

SKX-1000

series

Oxygen simulator

Manual

Version: V 2.1

# Chapter 1: Features and functions of the instrument

The following are the same as the SKX-1000 series oxygen saturation simulator is developed by Xuzhou MingSheng company for the measurement of blood oxygen saturation product development and testing of the signal simulation tool, because it can produce different curves, different pulse amplitude of the analog optical Signal, is the development of blood oxygen products must be the preferred tool, which has a wide range of signal amplitude, can simulate a variety of strength, frequency of blood oxygen signal is the development of blood oxygen products, an important tool. The simulator also has a blood oxygen measurement product testing function, used to detect blood oxygen products, the parameters of the indicators can reach the national standard requirements. Subsequent chapters detail the settings in the inspection process.

SKX-1000D features are as follows:

built-in single 18650 large capacity lithium battery, power management module, in the course of use to ensure stable power supply, low interference output; battery full power, you can work 24 hours; voltage below 3.6V digital tube flashing display, Suggesting low power; external 4.2V DC power charger.

the use of keys to operate, you can directly change the parameters of the data bits, parameter changes simple, convenient, fast, user-friendly settings.

using 4 digital display parameters, showing the oxygen saturation value, pulse rate value, signal strength, curve selection and other parameters the simulator for the transmission of blood oxygen optical simulation

equipment.

you can set the oxygen saturation and pulse rate periodic automatic adjustment, automatic adjustment cycle can be set, the cycle is set to zero, said manual adjustment; for the production of aging when the value of self-change.

Partial performance of blood oxygen:

- external analog finger, you can easily connect any blood oxygen detection equipment;
- is a transmission of multi-function optical simulator, built-in commonly used BCI, Nellcor, Minary, Masimo four waveforms;
- Oxygen saturation simulation range:  
80%, 85%, 90%, 98%  
4 point value detection calibration, error  $\leq 1\%$ ;  
60%, 65%, 70%, 75%  
4 point value detection calibration, error  $< 2\%$ ;
- pulse rate simulation range:  
30, 60, 80, 100, 120, 160, 180, 240bpm  
A total of 8 test points, the error  $\leq 1$ bpm;

Note: the market common in the production of large manufacturers of blood oxygen products, the curve is mostly NELLCOR curve, a small amount of BCI, Mindray series products, please select the corresponding Minary curve; brand monitor if marked with MASIMO logo instruments, Please use the corresponding MASIMO curve. As the product database does not necessarily cover all the instruments at home and abroad, it may be some of the instrument can not be detected in blood oxygen or test the value of the gap, welcome feedback to my company for product improvement and upgrading!

SKX-1000E features are as follows:

on the basis of SKX-1000D, increased ECG, resp (Resp)Function.

with 10 ECG products, universal connector, easy to connect a variety of ECG test Product performance.

ECG part of the performance description:

- normal ECG waveforms, can output different amplitude and type of 12-lead synchronous waveform, I, II, III, AvR, AvL, AvF, V1, V2, V3, V4, V5, V6;
- positive and negative heart rate detection waveform, used to detect heart rate range;
- square wave, the use of square wave measurement scanning speed;
- sine wave, measure the amplitude and frequency characteristics;
- can change the T wave amplitude, heart rate value, R wave amplitude, R wave width of the analog QRS waveform, by changing the width of the R wave to simulate adult or children or newborn ECG waveform;
- through the RA-LL standard II lead output vibration waveform, the baseline impedance is fixed to 1K, the impedance change is about  $2\Omega$  impedance respiratory waveform, and can change the respiratory rate of the value;
- can set the ECG waveform signal amplitude;
- Pulse pulse pacing signal with pulse width can be continuously adjusted for detecting ECP pulse pacing capability;

## Chapter 2: Precautions when using the instrument

because the oxygen saturation of the need to detect the corresponding optical signal, so the use of the simulator, please try to avoid the detection of light in the light, may cause numerical deviation, especially when the digital blood oxygen detection, If necessary, you can use some shading facilities for light block;

the simulation of the analog instrument has a positive and negative (or up and down) the direction of the only and must be in the right direction under the premise of the normal work;

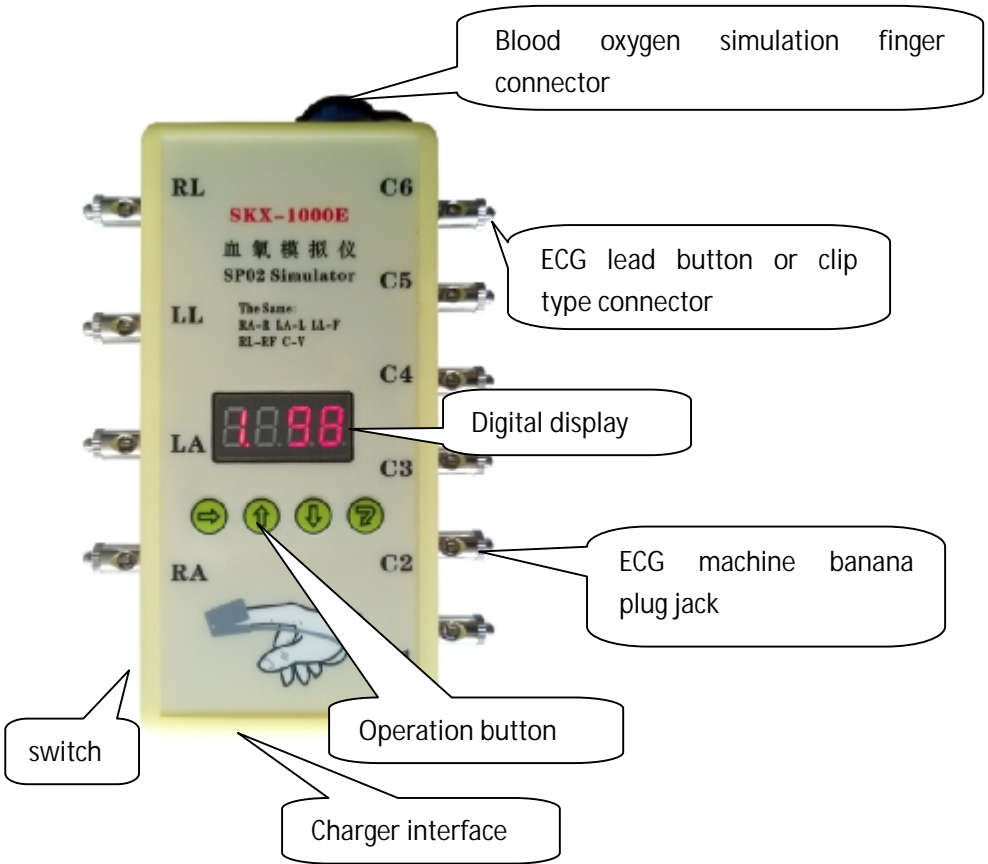
when the simulator work, if the connection using the charger, it may increase the ECG waveform frequency interference, under normal circumstances, the instrument ECG module part of this part of the interference will filter, respiratory waveform interference may be larger, will produce And superimposed sine wave signal, oxygen saturation of the analog waveform, will also cause the waveform superposition frequency interference;

when the digital tube flashing display, said the built-in battery voltage is lower than 3.6V, in this state can continue to work about 4 hours or so, then please note that the amplitude of ECG waveform will be reduced; in the state after this Please charge as soon as possible, so as not to affect the normal use;

the simulator power automatically generated after the oxygen saturation value of 98, the pulse rate of 80, NELLCOR curve of the blood oxygen parameters data and the code is 6 normal ECG waveform, breathing rate of 15bpm breathing waveform.

Note: When using NELLCOR or Mindray curve, please select 660nm/905nm oxygen probe, so easy and consistent with clinical data; when using BCI curve, please use 660nm/940nm blood oxygen probe, so easy and clinical Data consistency; when selecting MASIMO curve, please use MASIMO original probe

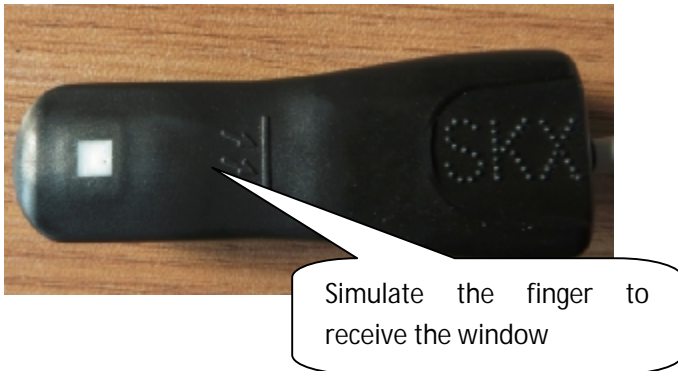
# Chapter 3: Instrument Connection Instructions




The connection between the oxygen probe and the simulated finger:




Place this side of the simulated finger (pictured above) on the receiving end of the oximeter



Place this side of the simulated finger (pictured above) on the red LED end of the oximeter

1, in the blood oxygenated finger  on the identification of the part, please face the oxygen probe part of the LED; in the blood oxygen

simulator finger  on the identification of the part, please face the oxygen tube receiver tube part, please be sure Note that the white window position on the finger needs to be aligned with the receiving tube position, otherwise it may cause a valid value to be obtained.

2, blood oxygen probe empty state, the oxygen probe red light is flashing, when the simulated finger into the oxygen probe, such as into the normal working condition, the blood oxygen probe is a red light is always bright state.

3, in the detection of oxygen saturation in the process, if the blood oxygen values have a certain deviation, you can repeatedly put the simulation finger to see if the numerical correction.

ECG part of the connection:

RA-R (right hand), LA-L (left), LL-F (left leg), RL-RF (N) (right leg), C1-C6 brachial

monitor connection: RA - right hand (white), LA - left hand (black), LL - left foot (red), RL - right foot (green), C1 - C6 chest (brown)

three guide connection method: RA - right hand (white), LA - left hand (black), LL - left foot (red)

European standard corresponding connection: L-LA R-RA RF (N) -RL F-LL C-V

the analog instrument boot when the default II lead amplitude is 1mV, in the heart rate detection waveform, square wave, sine wave, QRS wave, II lead the amplitude is 1mV, corresponding to the amplitude change changes.



## Chapter 4: Display Description

The simulator uses four digital tubes to display, each digital tube represents a different content, the following will be described in detail.



As shown above (1.98), from left to right a total of four digital tube, respectively, the following:

1, the first digital tube number 1, is the waveform code menu item, on behalf of the current analog instrument issued by the type of waveform, the specific waveform type code as follows

Waveform code	On behalf of the waveform
1	oxygen saturation value
2	pulse rate value
3	curve selection
4	pulse intensity
5	Oxygen saturation and pulse rate of the value of the automatic adjustment cycle
6	normal ECG waveforms
7	positive and negative heart rate detection waveform
8	square wave
9	sine wave
A	analog QRT waveform
B	can change the respiratory rate of respiratory waveform + fixed heart rate ECG waveform
C	Set the amplitude of the waveform size, the impact of the waveform for the 7,8,9, D, E

D(Extended)	ECG waveforms with pre-pacing signals can change heart rate and pacing pulses
E(Extended)	Positive and negative pacing pulse signal

2, the second, third and fourth digital tubes are the values of the specific parameters in the corresponding waveform menu items (corresponding to the hundred, ten and one of the parameters, respectively).

E.g:

When the display is 1.60, the current waveform is blood oxygen waveform, blood oxygen value is 60%

When the display is 1.98, the current waveform is blood oxygen waveform, blood oxygen value is 98%

When displayed as 2.80, the current waveform is a blood oxygen waveform with a pulse rate value of 80 bpm

When displayed as 6.60, the current waveform is ECG waveform, heart rate value of 60bpm

When displayed as 7.75, the current waveform is the heart rate detection waveform with a heart rate of 75 bpm

When the display is 8.10, the current waveform is square wave and the square wave frequency is 1Hz

When the display is 9.10, the current waveform is a sine wave and the frequency of the waveform is 10Hz

When displayed as A. 20, the current waveform is the QRS-T waveform, and the amplitude of the T wave is 0.2 mV

When displayed as b. 15, the current waveform is the respiratory wave, the respiration rate is 15 times / min

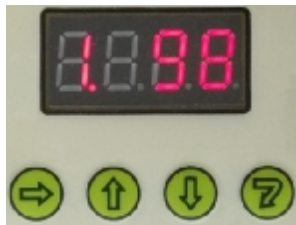
When displayed as C. 100, the amplitude of the current waveform is 1mV

When the current waveform is shown as d. 30,

the ECG waveform of the current waveform with the pacing signal, the pre-pacing pulse width is 30mS, the heart rate is 75bpm  
When displayed as E. 20, the current waveform is the pacing pulse signal with a pulse width of 2 mS

## Chapter 5: Key Description

The simulation of a total of four buttons, as shown below, respectively, shift selection key, the value of the increase key, the value of the key to confirm the change key; the following details of the four key functions.



As shown above, the current display of the digital tube is 1.98, the number 1 in the lower right corner of the digital tube has a red decimal point, representing the current number for the menu option can be changed;

Shift selection key: This button is used to select the content you want to change, if you want to change the type of waveform, use this button to move the red decimal point to the first digital tube can be;

Increment key: Increases the value of the current change;

Value reduction key: Decreases the value of the current change item;

Confirm Change Key: Select this button to confirm the change when the current change item changes;

For example: when the current display is 1.98, it is necessary to change the waveform of the waveform to normal ECG and change the heart rate to 178.

Then follow the following operational procedures to operate (general process):

by shifting the selection key, the red decimal point shift to the bottom of

the first digital tube (if the original here, please omit this step),  
select the value increase key, the first digital display will be changed to 6,  
press the confirm button to change, then the display of digital control to 6.  
60, said the current waveform has been changed to normal ECG waveform,  
the current heart rate of 60bpm;  
use the shift selection key, move the red decimal point to the second  
digital tube (the value of the hundred)  
select the value of the increase key, the second digital display content is 1,  
continue to use the shift selection key, move the red decimal point to the  
third digital tube (the value of the ten)  
select the value of the increase key, the third digital display content is 7,  
continue to use the shift selection key, move the red decimal point to the  
fourth digital tube (numerical bit),  
select the value of the increase key, the fourth digital display content is 8,  
the current heart rate that the value of the change is completed,  
finally select the Confirm Change button to confirm the changed content,

At this point the emulator issued by the waveform for the normal ECG  
waveform (waveform code 6), heart rate of 178bpm. A single change is  
complete.

How to use the key combination:

In the waveform of the waveform code A simulation QRS-T, you need  
to use the key combination to change the contents of each parameter, the  
following details of the operation:

first in accordance with the above general process to change the waveform  
to code A (analog QRS-T wave), then the digital display value of 10, said T  
wave amplitude of 0.1mV;

use the key combination, according to the following process operation keys  
to use the key combination

first press and hold the shift selection key at the same time, press the

confirm button to confirm,  
then release the confirmation button,  
and then release the shift selection key,  
press the Enter key twice again,  
then the digital display of the value of the display changes to 75, that the  
current R wave frequency of 75bpm; then use the key combination, the  
display content is updated to 100, that the current amplitude is 1mV; then  
use the key combination, the display update to 80, the bottom width of the  
R wave is 80ms; the above parameter options can be changed using the  
key combination

## Chapter 6: Parameter Performance Description

The following describes the waveform code for the 1-E waveform parameter content and setting range

1, oxygen saturation value:

- ★ 90%, 80%, 80%, 75%, 70%, 65%, 60%; initial value: 98%;
- ★ through the numerical increase key, the value of the key can be directly selected and set the blood oxygen value, do not need to confirm the change button.

2, pulse rate value:

- ★ pulse rate value set a total of eight sub-file, respectively, 30bpm, 60bpm, 80bpm, 100bpm, 120bpm, 160bpm, 180bpm, 240bpm;
- ★ error  $\leq$  1bpm;
- ★ initial value of 80bpm, through the numerical increase key, the value of the key can be directly selected and set the blood oxygen value, do not need to confirm the change button.

3, the waveform data curve selection: the current support a total of four kinds of curves, respectively

- Data 1 is the BCI curve;
- Data 2 is NELLCOR;
- Curve, 3 is the Mindray curve;
- Data 4 is the MASIMO curve.

4, the amplitude of the oxygen pulse signal (AMP)

- ★ amplitude value: 20%, 10%, 5%, 4%, 2%, 1%, the initial value of 10%.

5, the value automatically changes the time period

- ★ 0 means to manually change the value;
- ★ 1-60 that automatically change the time period, the unit is minutes;
- ★ When the value is set to automatically change the value, the value of the oxygen saturation value and the pulse rate are changed according to the set automatic period, and a total of 8 sets of data are changed.

6, the normal ECG waveform:

- ★ Heart rate setting range: 10-200bpm, initial value: 60bpm;
- ★ In this waveform option, the waveform of each waveform is fixed.

7, positive and negative heart rate detection waveform:

- ★ frequency range: 10-400bpm, the initial value: 75bpm;
- ★ range: 0.1-4Mv;
- ★ The two modes are forward waveform and negative waveform, respectively; through the combination of keys to choose.

8, square wave:

- ★ frequency range: 0.1Hz-10Hz, the initial value: 10 (1Hz);
- ★ range: 0.1-4Mv.

9, sine wave:

- ★ frequency range: 1-100Hz, the initial value: 25 Hz;
- ★ range: 0.1-4Mv;

A, analog QRS-T waveform:

- ★ This waveform has a total of 4 kinds of work mode
- Mode 1: can change the amplitude of the T wave;
- Mode 2: Set the waveform frequency (heart rate);
- Mode 3: Set the amplitude of the QRS waveform (R wave amplitude);
- Mode 4: Set the width of the QRS waveform;



Work mode in turn through the key combination to convert;

- ★ T wave amplitude setting range: 0.1mV-2mV, the initial value: 10 (0.1mV);
- ★ Waveform frequency setting range: 20-300bpm, initial value: 75bpm;
- ★ QRS waveform amplitude range: 0.1mV-2mV, the initial value: 100 (1mV);
- ★ QRS waveform width range: 10ms-150ms, the initial value: 80ms.

B, simulated breathing waveform:

- ★ frequency range: 10-100 times / min, the initial value: 15bpm;
- ★ Please note that the respiratory lead is RA-LL and the baseline impedance is 1K. If the monitor responds to other leads, set the monitor's breathing lead to RA-LL or change the corresponding lead connection.

C, signal amplitude setting:

- ★ Range: 0.1mV-4mV, the initial value: 100 represents 1mV
- ★ Please note that this amplitude setting will affect the waveform amplitude of 7, 8, 9, D,

D, simulation of pre-pacing signals QRS waveforms

- ★ mode one: the forward positive pacing pulse ECG signal;
- ★ mode 2: front negative pacing pulse ECG signal, through the combination of keys to choose;
- ★ Pulse waveform width: 1ms-30ms; (initial value: 30), the rising edge is less than 300us;
- ★ heart rate range: 20-250bpm; (initial value: 80ms);
- ★ pulse waveform width adjustment, affecting the pulse mode in both modes;
- ★ The amplitude of the pulse waveform is set by the signal amplitude of code C.

E, positive and negative direction of the pacing pulse signal

- ★ mode one: positive pacing pulse;
- ★ mode two: negative pacing pulse, through the combination of keys to choose;
- ★ Pulse waveform width: 1 (0.1ms) -20 (2ms), the rising edge is less than 300us;
- ★ heart rate fixed to 60bpm;
- ★ The amplitude of the pulse waveform is set by the signal amplitude of code C.

## Chapter 7: service

The company will provide you with a monitor from the date of purchase for a period of two years warranty, warranty expires, responsible for life-long maintenance, and according to the provisions of the cost of maintenance materials.

\* Our company will not provide free warranty service for the following reasons:

- Failure to disassemble or modify the product.
- The simulated finger is damaged by external damage and no warranty is provided.
- Inadvertently beaten or falling during use and handling.
- Failure due to lack of reasonable maintenance and failure to meet environmental requirements.
- Failure to operate in accordance with the correct instructions of the operating manual.
- Failure caused by self-maintenance without my company's permission.
- Disaster caused by natural force caused by natural disasters, fires, earthquakes and so on.

\* If you need warranty service, please contact us directly by telephone, letter, fax or other technical service center, such as contact with other personnel or department, may lead to information transmission interruption, resulting in time and service Misunderstanding, the most important thing is to affect your normal use.

\* service information:

- Full name: Xuzhou Ming Sheng Electronic Technology Co., Ltd.
- Company Address: Building 4, Jianghai Stainless Steel City, Yunlong District, Xuzhou City.
- Postal Code: 221004
- Phone: 0516-93460606,83469046
- Fax: 0516-83469046
- E-mail: xzFRD.163.com
- Company website: [WWW.XZMSDZ.COM](http://WWW.XZMSDZ.COM)