located instrument on the board, the definition of detailed description as follows.

(30)AC indicator light (31) DC indicator light (32) mute key (33) set key (34) frozen key (35) pressure measuring key (36) print key (37) menu bu tton (38) shuttle key (39) remote control knob received through the window (40) system switch (41) battery status indicator (42) remote control receiving indicator light

●30——AC indicator light (join into alternating current power supply, indicating after power supply switches on)

●31——DC indicator light (join into alternating current power supply, indicating when the system works)

●32——  Silence: Press it to switch on/off alarm sound and other systems sound

●33——  Alarm suspend key: Alarm suspend key, can make the alarm suspended two minutes (three optional Settings are "1 minute", "2 minutes" and "3 minutes").

●34——  Freeze: Press it to freeze the waveform to measure the ST segment.

●38——**Shuttle key**: Rotate it to choose menu item and change the setup. It can be rotated deasil or widdershins, and pressed down. It can help finish all the operations on the main screen, system menu and parameter menu. It can be used to move the basic direction in the freezing status.

● 35——  Start: Press it to start to puff the cuff to measure the blood pressure. In the procedure of measurement, press it to stop measurement and deflate; Press it every time to start and stop the blood pressure measurement by turns.

● 36——  PRINT: Press it to print the current show.

● 37——  MENU: Press it to pop-up the frame of function menu.

● 40——  Soft switch on the power supply system: can be open monitor.

- **39——** remote control knob received through the window：Infrared remote control for receiving a instructions.
- **41——** battery status indicator：Used for the state of the storage battery charging and discharging real-time instructions.
- **42——**remote control receiving indicator light**:** Press the remote and accept to remote control signal instructions.

Using Rotary knob to operate:
Cursor is moving when rotating the knob.The place where cursor located can be operated accordingly.
When cursor is at the area of waveforms,users can modify current setting. When it is located at parameter's area, users can set information according to each parameter.
The operation are as follows:

- Move cursor to items
- Press the knob
- Four conditions will occur
  - It pops uo menu or measurewindow, or new menua replaced
  - Cursor with color background truns to frame without color background
  - Occur a "√" mark, which means choosing this item

1.4 Display of the screen

The screen is TFT colored LCD display with high resolution, which can show each parameter and waveforms clearly. Other interface description：

(44) patient information area (45) demo tip information area (46) technology alarm information area (47) physiological alarm information area (48) system time instructions area (49) parameter information (50) waveform instructions area display (51) tip information area

46---- Technology alarm information area
Show technical alarm information or indicating information, Report monitor's screen status. When without any information, it shows nothing
47---- Physiological alarm information area
Show physiologic alarm information, display circularly when one more information
48---- System time
Show current date and time
49---- Parameter information
Consisted of each small parameter area, it shows the measurement values according to each parameter module. The upper left of each parameter is hot key. Through it, setting menu for each parameter can be opened, for details, please refer to each parameter chapter. The alarm information occurs regularly behind the area of each parameter. Showing menus alarm is under off, and the sound of alarm is turned off until users cancel this operation. If

without any display, it means this parameter is under alarm sound indication function.

Attention

◆ **When the mark occurs, systems won't carry out the alarm sound function. Therefore, users should use this function carefully.**

50----Waveforms Area

It mainly shows waveforms of parameters, the left corner is the name of waveforms.

It shows 4 channels waveforms, the sequence of which can be adjusted. At most, it can display 2 channels ECG waveforms, SPO2 pleth waveforms and RESP waveforms.

The name of waveforms is shown at the top left ECG lead can be chosen as requirement. It also display gain and filter mode of ECG waveforms. There is a ruler about 1mv on the left side of ECG waveforms. When pop up menu during operation, the menu always occupy the fixed place on the middle of waveforms,so it make some part of waveforms invisible. Exit the menu and return to previous menu.

The waveforms are renewed at the designed speed rate, please refer to each parameter's setting.

51----Indication Information

It display indicating information regarding to systems (demo,freezing),network mark, AC power or battery symbol.

Audio symbol

It is alarm pause symbol. Press "Alarm" key (not exceeding 1 second) and occurs this symbol, which means all of sound alarm having been off temporarily. It won't recover sound alarm unit "silence" key is pressed again or pause time is out. The time for pause is "1 minute" ,"2 minutes","3 minutes "three kinds.

It is silence symbol, press it and occurs this symbol, which means the sound of alarm and other system sound is turned off. It won't recover until users press "silence" again for long time to cancel silence status or systems happen new alarm event.

Alarm light and Alarm status:

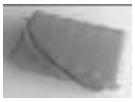
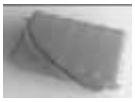
On normal condition, alarm light won't be on.When alarm happens, alarm light turns on or glitters. The color of light stands for different class of alarm, details refer to alarm function. Alarm information and indicating information, for more, please refer to regarding chapter.

Attention

◆ **12"Slim don't have independent alarm function!**

1.5 Lithium battery

Configuration: various models of monitor of the corresponding lithium ion battery model see the table below:

Model	Appearance	Battery model	Battery appearance	Specifications	Standby time
12.1" portable		TB0802		Li-ion Battery 11.1V / 4400mAh	≥2 hours
12.1"Slim type		TB0802		Li-ion Battery 11.1V / 4400mAh	≥2 hours
15"Slim type		TB0901		Li-ion Battery 11.1V / 4400mAh	≥1hour
7" portable		TB0801		Li-ion Battery 14.8V / 2200mAh	≥1 hour

The patient monitor has option of built-in 11.1V or 14.8V Lithium ion battery. On the upper right corner of the screen, there is a "  " symbol, indicating the battery state, in which the green part is the power of the battery. When the battery is full, the battery symbol will show "  " means the battery is full. When the monitor is not installed with built-in battery, the battery status will show as "  " means there is no battery.

With fully charged new battery the patient monitor can be used normally for two hour. When being connected with AC power, the battery can be recharged automatically until it is fully charged. The patient monitor will power off due to low power when using discharged battery. Then the battery should be recharged by plugging into AC power.

When using monitor on battery-power, regularly monitor and detect the battery power insufficient warning prompted in the information area "less battery, please charge." AC power should be connected at this time to charge the battery immediately.

When the battery needs to be changed, it is necessary to follow these steps: turn off the main switch of power supply, plug out the power line, press the battery shell, and open the cover as the direction indicated by the arrow mark. Please pay attention to the positive and negative terminal of the recharged battery. Don't connect contrarily.

Attention

- **Pull out battery before deliver monitors, or don't use it for long time!**

Battery removing operations:

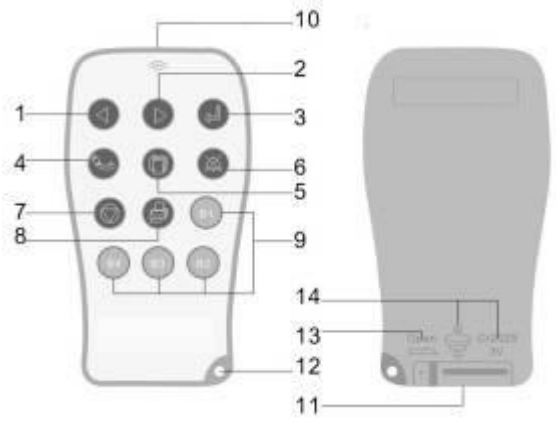
12.1"protable	Steps described
	1. Cut down power supply, pull out of power supply line. 2. Invert monitor, open the bottom of battery case 3. Loose two screws by cross screwdrivers 4. Pour out the battery, pull out negative and positive poles of battery 5. Make sure the same model as previous battery, and then connect the two poles of new battery

12"Slim type	Steps described
	1. Cut down power supply, pull out of power supply line. 2. Reverse place host, remove the four host screws; 3. Flip host and open, carefully excision and pulled out relevant connectors; 4. Pull out the output plug cable battery; 5. Cut open the fixed line firm, battery took battery and the line pitcher; 6. Will new battery pack reposition the appropriate cable fixed position; 7. Distinguish is negative, the plug into new battery pack original position; 8. The relative connectors restore plug and examination; 9. turn on the power switch, the host should be able to normal boot and into the system; 10. Turn off the power switch, to four host links side screws to fixed lock; 11. Insert AC adapter, observe whether charging instructions and normal power added;

15"Slim type	Steps described
	1. Turn off the power, unplug the power cord; 2. using crosswise screwdriver unscrew the screw on the left side of the battery compartment cover; 3. Remove the battery compartment cover and use thumb push up the battery pack lock; 4. After battery is ejected, pinch the label on the battery pack, pulling the battery pack off the battery compartment; 5. re-insert New battery pack to he battery compartment on right direction, and lock automatically lock; 6. Cover the battery compartment lid and with a Phillips screwdriver and screws to reconnect the host; 7. Turn on the power , the host should be able to start upt and into the system, charging indicator should be normal; 8. Battery charging supplement;

7"portable	Steps described
	1. Cut down power supply, pull out of power supply line. 2. Invert monitor, open the bottom of battery case 3. Loose two screws by cross screwdrivers 4. Pour out the battery, pull out negative and positive poles of battery 5. Make sure the same model as previous battery, and then connect the two poles of new battery

1.6 Remote controller specification:



1. Left key 2. Right key 3.Confirm key
4. Start key 5. Menu key 6.Silent key
7. Freezing key 8.Print key(optional) 9. Optional key (Not available now)
10. Infrared emitter 11.Battery position 12. Hole to hitch
13. Operation Identifier to open the battery door 14.Battery Model: CR 2025

Chapter 2 Installation

- **Open the packing carton and check the accessories.**
- **Connect the grounding end of the monitor.**
- **Check input power supply and earthing.**
- **Connect the sensor, cuff to the patient.**
- **Turn on the On-OFF switch of main power supply and of monitor.**

Attention

- **12'' slim type monitor use the AC/DC adapter for power supply。**

Attention

- **Please read this chapter and the chapter of security of the patients before using the patient monitor and install the monitor according to the requirement to ensure the patient monitor works normally.**

2.1 Open the carton and check

Take the patient monitor and the accessories out of the packing carton and keep the packing material for the future transportation and storage. Please check the accessories:

- Check whether there is any mechanical damage.
- Check all the accessories and their links connecting plug-in units.

Please contact after-sale service department of our company or the dealer immediately in case of any question.

2.2 Connecting AC power supply cable

Connect AC power supply as follows:

- Make sure that AC power supply comply with the standard: AC 100～240V 50/60Hz
- Use power cable equipped with the patient monitor. Plug one terminal into the power socket of the monitor while the other into the 3 pins of socket.

Attention

- **Connect the power cable to the special socket of the hospital.**

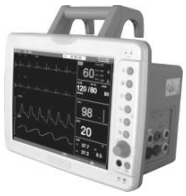
After long transportation and storage, the battery should be recharged. Therefore, the patient monitor can't work normally without connecting to AC power supply possibly due to low power of battery. By connectting with AC power supply, battery can be recharged (whether the patient monitor is on or off). The fuse should be changed when it's broken, the model of fuse must be F2A L 250V Φ5×20.

2.3 Powering on

① Standard configuration (without storage battery): check AC power supply cable. Turn on the main switch of power supply on the rear side of the monitor, then the indicatior light will be on, enter into the main screen of monitor after self-inspection of the system,then user can operate it normally.

② Functional configuration of optional storage battery: check AC power supply cable, turn on the main switch of power supply on the rear side of the monitor, then indicator "~" will be on. After one second press the soft switch "⏻" gently, the DC indicator will be on. When the patient monitor displays the main monitor display after self-inspection, the user can operate it normally.

Various models of monitor indicator light state and meaning please see table below：

	battery status indicator	green	flicker	battery abnormal
		green	Always on	charging
		No display	no	Has full
	DC indicator	green	Always on	System work
		No display	no	System does not work
	remote control light receiver‰	orange	flicker	Remote control receiver to respond
		red	Always on	Battery voltage low
	AC indicator	green	Always on	AC input instructions
		No display	no	Battery-powered or AC not connected

	battery status indicator	green	flicker	charging
		green	Always on	Has full
		orange	flicker	Battery voltage low
		orange	Always on	Battery discharge
		No display	no	No built-in battery
	AC indicator	green	Always on	AC input instructions
		orange	flicker	Remote control receiver to respond

	battery status indicator	green	flicker	charging
		green	Always on	Has full
		No display	no	No built-in battery
		orange	Always on	Battery discharge
		orange	flicker	Battery voltage low
	DC indicator	green	Always on	System work
		No display	no	System does not work
	remote control light receiver‰	orange	flicker	Remote control receiver to respond
	AC indicator	green	Always on	AC input instructions
		No display	no	Battery-powered or AC not connected

	battery status indicator	orange	Always on	charging
		green	Always on	Has full
		No display	no	No built-in battery
	DC indicator	orange	Always on	Battery voltage low
		green	Always on	Battery discharge
		red	Always on	Abnormsl crlls or without battery

		No display	no	AC power supply or battery power
	~ AC indicator	green	Always on	AC input instructions
		No display	no	Battery-powered or AC not connected

Attention

◆ **Press the soft switch ⏻ gently again for one second to swith off the system. If the patient monitor is in the standby state for a long time, the user should turn off the main switch of power supply and take the storage battery out of the monitor.**

◆ **Check all the functions to make sure that the patient monitor works well.**

If equipped with storage battery, battery should be recharged after each-time use to make sure enough power storage.

◆ **The user should inspect and maintain the storage battery regularly to make sure the battery works well.**

◆ **After turnning off the device, wait for one minute to turn on the device again.**

⚠ Warning

◆ **If there is any damage in the monitor or indication of errors, please do not use it and contact the after-sales service department of our company immediately.**

Connecting sensors

Connect the corresponding sensor to the patient monitor and the part of the patient.

Attention

◆ **Refer to the relative chapters for the ways of connecting all kinds of sensors and other requirements.**

Chapter 3 Systmes Menu

It introduces "Systems menu", others will be clarified in following chapter

3.1 Patient information manage

3.2 Default

3.3 Recall

3.4 Monitor information

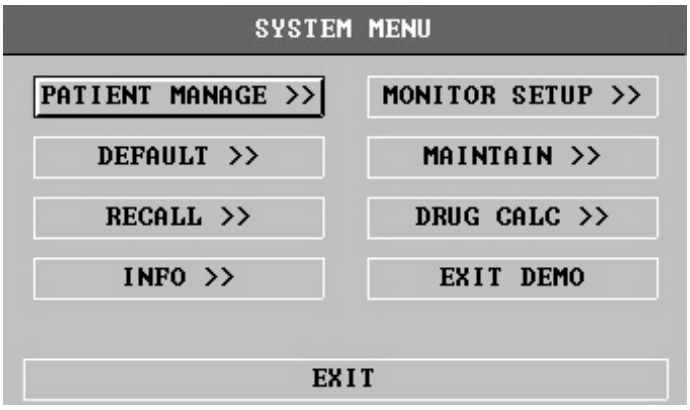
3.5 Monitor setup

3.6 Monitor maintenance

3.7 Drug calculation

3.8 Demo

This monitor is configurated flexibly. Users can set up the monitor information, speed rate of scanning and so on. Press"menu" key on the front panel and pop up menu as follows:



3-1 Systems menu

3.1 Patient manage

Attention

◆ Delect current patient data, please refer to "delete patient record "

Select "Patient manage"in "System menu", then pop up pic.3-2

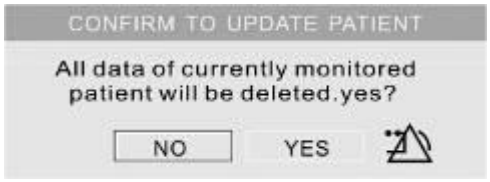
3-2 Patient manage

Set up the following information by this menu:

◆ Bed no. 1-200 optional

- Sex: Male or Female
- Patient type: Adult, pediatric, neonate
- Pace: on or off
- New patient : receive new patient ,but not delect the previous data

In this menu, users can choose"new patient"to enter "Confirm to update patient",as pic.3-3



3-3 Confirm to update patient

Select"Yes",delete all data of currently monitored patient and exit the menu

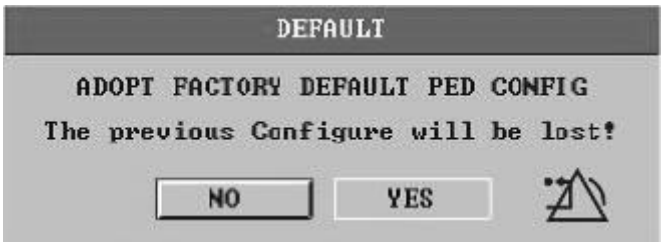
Select"No"， continue to store the data, and exit the menu

Attention

If select "Yes",it wil delect all data of currently monitored patient.

3.2 Default

Users can set current configuration as User default configuration.Then system will store all the setting, like parameter, ECG Lead, gain and filter, as user default accordingly,and pop uo the pic.3-4 window:



3-4 Default

Select "Yes", store all current configuration as default

Select "No", cancel current operation, system will still keep previous configuration

3.3 Recall

Select "Recall" in "System menu",and then pop up pic.3-5 menu:

3-5 Recall menu

There are "NIBP recall","Alarm recall","Trend Graph","Trend table"and so on, for more details,please refer to Recall function.

3.4 Monitor Information

Select "Monitor information"in "System menu" to check the version information of monitor, like pic.3-6 for reference, the actual content is accord to each monitor.

3-6 Monitor Versions

Select "Device Config list"to check the configuration of monitor, refer to pic.3-7

3-7 Device config list

3.5 Monitor setup

Select "Monitor setup" in "System menu" to pop up pic.3-8

3-8 Monitor setup

The submenu available in this menu:

- Face select: take reference to System menu
- The alarm limit: open is the parameters that in next to the parameters that the alarm limit;
  Close is the parameters in next to the parameter not display the alarm limit
- Alarm record time: three choices: 8seconds, 16 seconds, 32 seconds .When alarm happens, recorder will record and output it.
- Key volume : four choices: "Off", "Low", "Middle", "High" ,among of which "off" means without any key volume

3.5.1 System Time

Select "time setup" in "monitor setup", pop uo pic.3-9

3-9 time setup

Through rotary know, it can set up year, month, day, hour, minute and second.

Attention

- System time should be set up when turning on monitor (If users need this setting), otherwise it won't show the correct time when recall.

3.5.2 Record output setting

Select "Record setup" in "Monitor setup", pop up pic.3-10

3-10 Record set up

In this menu, users can set up the following items:

- Waveforms 1 Select the first waveforms for output, but keep different choice with Waveforms 2, otherwise system will adjust automatically
- Wavefomrs 2 Select the second waveforms for output, but keep different choice With Waveforms 1, otherwise system will adjust automatically
- Record grid on: output on recording paper with grid
  Off: ouput on recording paper without grid
- Record time three choices: 8 seconds, 16 seconds, 32 seconds
- Record speed two choices: 25mm/s, 50mm/s

3.5.3 Select "Event setup" in "Monitor setup",pop up pic.3-11

3-11 Event setup

Users can set up four envents, that is Event A, Event B, Event C, Event D by themselves. The chosen event will be marked with "@", if chosen again, the mark will disapear. The meaning of event marked is to define each situation related with patient and parameters.Example: taking medicine, administration of drug or other treatment. And it will display on Trend Graph to help the analysis of patient's parameter.

3.6 Monitor maintenance

Select "Maintain"in "System menu",pop up"maintenance password"window, pic.3-12

3-12 Maintenance password

In this menu, users can enter user password to maintain monitor.Users can't carry out factory maintenance function, it is only for factory.

Rotate the knob, enter user's password: **2016,** and press "confirm",appearing user maintain as pic.3-13

3-13 User maintain

- Language: English, Spanish and franch
- Lead Maming: AHA and EURO, please refer to "ECG/RESP"chapter for how to distinguish them
- Alarm button:Users can switch to select the alarm tone
- Battery type selection for the selection of system battery type，generally do not need to change.

⚠Warning

- **After the alarm sounds off .alarm system will not give the prompt of alarm sound.Do not turn-off.**

⚠ Warning

◆ **Incorrect settings may cause the damage to the battery and inaccurate information.**

◆Alarm pause time:Pause time can be modified in "1" "2" "3"minutes

◆ Color self-define: Define the color shown on waveforms and parameters

3-14 Color self-define

In this menu, users can setup the color shown on each parameter's waveforms and parameter on the screen as requirements.

◆ Nurse call setup: select this function, it will be carried out together with central monitoring systems

◆ touch screen calibration. If the touch recognition of touch screen is not accurate or position deviation, Enter the calibration screen and will appear four white punctuation, from the upper left corner, on clockwise turn accurately point to the punctuation, When you click on punctuation will turn red, after four punctuation are done , operation will automatically exit calibration.

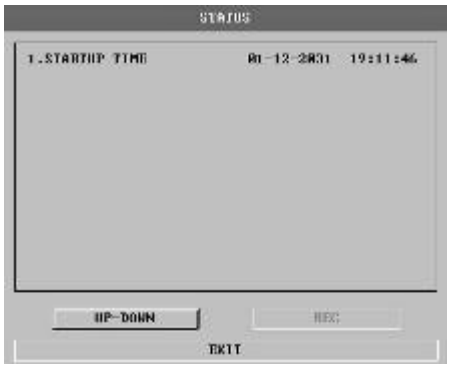
⚠ Warning

◆ **When calibrating touch screen, the location of the non-punctuation is easy to inadvertently and causing the calibration failure. In the calibration does not touch on the screen else.**

◆ **If the position deviation after calibration, please re-calibration again!**

3.6.1 Monitor status

Select "monitor status"in "Password" to enter "System event", pic.3-15

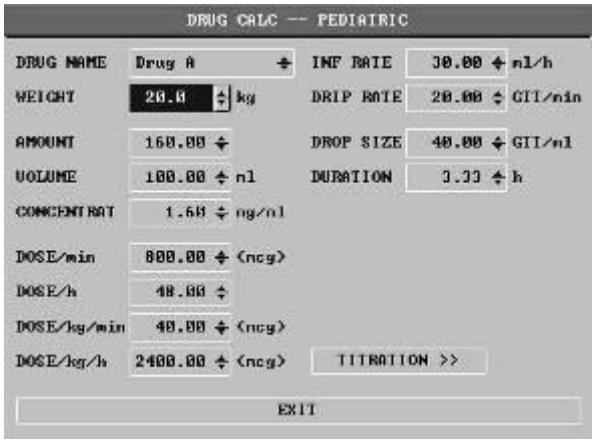


3-15 System Events

- Up-down In this menu, it will show 10sets of information at the most. If more,users can choose "up-down" to browse more information
- Record This key is not available for status inforamtion.

3.7 Drug calculation

Select "Drug calculation" in "System menu", entering into pic.3-16



3-16 Drug calculation

3.7.1 Calculation Formula

- Drug concentration=Drug Amount÷Liquid Volume
- Transfusion Rate=Drug dose÷Drug concentration
- Duration time=Drug Amount÷Drug dose
- Drug Dose=Transfusion Rate X Drug concentration

3.7.2 Operation step

- Drug: select the right frame beside "Drug name",rotate the knob, 15 kinds of drug available:Drug A, Drug B, Drug C, Drug D, Drug E, AMINOPHYLLINE,DOBUTAMINE,DOPAMINE,EPINEPHRINE,HEPARIN,ISUPREL,LIDOCAINE,NIPRIDE,NITROGLYCERIN,PITOCIN
- Weight: select the right frame beside "Weight" ,roate the know and enter the value
- Ener the correct values of parameter: after calculation, operators should verify the accuracy of parameter's values

3.7.3 Unit

It should adopt the same or fixed unit or unit series to calculate, operators should choose the

appropriate unit according to Doctor's requirement.In the same unit's series, the scale of unit will be adjusted automatically with the parameter's values.When some parameter's values exceed the scope of unit, it will display "--".Users can define the drug's unit as follows:

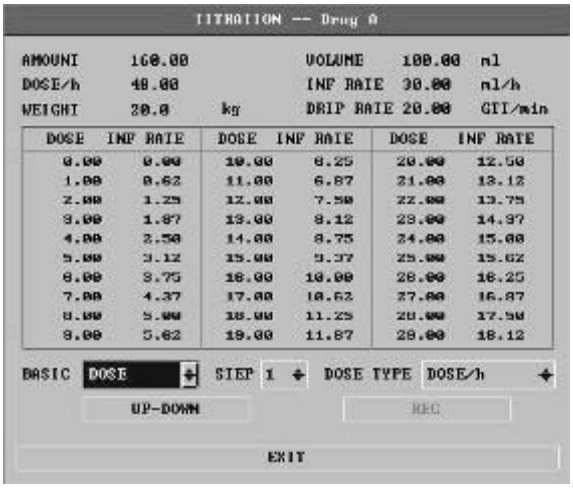
- The unit of Drug A.B.C: g , mg, mcg
- The unit of Drug D: Unit, Kunit, Munit
- The unit of Drug E: mEq

Attention

- **For new patient, "Infusion rate" and "volume" is limited**
- **It can make drug calculation only after entering patient's weight and choosing drug name**
- **The function of drug calculation is separated from other function**

3.7.4 Titration

After finishing drug calculation, select "Titration" to enter into pic.3-17 menu



3-17 Titrations

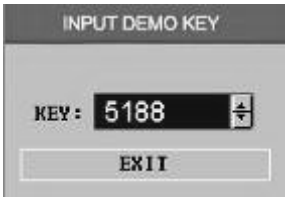
- Basic item: Rotate the knob, locate the cursor on the right frame
  Press the knob, "Dose", "Infusion rate" or "Drip rate" available
  The data on the trend graph will change accordingly
- Step: Rotate the knob, locate the cursor on the right frame
  Press the kno,"1-10"available scope
  The data on the trend graph will change accordingly
- Dose type: Rotate the knob, locate the cursor on the right frame
  Press the knob, "dose/min", "dose/h", "dose/kg/min", "dose/kg/h" available
  The data on the trend graph will change accordingly
- Up-down : Rotate the knob,locate the cursor on the key of "Up-down"
  Rotate the knob,it can browse more data
- Record: If the key is grey, the data shown on the current window can't be recorded

Attention

- **Titration is a separated function from monitor.The subject can be patient not monitored. It won't have effect on patient when making operation on Titration window**

3.8 Demo

Select "Demo" in system menu, display entering password window. Enter the correct password , it enters into Demo mode. The password is **"5188"**.



3-18 Demo

Chapter 4 Alarm Function

- This chapter introduces the general information and measures will be taken
- Refer to each parameter's alarm and indicating information in each parameter's setting

Attention

◆12 " slim type Monitor products do not have separate warning lights.

4.1 General

Alarm is an indication to users when patient monitored have changes of vital sign or when monitor itself has malfunction

4.2 Alarm

4.2.1 Alarm type

Alarm has three kinds: physiologic alarm, technical alarm and indicating information

- Physiologic alarm: If the alarm is caused by the patient's changes of vital sign, that is the physiologic parameter values exceed the limit or the physiologic abnormal situation can't be judged by single parameter exceeding alarm limit.
- Technical Alarm: It is caused by monitor itself, that is due to technical problem or monitor's malfunction, it can't monitor patient accurately

4-1 Example of physiologic alarm and technical alarm

Patient or monitor condition	Alarm type caused
HR measurement result is 114BMP,exceeding alarm limit	Physiologic alarm
Detecing atrial fibrillation	Physiologic alarm
ECG lead off when testing ECG module	Technical alarm
SPO2 module malfunction	Technical alarm

- Indicating information: It doesn't belong to alarm.It means that monitor will display some information about system status besides physiologic alarm and technical alarm. This information doesn't refer to vital sign,for example,displaying "NIBP alarm forbidden" when turning on the monitor or parameter's module is on,and unconnecting Lead or sensor,monitor will display regarding indication.Example: ECG lead off, SPO2 probe off,.Indicating information always display on technical alarm area, information aboiut NIBP will be shown on NIBP area.

4. 2. 1. 1 Classification of physiological alarm

Physiological alarm have two cases, the first is monitoring the patient's physiological parameters exceeds a certain range, the other is not a single patient physiological parameters occurred over the physical world to measure the abnormal situation.

This can temporarily mask the former belonging to the police, specifically in the following:
ECG signal is too weak;;
Stop beating; Ventricular fibrillation / Ventricular tachycardia"
Found no pulse;

RESP heart disturbance;
RESP apnea;
The other belonged to the former case.

4. 2. 1. 2 Alarm level

Every alarm, whether technical or physical alarm, both have a level of features, the higher the level, when this alarm occurs, the system will be more people in a way suggesting that the alarm alert. All users of technology can not change the alarm level. Some of the physiological level of alarm can be set by the user, while others are allowed to change the designation by the system.

4. 2. 1. 3 clear sound and light

To clear sound and light, referring to some technical alarm, if the operation was suspended, then suspended in terms of status, or return to normal alarm status, be changed to prompt the prompt manner, as follows:

1. The ability to drive sound and light alarm is cleared, that is, not to sound and light alarm.
2. The ability to drive the text is cleared; the background color will change with the same header background.
3. After the return to normal alarm state, when the alarm is triggered in re-alarm for a normal alarm.

Such technology is mainly a technical warning alarm in the lead off type of error, NIBP parameter alarm limit outside other errors the normal and obstacles to the normal use of the recorder.

4. 2. 1. 4 completely removed

Can be completely removed: refers to the press “mute” key to pause state, the alarm will be cleared, that is no longer any alarm; in the suspended state, not for the alarm; After the suspension, re-trigger the alarm unless it would not be alarm. They are mainly technical alarm module communication errors and the module initialization initialization error.

4.3 Alarm in the form

When happen alarm, the sound will be light and text prompts.

4. 3. 1 Characteristics of sound and light

4-2 different levels of alarm sound and alarm lighting Characteristics

Alarm level	Alarm sound characteristics	Alarm lights characteristics
High	Model for the "du- du - du ------ du - du, du - du - du ------ du - du" sound once every 11 seconds (interval count is made from this audible sound start to the next start)	Warning lights is red flashing, blinking frequency of fast
Middle	Model for the "du- du - du ------ du - du, du - du - du ------ du - du" sound once every 25 seconds (interval count is made from this audible sound start to the next start)	Warning lights is yellow flashing, blinking frequency slow
Low	Model for the "du-" sound once every 25 seconds (interval count is made from this audible sound start to the next start)	Steady is yellow

4. 3. 2 Words characteristics

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

String color: In addition to alarm NIBP technology area, regardless of the alarm level, has been black. NIBP technology area shows a string of alarm and alarm levels on the color, senior alarm is displayed in red, intermediate, and low-level alarm is displayed as yellow. When the measured parameter exceeds the alarm limit induced physiological alarm, the alarm is triggered the parameter value flashes. The top right of the screen display monitor information area "***" symbol indicates alarm, its color is red, if the technology alarm , the information area in the monitor without "*" symbol prompt."

4. 3. 3 Other

While producing a variety of different levels of alarm, the sound and light alarm prompted by the highest level of the current prompt."

4.4 Alarm status

4. 4. 1 Overview

For each alarm, have two states: the trigger and cleared Status. Each time can be only in a state.

Trigger status: the status of the alarm exists.

Clear status: the status of the alarm does not exist.

Begin working all the possible alarm is clear state, when alarm conditions met in the next time, the alarm is triggered into the state.

1、the normal state: The can trigger the alarm for all tips (including sound, light and text) of the state."

2、the alarm pause state: The status of the alarm is triggered, but the sound and light text without being prompted to state."

3、alarm mute status: The status the alarm is triggered by light and text prompts, but not for voice prompts state."

4, the alarm sounds off: the status of the alarm volume to 0.

Each time, the alarm system can be only in a state."m sound off: the status of the alarm volume to 0.

Each time, the alarm system can be only in a state."

4. 4. 2 Alarm mute status

Means that the alarm mute, monitor' any audio cues (this sound including the alarm, key, pulse) are closed."

Alarm Mute: Mute the alarm to reactivate the alarm after the time is adjustable, the time interval of 60s, 120s, 180s and open the alarm and display on the screen."

4. 4. 3 Alarm sound off status

Alarm mute status refers to in addition to alarm sound is turned off; the other voices will not be closed."

4. 4. 4 Alarm suspended status

When the alarm suspension of the following treatments:

Ban all alarm sound and light tips."

Ban all physical alarm text prompts.

The physical alarm description area the number of seconds left suspended.

Able to clear the sound and light alarm, the alarm to prompt information

Able to remove the alarm, clear the alarm information

4. 4. 5 State transitions

Normal state:

1、short press "mute" key(< 2s) to enter the alarm Suspended status, long press “mute” key (≥ 2s) to enter the alarm muted.

Suspended state:

2、short press “mute” key(< 2s) to enter the normal alarm, long press “mute” key (≥ 2s) to enter the alarm muted.

3、if no press key to suspended time enter the normal state.

4、the suspension of time, if there is new technology alarm, the alarm will be suspended from the end of the status, enter the normal status.

5、the suspension of time, if there is new physiological alarm, the alarm system is still in the suspended state.

Mute alarm state:

1、if there is new technology or physical alarm generation, will end the current state of the alarm mute, enter the normal state.

2、short press “mute” key(< 2s) to enter the Suspended status , long press “mute” key （≥2s） to enter the normal alarm.

Any else state:

1、In the user settings, set the alarm sound switch is off, enter the alarm sound off status.

2、In the user settings, set the alarm sound switch is open, enter the normal status

4. 5 Mode of alarm

4.5.1 Overview

Alarm has two ways: latch mode and Non-latch mode.

Latch: When the alarm condition does not exist after the system is still the characteristics of the alarm call of the latch mode, only in the alarm system no longer can be prompted to reset the alarm no longer exists.

Non-latch: Alarm condition does not exist that no longer be to alarm prompt..

4.5.2 Appliance Scope

All the physiological alarm can work in the latch mode.

All the technology alarm can work in the non-latch mode

4.5.3 after the alarm latch

When the latch was the alarm (that happened to this alarm, but this time the alarm is triggered

the alarm is not in the state), the alarm will occur silently related to the following changes:

1、Measurement parameters and alarm limits are no longer related to flash.

2、describes the prompt entry in the alarm after a previous state of the system time into the trigger.

4.5.4 Clear the latch mode.

Clear the latch mode, also known as alarm reset, the user can use the pause feature allows the alarm latch alarm is reset. When the latch alarm is cleared, but that there has been warning the role of the latch means, so far in the alarm condition no longer exists still in the case of alarm the alarm will be cleared.

Latch alarm in non-work mode, alarm pause button on the keyboard module is only suspended without reset the alarm function

4.6 Alarm settings

In the"Alarm" menu to set the alarm parameters

In the "Monitor Settings" menu, you can see in Figure 4-2 on the various parameters of the alarm set the alarm module.

4-3 Alarm Setting

Content in the public alarm

- Alarm limit display: select "Open" can be seen in the area of the display parameters set by alarm limit.
- Alarm recording time: there are three options, namely are 8 seconds, 16 seconds and 32 seconds."
- Alarm pause time: the alarm snooze time, there are four options, namely are 1 minute, 2 minutes and 3 minutes.
- Parameters alarm has two ways: latch mode and Non-latch mode.
- Alarm volume: There are five options, namely are 0,1,2,3,4, select 0 to disable the alarm volume."
- Keyboard Volume: Select "Open" to open the keyboard sound, Select "off" to turn off keyboard sound.

Set the alarm of the measured parameters

The parameters set in the corresponding alarm menu, for example: when entering "ECG

Settings" menu, you can set the alarm on the HR set.

The user can set the five elements, namely the "heart rate alarm"， "alarm level", "alarm records", "Alarm high limit", "low alarm limit". Users can rotate the button to move the cursor to set the options, press the spin button to be set. Other measurement parameters may also be more than the alarm set method."

⚠Warning

◆ **In alarm limits of targeted should set before the adjustment, please go to the alarm system effectiveness of testing and inspection, to ensure that the alarm system work and the line alarm effect, sound, image, color, flashing is normal. For example: will alarm limits set to existing clinical value below or above, to see if the alarm triggered the effective state and hints.**

◆ **This system of alarm limits once set or loaded, will be system, even if the shutdown or accident stored power, can also store the alarm set before. So when replacing the patient or restart should be based on the conditions of the patient after in alarm limits of inspection and modify Settings. To prevent the alarm limit and load current situation is not suitable for users and produce the wrong alarm judgment or omissions!**

4.6.1 Voice switch

Reference monitor system settings in the maintenance of the sound switch on the alarm description.

⚠Warning

◆ **The volume of alarm adjust: in clinical use, suggest using the default alarm the volume, but if the clinical environment background noise level if high, the operator should adjust the volume will alarm to higher volume level, to ensure that in high noise environment can clearly hear alarm sounds！**

4.6.2 Turn off the automatic alarm

Turn off the alarm is the failure of the alarm.The system won't trigger any alarm indication, print any alarm information, store any alarm information,even if alarm.

This system has not overall alarm closed, if need to switch to a closed, but the parameters alarm to the settings.

In a set of parameters, if the alarm switch, will be closed in the corresponding parameters zone display  alarming closed.

When a new measurement module or a measurement module to join the work has just begun, start working from the module after 30 seconds, all associated with the module will be automatically turned off the alarm, other alarms are not affected.

When monitor boot into the system of after 30 seconds, the parameters of the module will be automatically shut off, alarm has completed the parameters of the module initialization and initial preparation.

4.6.3 When the power to lead off

When the power, if you open the parameter module is not connected leads, then the following treatment:

1、About ECG or SPO2 Module will lead to tips off alarm (automatically clear sound and light), and then prompts the user.

2、For the other modules not to lead off the alarm.

4.7 Alarm Parameters

In the parameter menu, you can set the alarm parameters independently, and users can set the alarm limit and alarm status.

When a parameter alarm is turned off, the parameter in the parameter display area next to the display "  " prompt. All parameters can be independently set the alarm switch."

Set the alarm for the parameters of a parameters or several parameters when the value exceeds the alarm limit, monitor automatic alarm, the following treatments:

1) Prompt on the screen, this form as described in the alarm mode;

2） If you set the alarm volume, then according to the alarm level and alarm set the alarm sound volume;

3） Warning light flashes (If the machines have alarm lights);

Attention

◆ **Do not give alarm prompt; When**  **logo appears, the system will not alarm sound hints. So the operator cautious and alarm sound use alarm close function.**

4.8 alarm presets

4.8.1 alarm preset list

This system of alarm preset is divided into three levels for the corresponding level preset initialization of development. With the type of user as the foundation to promote, to the whole or a parameter of the preset may be classified in alarm, according to the demand for alarm presets. Different types of patients with corresponding alarm preset below.

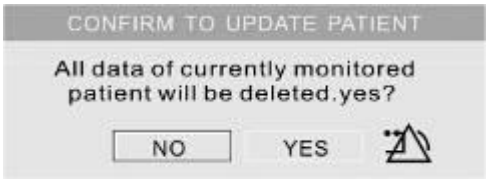
Corresponding alarm preset list for the Adult, newborns, children.

Alarm projest		Adult	Children	Newborn
ECG	Alarm upper limit	120	160	200
	Alarm low limit	50	75	100
NIBP	systolic blood pressure alarm upper limit	160	120	90
	systolic blood pressure alarm low limit	90	70	40
	Average pressure alarm upper limit	110	90	70
	Average pressure alarm low limit	60	50	25
	Diastolic pressure alarm upper limit	90	70	60
	Diastolic pressure alarm low limit	50	40	20

SPO2 PR	SPO2 alarm upper limit	100	100	95
	SPO2 alarm low limit	90	90	80
	PR alarm upper limit	120	160	200
	PR alarm low limit	50	75	100
RESP	alarm upper limit	30	30	100
	Alarm low limit	8	8	30
TEMP	T1 alarm upper limit	39.0	39.0	39.0
	T1 alarm low limit	36.0	36.0	36.0
	T2 alarm upper limit	39.0	39.0	39.0
	T2 Talarm low limit	36.0	36.0	36.0
	TD alarm upper limit	2.0	2.0	2.0
EtCO2	CO2 alarm upper limit	50	50	45
	CO2 alarm low limit	15	20	30
	INS alarm upper limit	4	4	4
	AWRR alarm upper limit	30	30	100
	AWRR alarm low limit	8	8	30

Above the limit set the alarm, with all sorts of different types of typical values and physiological crowd all kinds of professional standards of the basis of the limit range of setting.

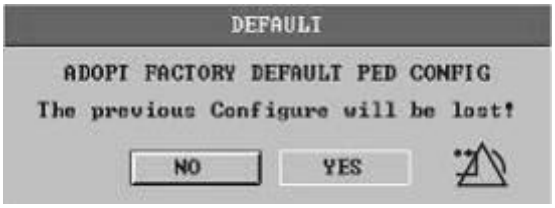
4.8.1.1 In this menu, users can choose"system menu"to enter "confirm to update patient",as picture follows



The system requirements, under normal circumstances, carry out patient care, the system should be run after the first patient in the management of patient information and patient information into the type of selection, based on the patient type, the system will be transferred to a different preset alarm information.

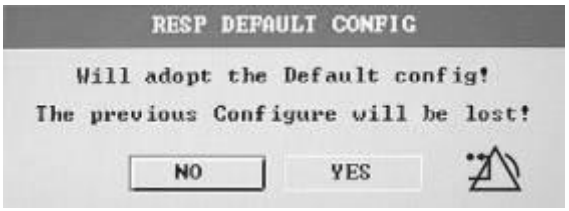
Similarly, if you replace or update the patient the patient is also achieved in the setting menu, when clicking "update patient", the whole system will reset the alarm preset load, the initial default mode for adults, the specific details of the data described in the table above.

4.8.1.2 In this menu, users can choose"system menu"to enter "default",as picture follows



When necessary, into the system menu in the default configuration, select "Yes" can be built on the current type of system preferences and patient alarm preset to reset to load. For example: the current patient type is "child", then the default configuration is that children recovered pre-alarm mode. See the specific data described in the table.

4.8.1.3 In this menu, users can choose "system menu" to enter "default",as picture follows



Specific operation: into the corresponding parameter Settings, then select the "default configuration", enter the choice "yes", and then to the current a preset parameters of the alarm on restoration.

⚠ Warning

◆ **Monitor alarm limit settings, by hand operation, and based on clinical subjects for individual differences in settings, do not exceed the limits set alarm limits, otherwise it will cause an alarm system failure or invalid! Non-medical is prohibited to modify products and set the alarm limits of storage!**

◆ **The monitor alarm limit can be transformed by the operator of the changes, alarm limits can store in the fall power after, for the next time users use again. Please in the replacement of users and when the computer use in alarm limits of inspection and reset.**

4.8.2 Alarm information classification

The below table lists the products in involved in the main alarm prompt classification.

prompt information	Alarm category	Alarm level
Alarm sound suspended		
Alarm sound suspended XX sec.	prompt	
ECG		
HR too high	Physiological alarm	Can set
HR too low	Physiological alarm	Can set
ECG signal is too weak	Physiological alarm	High
ECG communication error for Module	Technology alarm	High
HR alarm limit wrong	Technology alarm	High
ECG interference is too big	Technology alarm	Low
ECG guide league fall off	Technology alarm	Low
ST		
ST too high	Physiological alarm	Can set
ST too low	Physiological alarm	Can set
ST alarm limit wrong	Technology alarm	High
ST is learning	Prompt	Word
RESP		
RR too high	Physiological alarm	Can set

RR too low	Physiological alarm	Can set
RESP breathing suffocation	Physiological alarm	High
SpO2		
SPO2 too high	Physiological alarm	Can set
SPO2 too low	Physiological alarm	Can set
PR too high	Physiological alarm	Can set
PR too low	Physiological alarm	Can set
SPO2 communication error for Module	Technology alarm	High
SPO2 gold finger peel off	Technology alarm	Low
SPO2 not connected probe	Technology alarm	Low
Search pulse	Prompt	Word
TEMP		
T1 too high	Physiological alarm	Can set
T1 too low	Physiological alarm	Can set
EtCO2		
INS too high	Physiological alarm	Can set
INS too low	Physiological alarm	Can set
CO2 too high	Physiological alarm	Can set
CO2 too low	Physiological alarm	Can set
AWRR too high	Physiological alarm	Can set
AWRR too low	Physiological alarm	Can set
CO2 communication error	Technology alarm	High
CO2 check the sample tube	Technology alarm	High
CO2 check the adapter head	Technology alarm	High
CO2 warming up	Prompt	Word
CO2 sensor warm-up	Prompt	Word
CO2 is zeroing	Prompt	Word
Recorder		
Recorder communication error for Module	Technology alarm	Low
Recorder lack of paper	Prompt	Error instructions
Recorder plug paper	Prompt	Error instructions
NIBP		
NS too high	Physiological alarm	Can set
NS too low	Physiological alarm	Can set
NM too high	Physiological alarm	Can set
NM too low	Physiological alarm	Can set
ND too high	Physiological alarm	Can set
ND too low	Physiological alarm	Can set
Cuffs gas tubes got a flat	Technology alarm	Low
Signal is too weak	Technology alarm	Low
Arm movement	Technology alarm	Low

Over-voltage protection	Technology alarm	High
NIBP system failure	Technology alarm	High
Measurement overtime	Technology alarm	High
Manual measuring	Prompt	Word
Automatic measurement	Prompt	Word
Consecutive measurements	Prompt	Word
Measurement termination	Prompt	Word
Calibration...	Prompt	Word
Calibration termination	Prompt	Word
Leak detection...	Prompt	Word
Leak detection termination	Prompt	Word
IBP		
IS1 TOO HIGH	Physiological alarm	Can set
IS1 TOO LOW	Physiological alarm	Can set
ID1 TOO HIGH	Physiological alarm	Can set
ID1 TOO LOW	Physiological alarm	Can set
IM1 TOO HIGH	Physiological alarm	Can set
IM1 TOO LOW	Physiological alarm	Can set
IS2 TOO HIGH	Physiological alarm	Can set
IS2 TOO LOW	Physiological alarm	Can set
ID2 TO HIGH	Physiological alarm	Can set
ID2 TOO LOW	Physiological alarm	Can set
IM2 TOO HIGH	Physiological alarm	Can set
IM2 TOO LOW	Physiological alarm	Can set
IBP1 SENSOR OFF	Technology alarm	Low
IBP2 SENSOR OFF	Technology alarm	Low
IBP(1,2) COM STOP	Technology alarm	High
IBP(1,2) COM ERR	Technology alarm	High
IBP(1,2) INIT ERR	Technology alarm	High
IBP1 SYS EXCEED	Prompt	High
IBP1 DIA EXCEED	Prompt	High
IBP1 MEAN EXCEED	Prompt	High
IBP2 SYS EXCEED	Prompt	High
IBP2 DIA EXCEED	Prompt	High
IBP2 MEAN EXCEED	Prompt	High
IBP1 NEED ZERO-CAL	Prompt	Low
IBP2 NEED ZERO-CAL	Prompt	Low
Battery		
Because the batteries run out, in five minutes closed	Technology alarm	High

4.9 When the alarm is the measures to be taken

Attention

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

Alarm information displays in the System Information area or zone alarm information, the need

to identify the cause of the alarm and in accordance with the alarm to take corresponding measures.

1) Check the patient's condition.
2) Identify which parameters are alarm or what kind of alarm is occurring.
3) To identify the reasons for alarm.
4) If necessary, the alarm is muted.
5) When the alarm condition removed, the check alarm is eliminated.

Monitoring sections in each parameter can be found in the parameters of the alarm information and tips.

This chapter describes general information about the alarm and the alarm should occur when the measures taken. You can set various parameters in the section for each parameter alarm and prompt information.

Chapter 5 Recorder

■ **This chapter describes the functions related to the contents of the printed output.**

- ◆ Recorder Overview
- ◆ Recording method
- ◆ Record information

Attention

◆ **12 "Wall slim type Monitor product do not support recording and printing functions.**

Attention

◆ **15" Wall slim type Monitor product support external J03 type recorder shuttle print**

5.1 Recorder Overview

◆ The recorder is a high-speed digital thermal array recorder, wave print width is 48 mm.

Performance recorder

Printing method: digital thermal array printing;

- print life: up to 50km
- can record up to two waveforms;
- Thermal paper: 50mm wide, 20 meters / roll;
- Record range: 48mm;
- Real-time recording time and the wave form;
- alarm records automatically selected by the monitor and alarm parameters of the waveform.

5.2 Record Types

The monitor strip chart recorder produces the following:

- Real-time record of 8 seconds

Real-time record

8 seconds in real time waveform recorded by the monitor settings (usually only shows the first and second waveforms).

Attention

◆ **When the output operation is running, press the Print key parameters of the output will wait until after the end of the output current output.**

5.3 Record Output

Data and time

HR-- Heart rate PR--Pulse rate

SPO2—SPO2

SYST-- Systolic blood pressure

MEAN-- Mean pressure

DIAS-- Diastolic blood pressure

TEMP1--Temperature 1

LEAD—Lead

RESP—Respiratory

5.4 Recorder operation and status information

The requirements of the recording paper

Must meet the requirements of thermal paper, or may lead to record, record the decline in the quality or damaged thermal top.

Normal operation

- When the recorder is running, the recording paper to send uniform, this time can not force pulling it to avoid damage to the recorder.
- Recording paper can not be installed in the case of non-use recorder.

Steps for paper recorder

◆ Open the recorder door;

◆ The new paper being inserted into the mouth of paper, print side facing the thermal head;

◆ When the paper exposed the other side will pull it out, pay attention to the paper straight, aligned edges;

◆ Close the recorder door.

Attention

◆ **Change recording paper lightly so as to avoid touching thermal head. Unless you are troubleshooting for paper or otherwise, should not the recorder door is open.**

Clear paper jams

When you hear the voice recorder and the recording paper runs out is not normal, should open the door of the recorder check paper jam. When clearing a paper jam:

Open the recorder door;

Re-straighten the paper, paper edge alignment;

Recorder shut the door

Status Information

Recorder's doors next two lights, the right one for the power indicator light, when the recorder connected host, the light should be bright green.

The left one for the status indicator, when the abnormal situation is to show the orange,

prompting signal. For example: out of paper, communication errors.

External recorder connected operation

The TR-J03 external recorder for the TR-900E 15-inch series, connection steps as follow:

- turn off the power of the monitor;
- Connect and fix external recorder and the host plate by M3 * 10 combination screw;
- Connect both ends of the host and recorder use signal lines, and tighten the screws;
- Open the computer, pressing the Print button to test the print;
- Description: If the monitor contains CO2 function, only can choose one function from external printing and CO2 function, otherwise it would cause the system to connect conflict. And confirm the manufacturers set by the user in the system menu, any question please consult the manufacturer to solve!

Chapter 6 Review

In the “System Menu” select “review function”, Review of the following functions:

6.1 NIBP measurement review

6.2 Review of alarm events

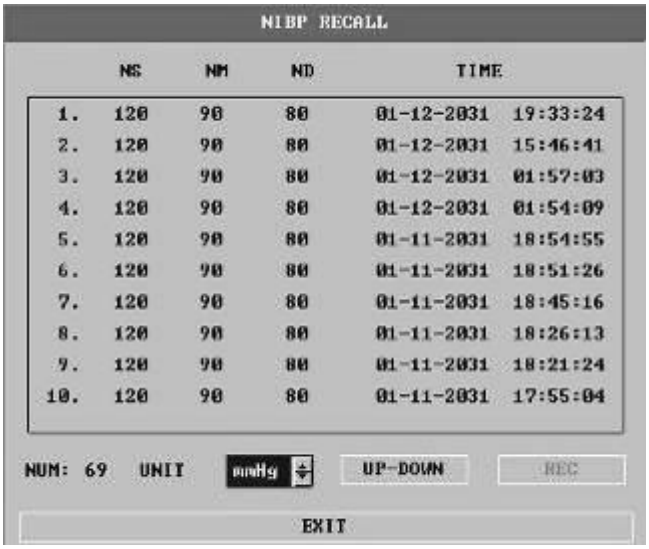
6.3 Review of trends

6.4 Review of trends in Table

6.1 NIBP measurement review

It can review the recent review of 400 sets of NIBP measurement data.

In the "System Menu" select "review function" in the "Review of functions” then select "NIBP Measurement Review" item, you can enter the window shown below:



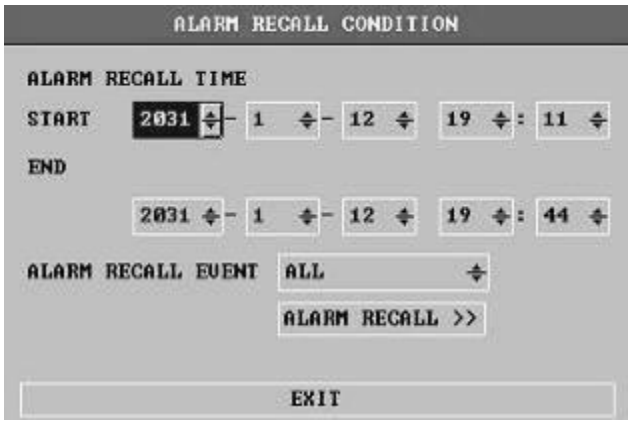
6-1 NIBP review

As shown above, "NIBP measuring Review" window shows the non-invasive blood pressure, "systolic", "average pressure", "diastolic" and "measurement time." "Pressure unit" choose "mmHg" or "kPa", the left shows the current number of existing measurements. Data in chronological order from near and far, each screen can display measurement data 10, when more than 10 times, can "flip" to see more data later or earlier. When measuring the number of more than 400 times the data show the last 400 measurements. Select "Record", the output of the recorder on all the measurement data in the review.

6.2 Review of alarm events

When a parameter alarm, monitor will memory the values of all parameters, and the time the alarm occurred before and after 4 seconds, 8 seconds or 16 seconds of the relevant waveforms for users to review alarm events.

In the “System Menu” select “review function>>”and then select “Alarm Event Review” to enter “Alarm Review Conditions” to enter the following figure:



6-2 Alarm Conditions Review

In this menu, users can set the alarm review conditions, contains the following items:"

- Review timing of alarm

  Set the review of the "start time" and "end time."

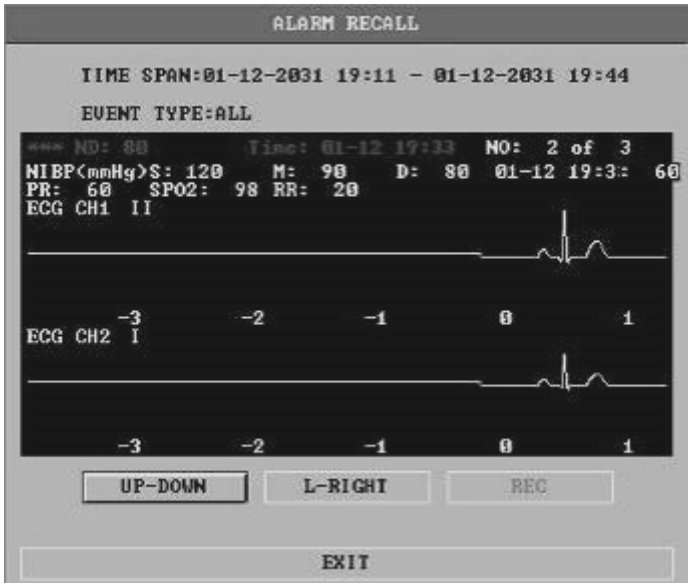
- Review timing of alarm

In the "Select the alarm incident review", according to the review of the parameters need to select "All", "ECG", "SPO2", "NIBP", "RESP", "TEMP", "HR-H>180" , "HR-L <60", "SPO2<90%", "RR-H> 40", "RR-L <10", TEMP-H> 40 ℃ "," TEMP-L <34 ℃ ". The "All" to select all the parameters of the alarm event, "H" said that a certain parameter limit, "L" said the lower limit of a parameter.

◆ Review of alarm events

After recalling the time the alarm and the review of alarm events , select the "Alarm Event Review>>" to enter the next figure "Alarm Event Review" window, the window displays the following information:

1. Alarm Review of "start time" and "end time"；
2. Alarm review event type;
3. Alarm parameters, parameter values, alarm level and alarm occurs time;
4. Alarm place number, the format is: NO: n of N; N represents that the total number of alarm events, n represents the current window of the alarm number is displayed;
5. Alarm is always some parameter values;
6. Alarm is two times the waveform, the waveform length of the "Alarm Settings" menu "Alarm recording time" setting, see the **4.6 alarm settings**.



6-3 Review of alarm events

Front page: monitor can store up to 70 alarm events, but "Alarm Event Review" window can only display a warning event. Select the "Front page " key, then turn the knob, can be observed earlier or later the alarm event;"

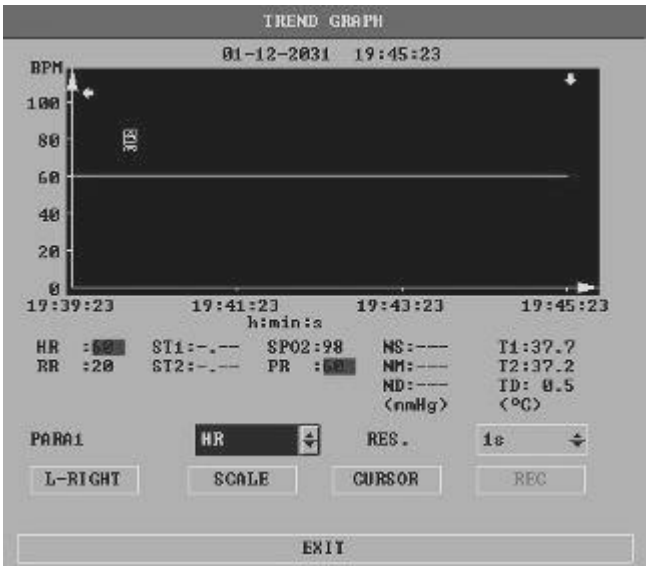
Move around: Select "Move left and right wave" key, then turn the knob, you can observe the memory of 8 seconds, 16 seconds or 32 seconds waveform;

Record: Select the "Record" key. Recorder output can be displayed in the current window and waveform parameter data.

6.3 Trend chart review

In the "System Menu" select "review function>>" in the "Review of functions," then select the "trend chart review>>"item, you can enter the next map Figure 6-4:

- users can press one second, 5 seconds for each monitoring parameters review the recent resolution of 1-hour trend data;
- users can also be 1 minute, 5 minutes, 10 minutes to review the resolution parameters for each monitoring 96 hours a recent trend, according to:



6-4 Trend Chart Menu

As shown above, trend graph shows the "Preferences" in the selected parameter trend curve. If you select "NIBP" that not displayed on the trend curve, and the "S" on behalf of systolic blood pressure to "D" on behalf of diastolic blood pressure with "M" represent the average pressure. Vertical axis measured value, the abscissa is the measured time. Map"🡻"is the trend cursor, it indicates the location of the measured value below the figure shows the trend corresponding to the time displayed on top of trends. In addition to NIBP value, other trends show a continuous curve.

Selecting parameter:

Select "parameter" item by cursor, and then the corresponding trend of the parameter will be displayed. Press the shuttle to confirm the required parameter. The trend of the parameter will be shown in the window.

The parameters are NIBP, RR, TEMP, HR, PVCS, ST, SPO2, and PR.

Resolution:

Select "resolution" item by cursor. Then choose 1 second or 5 seconds in order to look at the trend of one hour. Choose 1 minute, 5 minutes or 10 minutes in order to look at the trend of 96 hours.

Watching more trend graphs:

If there is "➔"in the right of the window, press the button of "move", and then rotate the shuttle in clockwise in order to look into later trend graphs. If there is "🡐"in the left of the window, press the button of "move", and then rotate the shuttle in anti-clockwise in order to look into the earlier trend graphs.

Chang zoom:

Adjust the ratio of vertical axis by "amplitude modulation", and the ratio of the trend graph will be changed. The value in the data, which is bigger than the value of coordinate, is the representative of the biggest value.

Cancel the trend data of some time in the trend graph:

Select "wavering cursor", and rotate the shuttle to left or right while the cursor will move, and the time also changes as the shuttle moving. The parameter data in some time will be displayed under the horizontal coordinate. If there is "➔"in the right of the window, when the wavering cursor arrives at its place, the trend graph will turn to next page automatically, and the later trend graphs will be displayed. If there is "🡐"in the left of the window, when the wavering cursor arrives at its place, the trend graph will turn to next page automatically, and the earlier trend graphs will be displayed.

Example for operation:

Look into the NIBP trend of the last 1 hour:

- Press "menu" key to get "system menu" window;
- Select "recall" item in the menu, and then select "trend recall" in the "recall" item;
- In "parameter" item, rotate the shuttle to get "NIBP" option;
- In "resolution" item, select "1 second" or "5 seconds";
- Select "move", and rotate the shuttle while watching the change of time in the trend graph and the change of trend graph;
- Stop rotating when the required trend appears. If the ratio of vertical coordinate, for

example, some trend data is bigger than the biggest value of vertical coordinate, the "amplitude modulation" item should be adjusted;

- Select "wavering cursor" and remove the cursor to some time. And the time will be displayed above the graph while the measurement value will be displayed below the graph;

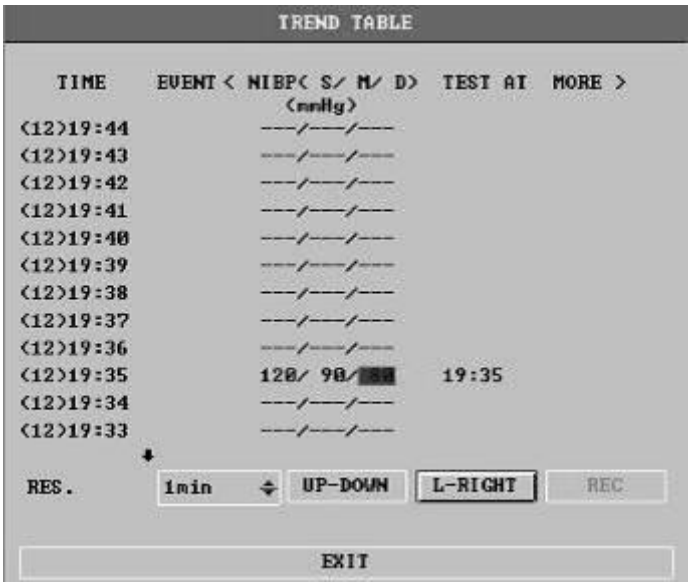
Stop looking into the trend by press "quit" key.

6.4 Trend list recall

In the "system menu", select "recall" function and then select "trend list recall" item, and then enter into the window like the following picture 6-5:

- The trend list can be displayed according to the following resolution: 1 minute, 5 minutes, 10 minutes, 30 minutes and 60 minutes.

Select "trend list recall" in the "system menu". The following window appears:



6-5 Setting menu of trend list

The corresponding time of every group trend data is displayed in the left column of the window, including data in the brackets. The event column is the list of marked event of the corresponding time. There are 7 groups of event parameter in the trend list. Look at one of the 7 groups by "move" item.

① <HR PVCS>
② <ST1 ST2>
③ <SPO2 PR>
④ <NIBP（S/M/D） TEST AT MORE>
⑤ <RR>
⑥ <T1 >

There are special characteristics in the display of NIBP trend data. Besides measurement data, the corresponding time will be shown below the "measurement point". If there are several values during the time, only one group can be displayed, while there is a "*"in the "more", which means there are more than two groups of measurement data.

Trend list of different resolution:

Select resolution by the cursor, and then rotate the shuttle to change the option in order to change the interval time of the trend data.

Watch much later or earlier trend graph:

If there is ▲ indicator in the top of the window, select "turn to next or above page", and then rotate the shuttle in clockwise in order to look at the later trend graph. If there is ▼ indicator in the bottom of the window, select "turn to next or above page", and then rotate the shuttle in anti-clockwise in order to look at the later trend graph.

Watch trend data of different parameter:

Select "move" to choose one of the 7 groups. If there is ">"in the right of the window, you can turn to right page. If there is "<"in the left of the window, you can turn to left page.

Example operation:

NIBP trend list:

- Press "menu" key to get "system menu";
- Select "recall" item to choose "trend list recall";
- Select "move" and then rotate the shuttle until the NIBP data appear;
- Select the first item of the left side and then choose the required data interval;
- Select "turn to next or above page" and then rotate the shuttle in order to look into NIBP trend data of different time;
- Stop looking into the trend list by "quit"

Chapter 7 System interface

■ chapter describes the introduction of this series monitor the contents of the main display screen. Monitor you purchased version of the system interface may be different pictures in this section. Picture for reference only, please show the actual content of the product shall prevail.

Attention

◆ 7 "portable screen monitor products due to size restrictions, the system interface is slightly different with other models and adjustment, this chapter will be 12" as the main interface description object, refer to the specific physical interface 7.

Select “Monitor setting” item in the “system menu” to enter into the following interface like 7-1. Here system interface are introduced.

7-1 Monitor setting

Select “work interface selection” item in the menu of “monitor setting”. There are standard, all-lead ECG, trend co-exist, oxyCRG, and big font.

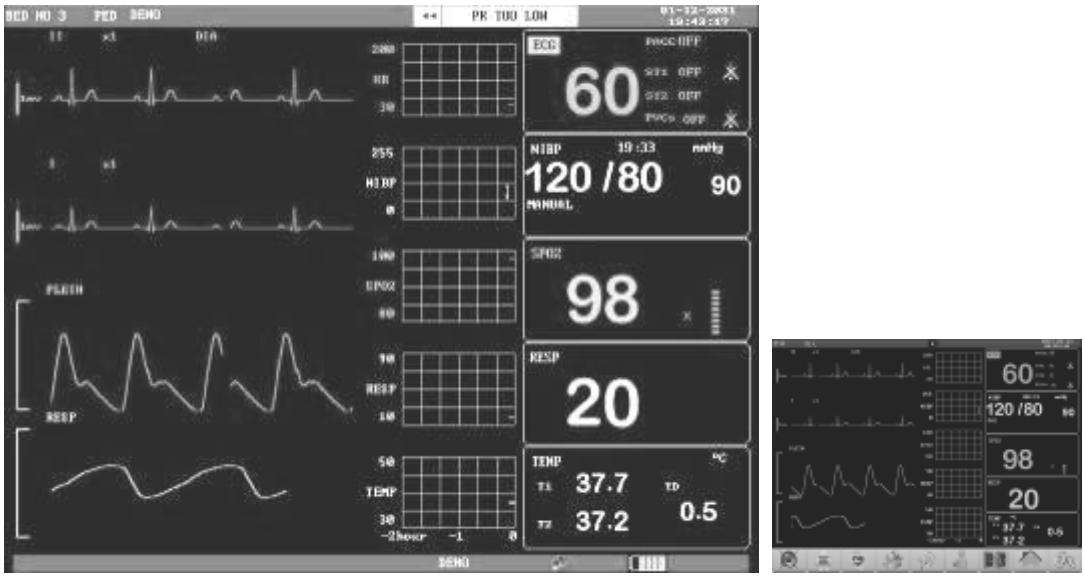
7.1 Standard

Standard interface is the default working interface. If the present interface is not standard, please select “standard” in the “work interface selection” menu, and then press the shuttle to enter into the following standard interface. Please refer to screen display about the detailed introduction of **2.4 standard interface.**

7-2 Standard interface

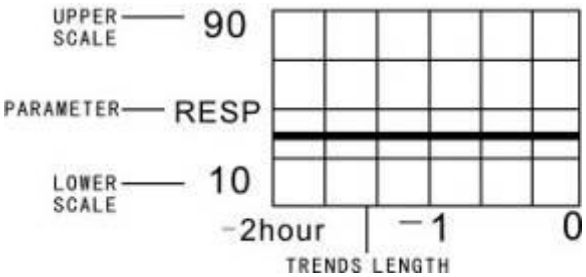
7.2 The trend of co-existence interface

In the "working interface options" menu, select "trend coexistence interface", then press the knob, then enter into the coexistence of the interface shown below:



7-3 Trend of coexistence interface

- Trend graph: trend graph area occupied by the right part of the region, showing dynamic short trend of the module corresponds to a parameter. RESP module parameters by example as shown below, the left show the up and down scales of RESP and the name of the parameter, the bottom shows the length the trend.

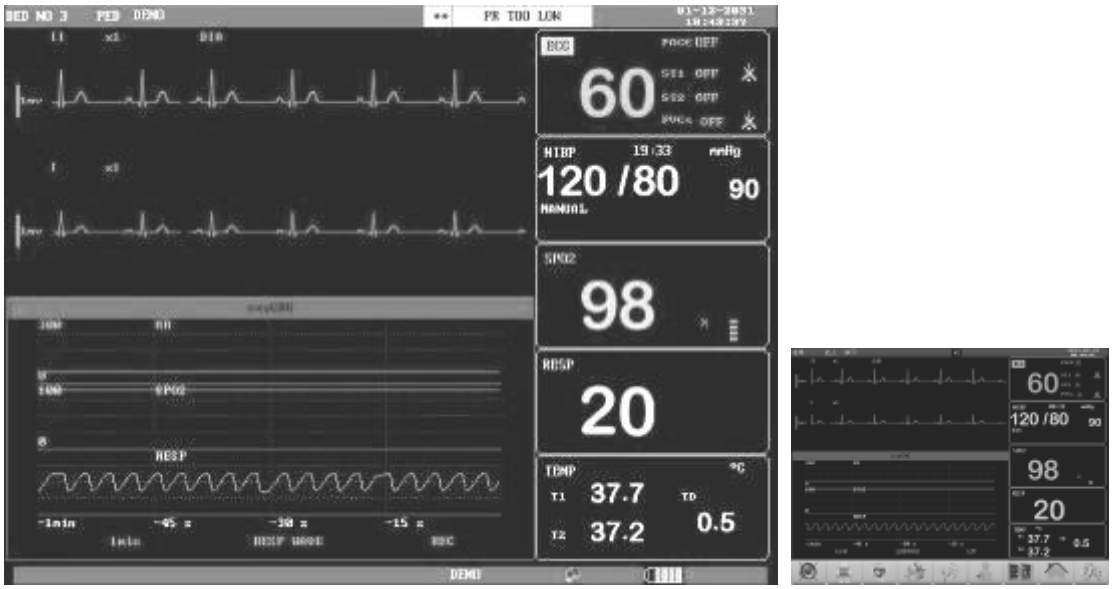


- Trends Length: the length of dynamic short trends is 2 hours, as shown above, the bottom of the trend graph below shows the time scale, the right side is 0 hours, the left is -2 hours.

- Choose Trend parameters: When a module has several trend parameters, you can choose the parameter name by the corresponding hotkey.

7.3 oxyCRG interface

In the "working interface options" menu, select "oxyCRG interface", press the knob, then enter into the next figure oxyCRG interface：



7-4 oxyCRG interface

"OxyCRG interface" is the respiratory oxygenation interface that takes the lower half of the waveform area, which formed by the HR trends, SPO2 trends and RESP trends or compressed. Below the RR trends or compressed RESP waveform shows time scales of the trend and there are three screen hotkeys below the time scale:

1min——time length of trend

Through the "time length of trends" hot key, you can choose three time length: 1 minute, 2 minutes and 4 minutes.

RESP WAVE——Compressed RESP Wave / RR trend

Through the “Compressed RESP Wave / RR trend " hot key, you can choose to display the dynamic trends of the compressed RESP Wave / RR trend below SPO2 trend .

REC——Record

Selecting "record" hot key, you can print our the three trend graphs or waveforms of the OxyCRG.

7.4 Big font interface

In the "working interface options" menu, select "Big font interface", then press the knob, then enter into Big font screen shown below:

7-5 Big font interface

As shown above, in Big font interface, ECG, SPO2 and diastolic blood pressure / mean pressure / systolic blood pressure (NIBP) are using a Big font, on the left shows ECG, SPO2 and RESP waveform.

Chapter 8 ECG / RESP Monitor

8.1 Overview

ECG defined patients with electrocardiographic monitoring cardiac electrical activity produces a continuous waveform in order to accurately assess the physiological state of the patient at that time. ECG cable connection should be correct, so as to obtain the correct measurements. The portable monitor in normal operation status shows two ECG waveforms.

- Using 5 leads, ECG can get two different waveforms from two different leads.
- The monitor displays parameters including HR, ST segment measurements and arrhythmia (optional).
- All the above parameters can be used as alarm parameters.

8.2 Notes

⚠ Warning

- **During defibrillation, the operator can not touch the patient, table or monitor.**
- **When using ECG signal monitoring, you must use the designated ECG cable.**
- **When you connect the cable and the electrode, be assured that they are not connect with any other conductive parts or the ground. In particular, to ensure that all ECG electrodes, including the neutral electrodes ,are attached to the patient in order to prevent them to connect with conductive parts and the ground.**
- **The skin of placement of electrode should be regularly checked daily, if signs of allergy, the skin of placement of electrode or electrode should be changed every 24 hours.**
- **When using non-resistance ECG cables, monitors can not be used in the defibrillation; when using on other monitors, if the monitor itself does not have defibrillation current limiting resistor, it can not be used for defibrillation.**
- **The interference from the unearthed equipment near patients and from ESU may cause waveform distortion.**
- **To prevent environment pollution, the used electrodes must be recycled and handle with appropriate treatment.**
- **Before monitoring the patient, you must check whether the ECG is normal, if ECG cable is pulled, the screen will display "lead off" message, and simultaneously trigger the audible alarm.**
- **Network Power isolation monitor transient: when the electrode or lead wire is bad contact or off, the monitor will reduce common mode rejection, when the power supply isolation monitor switching transients will become vulnerable to the influence of heart rate alarm, so that the operator may get the wrong conclusions on monitoring heart activity for patients. Proper ground wire access to equipment, electrode paste on the skin of patients correctly treated, use standard manufacturers electrode.**

⚠ Warning

- **electrode polarization: overload monitor should be able to quickly recover. However, in the defibrillation process, the current flows through the electrodes at the skin contact, resulting in polarization. Some different materials of the electrodes may become highly polarized, full recovery would be a very difficult task. Therefore, the user should use the designated electrode, or affect the recovery time after defibrillation.**
- **For patients equipped with cardiac pacing or other electrical stimulation devices, cardiac pacing pulse function will be taken as normal heart waves to count HR or as abnormal VPC waveforms to record, do not rely solely on heart rate count, should be closely monitoring Patients with a pacemaker. If this happens, please get rid of the reasons for this error to avoid this exception error functionality.**

Attention

- **The interference from unearthed equipment near the patient and from the ESU may cause waveform problems.**
- **Conductive paste coating should be separated from each other, chest electrodes do not touch each other, to avoid short circuit.**
- **Do not use saline instead of conductive paste, to prevent corrosion electrodes.**
- **When defibrillating, it is recommended to use 3M electrodes.**
- **If operating under conditions according to EN60601-1-2 to (anti-radiation capacity of 3 V / m), then electric field strength more than 1 V / m may caused measurement error under a variety of frequency. It is therefore recommended not to use electric radiation equipment near the place where ECG / respiration is measuring.**

8.3 Monitoring procedure

8.3.1 Skin preparation

ECG waveform signal quality depends on the quality of the electrode obtained. To ensure signal quality, electrode placed on the skin of patients with appropriate treatment is necessary. Choose flat skin and skin where as less muscle as possible to place electrodes.

Refer to the following methods to process the skin:

Shaving body hair at where electrodes place:

1. Gently rubbing the skin at where the electrodes will place to remove dead skin cells;
2. Wash skin thoroughly with soap and water. (Can not use the pure ether and alcohol, as this will increase the skin's resistance); placed electrodes, after the skin dry completely.

Place the spring clip or push button before placing electrode.

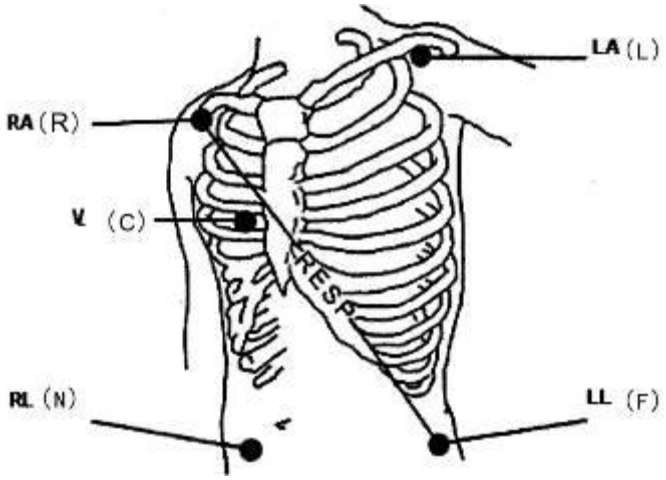
1. Place the electrodes on the patient, if using a non-conductive paste electrode, please place some conductive paste at first.
2. Connect the electrode lead with the patient cable.
3. Open the monitor power supply, enter into the "ECG Settings" menu, and select the correct "lead type."

8.3.2 Installing ECG LEAD

Put ECG monitoring electrodes in the position of

To U.S. standards, for example, five-lead electrode placement shown in Figure 8-1:

- RA White (right arm) electrode –place under the clavicle, near the right shoulder.
- LA Black (left arm) electrode --place under the clavicle, near the left shoulder. According to below photo to place on the chest.
- RL Green (right leg) electrode-- place on the right lower abdomen.
- LL red (left leg) electrode-- place on the left lower abdomen.
- V Brown (chest) electrode--place on the chest.



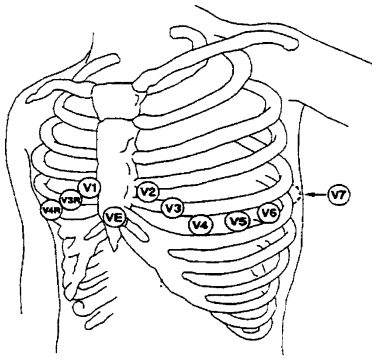
8-1 Five-lead electrode placement

As shown below, the chest (V) electrode can be placed in one of the following locations: Figure 8-2:

- V1 in the right edge of the 4th intercostal sternum.
- V2 in the left edge of the 4th intercostal sternum.
- V3 in the middle of V2 and V4.
- V4 in 5th intercostal space on the left mid clavicular line.
- V5 in Zuoye front, horizontal position with the V4.
- V6 in Zuoye midline, horizontal position with the V4.
- V3R-V7R in the right chest wall, its position corresponds to the left position.
- VE bump in the xiphoid.

The "V" electrode placed in the back should be placed in one of the following locations.

- V7 in the back of the line after the 5th intercostal Zuoye.
- V7R the back of the right posterior axillary line in 5th intercostal space.



8-2 V lead placement

The following tables list the lead names of Europe standard and the U.S. standard. (The

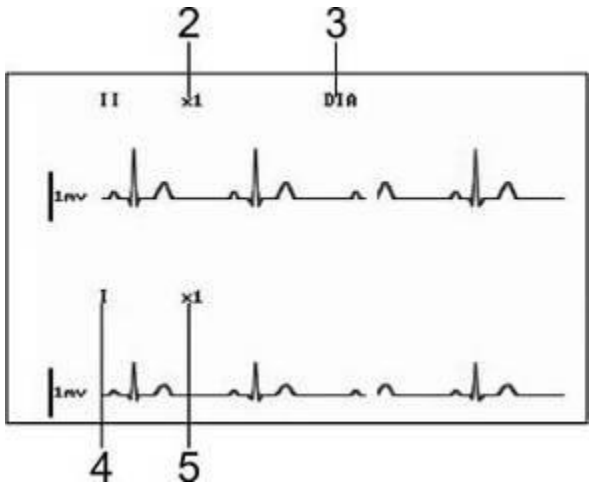
Europe standard uses R, L, N, F, C, to show the leads, while the U.S. standard uses RA, LA, RL, LL, V to show).

United States (AHA)		European (IEC)	
lead name	Lead color	lead name	Lead color
RA	White	R	Red
LA	Black	L	Yellow
LL	Red	F	Green
RL	Green	N	Black
V	Brown	C	White

8.4 ECG Display

8.4.1 ECG waveform

The patient can monitor the ECG activities of a patient, and show a continuous waveform and parameter values to accurately assess a patient's physiological state at that time. In the standard interface, when selecting the 3-lead, display an ECG waveform; when selecting the 5-lead, display two ECG waveforms, as shown in Figure 8-3:



8-3 ECG waveform

on the top of ECG waveform ,there are 5 screen hotkeys:

1 - Channel 1 of the lead (first lead)

Select Lead name for Channel 1:

- When using 3-lead, the optional leads are Ⅰ, Ⅱ, Ⅲ;
- When using the 5-lead, the optional leads are Ⅰ, Ⅱ, Ⅲ, aVR, aVL, Avf, Ⅴ.

2 - Channel 1 waveform gain

Used to adjust the ECG waveform size of channel 1,options are: × 0.25, × 0.5, × 1, × 2, auto; when selecting "Auto", the monitor automatically adjusts the gain.

Attention

◆When the ECG waveform amplitude is too high, the peak may appear invisible, then the user should select the appropriate gain in order to avoid waveform display

Can choose the calculation of channel gain, gain of × 0.25 × 0.5, × 1, × 2, at the left side of the ECG channel, 1 mV scale is given. 1 mV scale height is in proportion to amplitude.

3 - Filtering mode

more accurate waveform can be obtained by filtering, filtering methods are the following three options:

- Diagnosis: display the ECG waveform without filtering;
- monotoring: filter the pseudo-difference that may lead to false alarms;
- Surgery: reduced the pseudo-difference and interference from electrical surgical equipment.

Filtering methods simultaneously effect on two channels, but only display on the top of the first ECG waveform.

4 - Channel 2 leads (second lead)

Select lead name for Channel 2, and the same as channel 1.

5 - Channel 2 waveform gain

Select, the volatility of the size of ECG waveform name of Channel 2, the same as channel 1.

Additionally, if open pacing, when pacing signal is detected, the "¹" tag is displayed above the ECG waveform.

⚠Warning

◆The monitor only in the "diagnosis" mode, can provide the real untreated waveform. In the "monitoring" and "operation" mode, ECG waveform distortion occurs in varying degrees. It will have greater impact on the analysis of ST segment. In the "operation" mode, it may be part impact on the analysis results of ARR. Therefore, when the disturbance is small, "diagnosis" mode is recommended to monitor the patient.

Attention

◆Lead names of Channel 1 and Channel 2 can not be the same, otherwise the system will automatically change. In the "full screen multi-lead display " or "half-screen multi-lead display" mode, only the lead names of channels 1 and 2 can be set, the other lead names of channels can not be set.

Install leads for surgical patients

When installing the electrodes of leads for the surgical patient, the type of surgery should be taken into account. For example, for thoracic surgery, chest electrode can be placed on the side of the chest or back. In addition, in the use of electric surgical knife device, to reduce the artifact impact on the ECG waveform, the electrode can be placed on the left and right shoulder near the right and left side of the abdomen, and chest leads can be placed on the left of the middle of breast, to avoid putting the electrode on the upper arm, or ECG waves will become very small.

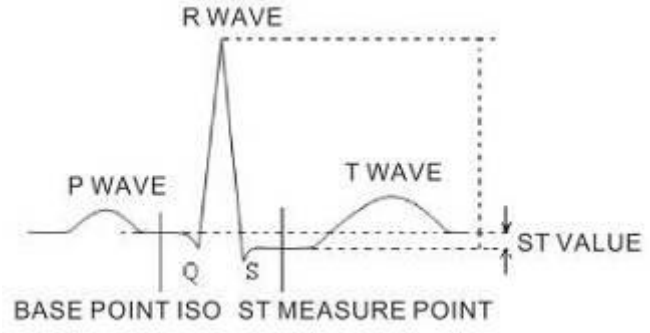
⚠ Warning

◆ **When using with electrosurgery (ES) equipment (high-frequency surgical equipment) simultaneously, do not place the electrodes near the grounding plate of surgical equipment, or ECG signal will be a lot of interference. Don't put ECG electrodes between the grounding plate of the ES and the electric surgical knife on the middle to avoid burns. Electrical cables and ECG cables can not be intertwined.**

8.4.2 Characteristics of good signal

Shown in Figure 8-4, a good ECG waveform should have the following characteristics:

- ◆ tall and narrow without notch.
- ◆ R wave tall, entirely above or below the baseline.
- ◆ pacing signal is not greater than the R wave height.
- ◆ T wave is 1 / 3 height less than R wave.
- ◆ P wave should be much smaller than the T wave.



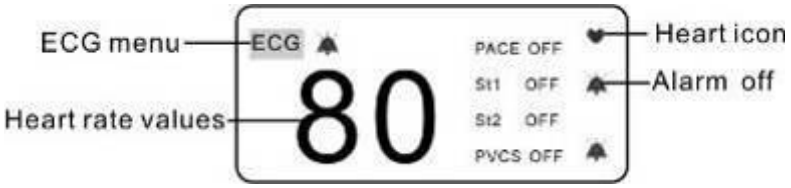
8-4 Standard ECG waveforms

In order to obtain the 1 mV ECG waves calibration, ECG should be calibrated, then the screen says "can not monitor the patient during calibration."

Attention

◆**If the electrodes are pasted correctly, but the ECG waveform is not accurate, it should replace the lead.**

8.4.3 ECG parameters

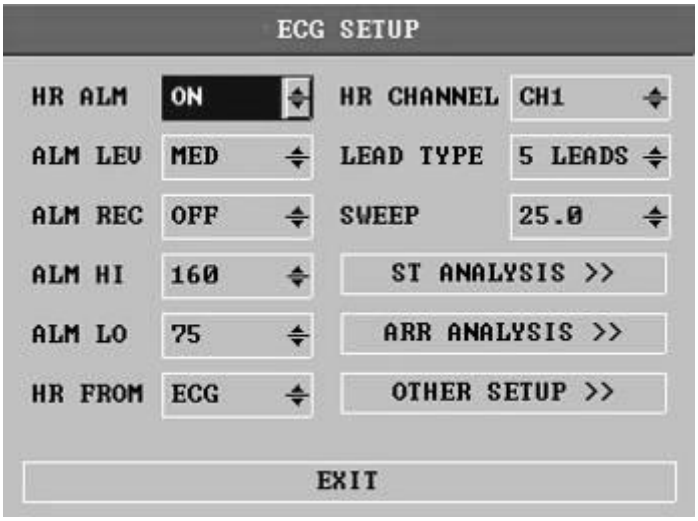


8-5 ECG parameters

The relevant ECG parameters are displayed on the right side of ECG waveform, as shown above. Heart beat icon twinkles. Flicker frequency is the same as the patient's heartbeat / pulse rate. Right side of heart rate / pulse value displays PACE (Pacing), ST1, ST2, switch status or value of PVCs.

8.5 ECG setup menu

Select "ECG" hot key in the parameter region to enter into the menu shown in Figure 8-6.



8-6 ECG setup menu

In this menu, the user can set the following items. Your monitor may not have some of the items.

◆ Heart rate alarm:

On: when heart rate alarm occurs, to prompt and store the alarm .

Off: when heart rate alarm occurs, not to prompt and store the alarm.

When selecting "Off", icon "  " will appear on the right side of "ECG" hot key.

◆ Alarm level three options: high, medium and low.

◆ Alarm record On: when heart rate alarm occurs ,to output the alarm record;
Off: when heart rate alarm occurs ,not to output the alarm record.

◆ High alarm limit to set the trigger for the upper limit of heart rate.

◆ Low alarm limit to set the trigger for the lower limit of heart rate.

When the heart rate exceeds the high limit or below the lower limit ,to alarm0

Attention

- ◆ It should set alarm limits based on each patient's clinical condition.
- ◆ heart rate alarm high limit setting is very important in the monitoring . Upper limit should not be set too high, the changing factors should be taken into account, do not set the heart rate alarm high limit 20 rate / min higher than the patients' heart rate.

◆ The source of heart rate ECG, SPO2, auto, Both;

ECG: HR is calculated from the ECG (heart waves) ;

SPO2: SPO2 (blood oxygen plethysmography wave) to detect heart rate;

If HR is provided by the SPO2, it is prompted PULSE (pulse) with a pulse rate sound.

When the heart rate comes from SPO2, alarm will not judged by HR, but by the pulse rate.

Auto: The source of HR is decided on the quality of the signal by monitor.

Both: the monitor will show both heart rate and pulse rate.

When you select "both" option, the right side of SPO2 on the main screen displays PR measurements; HR and PR can both alarm at the same time. Cardiac beat sound is in accordance with HR. If there are HR datas, it will have voice prompts, if no HR datas, PR will have voice prompts.

- Calculating channel
  "Channel 1" represents the first wave of the ECG waveform data is taken to calculate heart rate. "Channel 2" represents the second wave of the ECG waveform data is taken to calculate heart rate. "Auto": automatic selection for the calculation of heart rate monitor channel.
- Lead Type: choose 5 or 3-lead ECG
- wave speed

ECG scan speed :12.5mm / s, 25.0mm / s and 50.0mm / s there options to choose .

8.5.1 ST segment analysis

In the "ECG Settings" menu, select "ST segment analysis>>" to enter the menu shown in Figure 8-7:

8-7 ST segment analysis

In this menu, the user can set the following items:

- ST segment analysis open or close ST segment analysis;
- alarm switch ON: when ST segment analysis triggers alarm, to prompt and store the alarm; OFF: when ST segment analysis triggers alarm, not to prompt and store the alarm;
- When selecting "Off", icon "  " will appear on the right side of "ST1" in the parameter zone .
  alarm level three options: high, medium, low;
- Alarm record ON: when ST segment alarm occurs, to output the record;
  Off: when ST segment alarm occurs, not to output the record;
- Alarm limit to set the upper limit to trigger the ST segment alarm, the maximum value is 2.0mV; to set the lower limit to trigger the ST segment alarm, the minimum value is -2.0mV.

Attention

◆The alarm limits of the two ST segment measurements are the same. You cannot separately set alarm limit for each channel.

8.5.1.1 confirm the ST segment analysis points>>

- ST segment analysis is optional function;

- In the configuration of the monitor from the manufacturers, ST segment analysis function is

turned off;

◆ When openning the ST segment analysis, the monitor will automatically switch to the "diagnosis" mode;

◆ Users may select the "Monitoring" or "Operation" mode, but ST segment data will be seriously distorted;

◆ ST segment analysis can measure ST segment elevation or depression of the specified lead, and the measurement results show at ST1 and ST2 as figures in the parameters district

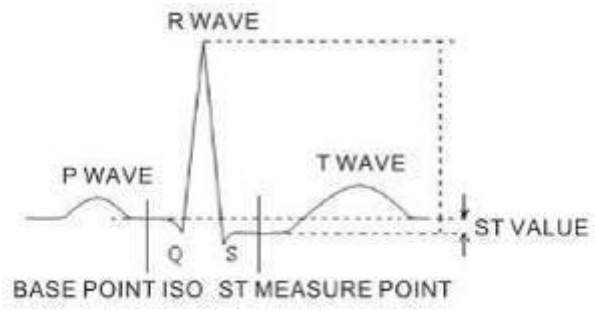
◆ In the " trend graph review" and "trend table review" , ST trend graph and data can be observed.

◆ ST segment measurement unit: mV (millivolt);

◆ ST segment measurements meaning: positive numbers indicate elevation, negative numbers indicate down;

◆ ST segment measurement range: -2.0 mV ~ +2.0 mV.

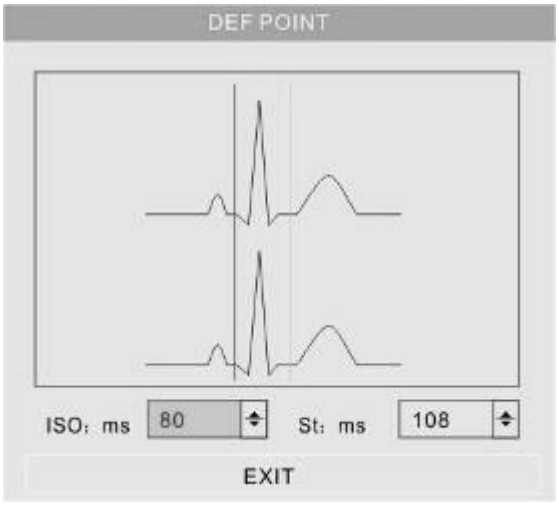
As shown in Figure 8-8, set the ST measurement point for the reference point as the R peak point, ST measurement of the integrated wave of every heartbeat is the two vertical distance between the measuring points.



8-8 ST analysis point

When you start to monitor or the patient's heart rate or ECG changes significantly, you need to adjust the ISO and the ST point position. ST segment analysis does not consider the abnormal QRS wave group.

In the "ST segment analysis" menu, select "confirm ST segment analysis points" and enter into the window as shown in Figure 8-9, the two cursor points represent the position of ISO and ST.



8-9 confirm ST segment analysis points

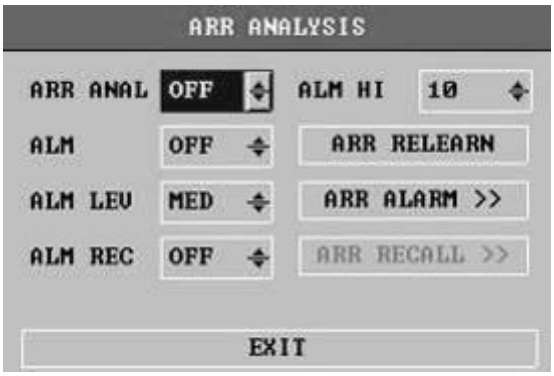
In this window, select "ISO" or "ST" button, you can adjust the position of ISO and ST point.

ISO: base point, is used to set baseline points of ST segment analysis;

ST: starting point, is used to set the measurement points of ST segment analysis.

8.5.2 Arrhythmia analysis

In the "ECG Settings" menu, select "arrhythmia analysis" to enter the menu shown in Figure 8-10: In this menu, the user can set the following items:



8-10 arrhythmias

- ARR analysis ON: Turn on the arrhythmia analysis function;

  Off: Turn off the arrhythmia analysis function;

- alarm switch ON: when arrhythmias alarm is triggered, to prompt and store the alarm;

  Off: when arrhythmias alarm is triggered,not to prompt and store the alarm;

- alarm level three options: high, medium, low;

- Alarm record open: when alarm is triggered arrhythmia, were recorded output;

Off: When the alarm is triggered arrhythmia, is not recorded output;

- Alarm high limit to set the upper limit of arrhythmia, the range is from 1 to 10; when the arrhythmia exceeds the high limit, it will trigger the alarm.

8.5.2.1 ARR self-learning

In the process of ECG monitoring, when there is a greater change in the ECG template, you maybe need to start a self-learning of arrhythmias. ECG template changes may be caused by the following reasons;

- false arrhythmia alarm

- ST measurement is lost

- inaccurate heart rate

ARR self-learning makes monitor can learn the new ECG templates to correct the arrhythmia alarm and heart rate value, and to restore ST measurement. To manually start a ARR self-learning, please enter into the "Arrhythmia analysis>>" menu, then select "ARR self-learning."

8.5.2.2 ARR alarm settings

In the "arrhythmia analysis" menu, select "ARR alarm settings" to enter the menu shown in Figure 8-11:

8-11 arrhythmia alarm settings

In this menu, the user can set the following items:

- Select arrhythmia, total 13 options: MISSED BEATS, ASYSTOLE, VFIB / VTAC, R ON T,

UT> 2, COUPLET, PVC, BIGEMINY, TRIGEMINY, TACHY, BRADY, PNC, PNP;

Among which ALM is the alarm switch, REC is the alarm record switch, LEV is the alarm level;

- Alarm full on: to set all arrhythmia alarms switch to "On";
- Alarm full: to set all arrhythmia alarms switch that can be set to "Off";
- Record on: to set all alarm record switch to "On";
- Record full off : to set all alarm record switch to "Off";
- Alarm level: three options: high, medium and low

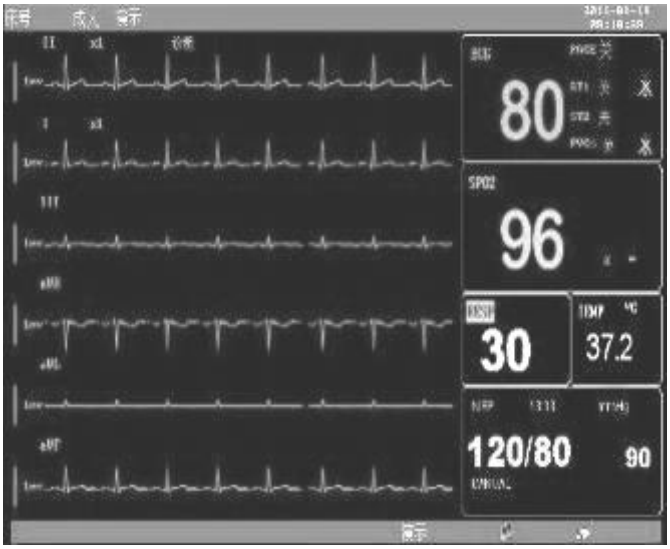
8.5.3 Other settings>>

In the "arrhythmia analysis>>" menu, select "ECG Settings" menu, you can enter the menu shown in Figure 8-12:

8-12 ECG setup menu

In this menu, the user can set the following items:

ECG monitoring can choose the type of the normal full-screen display and multi-lead display. Full-screen multi-display shown below 8-13 lead:



8-13 full-screen display multi-lead

- Heart beat sound volume :can choose the volume level 0,1,2,3,4.

- Pacing Analysis On: when pacing signal is detected, to label symbol "¹" above the ECG waveform; Off: Turn off the pacing analysis function;

Attention

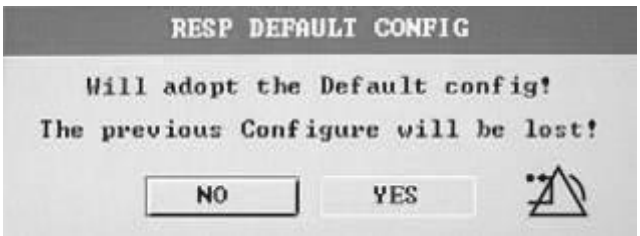
◆ST-segment measurements of the two alarm is the same, not separate alarm limits set for each channel.

◆When a patient with a pacemaker is monitored, "pacing analysis" must be selected "On", otherwise, the system will perhaps treat pacing pulse as a normal QRS wave to count. Do not rely solely on the alarm information of heart rate calculation. Patients with pacemakers need to be placed under close monitoring state.

◆When a patient without a pacemaker is monitored," pacing analysis" should be selected "Off."

◆When the "pacing analysis" select "On", and pressing the "record" button in real-time recording, you can output pacing mark.

- ◆ Power frequency suppression ON: suppress net electrical interference.
- ◆ ECG calibration to select the button to start ECG waveform calibration. Select the button again, or change the lead name on the screen, to close the waveform calibration.
- ◆ Default configuration Select the button into the ECG default configuration dialog box Figure 8-14. Can choose the system default configuration.



8-14 Default Configurations

- alarm information

Alarms may occur in ECG measuring are divided into two kinds: physiological alarm and

technological alarm, at the same time it may also produce a variety of tips. When these alarms or prompts appear, the monitor is characterized by visual and auditory representation that user can refer to the relevant section of the alarm function described. On the screen, physiological alarms and general tips (general alarm) are displayed in alarm zone, and, the technological alarm and the messages which can not be triggered are displayed in the information zone. When the alarm records switch in the related menu is opened, the recorder may be triggered by physiological alarm caused by parameter value exceeding the limits, and automatically output alarm parameter values and associated measured waveform.

The following classification list shows a variety of alarms that may occur in the part of measurement.

Physiological alarm:

Message	causes	alarm level
ECG signal is too weak	the patient's ECG signal can not be detected.	high
HR is too high	HR measurement is above the upper limit.	user-selectable
HR is too low	HR measurement is below the lower limit.	user-selectable

Technological alarm:

Message	causes	alarm level	counter-measure
ECG lead off	ECG electrodes fall off from the patient or ECG cable falls off from the monitor.	low	To ensure the electrodes, leads and cable are connected correctly.
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 module initialization error	ECG measurement module failure	high	Stop using the measurement function provided by ECG module, and notice biomedical engineer or maintenance person of the Company.
ECG module initialization error 1			
ECG module initialization error 2			
ECG module initialization error 3			
ECG module initialization error 4			
ECG module initialization error 5			
ECG module initialization error 6			
ECG module initialization error 7			
ECG module initialization error 8			
ECG module communication stop	ECG measurement module failure or communication failure	high	The same as above

ECG module communication error	Accidentally communication failure	high	If the failure going on, the treatment is the same as above.
HR alarm limit error	Functional safety failures	high	Stop using HR alarm function, and notice biomedical engineer or maintenance person of the Company.
ECG too much interference	ECG measurement signal is interfered greatly.	low	Be sure to keep the patient quiet, and the electrodes connecting correctly, and AC power supply system is grounded properly.

Tips(including general alarm)：

Message	causes	alarm level
HR measurements exceed limit.	HR values exceed the measurement limit.	high

8.7 Respiration measurement

8.7.1 Ways of measuring respiration

The patient monitor surveys and evaluates respiration according to the chest resistance value of the two electrodes. The resistance changes of two electrodes(R and L), which are caused by the chest activities, can produce one respiration waveform.

8.7.2 Setting of respiration monitor

Monitoring respiration does not need additional electrodes. However, the position of the electrodes is very important. Some patients, in view of their clinical condition, lateral spreading of their thorax leads to negative thorax internal pressure. In this instance, in order to get the best respiration wave, it is better to posit two respiration electrodes on the midline of right armpit and on the largest activity area of the left thorax respiration.

Attention

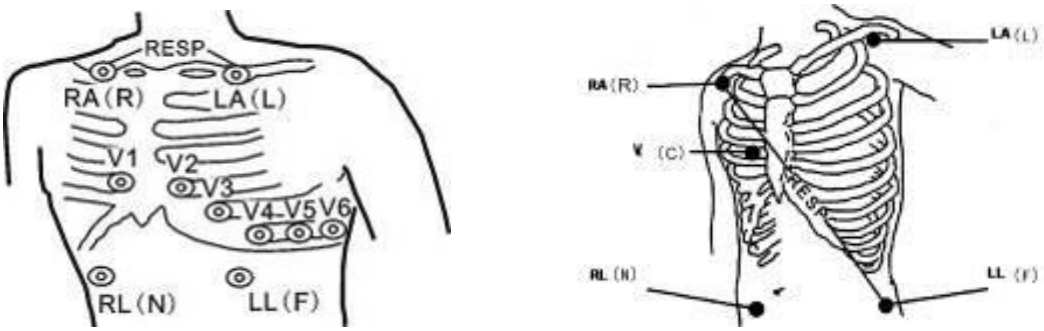
- **Respiration monitor is not applicable to the patients whose range of activities is very large. Since this may cause false alarms.**
- **Avoiding putting respiration electrode connection on area of the liver and ventricular, so you can avoid the heart covering or the pulse of blood flow produced the pseudo-differential, which is particularly important for the neonates.**
- **For get the best respiratory wave, select I lead measurement should be placed in the level of RA and LA electrodes; Select II lead respiration measurement should be placed on the diagonal of RA and LL electrodes.**

RESP Monitoring inspection

1）Install the electrodes spring clip or push button, place the electrodes to the patient as follows:：

2）Spring clip to the battery installed, or snaps, according to the method described below, the electrode is inserted into the patient.

Electrode placement for the measurement of respiration, as Figure 8-15:



8-15 electrode placements (five-lead)

8.7.3 RESP parameter

On the right of the RESP waveform shows the RESP relevant parameters, shown as Figure 8-15.

8-16 ECG parameters

8.7.4 RESP Setting

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

8-17 RESP setting

- Alarm switch:

On: Warning and storage when the respiratory rate alarm;

OFF: No warning, and"  " will be displayed in the parameter RESP area.

- Alarm level: "High", "Medium", "Low". "High" indicates that the most serious alarm.
- Alarm Record: On: the recorder output when the respiratory rate alarm occurs.
- Alarm Upper Limit: Be used to set upper limit of RESP alarm
- Alarm Lower Limit: Be used to set lower limit of RESP alarm

When respiration is over upper limit or below lower limit, alarm will occur.

The adjustment range of RESP alarm Upper/Lower Limits as follows:

Item	Upper Limit	Lower Limit	Single Adjust Volume
RR Adult	120	0	1
RR Pediatrics/Neonates	150	0	1

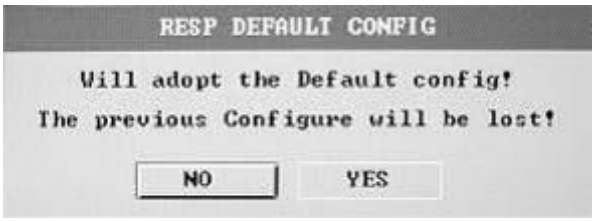
■ Asphyxia alarm Set the time to judge the patient asphyxia, between 10 seconds and 40 seconds, 5 seconds will be added or subtracted by every turning the knob.

No warning: there is no warning when the patient asphyxia.

■ Speed of waveform: The options of the scanning speed of respiration waveform are 6.25mm/s, 12.5mm/s and 25.0mm/s.

■ Gain：Five classes: ×0.25, ×0.5, ×1, ×2, ×4.

■ Default Configuration>> Select the RESP default configuration into the dialog box as Figure 8-18. It can choose the system default configuration



8-18 RESP Default Configurations

8.7.5 RESP Alarm information and tips

When the alarm records related to the menu switch is turned on, the physiological alarm which caused by parameters beyond alarm limit will trig the recorder automatically output the alarm parameter and relevant measurement waveform.

RESP measurement may occur in the physiological alarm, technology alarm and prompt information are as follows:

Physiological alarm

Prompt information	Induced causes	Alarm level
RR too High	RESP measurement over the upper limits	User Configuration
RR too Low	RESP measurement over the lower limits	User Configuration
RESP Asphyxia	No respiration measurement inter the specific time	High

Technical alarm

Prompt information	Reason	Alarm level	Countermeasure
RESP Alarm limit fault	Functional safety failures	High	Stop using the RESP alarm function, and notify the biomedical engineer or maintenance staff.

Prompt information

Prompt information	Induced causes	Alarm Level
RR measurements over the limits	RR measurements over the limits	High

Chapter 9 SpO2 Monitor

9.1 Definition of SpO2 Monitor

SpO2 Plethysmograph parameter measures the artery oxyhemoglobin saturation, that is, the percent of the amount of oxyhemoglobin. For example: in the erythrocyte of arterial blood, if there is 97% of the total hemoglobin cell attached to oxygen, the blood has 97% SpO2 oxygen saturation, and the reading of SpO2 value of the monitor should be 97%. The parameter of SpO2 value can provide the PR signal and Pleth. wave.

SpO2 plethysmography measurement principles

- Oxygen saturation is measured by pulse oxymetry. This is a continuous and non-invasive method of
  measuring hemoglobin oxygen saturation.
- The measurable wavelength of the sensor: red LED is 660nm. The infrared LED is 940nm. The maximum output power of LED 4Nw.
- The number of the passing rays depends on many factors, most of which are invariable. However, one of the factors, artery blood stream changes with time, because it is pulsant. The oxygen saturation of artery blood can be acquired by measuring the absorbing light during pulsatile time. Detecting pulsating movement can give a volume recording waveform and pulse rate signal.
- The value of SpO2 and PLETH wave will display on the main screen.
- The "SpO2"of this manual refers to the SpO2 measured by means of non-invasive method.

9.2 Attention items

⚠Warning

◆ If there are carboxy hemoglobin, met hemoglobin or dye dilute chemical, the value of SpO2 may be incorrect.

◆ Before monitoring, firstly check whether the cable of sensor is all right. When the spo2 sensor cable is taken out of the socket, the screen will display the information of "sensor off" and trigger alarm.

◆ The cables of sensors can not be entwined with the cables of electro surgery unit.

◆ Do not put the sensor on the limbs that have arterial duct or venous injection pipe.

◆ Do not probe the oxygen and blood pressure cuff blood pressure measurements on the same limb, because blood pressure during occlusion of blood flow will affect oxygen saturation readings.

◆ Continuous and long-time monitoring may add the danger of undesirable change of skin feature, especially in newborns. For example, abnormal allergy, erythrosis, blister or pressure necrosis. Special attention should be paid in accordance with changes in the quality of the skin. Regularly check the location of the sensor attached and the quality of the skin at the location of change. Because of different status of individual patients, frequent inspection may be required.

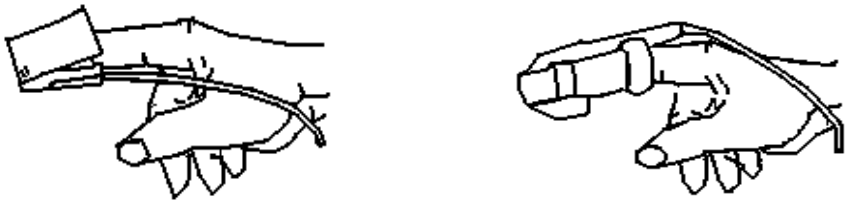
. 9.3 Monitor steps

Spo2 Plethysmograph measurement (spo2 sensor connection)

- Insert the plug into the socket labeled as spo2 on the side panel.
- Turn on the monitor.
- Attach sensor on patient's finger at the appropriate position.
- Cables should not be tucked or distorted.

Placed a finger oximeter probe

Finger oxygen probe placed relatively simple, as shown in Figure 9-1:



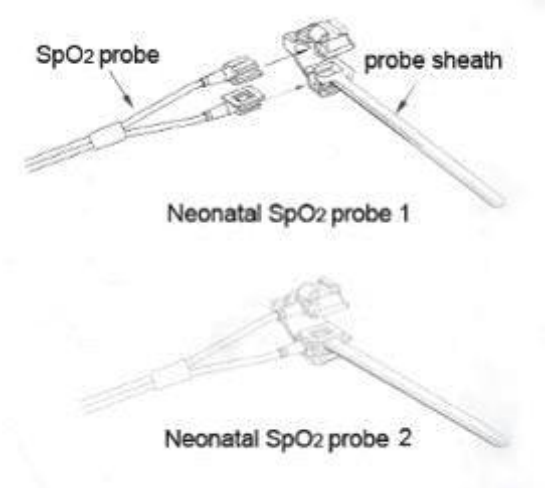
9-1 finger oxygen sensor connection

Attention

◆Oxygen probe cable should be placed in back of the hand, to ensure that the nail is shot on the oxygen sensor light source.

Neonate spo2 probe

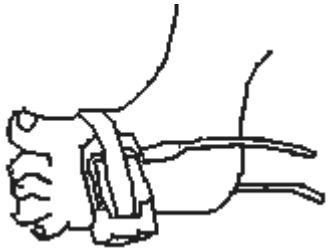
The neonate spo2 probe is made up of Y-spo2 probe and neonate spo2 probe sheath. Please insert the LED end and the PD end of Y-shape SpO2 probe into the up and down groove of the neonate SpO2 probe. The picture of the integral probe is as following:



9-2 neonatal oxygen probe placed

Put the SpO2 probe on the neonate hand or foot (as shown in the picture). Hold the probe and pull the belt, put the V side of the belt into the V groove of the sheath. And then lengthen the belt (about 20mm long) in order to put the other V-shape side into the other V-shape groove of the sheath. In this case, loose the belt so that the belt can be put through the first latch to fix the belt. If the belt is too long, put it through the second latch. The probe must be placed like this, so that the photoelectric elements can be in the right position. However, do not pull the belt so long, or

else this will block the circulation and lead to inaccurate measurement.



9-3 neonatal oxygen probe placed

Attention

◆If the test site and can not accurately locate the probe may lead to oxygen saturation readings are not allowed, not even to search for oxygen pulse wave can not be monitored at this time should be re-positioned.

◆Excessive movement may cause measurement site measurement is not accurate, then the patient should be quiet or replacement of measuring parts to reduce the excessive movement of the measurements.

⚠Warning

- **◆ In the long-time monitoring process, distal circulation and skin state of the testing part should be inspected every 2 hours. If there are bad changes, please change the place of probe.**
- **◆ In long-time monitor process, the position of probe should be inspected regularly in order to avoid the effect of moving on accuracy of measurement.**

9.4 Measurement limit

Measurement Limit

During the operating process, the following factors may effect the accuracy of SPO2 measuring:

- High frequency electrical disturbance, such as: disturbance generated by host system or by electrical surgical instruments connected with the system.
- During MRI, do not use anoxia-photometer. Spo2, induction current may lead to burn.
- Intravenous dyestuff.
- Frequent movement of patient.
- External light radiation.
- Inappropriate sensors setting or inappropriate contact position.
- Temperature of sensor (best temperature range: 28~42 ℃).

- If the sensor is put on the limbs that have blood pressure cuff, arterial duct.
- The concentration of non-functional hemoglobin, such as: COHb and MetHb.
- SPO2 is too low.
- Circumfusion of test part is not good.

9.5 SpO_2 Menu

Select the parameter area "SPO2" hotkey to enter the menu shown in Figure 9-4:

9-4 SPO2 setting

In this menu, the user can set the following items:

- Alarm switch ON: Warning and storage when the SpO2 alarm;

  OFF: No warning, and" " will be displayed on the right of SpO2 hotkey.
- Alarm level: "High", "Medium", "Low". "High" indicates that the most serious alarm.
- Alarm Record: ON: the recorder output when the SpO2 alarm occurs.

  OFF: no recorder output when the SpO2 alarm occurs.
- SpO2 Upper Limit: Set the upper alarm limit of SpO2 value.
- SpO2 Lower Limit: Set the lower alarm limit of SpO2 value.
- PR Upper Limit: Set the upper alarm limit of PR value.
- PR Lower Limit: Set the lower alarm limit of PR value.

Alarm range of SpO2 and PR:

Parameter	Upper Limit	Lower Limit	Single Adjust Volume
SpO2	100	0	1
PR	254	0	1

The default alarm range of SpO2 and PR default setting:

Parameter		Upper Limit	Lower Limit
SpO2	Adult	100	90
	Pediatrics	100	90
	Neonates	95	85
PR	Adult	120	50
	Pediatrics	160	75
	Neonates	200	100

- Speed of waveform: 12.5mm/s and 25.0mm/s.
- Pulse volume: Volume level: 0,1,2,3,4.
- Calculate sensitivity: 3 levels: high, medium and low. Means the average SpO2 in 4

seconds, 8 seconds or 16 seconds.

- Waveform Style: Line and filled.

◆ Default Configuration>> Select the SPO2 default configuration into the dialog box. It can choose the system default configuration.

9.6 SpO2 Alarm information

SpO2 Alarm information

When the alarm records related to the menu switch is turned on, the physiological alarm which caused by parameters beyond alarm limit will trig the recorder automatically output the alarm parameter and relevant measurement waveform.

SpO2 Module measurement may occur in the physiological alarm, technology alarm and prompt information are as follows:

-Physiological alarm

Prompt information	Reason	Alarm Level
SPO2 too high	SpO2 measurement over the upper limits	User Configuration
SpO2 too low	SpO2 measurement over the lower limits	User Configuration
PR too high	PR measurement over the upper limits	User Configuration
PR too low	PR measurement over the lower limits	User Configuration

Technology alarm

Prompt information	Reason	Alarm Level	Countermeasure
SPO2 Sensor off	SpO2 Sensor off from patient or monitor	low	Ensure that the sensor placed in the fingers or other parts of the patient, and monitor with the cable connected properly.
SPO2 Module initialization error	SpO2 Module Error	high	Stop using the SpO2 Module measurement function, and notify the biomedical engineer or maintenance staff.
SPO2 Module initialization error 1			
SPO2 Module initialization error 2			
SPO2 Module initialization error 3			
SPO2 Module initialization error 4			
SPO2 Module initialization error 5			
SPO2 Module initialization error 6			
SPO2 Module initialization error 7			
SPO2 Module initialization error 8			

SPO2 Module communication stop	SpO2 Module error or communication error	high	Stop using the SpO2 Module measurement function, and notify the biomedical engineer or maintenance staff.
SPO2 Alarm limit fault	Fault of safety function	high	Stop using the SpO2 Module measurement function, and notify the biomedical engineer or maintenance staff.
PR Alarm limit fault	Fault of safety function	high	Stop using the SpO2 Module measurement function, and notify the biomedical engineer or maintenance staff.

Prompt information （including general's warning）

Prompt information	Reason	Alarm Level
SPO2 measurement over the limits	SpO_2 measurement over the limits	high
PR measurement over the limits	PR measurement over the limits	high
Searching Pulse	SpO_2 module is searching pulse	No alarm
Pulse not found	SpO2 Module can not detect the SpO2 signal for a long time.	high

9.7 Maintenance and Cleanness

⚠Warning

◆ **witch off the power supply before cleaning the monitor or sensors.**

Attention

◆ **Do not autoclaved disinfect the sensor.**

◆ **Do not soak the sensor in the liquid.**

◆ **Do not re-use if the sensor or cable is damaged or deteriorated signs.**

Cleaning

- Clean the surface of the sensor with medicinal alcohol, and then dry with a dry cloth. LED sensor and receiver tubes can also use the same method to clean.
- Clean and disinfect the cable with 3% Peroxide or 70% Isopropanol, active reagent is also available. Connector can not soak in the above-mentioned liquid.

Chapter 10 NIBP Monitor

⚠ Warning

- **NIBP measurement cannot be carried out on the patients who suffer from the disease of sickle cell, any skin lesion or expecting damage.**
- **It depends on the clinical evaluation that whether auto NIBP measurement is used to measure the patients with serious obstacle of hemoglutination mechanism or not. Because of friction at the body and the cuff has generated the risk of hematoma.**
- **When the blood pressure of the pediatrics is measured, the patient monitor should be set in right mode. Using the wrong measuring mode may endanger the safety of the patients. Because the higher pressure of adults cannot be used for neonates.**
- **If the patient is a non-adult, do set the appropriate pressure measurement state in the menu. Otherwise, our company will not take any responsibility in these cause-related accidents.**
- **The equipment may not meet the performance specifications when the equipment store or use over the specified temperature and humidity range in the manual Article 18.2.2.**
- **The equipment measured blood pressure values and auscultation blood pressure values equivalence, the error should be consistent with YY0667-2008 requirements.**
- **Do replace the models which provided by our company when replace parts (the cuff, pressure sensors, etc.)**

Attention

- **There may cause measurement errors if the replacement parts provided by non-original manufacturer.**

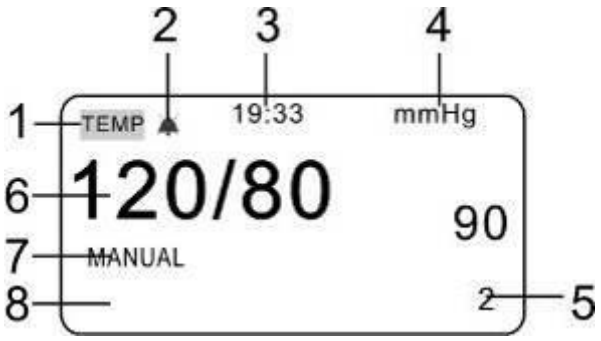
10.1 summaries

- NIBP measurement: Oscillation method.
- Adult, pediatric and neonatal mode.
- Measurement mode: manual , auto and continuous measurement. Every mode displays systolic pressure, mean pressure and diastolic pressure.

1. Manual mode: only one time NIBP measurement.
2. Auto mode: repeatable measurement. The interval time can be set: 1, 2, 3, 4, 5, 10, 15, 30, 60, 90, 120, 180, 240 and 480 minutes.

3. Continuous mode: continuous measurement in 5 minutes.

NIBP measurement using non-waveform display, only in the parameter area shows the result of NIBP measurements, as shown in Figure10-1



10-1 NIBP parameter

1— NIBP hotkey: Select the hot key to enter "NIBP Settings" menu

2— Blood pressure alarm off;

3— Pressure time last time

4—Unit of pressure: mmHg/kPa (optional).

5-- The current cuff pressure

6-- Systolic blood pressure values of 120 / 80 diastolic blood pressure values, the average pressure values of 90.

7-- Blood pressure measurement

8-- Message area: Tips, NIBP measurement modes and related information.

10.2 Measurement Procedures

NIBP measurement of the patient, please refer to the following steps:

1. If the monitor is turned off, first turn on the power monitor;

2. Confirmation "patient information area" of the patient type, if not, then enter the "Patient Information Settings" menu to select the ccorresponding patient type;

3. Insert the inflation pipe into the socket of the NIBP cuff;

4. Select the appropriate cuff size according the patient's body and wound on the patient's upper arm or thigh;

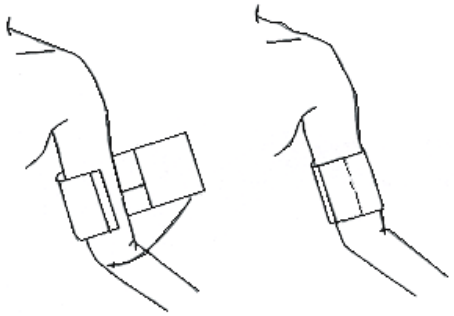
5. Connect the cuff with the inflation pipe;

6. Press the "Pressure" key on the front board to start measurement.

10.2.1 Cuff Selection and Placement

1. Determine the patient's limb circumference;

2. Select the appropriate cuff, the cuff is marked with the applicable physical perimeter;



10-2 cuff place

3. Make sure that the cuff is deflated completely. Place the cuff in the patient's upper arm or leg. The sign of φ should be placed on the proper artery.

4. Make sure that wrapping the pantomime with the cuff is not too tight, or else the color in remote part of the limb will change, and even the patient will be lack of blood.

5. The limb for NIBP measurement should be placed on the same level of heart of the patient. If not, the following steps can be used to revise the measurement result.

●If the cuff is higher than the level of heart, 0.75mmHg（0.10kPa）should be added to the displaying value for every centimeter distance.

●If the cuff is lower than the level of heart, 0.75mmHg（0.10kPa）should be subtracted from the displaying value for every centimeter distance.

Three kinds of cuffs are available for Adult, Neonates and Pediatrics:

Type of the patient	Circumference of the limb	Width of the cuff	Length of inflating pipe
Neonates	10cm～19cm	8cm	1.5m or 3m
Pediatrics	18cm～26cm	10.6cm	
Adult 1	25cm～35cm	14cm	
Adult 2	33cm～47cm	17cm	
Leg	46cm～66cm	21cm	

Disposable cuff for new-birth or neonates

Dimension	Circumference of the limb	Width of the cuff	Length of inflation pipe
1	3.1cm～5.7cm	2.5cm	1.5m or 3m
2	4.3cm～8.0cm	3.2cm	
3	5.8cm～10.9cm	4.3cm	
4	7.1cm～13.1cm	5.1cm	

⚠ Warning

- **The width of the cuff is 40% of the circumference of the limb (50% for neonate), or 2/3 of upper arm length. The length of inflation part of the cuff should be long enough to surround the 50~80% of the limb. The cuff with improper size could cause false reading. If there is something wrong with the size of the cuff, the bigger cuff should be used to decrease errors.**
- **Do not place the cuff on the limb which inserts a catheter or intravenous infusion. During the cuff inflation, when the infusion slowed or blocked, may cause damage to the surrounding tube.**
- **Blood pressure cuff and monitor connection inflatable tube should ensure smooth, not tangles.**

10.2.2 Operation clues

1. Measuring NIBP automatically for one time:

- Rotate the shuttle key to the NIBP item to set the relative item after entering the menu of

"system setup". The system will change measurement interval according to the setting.

⚠Warning

◆ **If the measurement time in auto mode is too long, there will be some problems such as purpura, ischemia and neurologic damage on the limb rubbing with the cuff. The color, temperature and sensitivity of the remote part of the limb should be checked during monitoring. Please put the cuff on other place or stop measuring immediately if any exceptional matter occurs once.**

2. Measuring manually for one time:

◆ Select "Interval" item in the menu of "NIBP setup" to change the value "manual". Press "Blood pressure" key to manual measuring.

◆ Press "Blood pressure" key in automatic measurement of idle time to start manual measurement. Press "Blood pressure" key again to stop manual measurement and continue to implement the automatic measurement.

3. Measuring manually during the procedure of auto measurement:

Press "Blood pressure" key on the Control Panel.

4. Measuring continuously

Select "continuous" item in the menu of "NIBP setup" to start continuous measurement. This process will last 5 minutes.

⚠Warning

◆ **If the measurement time in measuring continuously is too long, there will be some problems such as purpura, ischemia and neurologic damage on the limb rubbing with the cuff. The color, temperature and sensitivity of the remote part of the limb should be checked during monitoring. Please put the cuff on other place or stop measuring immediately if any exceptional matter occurs once.**

5. Stop continuous measurement in the middle

At any moment, press "Blood pressure" key to stop NIBP measurement.

Attention

◆ **If there is doubt about the accuracy of the reading, please inspect the physical sign of the patient before checking the function of the patient monitor.**

10.2.3 Measurement limit

There is some limit to Oscillation method according to the condition of the patient monitor. This method seeks the regular pulse wave produced by the artery pressure. In case patient's

condition makes seeking wave difficult, the measurement value will not be reliable and the measurement time will increase. The user should recognize that following cases will affect the

measurement method, make the value uncertain and prolong the measurement time. In such conditions, the measurement cannot be carried out.

- **Patient movement**

If the patient is moving, shaking or going into convulsions, the measurement will not be reliable or even impossible. Because these situations may interfere the checkout of pulse wave caused by artery pressure, and the measurement time will prolong.

◆ **VPC**

If VPC occurs in the patient, it can cause irregular cardiac activity and the measurement will not be reliable or even impossible, and the measurement time will prolong.

◆ **Heart-lung machine**

If the patient is connected with the heart-lung machine, the measurement will be not carried out.

◆ **Pressure change**

If in some time the machine is analyzing the pulsating movement of artery pressure to get the value, but at that time the blood pressure of the patient monitor changes rapidly, the measurement will be not reliable or even impossible.

◆ **Serious shock**

If the patient is in serious shock or the temperature is too low, the measurement is not reliable. The decrease in the blood flow can lead to the reduction of artery pulsating movement.

◆ **Limit of heart rate measurement**

If heart rate is lower than 40bpm (beat/minute) and higher than 240bpm (beat/minute), the blood pressure cannot be measured.

10.3 NIBP settings

Select the "NIBP" hotkey in the parameter area, show as the following picture：

figure10-3 NIBP settings

In this menu, users can set:

- Alarm switch On:Warning and storage when the NIBP alarm;

Off: No warning, and"  " will be displayed on the right of SpO2 hotkey.

- Alarm level: “High”, “Medium”, “Low”. "High" indicates that the most serious alarm.
- Alarm Record: On: the recorder output when the NIBP alarm occurs.

Off: no recorder output when the NIBP alarm occurs.

- Systolic pressure Limit: To set the trigger limit of systolic pressure value.
- Mean pressure Limit: To set the trigger limit of mean pressure value.
- Diastolic pressure Limit: To set the trigger limit of diastolic pressure value.

When the NIBP is beyond the limit, alarm is triggered. Alarm limits setting as follows:

Patient type	Adult	Pediatrics	Neonates
Systolic pressure	40～270 mmHg	40～200 mmHg	40～135 mmHg
Diastolic pressure	10～215 mmHg	10～150 mmHg	10～100 mmHg
Mean pressure	20～235 mmHg	20～165 mmHg	20～110 mmHg

- Unit: mmHg or kPa
- Cycle: Select measurement mode to "Manual" or "automatic" of the time interval. The optional time interval is 1, 2, 3, 4, 5, 10, 15, 30, 60, 90, 120, 180, 240, 480 minutes.
- Pre-inflated value

Press this key to select the next inflating initial cuff pressure, in a different default configuration; there are different pre-inflated values of the range of options, as follows:

Default Configuration	Default Pre-inflated value (mmHg/kPa)	The optional pre-inflated value of manual in NIBP menu (mmHg/kPa)
Factory default configuration of adult	160	80/90/100/110/120/130/140/150/160/170 180/190/200/210/220/230/240
Factory default configuration of pediatrics	120	80/90/100/110/120/130/140/150/160/170 180/190/200
Factory default configuration of neonates	70	60/70/80/90/100/110/120

Press the “Menu” button in front of the monitor to enter the “Default Configuration” menu in the “System Menu”. Confirm the default configuration and then return to the main interface to select the NIBP hotkey in the NIBP parameter area to enter the “NIBP Settings”. You can see the initial value of "pre-inflated value" is the initial inflation pressure value corresponds to the default configuration, as shown above. Move the cursor to the "pre-inflated value" option and click; you can see the optional pre-inflated value for manual adjustment that is as shown above.

Attention

◆ **The option "Pre-inflated value" is to help the user to select the next cuff inflation pressure. However, a subsequent measurement of the pre-inflation value is based on the same patient's systolic blood pressure measurements. Systems can memory the data to reduce the measurement time of the same patients, and increase the accuracy of the measurement.**

◆ **When the user only set up the "patient types" in the "patient information setting" and no any option in "Default configuration", the system will accord with the "patient types" related to the initial setup of the module parameters. And the default changes in "default configuration" will also change the "patient type" in "patient information setting".**

■ Reset

Reset the measurement state of blood pressure pump.

Press this key to the recovery of blood pressure values of the pump inflated the initial setup.

The monitor can not be prompted when the blood pump is not working properly; it is recommended to use this button. Because this make the blood pressure pumps for self-examination, resulting in accidental causes abnormal pump automatic recovery.

■ Continuous measurement

Start continuous measurement.

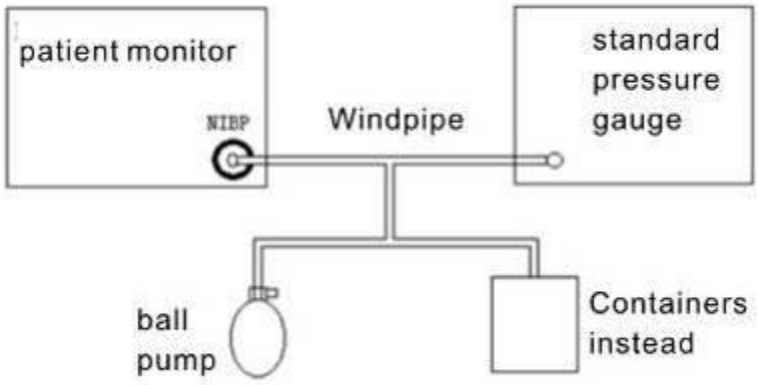
In this election, the menu will automatically disappear immediately continuous measurement, continuous measurement time will last 5 minutes.

■ Calibration

Select the "Calibration" button when the line can be calibrated blood pressure measurement; while the button changes to "stop the calibration," select the button again to stop the calibration.

Calibration work, should have been calibrated with accuracy higher than 1 mmHg of the pressure gauge (or mercury sphygmomanometer) for calibration. Calibration steps are as follows:

1. Using a volume of 500ml +25 ml containers instead of metal cuff;
2. An error less than 1mmHg, after calibration with a standard pressure gauge and a T-ball interface connected to the pump and the inflatable tube NIBP cuff on the monitor on, as shown in Figure 10-3.
3. Select the "Calibration" button;
4. Ball pump with the pressure of the metal containers were inflated to 0, 50 and 200 mmHg.
5. The difference between the value of the standard pressure gauge and the monitors' pressures values indicated should be within 3 mmHg. Otherwise, please contact our company maintenance engineer.



10-3 NIBP calibration diagram

Attention

◆ **NIBP measurement calibration should be once every two years (or by statute for the maintenance of your hospital.)**

■ Leak detection steps are as follows

1. connected the cuff and the monitor;
2. Wrapped the appropriate size cuff around the cylinder, as shown in Figure 10-4;
3. Select the "leak detection" button in the "NIBP Setting "Menu. Below the NIBP parameter area displayed "leak testing ... ..." means the system begins to perform leak detection.
4. The system automatically inflated to the pressure of 180mmHg.
5. After about 20 seconds, the system automatically opens the valve, means the leak detection complete.
6. If there is no message in NIBP parameter area, no leakage exists. If there is "pump leak ... ..."display on the screen which may be gas leakage fault the operator should check whether the connection is loose, and then test again when the connection is confirmation. If there still have trouble prompted, please contact the manufacturer for maintenance.

10-4 NIBP air leak test connection diagram

Attention

- Before leak testing, the "patient type" should set to "adult";
- The above-mentioned leak detection method is only for simple testing whether NIBP is leak

when inflate, is different from the EN1060-1 standard content.

■ Default configuration : Select this to enter the NIBP default configuration dialog box.

10.4 NIBP alarm information and remind information

When the alarm records related to the menu switch is turned on, the physiological alarm which caused by parameters beyond alarm limit will trig the recorder automatically output the alarm parameter and relevant measurement waveform.

NIBP Module measurement may occur in the physiological alarm, technology alarm and prompt information are as follows:

Physiological alarm

Prompt information	Reason	Alarm level
NS too high	NIBP Systolic blood pressure measurement above the upper limit alarm setting	User Configuration
NS too low	NIBP Systolic blood pressure measurement below the lower limit alarm setting	User Configuration
ND too high	NIBP Diastolic blood pressure measurement above the upper limit alarm setting	User Configuration
ND too low	NIBP Diastolic blood pressure measurement below the lower limit alarm setting	User Configuration
NM too high	NIBP Mean pressure measurement above the upper limit alarm setting	User Configuration
NM too low	NIBP Mean pressure measurement below the lower limit alarm setting	User Configuration

Technology alarm 1 (Information area in the monitor display)

Prompt information	Reason	Alarm Level	Countermeasure
NS Alarm limit fault	Functional safety failures	High	Stop using the NIBP Module measurement function, and notify the biomedical engineer or maintenance staff.
NM Alarm limit fault	Functional safety failures	High	Stop using the NIBP Module measurement function, and notify the biomedical engineer or maintenance staff.
ND Alarm limit fault	Functional safety failures	High	Stop using the NIBP Module measurement function, and notify the biomedical engineer or maintenance staff.

Technology alarm 2 (NIBP pressure value displayed in the area below the tips):

Prompt information	Reason	Alarm Level	Countermeasure
NIBP Self-test error	NIBP measurement module sensors or other hardware errors	High	Stop using the NIBP Module measurement function, and notify the biomedical engineer or maintenance staff.
NIBP Communication error	NIBP measurement module communication failure	High	If the problem continued，stop using the NIBP measurement function, and notify the biomedical engineer or maintenance staff.
Cuff is too loose or not connected	Cuff is not tied or no cuff	Low	Tied the cuff

cuff inflatable tube leak	Cuff, hose or connector damaged	Low	Check and replace leaking parts, if needed， notify the biomedical engineer or maintenance staff.
Air pressure fault	Pressure is not stable, such as hose tangles	Low	Check whether hose is tangle, if the problem continued, notify the biomedical engineer or maintenance staff.
Signal is too weak	Cuff is too loose or the patient's pulse is too weak	Low	Use other methods to measure blood pressure.
Pressure over the range	Measurement range over the upper limit	High	Reset NIBP measurement module, if the problem continued, stop using the NIBP Module measurement function, and notify the biomedical engineer or maintenance staff.
Arm movement	Affected by arm movement, the signal noise is too large or irregular pulse rate	Low	Ensure that patients is quiet, no movement.
Overvoltage protection	Pressure exceeds the safety limit	High	Measured again, if the problem continued, stop using the NIBP Module measurement function, and notify the biomedical engineer or maintenance staff.
Signal saturation	Significant movement	Low	Avoid patient movement.
Pump leak	Leakage in the leak test found	Low	Check and replace leaking parts, f needed, notify the biomedical engineer or maintenance staff.
NIBP System failure	Blood pump system running fault	High	Stop using the NIBP Module measurement function, and notify the biomedical engineer or maintenance staff.
Cuff type of error	Cuff type do not match the patient type	Low	Choose the appropriate cuff
Measurement Timeout	Measure time more than 120 seconds (adult / pediatrics) or 90 seconds (neonates)	High	Pressures measured again or use other methods.
NIBP Reset Error	Model reset abnormal	High	Use the reset function again.
Measurement error	When measuring, the system can not perform measurement and analysis or calculation	High	Check the cuff, to ensure that patient is no movement, and measure again.

——Prompt message（display at the below of NIBP range）:

Prompt message	Cause for	Alarm level
Manual measure…	manual measuring process	NO
Continuous measure...	continuous measure process	

Automatic measure...	automatic measure process	
Press start key	choose test blanking time in menu	
Stop test…	press start key in measuring process	
Correct…	in correct process	
Stop correct	correct process has finished	
Leakage test…	in leakage testing	
Stop leakage test…	stop leakage test	
Module reset…	the process of NIBP module uploading	
Hand-reset…	the process of NIBP reset(user triggered)	
Reset failed…	reset failed	

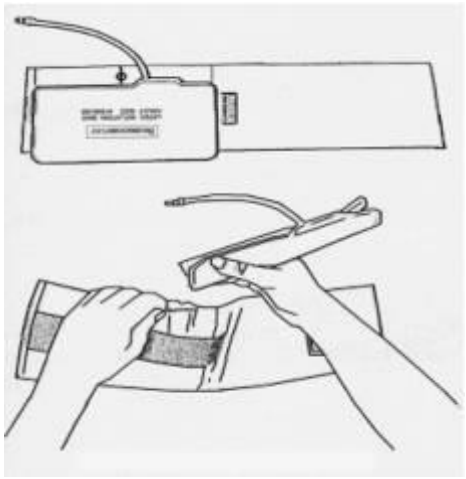
10.5 Maintenance and cleanliness

⚠Warning

- **Do not press or squeeze the rubber tube of the cuff.**
- **Prevent water or cleaner to flow into the connecting socket on the front of the patient monitor to avoid damage.**
- **While cleaning the patient monitor, do not clean the inner part of the connecting socket; only clean the periphery part of it.**
- **When the reusable cuff is not connected with the patient monitor, or is being washed, the nut cap should always be put on the rubber tube, which can prevent liquid to flow into the rubber tube and be sucked in the modules.**

Reusable cuff of blood pressure

The cuff can be sterilized in the normal hot air cabinet, or disinfected by gas or radiation disinfection, or sterilized by immerging into the detersive solution. Please remember to take out the rubber tube when using the third method. The cuff cannot be dry-cleaned. It can be washed by machine or by hand, which can prolong the life time of the cuff. Take out the rubber tube before washing. Fix the rubber tube again after the cuff becomes dry.



In order to fix the rubber tube into the cuff again, firstly put the rubber tube on the head of the cuff so that the rubber tube and the big opening of the cuff are in one line. Then roll up the rubber tube lengthways and insert into the big opening of the cuff. Twitter the whole cuff while holding the leather hose and the cuff until the rubber tube is in place. At last put the leather hose into the cuff and pull it out through small hole behind the inside lining.

One-off blood pressure cuff

One-off blood pressure cuff can only be used to measure one patient. Do not use the same one-off cuff to measure different patients. One-off cuff cannot be disinfected or sterilized with highly compressed steam. One-off cuff can be washed with soap to control infection.

Attention

One-off cuff should be recycled or dealt with properly in accordance with local laws and in order to protect environment.

Chapter 11 Temperature monitor

11.1 summarize

The patients' temperature data can be measured by the temperature probe and display the results in TEMP parameter area, as shown on 11-1

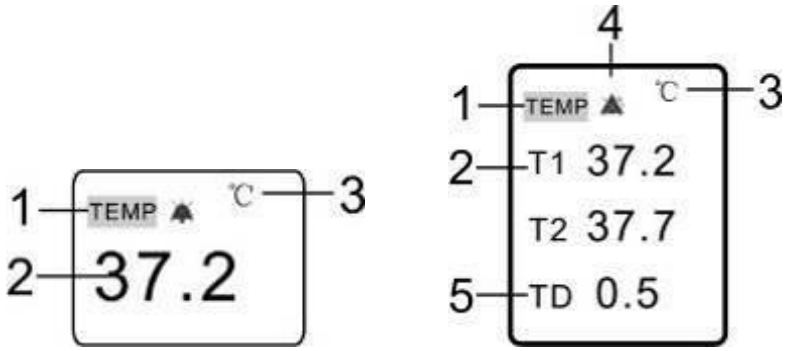


Figure11-1 TEMP parameter

1—TEMP hotkey: press hotkey to enter TEMP setting menu

2—Closed TEMP alarm

3—℃ temperature unit：℃ or ^{0}F

4— temperature alarm off

5—TD: temperature difference. Temperature difference that is between channel 1 and channel 2

Attention

◆ **Because different types of products have different configuration, it will show one or two channels' temperature content. Please refer to the products' model function chart of front page and with product kind prevail.**

11.2 Measuring steps

Please refer to the following steps when you test TEMP

1. If use disposable sensor, the temperature cable should be inserted in sensor socket at the side of monitor. And then connect sensor with cable; If use reusable sensor, it can be inserted in socket d directly.
2. Temperature probe should be attached with patient firmly.
3. Switch on power system, turn on the monitor power.

Attention

◆ **If choosing to use disposable temperature probe, then it only can be used once.**

◆ **In temperature test process, temperature survey can self-check every hour. Self-checking will continue 2 seconds, won't affect temperature monitor's regular work**

⚠ Warning

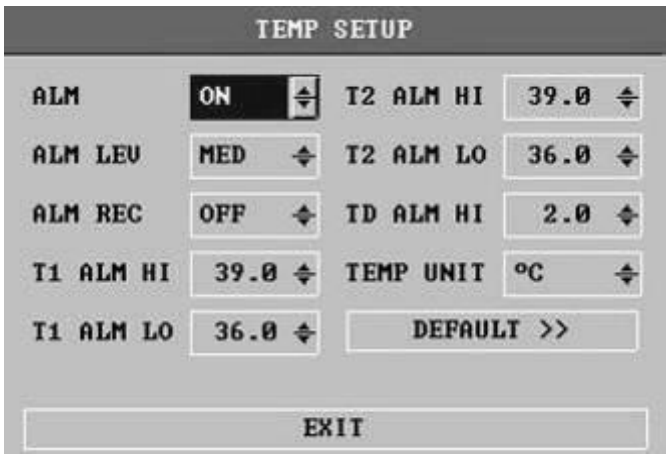
◆ **please check if the probe cable is available before testing. Take out the temperature probe cable of channel 1 from the socket. The screen will display mistake message"T1 sensor is take off" and give an alarm. Other channels are similar.**

◆**Handle temperature probe and cable carefully. Probe and cable should be loose with a coil. If wire be pulled too tight, it will lead to mechanical damage.**

◆**Correct of temperature measuring instrument should be test every two years (or according to hospital's demand).Please contact manufacturer when you need correct.**

11.3 TEMP setting menu

Choose "TEMP" key in parameter area to enter the menu, as picture 11-2:



Picture 11-2 TEMP setting

User can set up the following items in the menu:

- Alarm key

  On：Can prompt alarm and storage data while TEMP alarm occurs
  Off: Can not prompt alarm and storage data while TEMP alarm occurs

  Choose "off" "🔕"icon will display

- Alarm level

  Three items can be chosen, "High", "medium" and "low"。

- Alarm record

  On：Can record and input while TEMP alarm occurs
  Off: Can not record and input while TEMP alarm occurs

- T1 upper limit alarm / Low Alarm Limit

  Set up upper limit alarm and Low Alarm Limit in trigger channel 1

- T2 upper limit alarm / Low Alarm Limit

Set up upper limit alarm and Low Alarm Limit in trigger channel 2
Adjustment range of alarm limit:

parameter	highest raised to limit	lowest descend to limit	regulating variable once
T1,T2	50	0	0.1
TD	50	0	0.1

- TD upper limit alarm

Set up upper limit alarm of temperature difference between trigger channel1 and trigger channel2. T1 upper limit alarm: set up upper limit alarm in trigger

- temperature unit

two options：℃or "F；

- default settings:

select this option into TEMP default configuration dialog box.

11.4 TEMP alarm information and prompt messege

When relevant menu of alarm record is switch on，physiology alarm can trigger the monitor output alarm parameter values and related measure wave caused by parameter over alarm limit

Physiological alarm, technical alarm and prompt message may occur in TEMP testing as shown as below:

——physiological alarm：

prompt message	cause for	alarm level
T1/T2，too high	Measuring TEMP value is more than setting alarm upper limit	optional
T1/T2，too low	Measuring TEMP value is less than setting alarm low limit	optional
TD, too high	TEMP difference is more than setting alarm upper limit	optional

——technique alarm：

prompt message	cause for	alarm level	deal
TEMP probe took off	TEMP cable is took off from monitor	low	Make sure the cable connection is available
False TEMP alarm limit	A malfunction in function safety	high	Stop using TEMP alarm function; inform biomedical engineer or manufacturer company serviceman.

——prompt message：

prompt message	cause for	alarm level
TEMP measuring is exceed	beyond the range of TEMP measured value	high

11.5 Maintenance and cleanness

⚠ Warning

◆ **Power down before clean the patient monitor and its connecting sensor.**

Temperature probe used repeatable

- the heating temperature of the temperature probe could not be beyond 100℃. The probe could bear the short-time temperature 80℃.
- the probe cannot be sterilized with steam.
- it can be disinfected with detergent containing alcohol.
- the direct probe should be protected with protective colloid when using the direct probe.
- when washing the probe, one hand holds the head, while the other hand washes the probe with the wet lint free cloth down in the direction of coupler.

Attention

◆ **Do not allow to disinfect again and do not reuse if you used disposable probe.**

◆ **Disposable temperature probe should be recycle or treat with a proper way in order to protect the environment.**

Chapter 12 ETCO2 monitoring

12.1 summaries

Attention

◆ **This chapter should only applies to take CO2 monitoring function of the monitor. For example: 12 "portable monitor and 15"slim type monitor.**

The monitor is able to measure the patient of CO2 gas (carbon dioxide) pressure, and co2 waveforms in waveforms area. In CO2 parameter area, it will display:

- ◆ ETCO2
- ◆ INSCO2
- ◆ AWRR

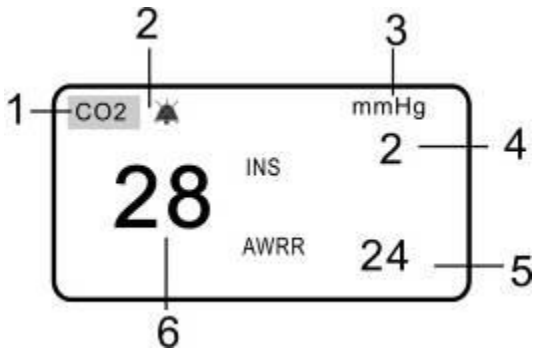


Figure 12-1 CO2 parameter

1— CO2 hot key: this button is used to enter "CO2 setting" menu

2— :CO2 alarm off

3— Pressure unit: mmHg or kPa

4— InsCO2 2: values of least CO2 inhalation

5— AWRR 24: Airway respiratory rate value

6— 28: the moisture content of carbon dioxid

These factors can affect the accuration of measurement:

- ■ Leakage or leakage of sampling gas
- ■ Mechanical shock
- ■ Higher than 10 kPa (100 cmH20) circlular pressure
- ■ Other sources (if any)

Attention

◆ **The sidestream CO2 have the function of automatic air pressure compensation**

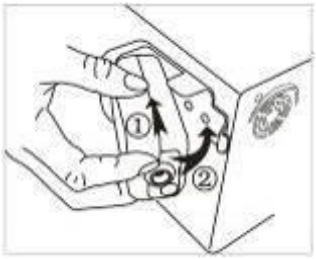
12.2 CO2 module connection

⚠ Warning

- Collision and vibration of CO2 module should be avoided as far as possible
- **The environment which CO2 concentration is too high (>0.5) may lead to errors**
- **Don't use the instrument in a flammable gas anesthesia environment**
- **The instrument is limited to professional operation who had a vocational training and is familiar with the manual.**

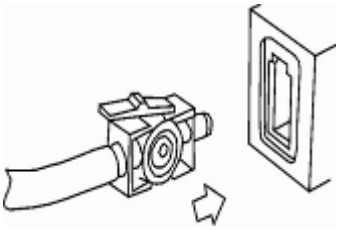
CO2 module and probe connection

Connect the CO2 sampling tube plug with the ETCO2 function joint, the other end to fixup breath nasal catheter or connect with spiles and joint .Please press down the lock spring when insert or pull out and don't haul the pipeline forcibly. Choosing adoptable connection according to the product configuration

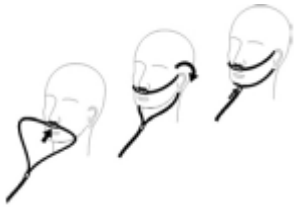


fix the module and the host according to the left figure

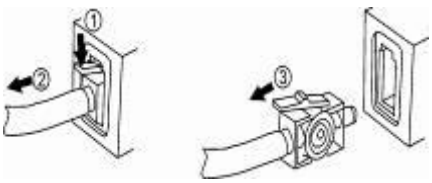
12.2.1 external side stream connection (not use for intubated patients)



（connection between sanpling tube and CO2 side stream module）

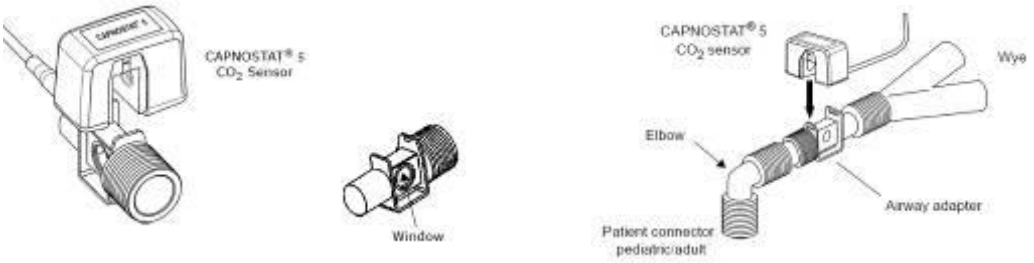


(the other end of sampling tube are connected to breathing tube)



(take sampling tube from CO2 module)

12.2.2 external main stream connection (use for intubated patients)



Attention

◆ **If the package or internal parts are damaged, please don't use the accessories and return it to the supplier**

◆ **When it display "Co2 warming-up" or Co2 transfer warming-up", that means the transfer is warming and initiating. Measurement cannot be carried out until this messege is disappeared from display**

◆ **Side stream sampling tube and sink is disposable and cannot be used twice. They are also not able for patients' cross using.**

12.3 CO2 menu

Choosing the "CO2" hot key of parameter area and you can enter the menu as 12-2 shows,

Figure12-2 CO2 setting

In this menu, users can set these items:

Alarm switch on: have alarm prompt and storage during CO2 alarm
Off: don't have alarm prompt and storage during CO2 alarm

Alarm level There three options. They are "high", "medium", "low" respectively. "high": represent the most serious alarm, the second serious degree are "medium", and "low". The change of "alarm level' can only affect CO2 parameters' (including EtCO2 upper limit, EtCO2 low limit, InsCo2 upper limit, InsCO2 low limit, AWRR upper limit, AWRR low limit) physical alarm level. The default alarm level is "medium".

Alarm recorder On: record output when CO2 alarm happen The default value is "off"

CO2 alarm upper limit/low limit Set the upper/low limit of triggered CO2 alarm. The screen will display "CO2 too high" when the measured value is higher than upper limit This message will disappear when the

measured value is normal. The screen will display "CO2 too low" when the measured value is lower than lower limit. This message will disappear when the measured value is normal.

INS alarm upper limit Used to adjust the InsCO2 alarm upper limit. The screen will display "INS too high" when the measures value is higher than upper limit. This message will disappear when the measured value is normal.

AWRR alarm upper limit/low limit The screen will display "AWRR too high" when the measured value is higher than upper limit This message will disappear when the measured value is normal. The screen will display "AWRR too low" when the measured value is lower than lower limit. This message will disappear when the measured value is normal.

Waveform speed Three options: "6.25 mm/s"、"12.5 mm/s "and "25.0 mm/s"

Pressure unit Three options: "mmHg"、"kPa" and "%"。

12.3.1 other settings

In the "CO2 setting" menu, choosing the "other setting" can enter the interface as 12-3 shows,

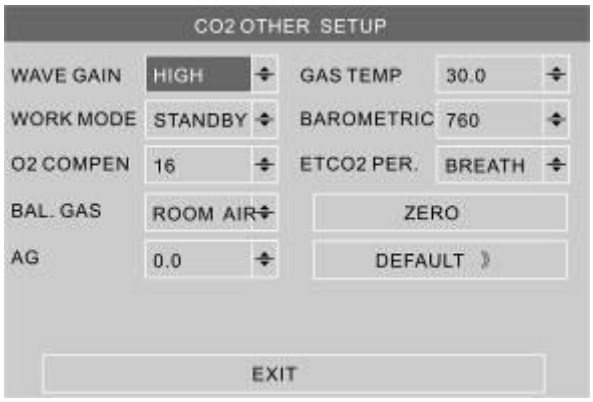


Figure 12-3 CO2 other settings

In this menu, users can set these items:

Waveform gain Two options: high, low

Working mode Two options: measurement, standby

Choosing "measurement" mode when monitor CO2. "standby" mode will close taking air pump and infrared IR source.. This can reduce energy consumption and extend the life of CO2 module and IR source. The default is "standby".

O2 compensation The existence of O2 will lead to measured CO2 value lower than actual value.

This item can compensate O2

Balance gas Three options: Indoor air, nitrogen dioxide, helium

Anesthesia gas 0~20

Gas temperature 0~50.0

Atmospheric pressure

Calculating circle Three options: A breath, 10 seconds, 20 seconds
Calibration refer to chapter 11.3.1.1

12.3.1.1 calibration

In the "CO2 other settings" menu, choosing "calibration" can enter the menu as following shows,

Figure 12-4 calibration

In this menu, users can set these items:
Calibrate gas Two options: nitrogen, indoor air

Attention

suffocation alarm cannot be closed

When many kinds of alarms occur at the same time, the screen will display the highest level

alarm information.

Default configuration select the CO2 into the "default configuration"dialog box, the user can choose to" factory default configuration "or" the user the default configuration "items. In the end, the system will be selected the dialogue box, require the user to choose to confirm.

In addition, the alarm function of CO2 module can refer to chapter "alarm function". It's record function can refer to chapter "record function". And alarm event replay, trend chart and trend figure of CO2 parameter can refer to "trend and event" section.

12.4 CO2 alarm information and tip information

When related menu of alarm records switch trun on, the physical alarm that is resulted from parameter higher than alarm limit will output alarm parameter values and related waveforms.

Physical alarm, technical alarm and tip information can be happened during measurement. As following shows,

—— physical alarm

Tip information	causes	Alarm level
CO2 too high	EtCO2 value higher than alarm upper limit	optional
CO2 too low	EtCO2 value lower than alarm lower limit	optional
INS too high	InsCO2 value higher than alarm upper limit	optional

AWRR too high	AwRR value higher than alarm upper limit	optional
AWRR too low	AwRR value lower than alarm upper limit	optional
CO2Breathing suffocation	Breathing stop（In setting the time delay not detect the breathing）	high

——Tip information

Tip information	causes	Alarm level
CO2S mode standby	Switch the measurement mode to standby mode can make the module in energy saving state	No alarm
CO2 preheating	Show that the sensor is in start heating stage	No alarm
COsensor preheating	show that the sensor just got into start-up phase	No alarm

——technical information

information	causes	Alarm level	suggestions
CO2 sensor off	Main stream sensor not inserted or off	low	Make sure that the main stream is insulted properly
CO2 sink off	Side stream sink not inserted or off	low	Make sure that side stream sink are fixed
CO2 sink jams	side	low	Make sure that side stream sink exhaust unimpeded
CO2 signal weak	Measuring module technically fault	low	You can restart the monitor when necessary. If the fault last，please stop using the CO2 function, and notice biomedical engineer and maintenance personnel.
CO2 signal too weak		low	
CO2 air pressure a little high		medium	
CO2 pump leakage		medium	
CO2 signal noise		low	
CO2 signal saturation		low	
CO2 calculating error		high	
CO2 sensor damage		high	
CO2 the temperature of sensor is too high		high	
CO2 the tenprature of sensor is too low		high	
CO2 Watchdog error		high	
CO2internal communication error		high	
CO2 system error1		high	
CO2 system error2		high	
CO2 system error3		high	
CO2 system error4		high	
CO2 system error5		high	
CO2 system error6		high	
CO2 dump danage		high	
CO2 abnormal reverse flow		high	

CO2forward flow anomalies		high	
CO2 function disorder		high	
CO2 pressure is high		high	
CO2 pressure is low		high	
CO2 communication error	CO2 module	high	please stop using the CO2 function, and notice biomedical engineer and maintenance personnel.
CO2 initiating error	Co2 module not insulted properly or have fault	high	please stop using the CO2 function, and notice biomedical engineer and maintenance personnel.
CO2 communication stop	Measuring module fault or communication ault	high	
CO2 alarm limit eeor	Functional safety fault	high	please stop using the CO2 function, and notice biomedical engineer and maintenance personnel.
INS alarm limit error	Functional safety fault	high	
AWRR alarm limit error	Functional safety fault	high	

12.5 maintenance and cleaning

1 The sampling tube of side stream mode module is disposable and cannot used twice.

2 When the sampling system streaming module happening, first check whether sampling tube clinging to, if do not have, together sampling tube plucked from the cistern, check the sink. If the screen prompt obstruction disappeared, you will have to be replaced sampling tube. If the screen is still there message that block will have to be replaced the sink.

Chapter13 IBP monitoring

13.1 The illustration of IBP monitoring

This chapter mainly introduce the monitoring of IBP and the maintainance and cleaning of its accessories.

Portable monitor can provide two channels for measuring the pressure of blood vessel.(diastolic pressure, mean pressure, systolic pressure). Its screen also can display two waveforms of pressure.

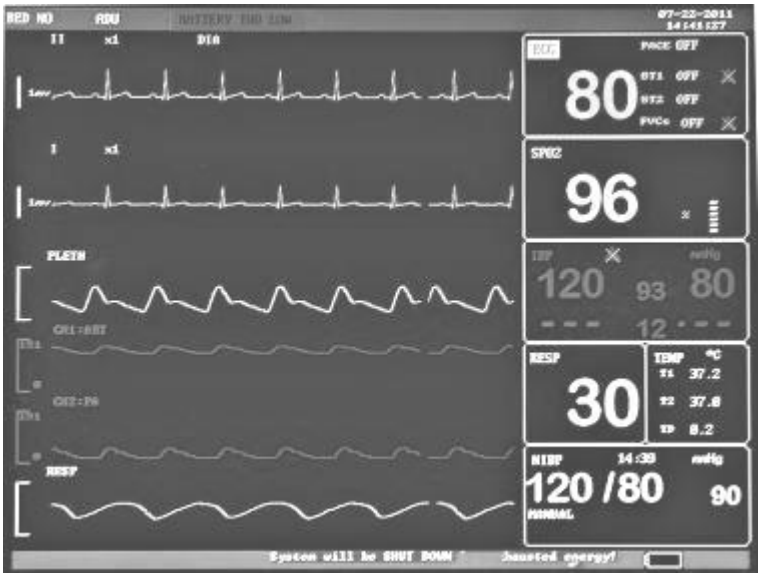


Chart 13-1 the interface of IBP monitoring

The IBP monitoring function of this monitor designate its disposable transducer's specification, which is DPT-248. Specific models are as follows:

Transducer"s specification: DPT-248

Transducer"s model: SCW-UTAH-01

13.1.1 Note

⚠ Warning

- **when using accessories, please make sure all the selected accessories meet medical equipment safety requirments.**
- **When connecting and using accessories, you should avoid making it touch any mental parts that is connected to electrical device.**
- **In order to prevent leakage burned patients, you should avoid any touches between transducer and high frequency surgical equipment when connecting the monitor to high frequency surgical equipment.**
- **Don't repeat the use of disposable pressure transducer.**
- **Please use the disposable pressure transducer that is valid.**

⚠Warning

◆ **Please check it before using the pressure transducer. It should have no damages and sterilization should be effective.**

◆ **Zero calibration must be carried out before the measuring, or it will lead to errors of measurement.**

Attention

◆ **Only the pressure transducer designated in the manual can be used. Other uncompatible transducer will lead to data losing and cause damage to the product.**

The designated transducer has the function of guarding against the shock (especially to prevent leakage current) and remove the influence of the heart defibrillator. It can be used in the surgery.

When the patient in defibrillation period, the pressure wave may be temporary disorders. After defibrillation, the monitor will work as normal. The operation mode and user configuration will not be affected.

⚠Warning

◆ **Before monitoring, you should check the cable of transducer is normal or not. Then pull off channel 1 transducer from jack, and the screen will display an error message "IBP sensor 1 fall off", and issued a warning of sound. Other channel is the same.**

◆ **Whether the transducer is new or old, you should do the calibration regularly according to hospital procedures.**

◆ **If liquid (not used for perfusion pressure pipe and transducer) is on the equipment or accessories, especially when liquid may enter a transducer or monitor contact hospital's maintenance department.**

13.2 The steps of monitoring

Preparing of measurement:

1) Put the cable insert corresponding socket. Check the guardianship instrument source has been through.
2) Make pressure pipe and transducer ready. The method is to use saline solution filling the system, and make sure that catheter system have no bubble.
3) Connect patient catheter to pressure tube, and make sure that catherter , pressure tube and transducer have no air.

> ⚠ Warning
>
> ◆ **If bubble appear in the pressure tube or transducer, then using infusion liquid flushing system.**
>
> ◆ **Before each use, each channel must has "zero pressure calibration.**

4) Put transducer on the same level of heart. It's about located on axillary center line.
5) Make sure you've chosen the right mark name. Refer to the next section.
6) Calibrate the transducer to zero. Refer to the next section.

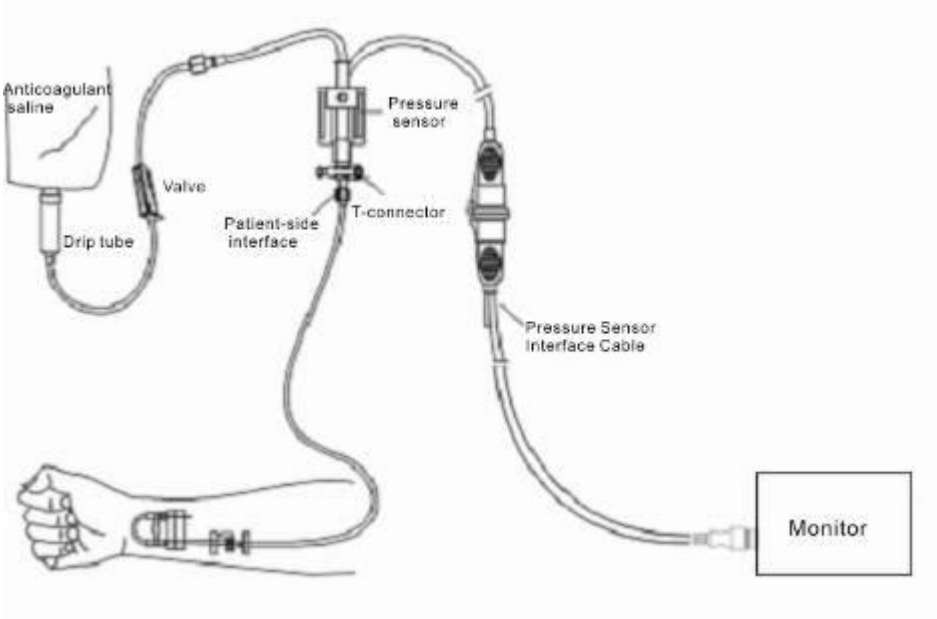


Chart 13-2 IBP monitoring

13.3 IBP menu

Turn the knob, and put the cursor on the IBP hotkeys of parameter area as displayed, then press the "set" button IBP popup menu

Chart 13-3 IBP setting menu

For the following content can be setted:

- Alarm switch : when choose “open” button, the alarm will provide alarm promot and storage. However, when choose “close”, alarm will not work screen have IBP tips.
- Alarm level: Used for setting alarm level. There are three option, “high", "medium", and "low".
- Alarm record: Choose "open" button in IBP , an alarm occurs for recorder output.
- Amplitude adjustment mode: used to regulate the range of the waveform. There aoption, they are "manual" and "automatic". When in the “automatic” mode, the IBP pressure name changes into P1 and P2 (or P3, mp4), and IBP measurement range is adjusted by system automatically. When in the “manual” mode, the IBP pressure name have 8 option. They are ART， PA， CVP，RAP，LAP， ICP， P1，P2. IBP measurement range is adjusted by the user through the "pressure gauge regulation".
- Wave speed: To set the IBP waveform scanning speed. Two options:12.5 mm/s and 25 mm/s
- Pressure units: There are two options, which are mmHg and kPa。
- Filter way: used to set the filter way of system. There are three option, respectively "normal filter" (16 Hz ac frequency filter), "smoothing" (with eight Hz ac frequency filter) and "filter" (display raw waveform). The system the default is "not filter".
- The alarm limit setting: choosing this item, the user can enter the son menu of “IBP alarm limit set”. In this son menu, you can set respectively channel 1 and 2 of the systolic blood pressure and diastolic pressure alarm and average with low limit upper limit.
- Pressure regulation gauge: choose this item, you will enter "the IBP pressure gauge adjustment" son menu. In this menu string, the user can adjust the waveform respectively on under the standard, ruler, and rod on the screen.
- Expand the pressure setting: choose this item you will enter “the IBP expand the pressure setting” son menu. Users can set in the PI, P2 pressure type.
- The default configuration: Choose this item, you will enter “the IBP default configuration” dialog box, the user can choose "factory default configuration" or "the user the default configuration" items. In the end, the system will be selected the dialogue box, require the user to choose to confirm.
- Exit: select this option to return to main screen.

⚠Warning

- **When setting the alarm limit, you should confirm the item that is setted.**

13.3.1 Alarm range setting

In “IBP settings” menu, select the “the alarm limit setting >>” and enter the IBP alarm limit set menu as figure 13-4 shows,

Chart 13-4 Alarm line setting

In this sun menu, you can set respectively channel 1 and 2 of the systolic blood pressure and diastolic pressure alarm and average with low limit upper limit. When measured value beyond alarm limit, the trigger alarm.

IBP alarm line:

Pressure mark name	Upper limit （mmHg）	Lower limit （mmHg）	Adjusted single step （mmHg）
ART	300	0	1
PA	120	-6	1
CVP	40	-10	1
RAP	40	-10	1
LAP	40	-10	1
ICP	40	-10	1

13.3.2 Pressure regulation gauge

In the "IBP setting" menu, select the "pressure regulation gauge" and enter the menu of IBP pressure regulation gauge as figure 13-5 shows:

Chart 13-5 IBP pressure regulation gauge

In this son menu, The user can adjust the position of the waveform respectively on under the standard, ruler, and rod on the screen.

The blood pressure waveforms are given to gauge the waveform area. Each waveform's three dotted line represent the waveform of upper limit on rod, reference ruler, and low limit rod from top to bottom. The three gauge of value can be set and specific methods will be introduced in this menu.

- IBP1, IBP2 pressure mark name: you can choose ART, RAP, LAP, CVP ICP, P1, P2 from IBP waveform hotkey's area of main screen.
- Gauge on: maximum pressure gauge on behalf of value. For the current selection scope of the pressure measurement range.

> Attention
>
> - **Scale limits cannot under limit**
> - **Rod limit can't higher than the upper**
> - **The low limit of pressure, upper limit of pressure, referenced rod and waveform display on the screen simultaneously, so that the user can observe waveform's change after adjusting the gauge.**

- Rod under: minimum pressure gauge on behalf of value. For the current selection scope of the pressure measurement range.
- Ruler in: refer to the pressure values that gauge represent (between HI and LO).

16.3.3 Expand the pressure setting

In the 'IBP setting" menu, select the "expand the pressure setting" and enter the menu of expanding the pressure setting as figure 13-6 shows,

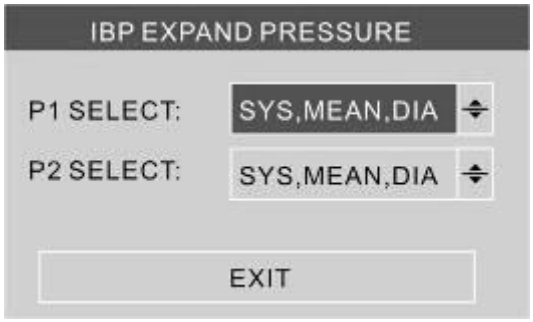


Chart 13-6 IBP expand the pressure setting

In this son menu, the user can carry out choice of P1、P2: "SYS,MEAN,DIA"or"MEAN".

13.3.4 Other settings

In the 'IBP setting" menu, select the "other settings" and enter the menu of other settings as figure 13-7 shows,

Chart13-7 IBP other settings

Press the "IBP zero pressure" to popup menu shown below:

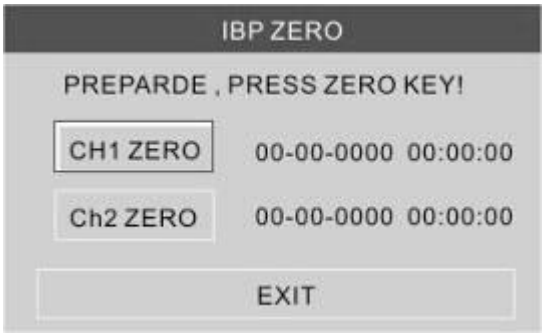


Figure 13-8 IBP zero pressure

⚠ Warning

◆ **Users should ensure that the sensor before in the measurement have made the zero calibration, otherwise the instrument is not effective zero value, which will result in inaccurate measurements.**

13.4.3.1 Sensor zero:

Select Channel 1 zero, the system Channel 1 zero; zero channel 2 is selected, the system of channels 2 to zero.

Zero points:

- Before start zero to close the patient side of the tee.
- Before star zero t, the sensor must first be vented to the atmosphere.
- Sensors must be placed in the same horizontal position and the heart, some in the axillary line.
- Care should begin before the zero, and at least once a day (each plug cables must be zero).

Zero-related tips: (In channel 1 as an example)

- "Channel 1 zero success."

Shows zero process has ended, you can connect the sensor to close the open air with the patient-side connector.

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

Make sure Channel 1 not has the sensor off tips, and then to zero, if the problem persists, please contact our service personnel.

- "Demo mode, can not be zero!"

Ensure that the equipment is not operating in "demonstration wave" state. Then zero, if the

problem persists, please contact our service personnel.

◆ "The pressure is out of range, can not be zero!"

Confirm tee switch to atmosphere, then zero, if the problem persists, replace the sensor, and with the factory for service.

◆ "Pulse pressure, can not be zero."

Confirm sensor Patients who have not connected, three-switch to atmosphere. Then zero, if the error persists, please contact the factory for service.

13.4.3.2 IBP pressure calibration

In the menu, press the "IBP pressure calibration" popup menu shown below:

Figure 13 9 IBP pressure calibration menu

13.4.3.3 Calibration Sensor:

Turn the knob, move the cursor to "Channel 1 pressure calibration value" items, press and turn the knob to select the calibration value, and then move the cursor to "calibrate" key to start calibration.

Turn the knob, move the cursor to "Channel 2 pressure calibration value" items, press and turn the knob to select the calibration value, and then move the cursor to "calibrate" key to start calibration.

Mercury manometer calibration points:

Mercury manometer calibration should be carried out in the opening of the new sensor, or should be by hospital procedures specified cycle.

The purpose of calibration is to ensure the system can provide accurate measurement results.

Calibrated mercury manometer at the beginning, you must first be zero process.

If the user needs to make this process should have the following equipment:

- standard sphygmomanometer
- Three switch
- about 25 cm pipe.

Mercury meter calibration steps:

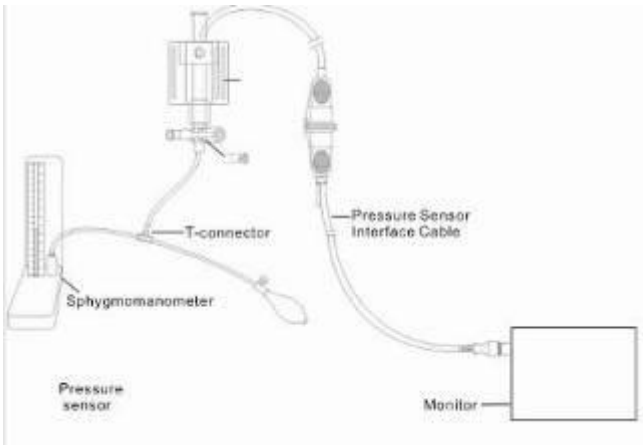


Figure 13 10 IBP pressure calibration connection diagram

⚠ Warning

- **patients in care, do not be pressure sensor calibration.**
- **Medical institutions should establish regular maintenance and calibration requirements plan, at least once a year IBP pressure calibration.**
- **After unused for long, such as the re-use should be carried out for IBP pressure calibration.**
- **IBP calibration does not pass, please stop using, and troubleshooting professionals before re-launch.**

1. close three-way switch to atmosphere to zero for the calibration.
2. connect the pipeline and blood pressure machine.
3. to determine the connection has been broken leading to the patient.
4. will be a three-way switch connect with the three-way catheter not connected to the patient (when the patient is monitoring). This three-way syringe connected to one end, and sphygmomanometer and the pipeline will connect with another side.
5. Open the way that one end of the sphygmomanometer.
6 In the pressure calibration menu, select the channel you want to calibrate, and adjust the channel to be calibrated pressure value.
7. Inflatable mercury rose to the menu set pressure value.
8. repeatedly adjusted until the menu in the pressure values and blood pressure values are equal so far.
9. Click Start calibration dial, instrument calibration began.
10. Waiting for the calibration results. According to the message, to determine the appropriate countermeasures to be taken.11. After calibration, remove the blood pressure pipeline and additional links.

Calibration-related message: (in channel 1 as an example)

- "Channel 1 Calibration successful!"
  Channel 1 is working properly, the user can use channel 1 for IBP patient care functions.
- "Channel 1 sensor off, can not calibrate!"
  Check the channel 1 sensor connection, ensure that there is no lead off silently, and then calibrated. If the error persists, please contact the factory service personnel.
- "in the demo mode, you can not calibrate"
  Ensure that the equipment is not operating in "demonstration wave" state, and then calibrated. If the error persists, please contact the factory service personnel.
- "The pressure is out of range, can not be calibrated".

  Confirm the selected calibration value is reasonable, then the calibration. If the error persists, please contact the factory service personnel.
- "pulse pressure, can not be calibrated".

Confirm the current pressure values blood pressure is constant, then the calibration. If the error persists, please contact the factory service personnel.

13.3.5 Default Configuration

In the "IBP Settings" menu, select "Default Configuration" as shown in Figure 13-11 to enter the default configuration menu:

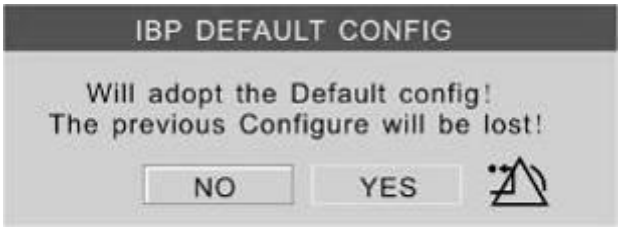


Figure 13-11 Default Configuration

Select "Yes", use the system default configuration.

Select "No", give up this operation, the system configuration of the original content remains unchanged.

13.4 Alarm Information and Tips

13.4.1 Alarm information

When the related menu switch the alarm recording, those parameters exceed the alarm limit as the physiological trigger the alarm will automatically trigger the recorder alarm output and relevant parameters measured waveform..

IBP module may occur in measuring the physiological alarm, alarm and prompt technical information are listed below:

Physiological alarms:

Message	Induced causes	Alarm level
IS1 is TOO HIGH	Channel 1 systolic blood pressure measurements higher than the set alarm limit	User-selectable
IS1 is TOO LOW	Channel 1 systolic blood pressure measurements below the set lower limit alarm	User-selectable
ID1 is TOO HIGH	Channel 1 measured diastolic blood pressure higher than the set alarm limit	User-selectable
ID1 is TOO LOW	Channel 1 measured diastolic blood pressure below the set alarm value lower limit	User-selectable
IM1 is TOO HIGH	Channel 1 mean pressure measurements higher than the set alarm limit	User-selectable
IM1 is TOO LOW	Channel 1 mean pressure measurements below the set lower limit alarm	User-selectable
IS2 is TOO HIGH	Channel 2 systolic blood pressure measurements higher than the set alarm limit	User-selectable

IS2 is TOO LOW	Channel 2 systolic blood pressure measurements below the set lower limit alarm	User-selectable
ID2 is TOO HIGH	Channel 2 diastolic blood pressure measurements above the upper limit set alarm	User-selectable
ID2 is TOO LOW	Channel 2 diastolic blood pressure measurements below the set lower limit alarm	User-selectable
IM2 is TOO HIGH	Channel 2 mean pressure measurements higher than the set alarm limit	User-selectable
IM2 is TOO LOW	Channel 2 mean pressure measurements below the set lower limit alarm	User-selectable

Technical report:

Message	Reason	Alarm level	Countermeasure
IBP1 SENSOR OFF	IBP cable channel 1 detached from the monitor	Low	Make sure the cable connection is reliable.
IBP2 SENSOR OFF	IBP cable channel 2 detached from the monitor	Low	Make sure the cable connection is reliable.
IBP(1,2) INIT ERR	IBP Measurement module failure	High	Stop using the IBP measurements, biomedical engineers or notify maintenance personnel of the company.
IBP(1,2) INIT ERR 1			
IBP(1,2) INIT ERR 2			
IBP(1,2) INIT ERR 3			
IBP(1,2) INIT ERR 4			
IBP(1,2) INIT ERR 5			
IBP(1,2) INIT ERR 6			
IBP(1,2) INIT ERR 7			
IBP(1,2) INIT ERR 8			
IBP(1,2) COM STOP	IBP Measurement module failure or communication failure	High	Stop using the IBP measurements, biomedical engineers or notify maintenance personnel of the company.

IBP(1,2) COM ERR	IBP Measurement module failure or communication failure	High	Stop using the IBP measurements, biomedical engineers or notify maintenance personnel of the company.
IBP1 ALM LMT ERR	Functional security failure	High	Stop using IBP alarm to notify the Company of biomedical engineers or maintenance personnel.
IBP2 ALM LMT ERR	Functional security failure	High	Stop using IBP alarm to notify the Company of biomedical engineers or maintenance personnel.

Message:

Message	Induced causes	Alarm level
IBP1 SYS EXCEED	Channel 1 IBP systolic blood pressure measurement is outside the range	High
IBP1 DIA EXCEED	Channel 1IBP diastolic blood pressure measurement is outside the range	High
IBP1 MEAN EXCEED	Channel 1IBP mean blood pressure measurement is outside the range	High
IBP2 SYS EXCEED	Channel 2 IBP systolic blood pressure measurement is outside the range	High
IBP2 DIA EXCEED	Channel 2 IBP diastolic blood pressure measurement is outside the range	High
IBP2 MEAN EXCEED	Channel 2 IBP mean blood pressure measurement is outside the range	High
IBP1 NEED ZERO-CAL	Channel 1 IBP do not zero	Low
IBP2 NEED ZERO-CAL	Channel 2 IBP do not zero	Low

13.5 Maintenance and Cleaning

13.5.1 Note and Clean

⚠ Warning

◆ **Before cleaning the sensor or monitor to turn off and disconnect AC power source.**

13.5.2 Pressure sensor cleaning (Reusable)

After the end of the pressure monitoring operation, remove the pipe and cap on the sensor,

wipe the sensor with water film**.** Sensors and cables can be cleaned listed below with the soap and detergent to scrub and soak in order to achieve the purpose of cleaning.

Cetylcide
Wavicide-01
Wescodyne
Glutaraldehyde
Vesphene

Any of the couplings can not be immersed in liquid. After cleaning, before collection let the sensor completely dry. Do not have cable or a slight fade the surface of a temporary increase in viscosity as abnormal. If you must remove the residue from the sensor cable on the tape, using double-sided adhesive scavenger is a very effective , be used with care, can damage the cable will be reduced to a minimum. Do not advocate the use of acetone, alcohol, ammonia and chloroform or other strong solvents,because a long time, they will damage the vinyl cables.

⚠Warning

◆ **If you are using disposable sensors or cap, can not re-sterilize or re-use.**

◆ **In order to protect the environment, single-use sensors or cap must be recycled or properly disposed of**.

13.5.3 Disinfection

◆ Chemical liquid disinfection

According to the steps described earlier to remove visible dirt. You choose a unit that for the operating room equipment for chemical disinfection and effective disinfectant, glutaraldehyde has been found in buffer (such as glutaraldehyde or preservatives) is very effective. Do not use a tetravalent cationic detergents, such as benzyl ammonium hydrocarbons chloride. If you want to disinfect the entire device, according to the recommended time put the sensor (except for electrical coupling) immersed in disinfectant. To ensure the cap is removed, then the sensor all parts (except electrical coupling) with sterile water or saline drift net. In the collection before, the sensor must be dry.

◆ Gas sterilization

To achieve complete sterility, to adopt the gas sterilization method.

• cleaning with the steps described earlier to remove visible dirt. Using ethylene oxide gas disinfectant, in order to suppress the formation of ethylene glycol, the sensor should be completely dry.

• Always follow the manufacturer's operating gas disinfectant method.

⚠Warning

◆ **Disinfectant temperature must not exceed 70 ℃ (150 F), pressure sensors in the plastic above this temperature may deform or melt.**

Chapter14 Common Troubleshooting

Attention

◆ **If instruments have some faults in the process of using, users can check the machine according the following methods. If the fault is still not out, please contact with local sales or factories. Users cannot open the box without authorization.**

14.1 Screen show nothing

- Firstly observe whether the indictor and battery indictor are normal. If it is normal, that means power input is in good state. Secondly press the open button to see whether it have the voice of suction or the fan is normal. If all of these are normal, then press the pressure measurement button to see if there is the voice air pump filling. If it have, that means it's the fault of display or inverter, please contact supplier or maintenance personnel.
- If across power indicator don't on,, this shows that there is no power supply output in adapter. Then pulling out off the power adapter from the host, and using a multimeter to measure whether DC have 15v output. If not, separate the power cord from adapter. Then using multimeter to measure internet power supply. General requirement input should be ~ 220 V 50 Hz ac or ~ 100 260 V 50/60 Hz ac. If it have fault, please check external power supply system. If the adapter director power output is wrong or don't have output, please change new power adapter.

14.2 Platoon fan after machine don't turn on, please do the following check

- Check and deal with the power according to the second parts of 16.1 section
- If power output is normal and the fan don't turn on, then the fan need to be changed. Refer to maintenance manual.

14.3 ECG signal interference is too high and baseline is too weak

- Check the electrode whether in the right place , lose efficiency or exceed the time limit
- Check the cable plug. If there is no ECG waveform, please check whether the cable is disconnected
- Check whether power socket have standard grounding wires and the monitor have connected to grounding wires.
- Check whether working frequency filter is turned on and monitoring mode is right in the ECG setting.

14.4 Blood pressure and SPO2 have no results

- Check if the cuff is on the right place according to the specifications and whether it have leakage. Besides, air tube panel is connected to NIBP socket fixedly or not. Users can do leak detection in the blood pressure settings.
- Check the SPO2 probe is flashed or not. Check SPO2 probe is connected to SPO2 socket fixedly or not.

- please contact the manufactures if all above steps are confirmed and measurement still can't be carried out.

14.5 Monitor invalid state performance

Attention

When the monitor ECG is invalid, the screen will display "signal saturation".

- The monitor is in invalid state when it appears blue screen, flowerful screen and black screen. Then it need to restart the instrument. If the same situation happen after restarting the machine for many times, users need to contact the manufacture.
- The monitor cannot enter normal monitoring interface during the starting process. Users need to restart the monitor. If the same situation happen after restarting the machine for many times, users need to contact the manufacture.
- During the process of using monitors, if users press the button "confirm" that cause square wave, then any ECG parameters shown on normal interface don't mean anything. Please press the "confirm" button again to end the function of causing square wave signal.
- in the monitor LCD screen networking status display in the lower broken network state, cannot achieve monitor of the function of remote monitoring, but not influence monitor local monitoring function.

Chapter15 Specifications

15.1 Type of the patient monitor

Classifications of Electric shock guard: Class I

EMC: A Scale

Classifications of Electric shock guard: ECG is CF model;TEMP,SpO2、NIBP、$ETCO_2$ are BF model

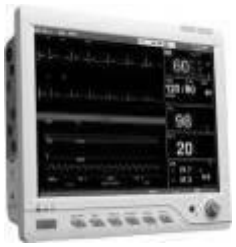
Liquid-proof extent: general hermetically sealed instrument, not having the function to prevent the liquid access.

Sterilize way: Detailed information please check chapter 5.

Operating mode: continuous process.

15.2 Specifications of the patient monitor

15.2.1 Dimension and weight of the patient monitor

model				
dimension	330*170*305mm	350*65*315mm	300*60*275mm	240*155*220mm
weight	4 kg	3.8kg	2.5 kg	3 kg

15.2.2 Working conditions

Temperature range

Working temperature: 5℃～40℃

Temperature of transportation and storage: -20℃~+55℃

Range of relative humidity

Working humidity: ≤85%

Humidity of transportation and storage: ≤95%（no condensation）

Range of atmospheric pressure

Working: 86~106kPa

Transportation and storage: 50~106kPa

Electric specifications: ~100V-240V,50/60Hz.

Maxmin input power: <80VA.

Fuse: F2AL250V Φ5×20. （**Peculiar：12.1" + 7"+15""slim type**）

Match fitness: output DC15V3.3A **(Peculiar:12.1"slim type + 15"slim type)**

15.3 Display informations of monitor

Display: TFT LCD display with high resolution

Informations: The interface have 8 word waveforms display, Trend Graph, Big Font, OxyCRG, and Standard.
Level 3 sound , light and electricity alarm and system hints
Power indicator and the remote control receiving instructions (green/orange)
A working indicator light (green)
A charging battery indicator light (yellow) and owe pressure system hints

15.4 Interface

ECG, TEMP, SPO2, NIBP, IBP, EtCO2 interface . RJ45 internet and across power input interface

15.5 Battery

Built-in battery specifications: lithium-ion rechargeable battery

Number	Battery model	Battery specifications	Suitable model	Product model
01	TB0801	14.8V 2200mAh	7"	TR-600B
02	TB0802	11.1V 4400mAh	12.1"	TR-900B TR-900E 12"
03	TB0901	11.1V 4400mAh	15"	TR-900E 15"

The battery can be used for one or two hour with full power and normal use.
After the first low power alarm, the monitor can be able to continue to work about five minutes
Maximum charging time of the battery is 6 hours, lithium battery charging management built-in.

15.6 Recorder

Recording width: 48mm
Paper going speed: 25mm/s
Waveform description: 2
Recording type: 8 seconds real-time record

15.7 Performance requirements

The standard items of this chart is conformed with the standard items that our company registered. Their performances is fitted to IEC60601 and other relative standards about monitors

Standard items	Required description	minimum/ maximum	unit	minimum/maximum values
4.1	Normal working condition			
4.1a)	Environmental temperature	range	℃	5~40
4.1b)	Relative humidity	range	%	≤85%
4.1c)	Air pressure	range	hPa	860~1060
4.1d)	Internet (power) frequency	range	Hz	50±1
	Internet (power) pressure（rms）	range	V	220±22
4.1e)	Preheating time	minimum	min	2
4.2	Marking requirement	exist		
4.3	Performance requirement			
4.3.1	ECG section			
4.3.1.1	Overload protection：loading1V、industrial frequency 、 across voltage10s no damages	minimum	V	1

4.3.1.2	Auxiliary output (if provide)	Not applicable		
	No damage in short circuit state			
4.3.1.3	Breathing, lead united fall off detection and active noise suppression	exist		

	Active guide united direct current	maximum	μA	0.1
4.3.1.4	QRS wave monitoring			
4.3.1.4.1	QRS range of wave and width are conformed with 4.2.6 standard			
	range	range	mV	0.5~5
	width(adult monitor)	range	ms	70~120
	width(neonate/pediatrics)	range	ms	40~120
	No response to the following signal			
	range(except neonate/ pediatrics working mode)	maximum	mV	0.15
	Width when the range is 1mV(except neonate/pediatric)	maximum	ms	10
4.3.1.4.2	Industrial frequency voltage tolerance	minimum	uV	100
4.3.1.4.3	Drifting tolerance			
	Triangle wave amplitude	inapplicable	mV	4
	QRS wave amplitude	inapplicable	mV	0.5
	QRS wave width	inapplicable	ms	100
	QRS no repeat rate	inapplicable	bpm	80
4.3.1.5	The range and accuration of heart rate gauge			
	Range (adult monitor)	range	bpm	30~300
	range(neonate/pediatric monitor)	range	bpm	30~350
	tolerance	maximum	%	±10
	or（the higher）	maximum	bpm	±5
	HR to minimum nominal HR	maximum	bpm	30
	Hr of signal of repeat rate=300bom（adult mode）	minimum	bpm	300
	HR of signal of repeat rate=350bom(neonate/pediatric monitor)	minimum	bpm	350
4.3.1.6	Alarm system requirements			
4.3.1.6.1	The range of alarm limit			
	Alarm upper limit of adult	minimum	bpm	17~300
	Alarm lower limit of adult	minimum	bpm	15~298
	Alarm upper limit of neonate/pediatric	minimum	bpm	17~350
	Alarm lower limit of neonate/pediatric	minimum	bpm	15~348

Addition

Standard item	Required description	minimum/ maximum	unit	Minimum/ maximum values
4.3.1.6.2	Alarm resolution	minimum	%	±10
	or（the higher）	minimum	bpm	±5
4.3.1.6.3	Alarm accuration，	maximum	%	±10
	Or (the higher）	maximum	bpm	±5
4.3.1.6.4	Starting time of Cardiac arrest alarm	maximum	s	10
4.3.1.6.5	Starting time of heart rate low alarm	maximum	s	10

4.3.1.6.6	Starting time of heart rate high alarm	maximum	s	10
4.3.1.6.7	Alarm mute	Provide mute and restart configuration		

4.3.1.6.8	Alarm banned	Fit the requirement of 4.2.7.8 in YY1079-2008		
4.3.1.7	Special requirements of monitors that have the ability of ECG waveform display			
4.3.1.7.1	Dynamic range input			
	Signal range input	maximum	mV	±5
	Speed rate	maximum	mV /s	320
	Direct offset voltage	range	mV	-300~+300
	Signal change output	maximum	%	±10
	No working display（minus degree before display）	maximum	%	50
4.3.1.7.2	Input impedance：signal attenuation（0.67Hz~40Hz）	maximum	%	20
4.3.1.7.3	System noise	maximum	uV	30
4.3.1.7.4	Muti-channel cross interference: no signal channel is interfered by signal channel	maximum	%	5
4.3.1.7.5	Gain control and stability			
	Gain control			
	All display	minimum	mm/mV	5
	Permanent display	required	mm/mV	10
	Allow continual changes of gain control. Change by manual mode			
	Gain changes for every minute	maximum	%/min	0.66
	Gain changes in 1hour	maximum	%	±10
4.3.1.7.6	Time benchmark choice and accuration			
	Time benchmark choice			
	Permanent display	required	min/s	25
	Impermanent display	inapplicable	mm/s	12.5、25、50
	The biggest tolerance of time benchmark	maximum	%	±10
4.3.1.7.7	Output display			
	Channel width	minimum	mm	30
	Aspect ratio	inapplicable	s/mV	0.2、0.4、0.8
4.3.1.7.8	Signal input to reconstruct accuration			
	System tolerance	maximum	%	±20
	Or （the higher）	maximum	uV	±100
	Frequency response			
	A）Sin input	range	Hz	0.67~40(minus-3dB)
	B）response to input 20ms Triangle wave	range	%	Wave value minus from 0-25
	Impulse response：the impact to0.3mV.s beyond impact range			
	migration	maximum	mV	0.1
	slope	maximum	mV /s	0.30
	Electrode weighting factor	maximum	%	±5

	Lagging effect after 15mm migration	maximum	min	0.5

Addition

Standard item	Required description		minimum/ maximum	unit	Minimum/maximum values
4.3.1.7.9	Calibration voltage		Refer to YY1079 的 4.2.8.9		
4.3.1.7.10	Common mode rejection allowed 10 V industrial frequency noise		maximum	mV	1
4.3.1.7.11	Baseline control and stability				
	Recovery time after reset		maximum	s	3
	Migrating rate after 10s		maximum	uV/s	10
	Baseline migration in 1hour		maximum	uV	500
	Period line migration in working temperature		maximum	uV/℃	50
4.3.1.7.12	Pacing pulse：display ECG when the range is 2mV~700mV，width is 0.5ms~2ms , biggest rising time is 100us and 100 pulses happens in every minutes.		minimum	mV	0.2
	Synchronous pulse：time interval from R wave crest to synchronous pulse output，with announced range, width and output impedance Z		maximum	ms	35
4.3.1.7.14	The surgical interference suppression：compared with heart rate changes before interference		maximum	%	±10
4.3.2	RESP section				
4.3.2.1	Measured range of respiration rate		range	bpm	10~100
4.3.2.2	Displayed precision of respiration rate	10times/min~59times/min	maximum	times/ min	±2
		60times/min~100times/min	maximum	times/ min	±5
4.3.2.3	Resolution of respiration display		maximum	bpm	1
4.3.2.4	Alarm upper limit of respiration rate		minimum	bpm	8~120
	Alarm lower limit of respiration rate		minimum	bpm	6~118
	Alarm tolerance of respiration rate		maximum	times/ min	±1
4.3.3	TEMP section				
4.3.3.1	Range of measurement		range	℃	25.0~45.0
4.3.3.2	precision		maximum	℃	±0.2
4.3.3.3	Alarm upper limit		minimum	℃	26~45
	Alarm lower limit		minimum	℃	25~44
	Alarm time		maximum	s	12
4.3.4	NIBP section				
4.3.4.1	Instrument that have auto inflatable system				
4.3.4.1.1	Biggest cuff（adult）		maximum	mmHg	300
	Biggest cuff（neonate）		maximum	mmHg	150
	Time of the cuff above 15mmHg（adult）		maximum	min	3
	Time of the cuff above 5mmHg（neonate）		maximum	s	90
4.3.4.1.2	Time of air escape pressure from 260mmHg to 15mmHg (adult)		maximum	s	10
	Time of air escape pressure from		maximum	s	5

	150mmHg to 5mmHg (neonate)			

4.3.4.2	Performance requirement			
4.3.4.2.1	Measuring range	range	mmHg	0~260
4.3.4.2.2	Resolution	minimum	mmHg	1
4.3.4.2.3	error（repeatability）	maximum	mmHg	±4
4.3.4.2.4	Precision of pressure sensor	maximum	mmHg	±3
4.3.4.3.1	Time that air source provide enough air to make the pressure of 200cm3 condition become 40kpa	maximum	s	10
4.3.4.3.2	Automatic air valve			
4.3.4.3.2.1	Air leakage：valve closed. The biggest pressure drop of a condition that is less than 200cm3 when the initial pressure are 33.33kPa(250mmHg)、20kPa(150mmHg) and 6.67kPa(50mmHg) respectively.	maximum	mmHg	2
4.3.4.3.2.2	Gas out rate of valve/cuff	Fit 4.5.4 and 4.5.5 of YY0670		

Addition

Standard item	Required description		Minimum/ maximum	unit	Minimum/maximum values
4.3.4.5	System leakage		minimum	mmHg/s	1
4.3.4.6	adult/pediatric：measured range of SYS		minimum	mmHg	40～270
	Adult/pediatric：measured range of DIA		minimum	mmHg	10～210
	Adult/pediatric: measured range of MEAN		minimum	mmHg	20～230
	neonate：measured range of SYS		minimum	mmHg	40～140
	neonate：measured range of DIA		minimum	mmHg	10～100
	neonate：measured range of MEAN		minimum	mmHg	20～110
	adult/pediatric	Alarm upper limit of SYS	minimum	mmHg	42～270
		Alarm lower limit of SYS	minimum	mmHg	40～268
		Alarm upper limit of MEAN	minimum	mmHg	22～230
		Alarm lower limit of MEAN	minimum	mmHg	20～228
		Alarm upper limit of DIA	minimum	mmHg	12～210
		Alarm lower limit of DIA	minimum	mmHg	10～208
	Neonate	Alarm upper limit of SYS	minimum	mmHg	42～140
		Alarm lower limit of SYS	minimum	mmHg	40～138
		Alarm upper limit of MEAN	minimum	mmHg	22～110

		Alarm lower limit of MEAN	minimum	mmHg	20～108
		Alarm upper limit of DIA	minimum	mmHg	12～100
		Alarm lower limit of DIA	minimum	mmHg	10～98
4.3.5	SPO2 section				
4.3.5.1	Range of measurement		range	%	40～100
4.3.5.2	precision（error）		maximum	%	(90%~99%)the error is ±2% (70%~89%)the error is ±4% (40%~69%)the error is ±6%
4.3.5.3	Alarm upper limit		range	%	1~100
4.3.5.4	Alarm lower limit		range	%	0~99
	Time		maximum	s	12
4.3.5.5	Measured range of pulse		range	bpm	40-250
	Precision of measurement(error)		maximum	bpm	±2
	resolution：		maximum	bpm	±1
	Alarm upper limit		range	bpm	2-254
	Alarm upper limit		range	bpm	0-252
4.3.6	Alarm function				
4.3.6.1	Physical alarm device		exist		
4.3.6.2	Technical alarm device		exist		
4.3.6.3	Suspending and inhibiting of all the physical and technical alarm		If Visual alarm is physical alarm , it can be suspended，It cannot be suspended when it is technical alarm		

Addition

4.3.6.4	Mute/reset of alarm	exist
4.3.6.5	Bolt lock alarm or not	not
4.3.6.6	Not bolt lock alarm	exist
4.3.6.7	Delayed time of alarm	The delayed time is no more than 0.5s from device to signal output.
4.3.6.8	Remote control of inhibiting and suspending alarm	inapplicable
4.3.6.9	Remote control of mute and reset	inapplicable
4.3.7	Physical alarm	
4.3.7.1	physical alarm of single parameter inhibiting	exist
4.3.7.2	Mute/reset of physical alarm	exist
4.3.7.3	Physical alarm choosing，range of alarm and alarm delayed time	exist
4.3.7.4	Audition tip	Not continual
4.3.7.5	Visual tip	Continual or not continual
4.3.8	Technical alarm	
4.3.8.1	Audition tip	Not continual
4.3.8.2	Visual tip	Continual or not continual

4.3.8.3	Remote device	Exist
4.3.8.4	Sound pressure level of audition alarm	The range of peak value is between 445dB to 85dB in 1m length. Adjustable
4.3.8.5	Recovery of defibrillation and discharge	Discharge in 1min， monitor work normally。
4.3.9	Normal working state	All the functions are normal after the monitor are connected to functional signal

EtCO2 technological index

Interface form	External interface
Range of measurement	0~10 kPa or (0~75) mmHg
precision（error）	(0kPa~5.4kPa) the error is ±0.3kPa、 (5.5kPa~10.0kPa)the error is ±0.7kPa
Alarm upper limit	2.1~13.2 kPa
Alarm lower limit	0~6.5 kPa
time	12s
EtCO2	exist
Unit	kPa / mmHg / %
Compatibility	RESPIRONICS external main stream and side stream are compatible

IBP technological index

Measured channel	Single way and double way are optional
Range of measurement	SYS： 6.7kPa～32.0kPa(50mmHg～240mmHg) MEAN： 3.4kPa～26.6kPa(26mmHg～200mmHg) DIA： 2.9kPa～24.0kPa(22mmHg～180mmHg)
Mean error	≤±0.4kPa (±3mmHg)
Range of alarm	SYS： upper limit 0.3kPa~53.3kPa(2mmHg~400mmHg) Lower limit 0kPa~53.1kPa(0mmHg~398mmHg) MEAN： upper limit 0.3kPa~53.3kPa (2mmHg~400mmHg) Lower limit 0kPa~53.1kPa (0mmHg~398mmHg) DIA： upper limit 0.3kPa~53.3kPa (2mmHg~400mmHg) Lower limit 0kPa~53.1kPa (0mmHg~398mmHg)
Measured unit	mmHg/kPa
Specification of sensor	DPT-248（space）
Consumables mode	SCW-UTAH-01

Chapter 16 Install for Bracket

■ This chapter introduce the standard of the installation and adjustment support content for the 12 inch and 15 inch silm type monitor

■ Please according to the following content for the installation of the wall bracket, the wrong installation may cause accidents dropped or damage to the product.

16.1 Introduction

Attention

◆ **L-2 and WLB011 type bracket be used to 12.1" and 15" slim type monitor** 

16.1.1 Bracket application league table

Bracket type	Bracket appearance					Applicable scope	note
L-2		×	√	√	×	Fixed on wall	Standard for 12.1" inch slim type
WLB011		×	√	√	×	Fixed on wall	Standard for 15" inch slim type
JHQ		√	×	×	√	Wall and car	Optional
TRC		√	×	×	√	Table and car	Optional

16.2 L-2 and WLB011 Bracket introduction

16.2.1 Bracket requirements for monitor

◆ Bearing ability not less than 15kg；

◆ Positioning hole size is 75*75mm or 100*100mm，Screws into the host machine not could exceeded
10mm，The metric threads for M4 specifications。

◆ Monitor installation height should in visual Angle range, is apart from the ground distance of about 1.3-1.7 meters。

16.2.2 L-2 and WLB011 type bracket specifications

- Bracket type：L-2 or WLB011；
- Bearing ability：15kg；
- Scope from professional application: Wall, Car;
- Positioning hole size：75*75mm or 100*100mm；
- Level rotation Angle：180°；
- Vertical rotation Angle：180°；
- Screw specifications：M4*8；

16.2.3 bracket list：

L-2 type：

Item	Name	Model	pcs	photos	Purpose Explain
A	Screw	M4*10	4		Be used to connect for bracket and monitor
	Spring Washer	&4	4		Be used to connect for bracket and monitor
B	Swell Screw	M6*30	4		Be used to crutch for inside wall
C	Tapping Screw	M4*25	4		Be used to wall fixed for bottom bracket
D	Special Spanner	.....	1		Be used to pensile angel for adjust monitor
E	Screw	M4*8	1		Be used to Bracket Installation after fixed
F	Axial Shield	……	1		Be used to preserve for axial and nut
G	Bracket	L-2	1	……	Be used to crutch for monitor

L-2 type：

Item	Name	Model	pcs	photos	Purpose Explain	Item
A	Screw	M4*10	4	B		Be used to connect for bracket and monitor
B	Swell Screw	M8*40	3	G		Be used to crutch for inside wall
C	Tapping Screw	M4*25	3	F		Be used to wall fixed for bottom bracket
D	Special Spanner	Φ10*12	3	H		Used for hanging host and stent
E	Screw	M4*16	1			Be used to Bracket Installation after fixed
F	Axial Shield	Φ4	7	E		Used connection for stent and host
G	Bracket	WLB011	1		……	Be used to crutch for monitor

16.3 Other description for bracket

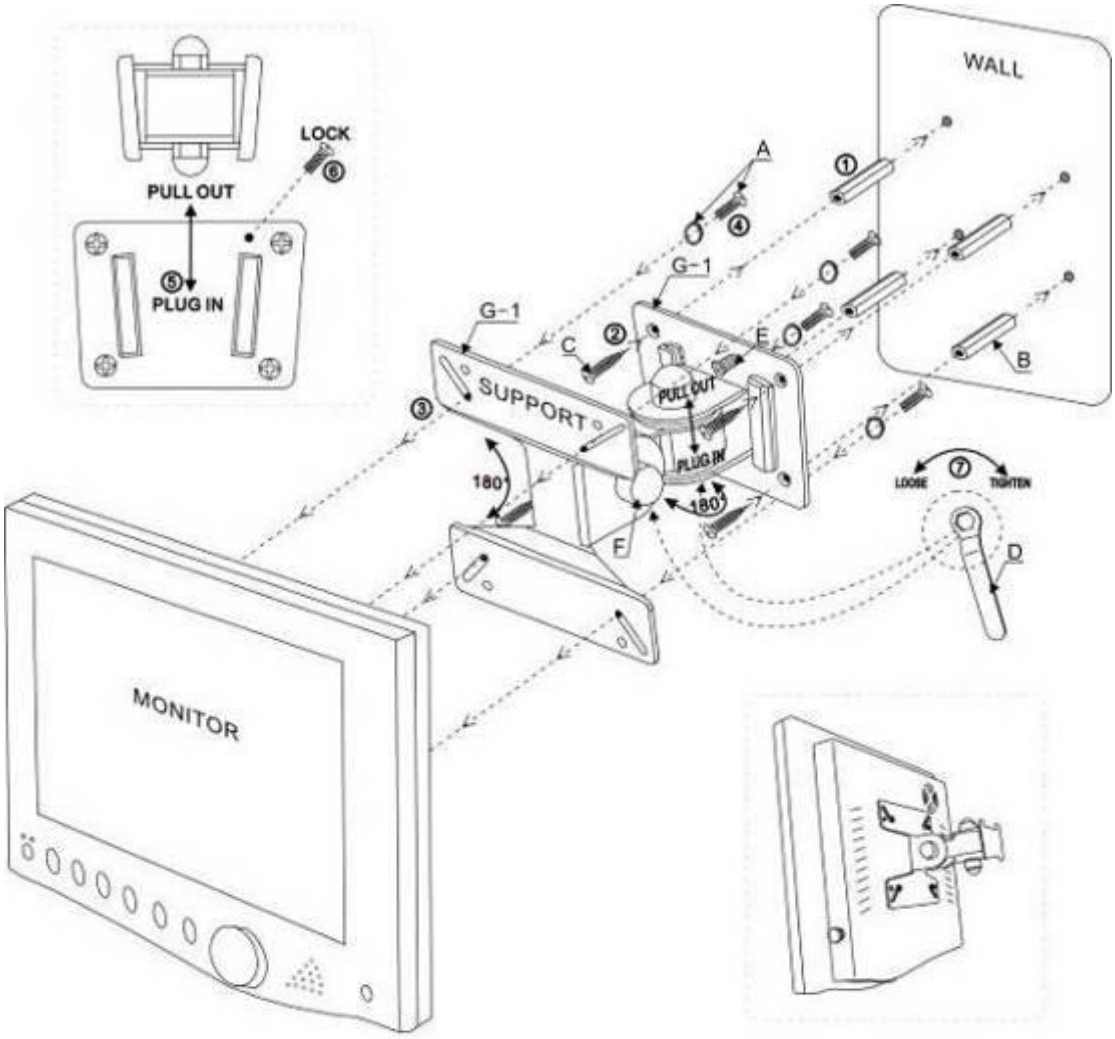
16.3.1 JHQ type bracket Specifications

- Bracket type：JHQ；
- Bearing ability：20kg；
- Scope from professional application: Wall, Car;
- Positioning hole size：75*75mm/127*31mm/145*80mm；
- Level rotation Angle：360°；
- Vertical rotation Angle：30°；

16.3.3 TRC type bracket Specifications

- Bracket type：TRC；
- Bearing ability：30kg；
- Scope from professional application: Wall, Car;
- Positioning hole size：75*75mm/127*31mm/145*80mm；
- Level rotation Angle：360°；
- Vertical rotation Angle：0°；

Graph 1：（L-2）Bracket installation diagram:



Number	Name	Gauge	Quantity	Figure	Purpose Explain
A	Screw	M4*10	4		Be used to connect for bracket and monitor
	Spring Washer	Φ4	4		Be used to connect for bracket and monitor
B	Swell Screw	M6*30	4		Be used to crutch for inside wall
C	Tapping Screw	M4*25	4		Be used to wall fixed for bottom bracket
D	Special Spanner	——	1		Be use to pensile angle for adjust monitor
E	Screw	M4*8	1		Be used to Bracket Installation after fixed
F	Axial Shield	——	1		Be used to preserve for axial and nut
G	Bracket	L-2	1	——	Be used to crutch for monitor

Bracket installation steps:

①According to the bottom bracket G-2 hole to the wall boring;

②bottom bracket with screws C to F-2 fixed to the wall;

③The bracket G-1 and the stand back of the monitor align the bracket holes;

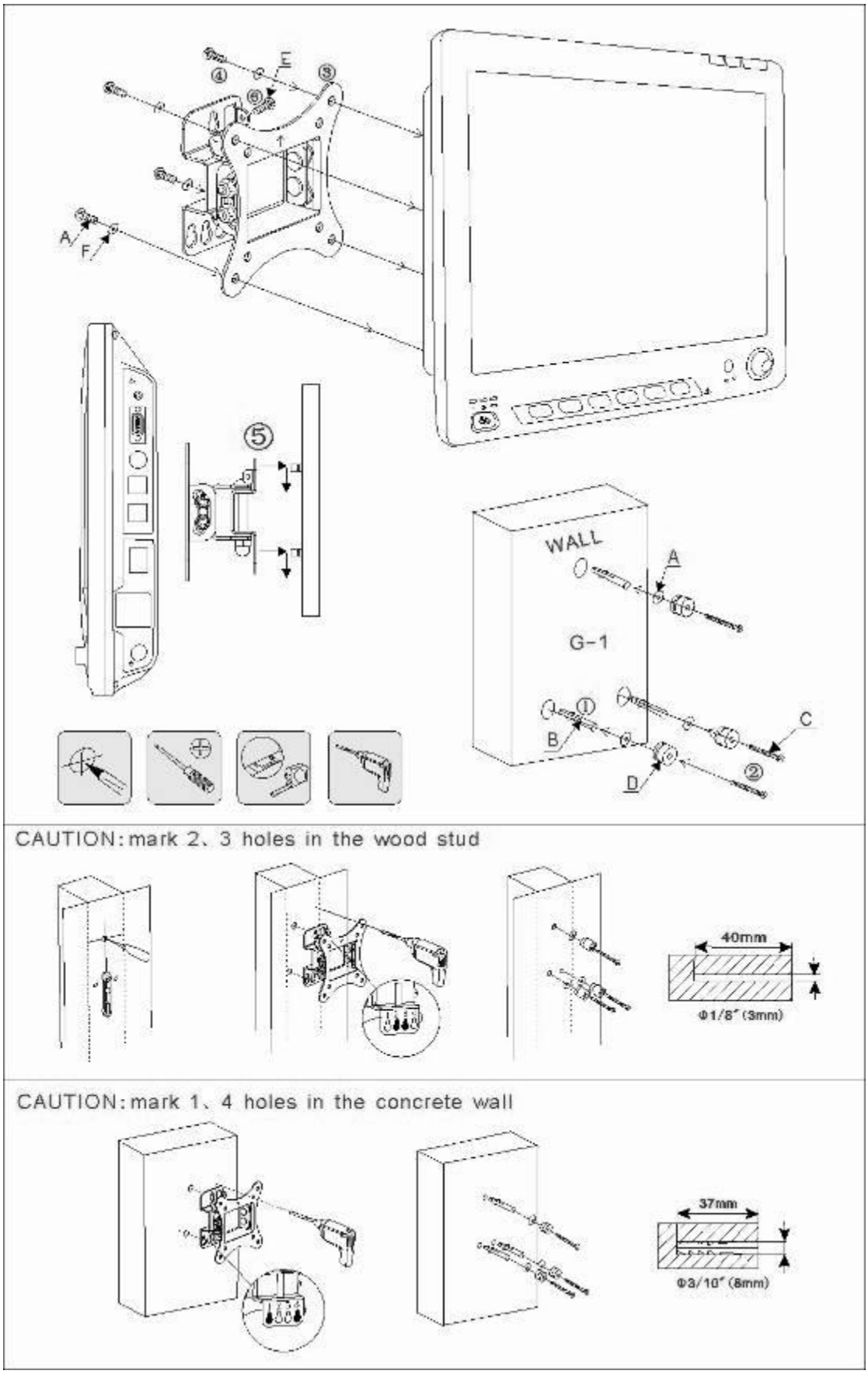
④A with a screw fixed to the bracket G-1 on the monitor;

⑤Bracket G-1 into the bracket from the bottom of the slot G-2;

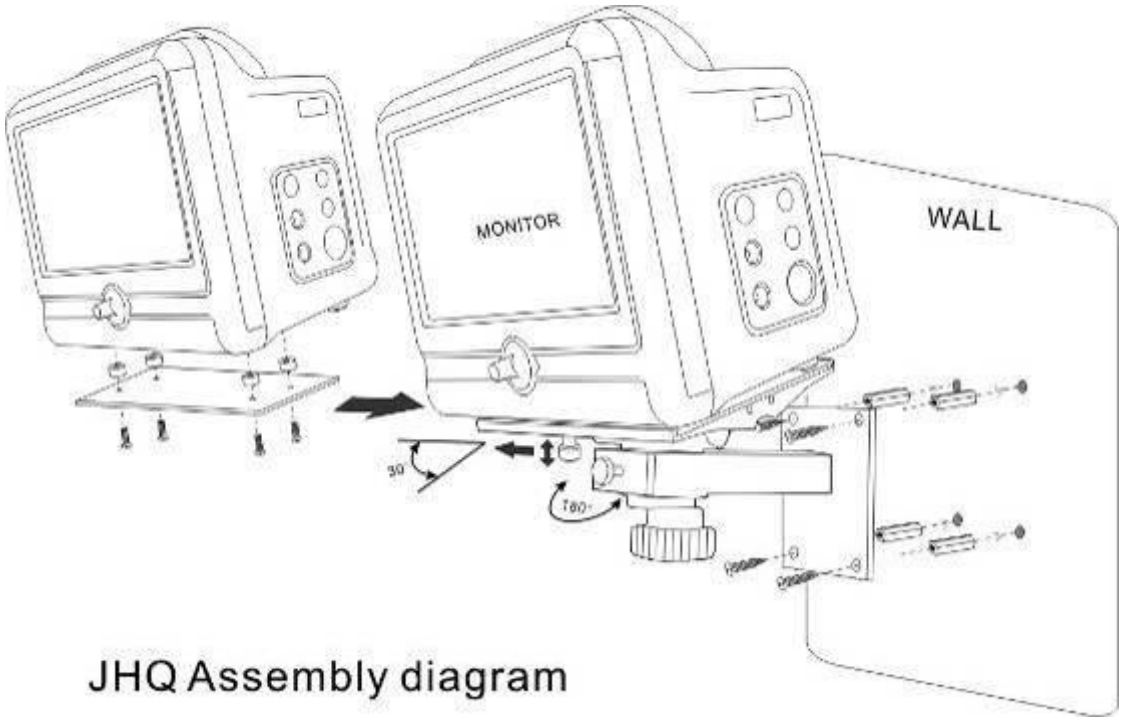
⑥the locking screw E screwed into the bracket locking hole (for demolition of the contrary);

⑦can be used of shaft wrench D removal Shield F after be used to adjust the host-specific horizontal, vertical viewing angle, tension and fixed locking;

Graph 2：（WLB011）Bracket installation diagram:

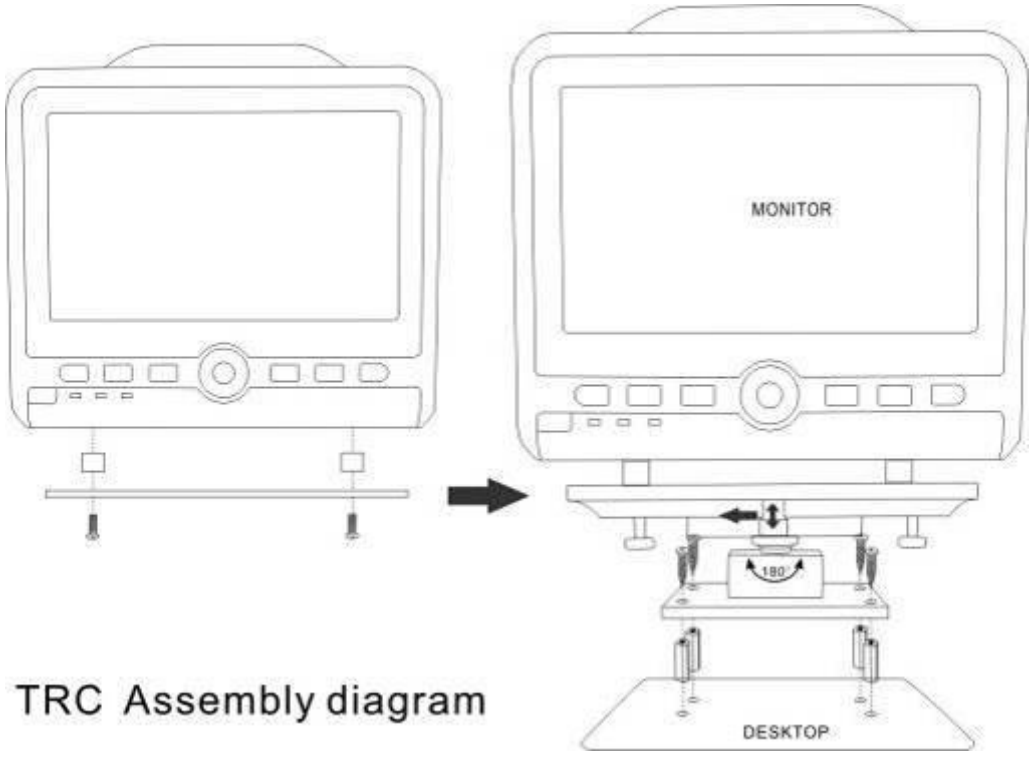


Graph 3:JHQ Assembly diagram



JHQ Assembly diagram

Graph 4：TRC Assembly diagram



TRC Assembly diagram