InSight® Vital Signs + ECG

Monitor

Operator's Manual

Contents

Preface

This manual introduces the InSight Vital Signs + ECG Monitor's performance, operation methods and other safety information in detail. This is the best starting point for new users to start using the monitor.

The following symbols indicate some important tips, which users should pay attention to:
Warnings are information that you should know how to help avoid injury to animals and medical personnel.
Caution is the information you should know how to avoid damage to your equipment.
Note is to emphasise important information.

This manual is for personnel who are familiar with the various measurements performed and have experience in using monitoring equipment.

This monitor is a handheld vital signs monitor which can be used for same-day surgery, surgery/anaesthesia recovery, emergency room and other occasions to monitor the vital signs of large and small animals.

This portable monitor is easy to carry and can be powered by the built-in battery.

Practical Range
This monitor is suitable for monitoring and measuring vital signs including heart rate/pulse rate, non-invasive blood pressure (systolic blood pressure, diastolic blood pressure, mean blood pressure), electrocardiogram, blood oxygen saturation and temperature.

Warnings
● This device is not a treatment device.
● If the device is not secured properly, it may fall, causing personal injury or equipment damage. To prevent personal injury or equipment damage, install the equipment in a fixed location.
● This device should not be used in the presence of magnetic resonance imaging (MRI) equipment, otherwise the induced current may cause animal burns.
● This equipment must not be operated in the presence of flammable anaesthetic gas or other gases.
● This device cannot be used in places with electromagnetic radiation, including places where mobile phones are used.
● In order to avoid personal injury, only Woodley Equipment Company authorised personnel can repair the equipment.
● Do not replace the power adapter of this device.
● Do not touch animals, this equipment or the treatment surface during defibrillation.

Precautions

● Before use, verify that the calibration is correct and that the device is working properly.

● Pay attention to the placement of power adapters, conduits and all cables to avoid the danger of strangling animals or tripping other people.

● This equipment is strictly prohibited to be blocked in order to radiate heat.

● If liquid spills into the cabinet of the device, please disconnect the power immediately and contact Woodley Equipment Company.

Chapter I Overview

■ For a comprehensive understanding of the monitor, please read the overview of the monitor information in Section 1.1
■ For an introduction to the various information displayed on the screen, please read the introduction to the screen display information in Section 1.2
■ To master the operation method, please read the key function and basic operation of the monitor information in Section 6
■ To understand the location of various interfaces, please read the external interface of the monitor information in Section 3

Warnings

- Do not open the casing of the instrument to avoid possible electric shock hazard. Any maintenance and upgrade of the monitor must be carried out by Woodley Equipment Company authorised personnel.
- Do not use this instrument where flammable materials such as anaesthetics are placed to prevent explosion.
- Before use, the user should check whether the instrument and its accessories are working normally and safely.
- To prevent delays in treatment, please make an adequate alarm setting for each animal. At the same time, please check that the alarm sound can be emitted when the alarm is issued.
- Do not use mobile phones near the monitor. Mobile phones can generate excessively strong radiation fields that can interfere with the function of the monitor.
- When the monitor is shared with electrosurgical equipment, the user should take care to ensure the safety of the animals being monitored.
- Dispose of any waste in accordance with local and national regulations.

Precaution

When in doubt about the integrity of the external grounding of the monitor and its arrangement, the internal battery must be used for operation.

1.1 Introduction

The InSight Vital Signs + ECG Monitor is a small device with a built-in battery which is convenient for animal transfer. It can monitor and measure vital signs such as heart rate/pulse rate, non-invasive blood pressure (systolic blood pressure, diastolic blood pressure, mean blood pressure), electrocardiogram, blood oxygen saturation and temperature for large or small animals.

Characteristics

- 4-inch large screen, colour screen, LCD display.
- The operation of the display interface is simple and convenient.
- Built-in rechargeable battery.
- Large memory.
- Automatic sound.

Working Environment

Working Temperature: 0 ~ 40°C
Transportation and Storage Temperature: -20 ~ 60°C
Working Humidity: ≤ 85%
Transportation and Storage Humidity: ≤ 93%
Operating Altitude: -500 - 4600 meters (-1,600 - 15,000 feet)
Transportation and Storage Altitude: -500 - 13,100 meters (-1600 - 43,000 feet)

Power Adapter

Input: 100—240 (V) AC, 50/60 (Hz)
Output: 5.0 (V) direct current, 2.0 (A)

Built-in Lithium Battery: 3.7V-2000mAh

Warning

Do not use the monitor outside the temperature and humidity range specified by the manufacturer, otherwise the performance specifications stated in Appendix II will not be met.

The InSight Vital Signs + ECG Monitor has many functions, as shown in Figure 1-1. Users can also choose different measurement parameter configurations according to different needs.

The InSight Vital Signs + ECG Monitor can monitor parameters including electrocardiogram (ECG), blood oxygen saturation (SpO2), non-invasive blood pressure (NIBP) and temperature (TEMP). The built-in battery provides convenience for moving patients and can clearly display 2 to 3 waveforms and all monitoring parameter information on its high-resolution display interface.

1.1.1 Button and Indicator Light

Fig. 1-1 Buttons and Indicator Light

- **Power** - Switch on/off
- **Mute** - Press this key to suspend or resume the alarm loudspeaker
- **Function 1** - Carry out functions as indicated by text showing on the lower left corner of screen
- **Function 2** - Carry out functions as indicated by text showing on the lower right corner of screen
- **Select** - Choose different options on setting menu
- **Alarm light** - Red light flashes when alarm sounds
- **Power light** – Red light flashes when charging or in low power. Green light flashes when fully charged. No flashing under normal conditions

1.1.2 Power Socket

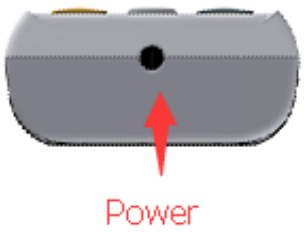


Fig. 1-2 Power Socket

NOTE

Please only use the power adapter supplied. Do not use device whilst it is charging.

1.1.3 Reset Micro USB

Fig. 1-3 Reset Micro USB

Open the protecting shell and insert a needle into the reset hole. Press the reset button, the device will be reset.

Warning
USB data upload, ECG will not appear.

1.1.4 Ports

Fig. 1-4 Ports

TEMP: Temperature probe interface.
S & E: The interface between the blood oxygen probe and the ECG lead wire or between the blood oxygen probe and EtCO2 part.

1.1.5 Cage Clip

Fig. 1-5 Cage Clip

NOTE
Device is supplied with cage clip in situ.

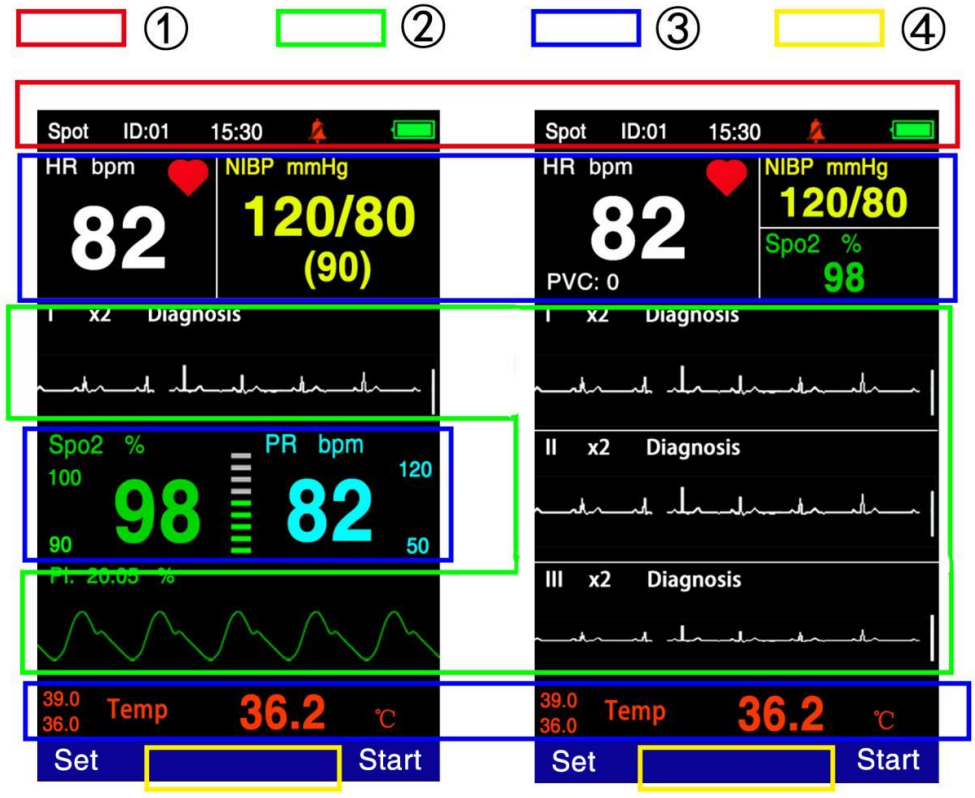
Abbreviations

Abbreviation	Definition
ECG	Electrocardiography
TEMP	Temperature
NIBP	Non-invasive blood pressure
SPO2	Blood oxygen saturation
EtCO2	End tidal carbon dioxide
RR	Respiration rate
HR	Heart rate
PR	Pulse rate
PI	Perfusion index
PVC	Premature ventricular contractions
SYS	Systolic blood pressure
DIA	Diastolic blood pressure
MAP	Mean arterial pressure
Monitor	Continuous measurement mode
Spot	Field mode (multi-user measurement)

1.2 Introduction to the Display Interface

The monitor's display screen is a colour LCD screen which can simultaneously display the collected animal ID, waveform parameters, alarm information provided by the monitor, monitor status, clock and other prompt information.

The main screen is divided into three areas (as shown in Figure 1-6):
1. Information area①④
2. Waveform area②
3. Parameter area ③



3 Lead ECG Interface **5 Lead ECG Interface**

Fig. 1-6 Main Interface

Information Area (①④):

The information area is located at the top of the screen, displaying the status of the monitor and the current user. The meaning of the content of the information area is as follows:

"Spot": Refers to the current working mode of the instrument.

"ID: 01": Refers to the current user serial number.

"15:30": Refers to the current time.

 : Battery power status.

Other prompt messages in the information area appear and disappear at the same time as the reported status and are divided into:
The monitor prompts information, the physiological alarm is fixed in the area ④; the technical alarm of NIBP is fixed under the NIBP mmHg, the SpO2 technology alarm of the ECG 3-lead interface is fixed behind the PI value and the SpO2 technology of the ECG 5-lead interface. The alarm always appears below SpO2% and the temperature technical alarm always appears behind Temp.
Monitor alarm information (see the "Alarm Setting" chapter for specific setting methods).

 **Alarm mute:** This symbol appears when you press the "Mute" button, indicating that all alarm sounds have been turned off. The voice prompt will not resume until the operator presses the "mute" button again to turn the alarm sounds back on.

 **Warning:** When the sign appears, the system will not be able to give an alarm sound so the operator should use this function with special care.

Waveform Area (②):
The waveform area of the ECG 3-lead interface displays 2 waveforms and the waveform area of the ECG 5-lead interface displays 3 waveforms. The display sequence can be adjusted. The name of the waveform is displayed on the upper left of each waveform. ECG leads can be selected according to requirements. Each ECG wave also shows the gain of this channel and the filter method of the ECG wave. There is a 1 millivolt ruler on the left side of the ECG waveform. When the menu displays during screen operation, it will occupy a fixed position in the middle of the waveform area, making part of the waveform temporarily invisible. After exiting from the menu, the original screen display will be restored. The waveform is refreshed at the set rate. For the adjustment of the refresh rate of each waveform, please refer to the Setting of each parameter.

Parameter Area (③):
The parameter area and the waveform are placed correspondingly. The parameters displayed in the parameter area are:

ECG
- Heart rate (unit: beats/minute)

SpO2
- SpO2 (unit: %)
- Pulse rate (unit: beats/minute)

NIBP
- From left to right, systolic blood pressure, diastolic blood pressure, mean blood pressure; (unit: mmHg or kPa)

TEMP
- Temperature (unit: Celsius ℃ or Fahrenheit ℉)

Alarm Lights and Alarm Status:
In the normal state, the warning light does not light up.

When an alarm occurs, the alarm light flashes and lights up in red. For details, please refer to Section 3.5.

Chapter II Installation of the Monitor

2.1 Unpacking and Checking

Carefully remove the monitor and accessories from the packaging box and save the packaging materials for future transportation or storage. Please check the contents according to the packing list.

- Check for any mechanical damage.
- Check all exposed wires.

When installing, leave at least 2 inches (5 cm) of space around the monitor to ensure air circulation. The environment in which the monitor is used should be reasonably protected from vibration, dust, corrosive or explosive gas, extreme temperature and humidity.
If you have any questions, please contact Woodley Equipment Company.

2.2 Electrical Connection

Steps to connect the AC power cord:

- Make sure that the AC power supply meets the following specifications: 100-240VAC, 50/60Hz
- Use the power cord provided with the monitor. Plug the power cord into the monitor power connector and plug the other end of the power cord into a grounded power socket.

Warning
Connect the power cord to a dedicated socket.
Warning
When there is a battery configuration, the battery must be charged after the instrument has been transported or stored. Therefore, if the instrument is turned on without connecting to AC power, the instrument may not work normally due to insufficient battery power. Switch on the AC power source and charge the battery regardless of whether the monitor is turned on or not.

2.3 Power On

After turning on the power switch, the system successfully enters the monitoring main screen after the system self-test and the user can perform operations at this time.

Warnings

- If you find any signs of damage to the monitor function, or an error message appears, do not use this monitor, contact Woodley Equipment Company.
- If an error is found during the self-check, the system will give an alarm.

- Check all the monitoring functions that can be used to ensure that the monitor is functioning properly.
- If equipped with a battery, the battery must be charged after each use to ensure that there is sufficient power reserve.

2.4 Sensor Connection

Connect the required sensors to the monitor and the animal.

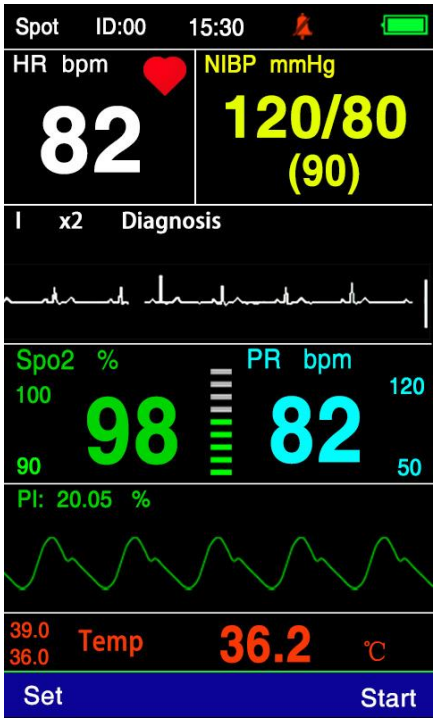
Warning
Please refer to the relevant chapters for the correct connection methods and related requirements of various sensors.

Chapter III System Menu

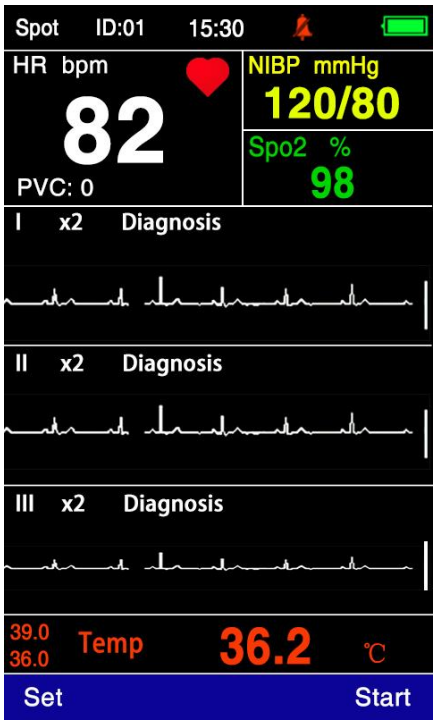
- Main Interface
- Menu setting
- Working mode
- User Setting
- Alarm setting
- Blood pressure setting
- Blood oxygen setting
- ECG Setting
- Temperature
- System Setting
- Data review

3.1 Main Interface

Press the power button, the system enters the main interface. The menu is shown in Figure 3-1.



3 Lead ECG Interface



5 Lead ECG Interface

Fig. 3-1 Main Interface

According to the lead type of the ECG setting, it is determined whether the main interface is a 3-lead or 5-lead interface. The 3-lead ECG can only display the waveform of one channel and one blood oxygen waveform while in the 5-lead mode, it can display the waveform of three channels without the blood oxygen waveform.

- In SPOT mode (energy-saving mode is on), if there is no key operation within 1 minute, the instrument will be turned off automatically.
- When the battery is low, the battery progress bar is empty. An audible alarm is generated at the same time and the alarm red light flashes regularly.
- The alarm sound switch status is displayed on the upper left corner of the screen and the alarm sound switch can be set in the system Setting.
- The mute button can mute or unmute.
- The top displays the test mode, user ID, time, alarm symbol, Bluetooth and battery symbol.

Warning

The oldest record will be overwritten after the memory is filled.

3.2 Menu Setting

In the Main interface, select the setup button in the upper left corner to enter the setup menu. The menu shown in Figure 3-2.

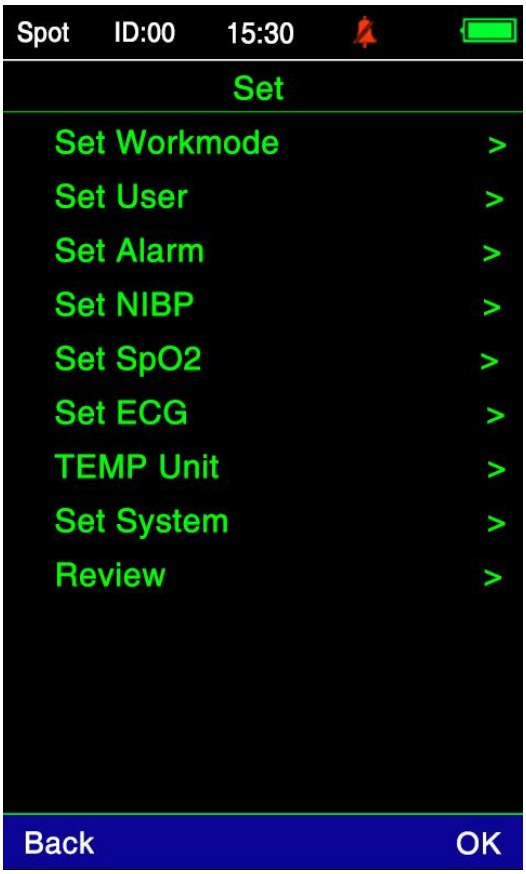


Fig. 3-2 Menu Setting

3.3 Working Mode

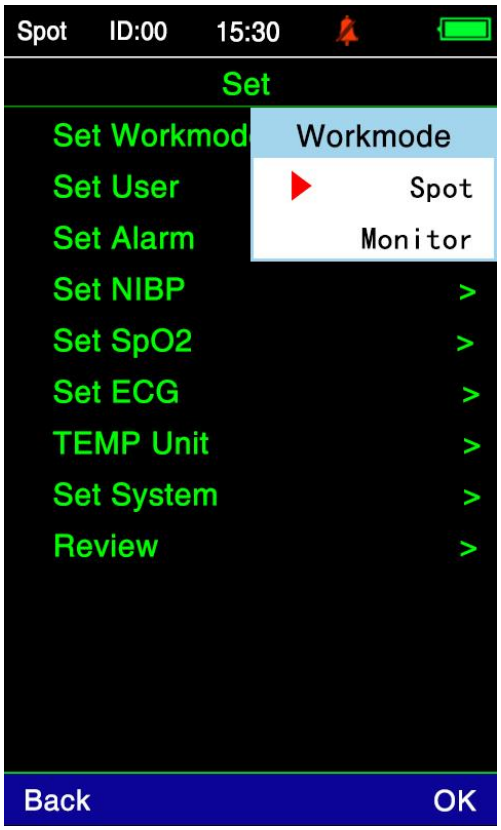


Fig. 3-3 Working Mode

- Spot mode will automatically sleep for 1 minute when there is no measurement operation (power saving mode is turned on).
- Monitor mode does not automatically sleep.
- If you switch from Spot mode to Monitor mode, you will be prompted to choose whether to keep the data in Spot mode. The drop-down box is shown in Figure 3-4.

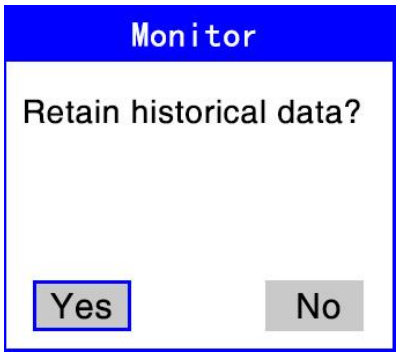


Fig. 3-4 Monitor Prompt Box

3.4 User Setting

Under the setting menu, select user setting and press the confirm key to enter the user setting interface menu. The menu shown in Figure 3-5.

Spot mode Monitor mode

Fig. 3-5 User Setting

- The user setting interface shows different interfaces according to different working modes.
- "User Setting": User selection, add user, delete user.
- Up to 100 users (200 records per user) can be stored in Spot mode and 48 hours of measurement data can be stored for single user data in monitoring mode.
- When the number of stored users in Spot mode has reached the maximum, it will prompt "Users are full", as shown in Figure 3-6. Only by deleting some users can you continue to add users.

Fig. 3-6 Add User Menu

Each time a user is added in the Monitor mode, it will prompt whether to keep the previous data, as shown in Figure 3-7.

Fig. 3-7 Add User Menu

3.5 Alarm Setting

Under the setting menu, select the alarm setting and press the confirm key to enter the alarm setting interface menu. The menu is shown in Figure 3-8.

Spot mode Monitor mode

Fig. 3-8 Alarm Setting

The alarm setting interface shows different interfaces according to the type of ECG lead.

In the 3 lead ECG mode, there is no PVC so there is no upper and lower alarm limit Setting. This is only available in the 5 lead ECG mode.

The alarm setting can be modified according to the up and down buttons. The upper limit of the same parameter cannot be lower than the lower limit. Similarly, the lower limit cannot be higher than the upper limit.

Alarm Limit Setting

Sys: 40-280 mmHg
Dia: 10-220 mmHg
SpO2: 0~100%
PR: 0 bpm ~ 250 bpm
Temp: 18°C ~ 45°C
HR: 0 bpm ~ 500 bpm
PVC: 0 bpm ~ 500 bpm

3.6 Blood Pressure Setting

Under the setting menu, select blood pressure setting and press the confirm key to enter the blood pressure setting interface menu. The menu is shown in Figure 3-9.

Fig. 3-9 Blood Pressure Setting

NIBP Setting

Measurement Mode: manual, auto, stat (continuous 5min measurement)
Measure systolic, mean, diastolic blood pressure and pulse rate
Cuff Type: small, large cuff
Pressure Unit: mmHg, KPA
Measurement Interval: 1min, 2min, 3min, 5min, 10min, 15min, 30min, 60min, 90min.
Measurement interval in Auto (automatic mode).

3.7 Blood Oxygen Setting

Under the setting menu, select the blood oxygen setting and press the confirm key to enter the blood oxygen setting interface menu. The menu is shown in Figure 3-10.

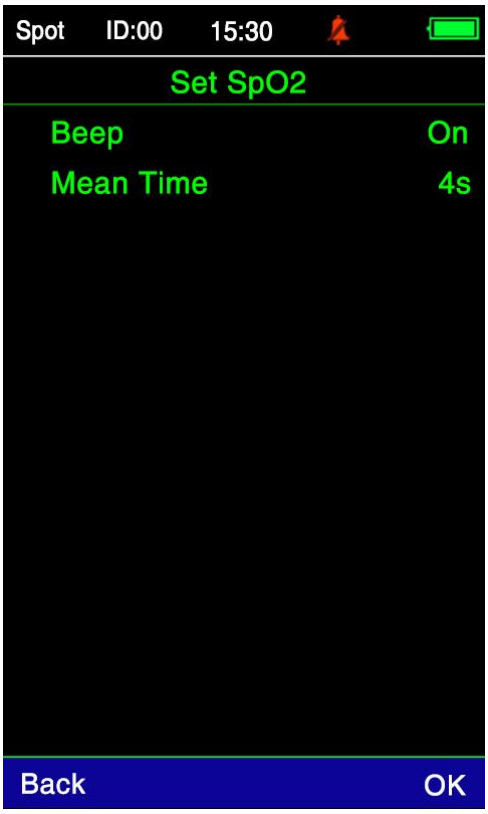


Fig. 3-10 Blood Oxygen Setting

SpO2 Setting

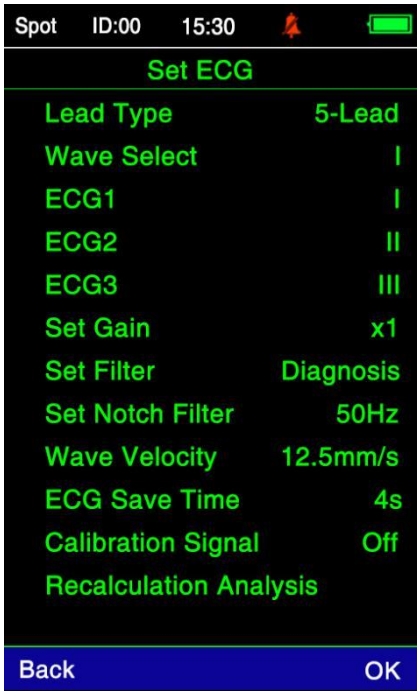
Pulse Sound: on/off.

Average Time: 4s, 6s, 8s, 10s, 12s, 14s, 16s, 30s, 60s, 120s.

3.8 ECG Setting

Under the setting menu, select ECG setting and press the confirm key to enter the ECG setting interface menu. The menu is shown in Figure 3-11 :

3 Lead ECG Mode



5 Lead ECG Mode

Fig. 3-11 ECG Setting

ECG Setting

Lead Type: 3-lead, 5-lead.

Waveform Selection: Three leads: I, II, III

Five leads: I, II, III, AVR, AVL, AVF, V1

ECG1: I, II, III, AVR, AVL, AVF, V1

ECG2: I, II, III, AVR, AVL, AVF, V1

ECG3: I, II, III, AVR, AVL, AVF, V1

Gain Setting: x0.25, x0.5, x1, x2

Filter Setting: Diagnosis (diagnosis mode), Monitor (monitoring mode), Surgery (surgery mode), Strong (strong wave mode).

Notch Filter: 50Hz, 60Hz, off.

Wave Velocity: 6.25mm/s, 12.5mm/s, 25mm/s.

Storage Time: 4s, 6s, 8s, 10s, 12s, 14s, 16s, 30s, 60s, 120s.

Calibration Signal: on/off.

Recalculate the analysis.

3.9 ETCO2 setting

ETCO2 Set Up

CO2 Unit: Choose mmHg, kPa or %

Apnea Time(s): Set time - device will alarm when no air is detected.

Note: Monitor must detect 3 breaths before this timer is activated.

CO2 Save Time(s): Set how often monitor records ETCO2 data (in seconds)

CO2 Range: Choose how high the vertical axis (Y Axis) of the ETCO2 waveform graph will display

ETCO2 Zero: Use this when connecting a new adaptor or resetting a current adaptor. Pressing “OK” while ETCO2 zero is highlighted will start the operation.

3.10 Temperature

Under the setting menu, select the Temperature unit and press the confirm key to enter the Temperature unit interface menu. The menu is shown in Figure 3-12.

Fig. 3-12 TEMP Setting

TEMP Unit: Celsius, Fahrenheit

3.11 System Setting

Under the setting menu, select the system setting and press the confirm key to enter the system setting interface menu. The menu is shown in Figure 3-13.

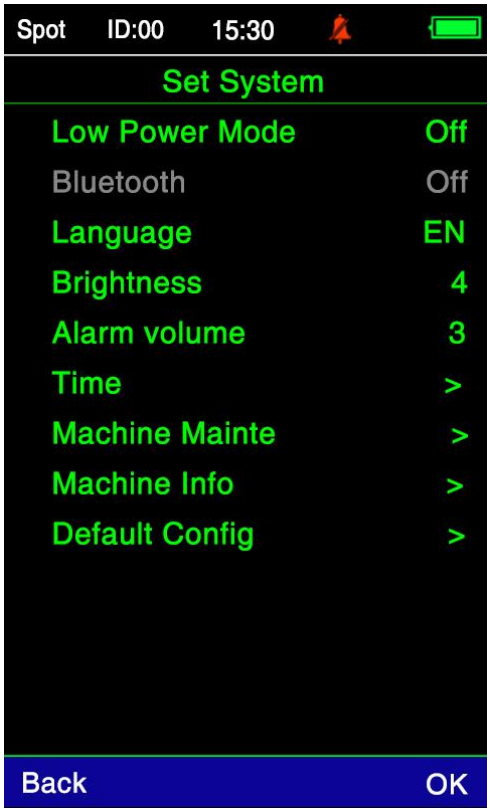


Fig. 3-13 System Setting

System Settings

"Low Power Mode": When on, it will automatically shut down in SPOT mode. When off, it will not shut down automatically in SPOT mode.

Warning

The low power mode has no effect on the monitoring mode.

"Bluetooth": Bluetooth module switch.

Warning

Bluetooth mode is currently not supported.

- "Language" Options: Chinese, English.
- "Brightness" Options: 1~4 levels.
- "Alarm volume" Options: 1~3 levels.
- "Time": Time adjustment.
- "Machine Mainte": Maintenance information.
- "Machine Info": The manufacture date and version number of the device.
- "Default Config": Restore the default factory settings.

3.12 Data Review

Under the setting menu, select data review and press the confirm key to enter the data review interface menu. The menu is shown in Figure 3-14.

View ID

View the list

Fig. 3-14 Data Review

If the current working mode is Spot mode, you must select the ID number you want to view before entering the view list. If the current working mode is Monitor mode, directly enter the selection view list because this mode is single user.

3.12.1 List Description

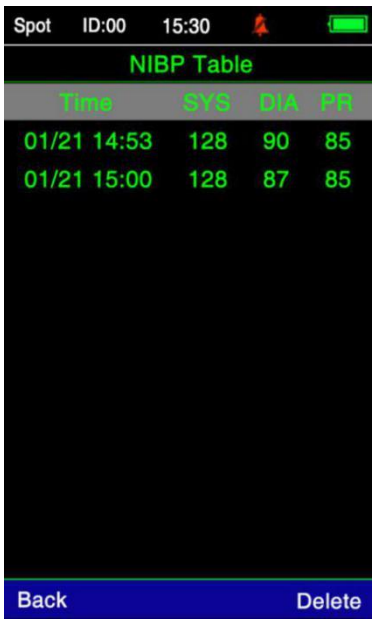


Fig. 3-15 NIBP Table

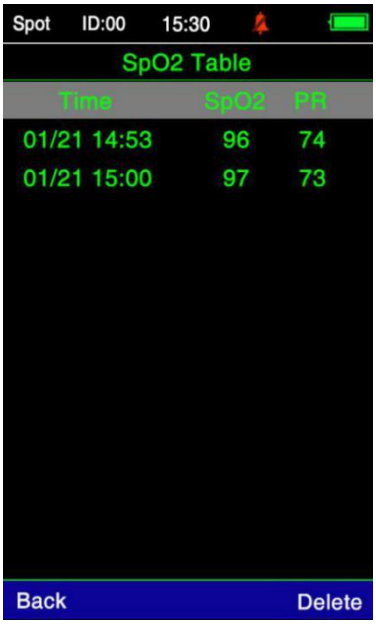


Fig. 3-16 SpO2 Table

NIBP Table: Time, SYS, DIA, PR. As shown in Figure 3-15.
SpO2 Table: Time, SPO2, PR. As shown in Figure 3-16.

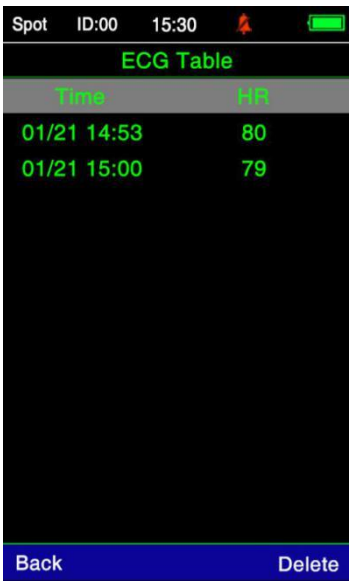


Fig. 3-17 ECG Table

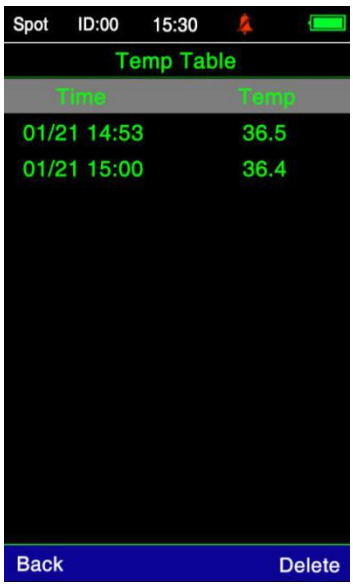


Fig. 3-18 TEMP Table

ECG Table: Time, HR. As shown in Figure 3-17.
TEMP Table: Time, TEMP. As shown in Figure 3-18.

3.12.2 Description of Trend Graph

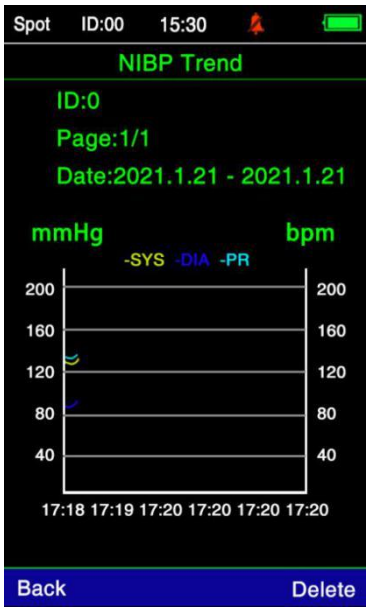


Fig. 3-19 NIBP Trend

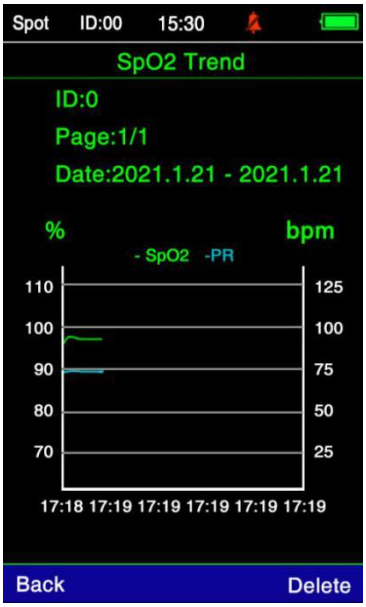


Fig. 3-20 SpO2 Trend

NIBP Trend

The trend graph displays systolic blood pressure, diastolic blood pressure, pulse rate, in different colours. The vertical axis on the left represents pressure, the vertical axis on the right represents pulse rate and the horizontal axis shows time. The trend also includes ID, page number and the date. As shown in Figure 3-19.

SpO2 Trend

The trend graph displays blood oxygen and pulse rate. The horizontal axis on the left is in %, the pulse rate is on the right and the horizontal axis is the measurement time. As shown in Figure 3-20.

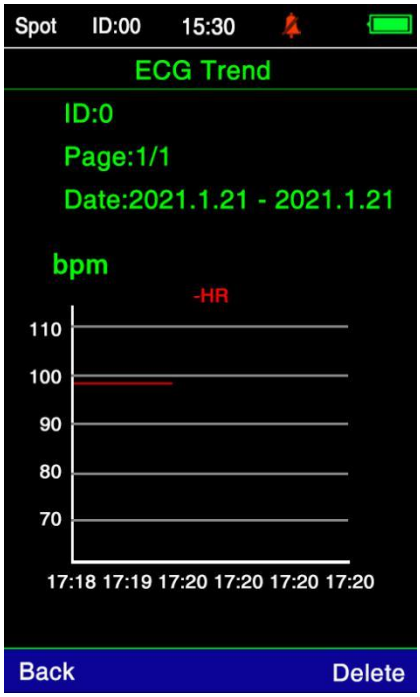


Fig. 3-21 ECG Trend

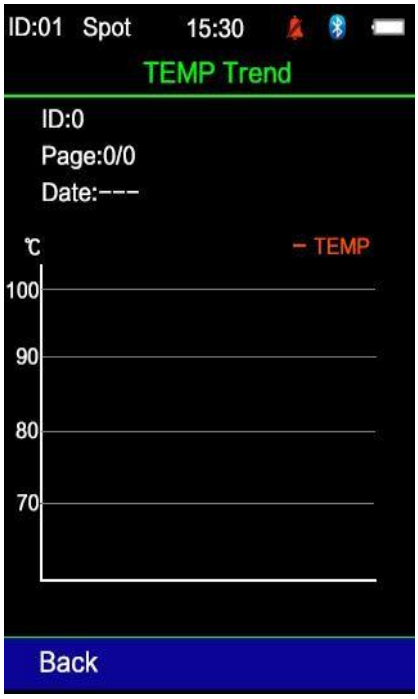


Fig. 3-22 TEMP Trend

ECG Trend

The heart rate is displayed in the trend graph, the unit of the horizontal axis on the left is bpm and the horizontal axis is the measurement time. As shown in Figure 3-21.

Temp Trend

The trend graph displays temperature, the horizontal axis on the left is in Celsius or Fahrenheit and the horizontal axis is the measurement time. As shown in Figure 3-22.

Warning

11 groups of data are displayed on each page, and all the data can be viewed by pressing the up/down arrow.

Chapter IV Maintenance and Cleaning

4.1 Maintenance and Inspection

Before using this equipment, the following checks must be carried out:
● Check for any mechanical damage.
● Check all exposed wires, inserts and accessories.
● Check the function of all instruments that may be used to monitor animals and ensure that the instruments are in good working condition.
If you find any signs that may prove that the function of the device is damaged, you should stop using this monitor. Please contact Woodley Equipment Company.

4.2 Normal Cleaning

Warning: Turn off the power supply and disconnect the AC power supply before cleaning the equipment and sensor.

- The device should be placed in a dust-free environment.
- It is recommended to clean the outer surface of the housing and the display screen. Clean the case with non-etching detergent such as soap and water. Do not use strong solvents such as acetone. Be careful not to damage the monitor.
- Most detergents must be diluted before using.
- Dilute according to the manufacturer's instructions and never use abrasive materials (such as steel velvet or silver polish) or solvents, such as acetone. Be careful not to damage the monitor.
- Do not allow any liquid to enter the casing. Do not immerse any part of the system in liquid.
- Do not leave any cleaning solution on any part of the surface of the device.

4.3 Cleaning Solution Guidance

Except for the solutions listed in the ‘caution’ section, any solution that can be classified as the following properties can be used as a detergent:

- Dilute ammonia
- Diluted sodium hypochlorite (washing bleach)
- Sodium hypochlorite in the concentration range of about 500ppm (1:100 diluted household bleach) to 5000ppm (1:10 diluted household bleach) is very effective. The amount of ppm depends on how much organic matter (blood, animal and plant mucus) is present on the clean and disinfected surface.
- Hydrogen peroxide 3%
- Ethanol
- Isopropanol
- The surface of the monitor and its sensor can be wiped with medical alcohol,

dried naturally or cleaned with clean and dry cloth.
- We are not responsible for the effectiveness of these chemicals as a means of infectious disease control.

Please consult with the relevant person in charge of infection control or infectious disease experts.

4.4 Sterilisation

In order to avoid long-term damage to the device, we recommend sterilising the product only when it is considered necessary. We also suggest that sterilised products should be cleaned first.
Recommended sterilisation materials: ethanol based, acetaldehyde based.

Caution

- Dilute or use as low a concentration as possible according to the manufacturer's instructions.
- Do not allow fluid to immerse the housing.
- Never soak any part of the system.
- Do not dump liquid on the system during sterilisation.
- Do not let the bactericide remain on any surface of the equipment. If there is any residue, please wipe it immediately with a wet cloth.

4.5 Disinfection

In order to avoid long-term damage to the device, we recommend that the device should be disinfected only when deemed necessary. We also suggest that disinfected device should be cleaned first.
For ECG lead, SpO2 sensor, blood pressure cuff and temperature probe, please refer to the relevant sections of this manual for information.

Caution

To prevent damage to the monitor, do not use gas (ETO) or formaldehyde to disinfect the monitor.

Chapter V Alarm

This chapter introduces the information about the alarm and the measures to be taken when the alarm occurs. You can get the information for the parameter alarm and prompt in the chapter about parameter setting.

5.1 Overview

The alarm refers to the prompt given by the monitor to the user when the animal being monitored has a vital sign change or the machine itself is unable to record patient data.

5.2 Alarm Properties

5.2.1 Alarm Type

The alarm can be divided into two categories:

- If the alarm originates from the change of vital signs of the animal.
- If the alarm originates from the monitor itself, if there is a technical fault

5-1 Examples of Physiological Alarm and Technical Alarm

Animal or Machine Condition	Type of Alarm Generated
The heart rate of the animal is 200bpm which is beyond the alarm range set by the user	Physiological alarm
Ventricular fibrillation was found	Physiological alarm
ECG measurement module found ECG lead falling off	Technical alarm
SpO2 measurement module failure	Technical alarm

5.2.1.1 Physiological Alarm Category

Physiological alarm can be divided into two situations: one is that the physiological parameters of the monitored animal exceed a specific range and the other is that the animal has physiological abnormalities that cannot be measured by a single physiological parameter.

- ECG signal is too weak
- Cardiac arrest
- Ventricular fibrillation / tachycardia
- No pulse was found

5.3 Alarm Mode

In case of alarm, sound, light and text prompt will be given.

5.3.1 Alarm Properties

5-2 Alarm Sound and Light Characteristics

Alarm Sound Mode	Alarm Light Mode
The device will ‘beep’ every 30 seconds.	The alarm light flashes red.

5.3.2 Content Properties

Background Colour: The alarm background colour is red.

5.4 Alarm Status

5.4.1 Alarm Mute Status

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

5.5 Parameter Alarm

In the alarm setting menu, the alarm parameters can be set independently and the user can set the upper and lower limits of the alarm. When the value of one or several parameters exceeds the alarm limit, the monitor will alarm automatically and perform the following processing:

1) A prompt appears on the screen in the form described in the alarm prompt
2) If the alarm volume is set, the alarm will sound according to the set alarm volume
3) The alarm light flashes

5.6 Measures to be Taken in Case of Alarm

Note

When an alarm occurs, the condition of the animal should be checked first.

The alarm information is displayed in the system information area or the system alarm information area. It is necessary to identify the alarm and take corresponding measures according to the alarm reason.

1) Check the condition of the animal.
2) Identify which parameter is alarming.
3) Identify the cause of the alarm.
4) Silence the alarm if necessary.

Alarm information and prompt information about parameters can be found in the chapter for parameter monitoring.

Chapter VI ECG

6.1 Instructions for ECG Monitoring

6.1.1 ECG Monitor Definition

ECG monitoring generates continuous waveforms of animal ECG to accurately evaluate the physiological state of the animal at that time. The portable monitor only displays one ECG waveform in three lead state.

- The parameters of monitoring display include heart rate(HR).
- The above parameters can be used as alarm parameters.

6.1.2 ECG Monitor Points for Attention

Warning

- When using this portable monitor to monitor ECG signal, the ECG cable provided by Woodley Equipment Company must be used.
- Ensure no contact to other conductive parts.
- Ensure all ECG electrodes, including neutral electrodes, are attached to the animal.
- It is recommended not to use equipment with electrical radiation near ECG / respiratory measurement.

6.2 ECG Monitoring Operation Method

6.2.1 Preparation

1) Prepare the skin before placing the electrode.

- If necessary, shave the fur at the place where the electrode is placed.
- Wash skin thoroughly with soap and water. Do not use pure alcohol as this will increase the skin resistance.
- Dry wipe the skin to increase capillary blood flow in the tissue and remove skin debris and oil.
- Confirm that the power supply of the monitor is normal.

Warnings

- The electrode should be attached carefully and the contact should be confirmed.
- In order to protect the environment, used electrodes must be recycled or properly treated.
- Before monitoring, it is necessary to check whether the lead is good condition. After pulling out the ECG cable, the screen will display the error message of lead falling off and simultaneously trigger the sound alarm.

6.2.2 Installation of ECG Lead

The location of ECG monitoring electrode is determined according to the animal type as shown in Figure 6-2.

Warning

The lead names in European and American standards are listed in the table below (in European standard, R, l, N, F and C are used for each lead, while in American Standard, RA, La, RL, ll and V are used for each lead).

American		European	
Lead	Colour	Lead	Colour
RA	White	R	Red
LA	Black	L	Yellow
LL	Red	F	Green
RL	Green	N	Black
V	Brown	C	White

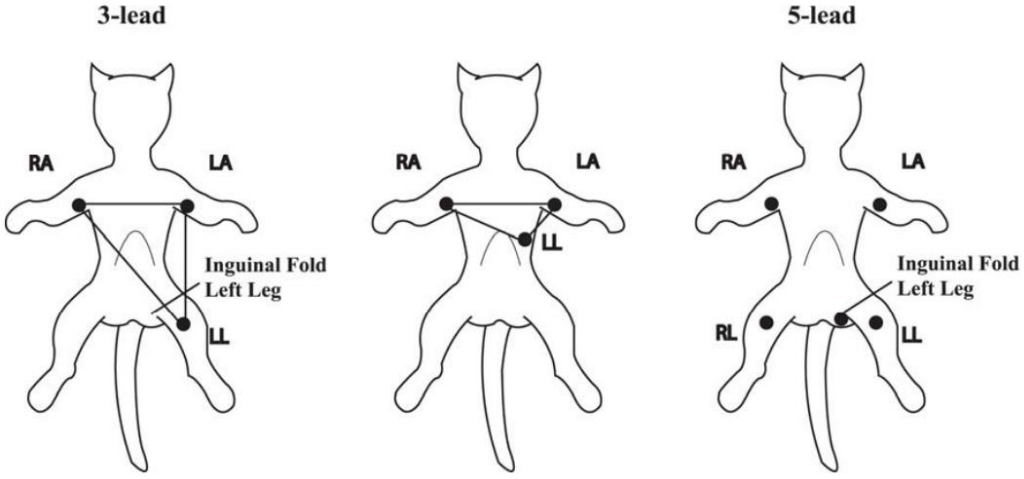


Fig.6-2 Indicative map of the placement of ECG electrodes

ECG Lead Connection Recommended for Surgery

Warning

When using the electrosurgical (ES) equipment, the ECG electrode should be placed in the middle between the ES grounding plate and the electrosurgical knife to avoid burns. The cable for the electrosurgical equipment should not be entangled with the ECG cable.

The placement of ECG leads depends on the type of operation performed.

Warning

When using the electrical surgical (ES) equipment, the electrode must not be placed on the ground plate near the surgical electrical equipment, otherwise there could be interference with the ECG signal.

Characteristics of a good signal:

- Narrow without interference.
- The R wave is tall and completely above or below the baseline.

- The pacing signal was not greater than the height of R wave.
- The height of T wave is less than 1/3 of that of R wave.
- P wave should be much smaller than T wave.
- In order to obtain 1 MV calibrated ECG wave, ECG calibration should be performed. At this time, the screen will prompt that ‘animals cannot be monitored during calibration’.

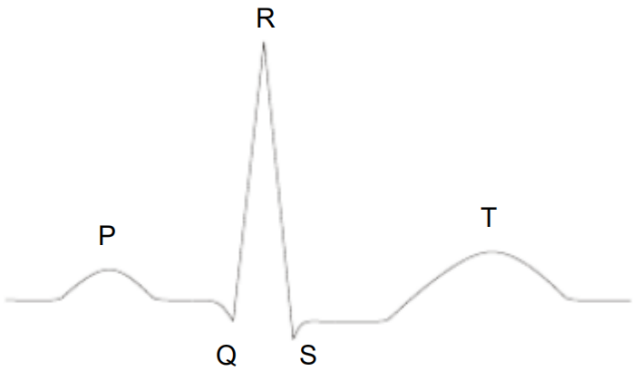


Fig. 6-3 Standard ECG waveform

Using Five Lead ECG Device

Users can arrange the leads on channel 1, channel 2 and channel 3 according to their own needs. The lead labels on the three channels are displayed above the corresponding waveforms and can be changed in the ECG menu. For channel 1, channel 2 and channel 3, select the appropriate lead from I, II, III, AVR, AVL, AVF and V.

Warnings

- If the electrode is correct and the ECG waveform is not accurate, replace the lead.
- Interference from ungrounded instruments near animals and ESU interference may cause waveform problems.

6.3 ECG Operation

ECG Alarm

The alarm will be given when the ECG is out of the upper limit or lower limit.

Warning

- The upper and lower limits of alarm should be set according to the clinical conditions of the animal.

Lead Type

5 lead or 3 lead can be selected

Waveform Selection

Choose which ECG waveform data to calculate heart rate.

Waveform Speed

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

ECG 1, ECG 2, ECG 3

Selective leads are Ⅰ,Ⅱ,Ⅲ,AVR,AVL,AVF,V.

Gain Setting

When the input signal is large, the peak may be shortened. At this time, the user can refer to the actual waveform to manually change the ECG waveform gain file to avoid incomplete waveform display.

The gain of each calculation channel can be selected. There are four levels of gain: x0.25, x0.5, X1 and x2. The scale of 1mV is given on the left side of each ECG waveform. The height of a 1 MV scale is proportional to the amplitude of the wave.

Filter Settings

1. Diagnosis mode, Monitor mode, Surgery mode, Strong mode.
2. Only in the diagnosis mode can the system provide the real signal without processing.
3. In the ‘monitoring’ and ‘operation’ filtering mode, ECG waveform will have varying degrees of distortion. The system can only provide the basic condition of ECG, which will have a great impact on the results of ST segment analysis.
4. In the operation mode, the analysis results of AVR may also have some influence. Therefore, it is suggested that when the interference is small, the diagnosis mode should be used for animal monitoring as far as possible. More clean or accurate waveforms can be obtained by filtering.
5. In the diagnosis mode, the ECG wave without filtering is displayed; in the monitoring mode, the false alarm may be filtered; in the operating room, the operation mode can reduce the false error and interference from the electrosurgical equipment.

6.4 ECG Alarm Information and Prompt Information

Alarm Information

There are two kinds of alarms in ECG measurement: physiological alarm and technical alarm. At the same time, various prompt messages may be generated in the process of ECG measurement. When these alarms or prompts appear, the visual and auditory representations of the monitor can refer to the relevant description in the chapter of alarm settings. On the display screen, physiological alarm and general prompt information (general alarm) are displayed in the alarm area of the monitor, while technical alarm is displayed in the information area of the monitor.

The following classification list describes some alarms that may be generated by this measurement.

Physiological Alarm

Notification	Reason
HR High	HR measured value is higher than the set alarm upper limit
HR Low	HR measured value is lower than the set alarm lower limit
PVC High	PVCHR measured value is higher than the set alarm upper limit

Technical Alarm

Notification	Reason	Solution
RA shedding	The electrocardiograph electrode does not have good contact with the animal or the electrocardiograph cable falls off from the monitor.	Ensure that all electrodes, leads and cables are connected properly.
LA shedding		
LL shedding		
V1 shedding		

6.5 Maintenance and Cleaning

Maintenance and Cleaning

Warning

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

If the ECG cable is damaged or ageing, replace it with a new one.

Cleaning

The surface of the monitor and its sensor can be wiped with medical alcohol, dried naturally or cleaned with a clean, dry cloth.

Sterilisation

In order to avoid long-term damage to the product, we recommend sterilising the product only when it is considered necessary.

We also suggest that sterilised products should be cleaned first.

Recommended sterilisation materials for monitor:

Ethoxyl: 70% whey, 70% ethyl propyl.

Acetaldehyde group

Disinfection

In order to avoid long-term damage to the product, we recommend that the product be disinfected only when deemed necessary.

We also suggest that disinfected products should be cleaned first.

Chapter VII SpO2 Measurement

7.1 SpO2 Monitor instruction

7.1.1 SpO2 Definition

SpO2 plethysmography measure arterial oxygen saturation, which is the percentage of total oxygenated haemoglobin. For example, if 97% of the total haemoglobin molecules in the red blood cells of arterial blood are combined with oxygen, the blood will have 97% SpO2 oxygen saturation, and the SpO2 value reading on the monitor should be 97%. The SpO2 value shows the percentage of oxygen carrying haemoglobin molecules forming oxyhaemoglobin. SpO2 plethysmography can also provide pulse rate signal and plethysmography wave.

7.1.2 Measurement Principle of SpO2 Plethysmography

Blood oxygen saturation was measured by pulse oximetry. This is a continuous and non-invasive method for measuring haemoglobin oxygenation saturation.
It measures how much light emitted from one side of the sensor light source passes through animal tissues (such as ears, tongue, etc.) and reaches the receiver of the other side.

The wavelength that the sensor can measure is usually 660nm for red LED and 940nm for infrared LED. The maximum optional output power of LED is 4MW.
The amount of light passing through depends on a number of factors, most of which are constant. But one of these factors, arterial blood flow, changes over time because it's pulsating. By measuring the light absorbed during pulsation, it is possible to obtain arterial blood oxygen saturation. The detection of pulse itself can give a plethysmography waveform and pulse rate signal.
The SpO2 value and plethysmography waveform can be displayed on the main screen.

Warning
If carboxyhaemoglobin, methaemoglobin or dye dilution chemicals are present, the SpO2 value will deviate.

7.1.3 Measurement of SpO2 Plethysmography Parameters

The ‘SpO2’ value and waveform can be displayed on the main screen.

Warning
If carboxyhaemoglobin, methaemoglobin or dye dilution chemicals are present, the SpO2 value will deviate. Oxygen saturation / pulse monitoring.

Warning
The cable of the electrosurgical equipment should not be entangled with the sensor cable.

Warning
Make sure the blood oxygen probe is out of the light.

Warning
The SpO2 value is always displayed in a fixed place.

Warning
The SpO2 waveform is not proportional to the pulse volume.

Warning
Before monitoring, check whether the sensor cable is normal. When the SpO2 sensor cable is removed from the socket, the screen will display the error message of "probe falling off" and trigger the sound alarm at the same time

Warning
If the sensor packaging or sensor has signs of damage, do not use this SpO2 sensor, contact Woodley Equipment Company.

Warning
Continuous and prolonged monitoring may increase the risk of unwanted changes in skin characteristics, such as hypersensitivity, redness, blistering or compressive necrosis, especially in small animal tongues or animals with perfusion disorders and altered or immature skin patterns.

Ensure to check the position of the sensor according to the quality change of the skin and the correct light path alignment and attachment method. Regularly check the sensor attachment position and change the attachment position when the skin quality decreases. Due to the different status of individual animals, more frequent examinations may be required.

7.2 SpO2 Measurement Operation

7.2.1 SpO2 Plethysmography

1. Turn on the monitor.
2. Place the sensor on the animal's tongue or ear at the appropriate position. If the hair is over, remove the hair before use.
3. Plug the connector at one end of the sensor cable and into the SpO2 connector of the monitor.

Warning
If the test position and probe cannot be accurately located, it may lead to inaccurate reading of blood oxygen saturation.

Warning
In the long-term continuous monitoring process, check the peripheral circulation and skin condition of the measuring part every 2 hours or so. If adverse changes are found, the measuring part should be changed in time.

In the process of long-term continuous monitoring, the positioning of the probe should be checked periodically to avoid the change of the probe positioning caused by moving and other factors, which will affect the accuracy of measurement.

7.3 SpO2 Monitoring Measurement Limit

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

- High frequency electrical interference, such as the interference generated by the host system itself or the interference from the electrical instruments connected to the system.
- Do not use photoelectric oximeter and oxygen sensor during MRI scanning. Induced current may cause burns.
- Intravenous dye.
- Active animal.
- External light radiation.
- Improper installation of sensor or improper contact with object.
- Sensor temperature (the best temperature should be in the range of 28 ℃ ~ 42 ℃).
- Placing the sensor on the limb with blood pressure cuff, arterial catheter or endovascular tube.
- The concentration of non-functional haemoglobin such as carboxyhaemoglobin (COHb) and MetHb.
- Low oxygen saturation.
- The circulation perfusion of the test site was poor.
- Shock, anaemia, hypothermia and vasoconstrictor drugs may reduce the arterial blood flow to an unmeasurable level.
- The measurement also depends on the absorption of specific wavelengths of light by oxyhaemoglobin and reduced haemoglobin.
- If there are other substances absorbing the same wavelength, they will lead to false or low SpO2 values. Such as: carbohaemoglobin, methaemoglobin, methylene blue, indigo carmine.
- It is recommended to use the SpO2 sensor described in the attachment.

7.4 SpO2 Alarm Information

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

Physiological Alarm

Notification	Reason
SpO2 too high	SpO2 measured is higher than the upper alarm limit
SpO2 too low	SpO2 measured is below the lower alarm limit
PR too high	PR measured is higher than the upper alarm limit
PR too low	PR measured is below the lower alarm limit

Technical Alarm

Notification	Reason	Solution
System Error3/SysErr3	Self-test failure of blood oxygen module	Contact Woodley Equipment Company.
System Erro4/SysErr4	Blood oxygen module communication error	Contact Woodley Equipment Company.
No Sensor	Sensor not connected	Make sure that the sensor is placed on the animal's tongue or ear and that the monitor is connected to the cable properly.
Sensor off	Sensor switched off	

Tips (including general warnings)

Notification	Reason
No pulse	No pulse was found
Searching	Searching for a pulse

7.5 Maintenance and Cleaning

Warning

Before cleaning the monitor or sensor, turn off the power and disconnect the AC power.

Warning

Do not autoclave the sensor.

Do not immerse the sensor in liquid,

If the sensor or cable has signs of damage or deterioration, it is forbidden to use again.

Cleaning:

The surface of the sensor can be wiped with cotton ball or soft cloth dipped with medical alcohol, and then dried with dry cloth. The light emitting tube and the receiver part of the sensor can be cleaned in the same way.

The cable can be cleaned and disinfected with 3% hydrogen peroxide or 70% isopropanol. The connector cannot be immersed in the above solution.

Chapter VIII Temperature Measurement

8.1 Temperature Monitor Instruction

The portable monitor can use the temperature probe to measure the temperature data.

Temperature Measurement Setting

- If you are using a disposable temperature probe, insert the temperature cable into the socket and then connect the probe with the cable. For a reusable temperature probe, you can insert it directly into the socket.
- The temperature probe is inserted into the anus of the animal and the insertion depth is determined according to the size of the animal.

Warning
Before monitoring, check whether the probe cable is normal.

Warning
The disposable temperature probe can only be used once.

Warning
Handle the temperature probe and cable carefully. When not in use, the probe and cable should be pulled into a loose ring. If the wire inside is too tight, it will cause damage to the cable.

8.2 Temperature Alarm Information and Prompt Information

Physiological alarm, technical alarm and prompt information that may occur in TEM measurement are listed in the table below.

Physiological Alarm

Notification	Reason
TEMP TOO HIGH	TEMP measured value is higher than the upper alarm limit.
TEMP TOO LOW	TEMP measured value is below the lower alarm limit.

Technical Alarm

Notification	Reason
System Error 5/SysErr5	Temperature module self-check error / communication error

Prompt and Alarm

Notification	Reason
Overrange	Out of range

8.3 Maintenance and Cleaning

Warning

Turn off the power and disconnect the AC power before cleaning the monitor or the sensor connected to it.

Reusable temperature probe:

1) The heating of the temperature probe should not exceed 100°C.
2) Do not steam sterilise the probe.
3) Only use alcohol detergent to disinfect.
4) When using the straight probe, it should be possible to cover it with protective tape.
5) When cleaning the probe, hold the top of the probe in one hand and scrub the probe downward toward the coupling with a wet, lint free cloth in the other hand.

Warning

If you are using a disposable temperature probe, do not disinfect again or re-use.

Warning

In order to protect the environment, the disposable temperature probe should be disposed of according to local regulations.

Chapter IX NIBP Measurement

9.1 NIBP Monitor Instruction

Non-invasive blood pressure (NIBP) is measured by oscillatory method.
It can be used for measuring an animal's blood pressure.

- Measurement Mode：Manual, Auto and Stat.
- Every mode will display SYS,DIA & MAP
- 'Manual' Mode：Take only one measurement.
- 'Auto' Mode：The measurement was repeated. The interval can be set as 1 / 2 / 3 / 5 / 10 / 15 / 30 / 60 / 90 minutes.
- 'Stat' Mode：Continuous measurement for 5 min.

Warning
For animals with severe coagulation disorder, it is necessary to determine whether to take automatic blood pressure measurement according to clinical evaluation, because there is a risk of haematoma at the friction between limb and cuff.
When measuring on a small animal, make sure that the correct mode setting is selected (see cuff type setting).

9.2 NIBP Monitor Measurement Operation

9.2.1 NIBP Measurement

The inflation tube connecting the blood pressure cuff and the monitor should be in good condition.

1. Turn on the device and insert the inflation tube into the blood pressure cuff and the monitor.
   - Measure the circumference of the animal's limbs and choose the appropriate cuff.
   - Make sure the cuff is completely deflated.
   - Use appropriate size cuff for animals to ensure that the marker is just above the appropriate artery. Ensure that the cuff is not too tight around the limb.

Warning
The length of the inflatable part of the cuff should be enough to surround 50-80% of the limb. The wrong size of the cuff will produce the wrong reading. If there is a problem with the cuff size, use a larger cuff to reduce errors.

- Check that the edge of the cuff falls within the range marked < - >. If not, replace it with a more suitable cuff.
- Connect the cuff with the inflation tube.
- Confirm whether the measurement mode is correct (the measurement mode is displayed in the information area of the power on Interface).
- Press the corresponding function button on the front panel to start inflation and pressure measurement.

9.3 Operation Tips

1. Take an automatic measurement

The user can select the time interval value for automatic measurement. After that, the system will automatically inflate and measure according to the set interval.

Caution

If the non-invasive pressure measurement time in the automatic mode is too long, the limbs rubbing with the cuff may be accompanied by purpura, ischemia, and nerve damage. During monitoring, always check the colour, warmth and sensitivity of the distal limbs. Once any abnormality is observed, place the cuff in another place or immediately stop blood pressure measurement.

2. Stop automatic measurement

Pressing the stop button at any time during the automatic measurement will stop this automatic measurement, the interval time will be re-timed, and the measurement will be restarted after the next measurement time is reached.

3. Take a manual measurement

- Press the start button to start a manual measurement.
- During the idle time of automatic measurement, press the start measurement button to start a manual measurement. If the stop button is pressed again at this time, manual measurement will be stopped and automatic measurement will continue.

Caution

If liquid spills on the equipment or accessories, please stop using it and contact Woodley Equipment Company.

Limits of Measurement

Depending on the condition of the animal, the oscillation method has certain limitations. This measurement looks for regular pulse waves produced by arterial pressure. When animal conditions make this detection method difficult, the measurement value becomes unreliable and the measurement time increases. The user should be aware that the following conditions will interfere with the measurement method, make the measurement unreliable or prolong the measurement time. In this case, the condition of the animal will make the measurement impossible:

Movement

- If the animal is moving, shaking or convulsing, the measurement will be unreliable or even impossible, because these conditions may interfere with the detection of arterial pressure pulsations and the measurement time will be extended.

Arrhythmia

- If the display shows an arrhythmia that results in an irregular heartbeat, the measurement will be unreliable or even impossible, and the measurement time will be extended.

Heart-lung machine

- If the animal is connected with an artificial heart-lung machine, the measurement will not be possible.

Pressure change

- If within a certain period of time, the arterial pressure pulsation is being analysed to obtain a measurement value, and the blood pressure changes rapidly at this time, the measurement will be unreliable or even impossible.

Severe shock

- If the animal is in severe shock or hypothermia, the measurement will be unreliable. Because the decrease in blood flow to the periphery will result in a decrease in arterial pulsation.

Extreme heart rate

- Blood pressure cannot be measured when the heart rate is lower than 40bpm and higher than 254bpm.

Thick fur

- Thick hair under the limbs will reduce the accuracy of the measurement.

9.4 NIBP Alarm Information

The following situations may cause a longer measurement time or unreliable values:

- Animal Movement
- Severe Shock
- Low Heart Rate
- Arrhythmia
- Rapid Pressure Changes
- Extremely Large Animals

Error	Cause
SysErr	Self-test fail
SysErr2	NIBP module system error
CuffLoose	Cuff is too loose or cuff not connected
CuffErr	Using small cuff in big cuff mode
Leakage	Valve or gas circuit leak
PressErr	NIBP Valve is not working appropriately
Weak	Animal’s pulse is too weak or cuff is loose
OveRange	Animal’s blood pressure exceeds the measurement range
Movement	During measurement, interruption in signal or too much interference
Protect0	Cuff pressure exceeds the range 300mmHg
Saturate	Large signal amplitude caused by interference
TimeOut	Big Cuff: cuff pressure over 2kPa(15mmHg) lasting for more than 3 minutes. Small Cuff: cuff pressure over 0.67kPa (5mmHg) lasting for more than 90s
Reset	NIBP module reset

9.5 Maintenance and Cleaning

- Don’t constrict or kink the rubber hose
- Don’t allow liquid to come in contact with the vital signs monitor or charging dock
- When cleaning the monitor, only wipe the case
- Don’t submerge or place in any type of gas or steam sterilizer

Disposable NIBP cuff should be used for only one animal, it cannot be disinfected or be sterilised under high pressure steam.

Warning
To protect the environment, single-use blood pressure cuffs must be recycled or properly disposed of according to local regulations.

Chapter X Mainstream CO2 Module

10.1 Hardware Interface

10.1.1 Mainstream CO2 Module

Fig. 10.1.1 Mainstream CO2 Probe

10.1.2 Points for Attention

Zero Operation

It is recommended that users ensure each module goes down to zero before use to ensure the best measurement accuracy. During the zero calibration operation, ensure that the gas sampled by the module is air. If the module is in use and zero calibration must be performed, the module must alarm “apnea” first and the user must disconnect the module from the patient, ensuring that none of the gas sampled is from the patient. If the probe needs to return to zero, just unplug the adaptor and re-insert it. The probe will automatically return to zero without having to enter the monitor set-up software (see section 3.5.4).

Check Adapter

When “check adapter” warning appears, check to see if the adapter is connected and that the optical analysis window is clean.

Clean probe with alcohol or install a new probe if needed.

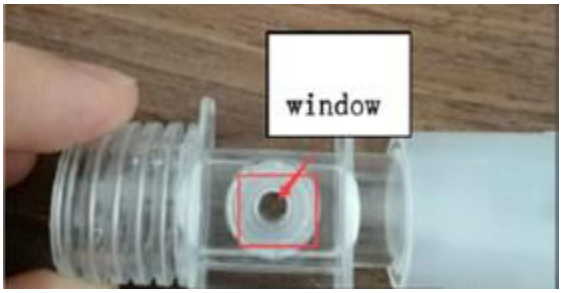


Fig 10.1.2. Airway Adapter

10.1.2.3

The monitor may report “compensation not set” after power failure or device reset. If this warning occurs, enter the Set ETCO2 menu to adjust the compensation settings.

10.1.2.4

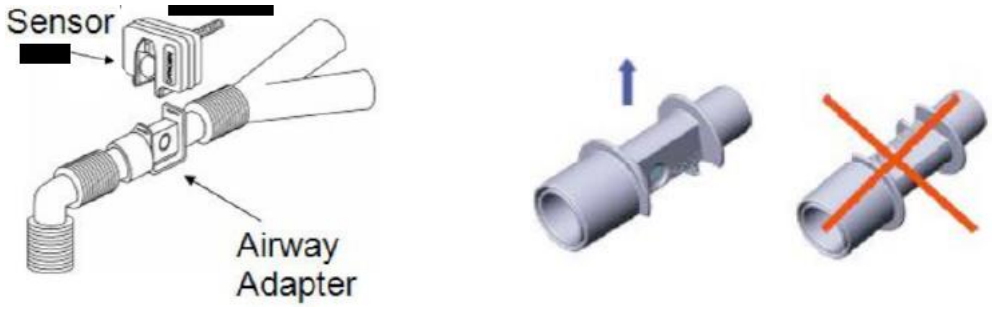
On initial power up and after connecting a new probe to the monitor, a solid red light will illuminate on the module itself. This means the module is in a pre-heated state. When the red light goes out, the adapter is preheated. When the adapter is pre-heated and in a normal measurement state, a green light will illuminate during exhalation and will turn off during inhalation. If the red light is slowly blinking, that

indicates a “check adaptor” alarm. A fast blinking red light indicates the adapter needs to return to zero (see section 10.1.2).

Note: The adapter needs to be preheated for 2-3 minutes (until the red light extinguishes) to prevent condensation on the optical analysis window from affecting the measurement results.

10.2 Proper Connection

For the mainstream module, the adaptor should always be kept in the correct position, as follows:



10.3 Troubleshooting of Mainstream CO2 Module

The mainstream ETCO2 module needs to be pre-heated before use. Preheating time takes about 3 minutes, depending on the ambient temperature. For example, the preheating time in a colder room will take about 3 minutes where as a warmer room may take as little as 1 minute. The purpose of preheating is to prevent condensation from building up in the adapter. When condensation occurs, the monitor will prompt the “check adaptor” alarm. When a new probe is connected to the monitor, the red light will always be on, which means the module is in a preheated state. When the red light goes out, the module is preheated and no lights will be on. When the probe is in a normal measurement state, the green light will turn on when exhalation is detected and will turn off when inhalation is detected. If the module has a slow flashing red light, it is in a “check adapter” state. The user should check to ensure the adapter is connected properly and the optical analysis window is clear. If the module has a fast flashing red light, it is indicating “return to zero”. Disconnect the module from the patient, ensure no respiratory gases are in the adapter, then disconnect and reconnect the adapter to the module. The module will automatically return to zero without entering the monitor set up software.

When the mainstream ETCO2 module is being used for a long period of time, it is recommended to periodically check to whether the optical analysis window is contaminated by respiratory secretions. If the optical analysis window is found to be dirty, it is necessary to clean the adapter window or replace with a new adapter. If the

optical analysis window is dirty, the monitor will display the “check adapter” alarm. If the user attempts to zero the module, the procedure will cause an error. At this point, the module will not work properly and will continue to prompt the “check adapter” or “adapter need replace” warnings. If the user attempts to clean the module but the warning and alarms persist, a new adapter should be connected. Baseline elevation will cause the ETCO2 readings to be high. When a new adapter is connected, the module will automatically carry out a return to zero operation. This process can last about 15 seconds and the user should ensure that no respiratory gases enter the adapter during this time.

10.4 CO2 Compensations

The measurement of CO2 is affected by temperature, pressure and gas compensations. The barometric pressure, as well as the presence of O2, N2O, Helium, and anaesthetic agents in the gas mixture need to be compensated for by the device in order to achieve its stated accuracy. The device provides instrument settings to allow the user to communicate these operating conditions. Please set the correct settings according to your operation environment the first time you use this monitor. The settings can be found in the ETCO2 set up menu.

10.5 Apnea Alarm

The “Apnea Time(s)” is the maximum time allowed from the detection of one breath to the next breath. Therefore, if the time between breaths exceeds the time out period, the alarm “Apnea” will be triggered.
At start-up, or following a zero operation, three breaths need to be detected before this timer is activated. To clear the “Apnea” alarm, three breaths are required, or a zero operation must be carried out.

Note: The ETCO2 monitor is not an apnea monitor. The software cannot discriminate between the patient no longer breathing and a sensor that has been disconnected from the patient circuit.

10.6 Cleaning

Cleaning the CO2Module case, Cable and connector:

1. Use a cloth dampened with isopropyl alcohol 70%, a 10% aqueous solution of sodium hypochlorite (bleach), a 2% glutaraldehyde solution, ammonia, mild soap or disinfectant spray cleaner.
2. Wipe down with a clean water-dampened cloth to rinse and dry before use.

NOTE: Do not immerse or sterilise the Module.

Appendix I Accessories Specifications

Warning

The accessory models specified by the manufacturer are listed below. The use of other types of accessories may damage the monitor

1. ECG Accessories

Name	Specification
One-piece 3-lead cable	Plug: LEMO type 6PIN plug
	Cable: shielded wire
	Lead wire: single core double shielded wire
	Electrode connector: clip

2. SpO2 Accessories

Name	Specification
SpO2 sensor	Adopt imported special Nellcor sensor. Equipped with a large clip and a small clip. Probe: tongue or ear

3. TEMP (temperature) Accessories

Name	Specification
Body cavity probe	Plug: audio plug
	Probe: 2.25mm
	Accuracy: 30~45 ℃± 0.1℃

4. NIBP (blood pressure) Accessories

Disposable NIBP Cuff

Cuff size	Limb Circumference	Inflatable Tube Length
#1	3～6cm	1.5m～3m
#2	4～8cm	
#3	6～11cm	
#4	7～13cm	
#5	8～15cm	

5. ETCO2 (End-tidal carbon dioxide) Accessories

Name	Specification
Mainstream	Disposable adapter with big size and small size

Appendix II Product Specifications

1. Monitor Specifications

1.1 Monitor size and weight

Size	146mm x 67mm x 30mm
Weight	250g

1.2 Working Environment

Temperature
Operating: 0°~ 40°C
Storage/Transportation: -20°~+60°C
Operating Humidity: ≤80%
Storage/Transportation:≤ 93%
Working Altitude range: -500-4,600 meters (-1,600-15,000 feet)
Transportation and storage altitude: -500-13,100 meters (-1,600-43,000 feet)

1.3 Display information

Up to 3 waveform displays
An alarm indicator (red)
A battery charging status indicator (red/green)

1.4 Power

Input: 100～240 V AC, 50/60 Hz,
Output: DC: 5V, 2A
3.7V-2000mAh lithium rechargeable battery

2. ECG Specifications

2.1 Lead configuration

Standard 3-lead or 5-lead cable

3 lead	RA, LA, LL, lead mode: I, II, III
5 lead	RA, LA, LL, RL, V, lead mode: I, II, III, aVR, aVL, aVF, V

2.2 Gain

250, 500, 1000, 2000

2.3 Heart rate

Heart rate range: 15 ~ 350bpm (beat/min)
Accuracy: ±1% or ±1bpm, whichever is greater
Resolution: 1 bpm (beats/min)

2.4 Sensitivity

> 200 uV (peak-to-peak)

2.5 Input impedance

> 5 (Megaohm)

2.6 Bandwidth

Diagnosis mode: 0.05 ~ 130Hz
Monitoring mode: 0.5 ～ 40Hz
Operation mode: 1 ～ 20Hz

2.7 Electrode polarization voltage range

300mV

2.8 Pacing pulse detection

For pacing pulses that meet the following conditions, it can be detected:
Amplitude: ±2mV ～ ±700mV
Width: 0.1ms ～ 2ms
Rise time: 10us ～ 100μs

2.9 Pacing pulse suppression

When the pacing analysis switch is turned on, the pacing pulses that meet the following conditions can be suppressed without affecting the heart rate calculation:
Amplitude: ±2mV ～ ±700mV
Width: 0.1ms ～ 2ms
Rise time: 10us ～ 100μs

2.10 Baseline recovery time

<3 seconds after defibrillation

2.11 Signal range
8mV (peak-to-peak value)

2.12 Calibration signal
1mV (peak-to-peak value), accuracy 5%

3. SpO2 specifications

3.1 Measuring range:
SpO2: 0-100%
PR: 0-500bpm
PI: 0.05%-20%

3.2 Accuracy range
SpO2: 70%-100%
PR: 30-500bpm
PI: 0.05%-20%

3.3 Accuracy
SpO2: ±3(70%-100%)
PR: ±3bpm (under exercise conditions: ±5bpm)

4.TEMP Specifications

4.1 Applicable temperature sensor
YSI series, CYF series

4.2 Measurement
Range 25 ～ 45 ℃
Resolution 0.1 ℃
Accuracy 0.1 ℃ (not including sensor error)

5. NIBP specifications

5.1 Measurement method
Pulse wave oscillation

5.2 Working mode
Manual / automatic / continuous measurement

5.3 Measurement interval time in automatic measurement mode
1,2,3,5,10,15,30,60,90

5.4 Pulse rate range
40 – 240 bpm

5.5 Range
Systolic blood pressure: 40 ~ 270 mmHg
Diastolic blood pressure: 10 ～ 230 mmHg
Average pressure: 20 ～ 210 mmHg
Static pressure range: 0 ~ 300 mmHg
Static pressure accuracy: ±3 mmHg

5.6 Pulse rate range
40 – 240 bpm

5.7 Overvoltage protection
300mmHg

6. ETO2 specifications

6.1 Measuring range:
0-150mmhg
0-19.7%
0-20 kpa

6.2 Accuracy range:

ETCO2 Concentration	Accuracy
0-40mmHg	±2 mmHg
41- 70 mmHg	±5% of reading
71 – 100mmHg	±8% of reading
101-150mmHg	±10% of reading

6.3 Accuracy
CO2 concentration measurement resolution: 0.1mmHg

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