S10&S12 Patient Monitor
Service Manual

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Chapter 1 Summary

1.1 About the Manual

1.1.1 Notes

This service manual introduces in detail the hardware composition, assembling, disassembling, testing and trouble-shooting of this product and its relevant spare parts so as to facilitate the maintenance personnel to handle common failures more effectively. This service manual does not provide profound introduction on the product's structure and design mechanism, and in case of unsolvable problems, please contact the after-sale department of our Company.

This service manual introduces the product based on its basic configuration; therefore, part of its content may not apply to the product that you maintain. In case of any queries, please contact the after-sale department of our Company.

Prior to product maintenance, you are kindly requested to carefully read this service manual, and ensure that you have fully understood its content so as to guarantee that maintenance work can be executed appropriately to avoid causing product or personal damages.

1.1.2 Users of the Manual

This manual is targeted to technicians, maintenance workers of biomedical instruments and after service commissaries.

1.1.3 Intended Use

The monitor is intended to be used for monitoring, displaying, reviewing, storing and alarming of multiple physiological parameters of patients, including ECG, ST segment analysis, arrhythmia analysis, Heart Rate (HR), Respiration Rate (RR), Temperature(Temp), Pulse Oxygen Saturation(SpO2), Pulse Rate(PR), Non-invasive Blood Pressure(NIBP), Invasive Blood Pressure(IBP), Carbon dioxide(CO2), Cardio Output(C.O.).

The monitor is intended to be used ICU, PICU,NICU,OR, ER, general ward and so on.

Warning:

The monitor is intended for use only by clinical Professionals or under their guidance. It must only be used by persons who have received adequate training

in its use. Anyone unauthorized or untrained must not perform any operations on it.

1.2 Safety Information

1.2.1 Terms

The terms in the manual (e.g. danger, warning, caution, and note) point out the hazard, and inform users of the issues they should pay attention to during the operations according to different degrees of severity.

Danger

It indicates urgent danger, which, if not avoided, might cause death, severe personal harms or property loss.

Warning

It indicates potential dangers or unsafe maintenance operations, which, if not avoided, might cause death, severe personal harms, product damage or property loss.

Caution

It indicates unsafe maintenance operations, which, if not avoided, might cause slight personal harms, product damage or property loss.

Note

It emphasizes important notes, provides explanations or interpretation so as to better service this product.

1.2.2 Danger

This Manual does not involve any indicative information of danger class.

1.2.3 Warning

■ Only the Company's authorized professional maintenance personnel can disassemble the monitor.

■ Before Disassembling the monitor, make sure the AC power code unplug, and batteries are removed, so as to avoid high-voltage electric shock.

■ Please connect the monitor to a socket with protective earth. If the socket does not have protective earth conductor, please do not use the socket and use battery to provide power to the monitor

■ Keep the packing materials out of children's reach. Disposal of the packing materials should observe the applicable waste control regulations.

1.2.4 Caution

■ When the monitor is conducting some performance tests, make sure the monitor will not be interfered by electromagnetic radiation. Mobile phones, X rays or MRI equipment are all possible interference sources, because they can produce high-intensity electromagnetic radiation.

■ Before energizing the monitor, make sure the voltage and frequency of the power conform to the requirements specified in the label on the monitor or in this Manual.

■ During maintenance, pay attention to preventing the monitor from falling, being knocked, or intensely shaken or damaged by other mechanical forces.

1.2.5 Note

For the detailed operation and other information, please refer to the User's manual.

1.3 Equipment Symbols

Symbol	Symbol Note	Symbol	Symbol Note
	Attention: Consult accompanying documents (this menual).	**ECG**	Short for "Electrocardiogram"
	Non-ionizing radiation	**SpO2**	Short for "Pulse Oxygen Saturation"
	Dangerous voltage	**TEMP**	Short for "Temperature"
	Equipotential grounding	**IBP**	Short for "Invasive Blood Pressure"
	Alternating current	**NIBP**	Short for "Non-invasive Blood Pressure"
	Auxiliary output connector	**CO_2**	Short for "Carbon dioxide"
	DVI display connector	**C.O.**	Short for "Cardio Output"
	VGA display connector		USB socket

Symbol	Symbol Note	Symbol	Symbol Note
	Network connector		Defibrillator synchronization output connector
	Manufacture date		Manufacturer
SN	Serial number	**REF**	Catalog number
CE 0123	CE mark		
	Symbol for the marking of electrical and electronics devices according to Directive 2002/96/EC.		
	Type CF applied part, defibrillation protected The unit displaying this symbol contains an F-Type isolated (floating) applied part providing a high degree of protection against shock, and is defibrillator-proof.		
	Type BF applied part, defibrillation protected The unit displaying this symbol contains an F-Type isolated (floating) applied part providing a high degree of protection against shock, and is defibrillator-proof.		

Chapter 2 Monitor Introduction

2.1 Main Frame

2.1.1 General Introduction

The monitor is intended to be used for monitoring of multiple physiological parameters of patients, including ECG, ST segment analysis, arrhythmia analysis, Heart Rate (HR), Respiration Rate (RR), Temperature(Temp), Pulse Oxygen Saturation(SpO2), Pulse Rate(PR), Non-invasive Blood Pressure(NIBP). Besides, it can upgrade to Invasive Blood Pressure(IBP), Carbon dioxide(CO2), Cardio Output (C.O.) and Drip Monitor (DM)

Over view

S10 S12

This monitor also provides the following functions:

◆Conduct visual and audio alarms on patients' physiological abnormalities and equipment's technical problems.

◆Conduct real-time display, review, storage, and output of the monitored parameters or waveforms.

◆Multiple operation input mode, including, touch-screen and mouse.

◆Wire connection with CMS system provided.

◆Options : DM module, recorder, trolley,wall mount,Large capacity battery act.

2.1.2 Appearance, interfaces

2.1.3 **Hardware Structure**

The monitor is composed of the following parts:

◆Input system: touch-screen, power switch

◆Output system: display screen, alarm indicator board, recorder, loudspeaker

◆Processing and communication system: main-board

◆Power management system: battery and power supply module

◆Equipment interface system: connector panel A/B (ECG, SpO2,NIBP, TEMP) , connector panel C (2-IBP,CO2, C.O.)

2.1.3.1 Input System

◆Touch-screen

The touch-screen is capacitive screen, supports touch control function,easy to operate. It can be calibrated and connected with the main-board.

◆Mouse

The monitor can connect a mouse to operate.

◆ Power switch and indicator board

It has three groups of LEDs used for indicating the status of AC power and battery. It is connected with main-board.

2.1.3.2 Output System

◆Display

The monitor has a built-in high-brightness LCD display.The display is connected with the main-board.

◆Alarm light

The monitor comprises two kinds of alarm lights: physiological alarm lights and

technical alarm lights. The physiological alarm lights can emit light in two colors of yellow and red and technical alarm lights can emit light in blue color. They both support different flashing frequencies.

◆Recorder

The recorder receives the data transmitted by the main-board and then transmits the data to the thermal print head for print-out. The front panel of the recorder has an orange indicator (it lights up when an alarm or error occurs) and a green indicator (it lights up during normal operation).It is connected with the main-board.

◆Loudspeaker

The loudspeaker is used for sounding alarm, touch tones, heartbeat tones and pulse tones and is supports the multi-volume function. It is connected with the main-board and its DC power is supplied by the main-board.

2.1.3.3 Processing and Communication System

◆Main-board

As the heart of the monitor, the main-board accomplishes such a series of tasks as input and output control, data storage and processing, display processing, system control, communications management, printing management and failure alarm.

2.1.3.4 Power Management System: Battery, Power Module

◆Battery

the monitor supports DC power supply, and can use two types of rechargeable lithium batteries: 11.1V/5000mAh and 11.1V/2500mAh. Working time up to 4 hours (2500mAh) or 8 hours (5000mA) (One new fully charged battery with a temperature of 25℃, ECG, SpO2 are connected, and NIBP in automatic mode at intervals of 30 minutes);

◆Power module:

AC: 100-240V (±10%), 50/60Hz, ≤100VA;

2.1.3.5 Equipment Interface System:

◆connector panel A/B (DM,ECG, SpO2,NIBP, 2-TEMP);

◆connector panel C (2-IBP, CO2, C.O.);

◆Interfaces on main board（VGA,USB, RJ45,SCSI）;

1) VGA interfaces: It can be connected with VGA video output;

2) Network interface: It is networked with the central monitoring system via the internet;

3) USB interface: It can connect with mouse and keyboard to facilitate the

operation and entry of relevant information; Software update, supply the power to WiFi module and so on;

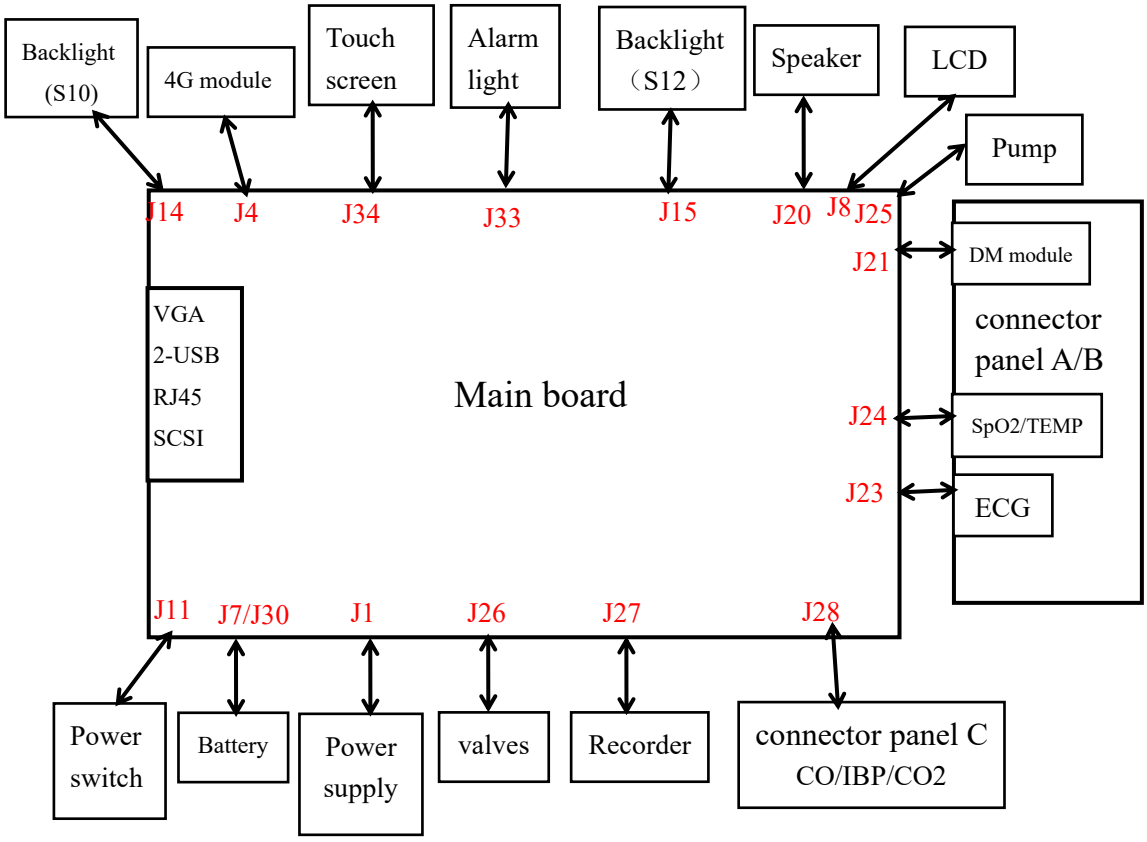
4) SCSI Interface:

* Defibrillation synchronous output/Analog output interface: it is connected with the defibrillation device and sends defibrillation synchronous signals. And also connected to device, such as oscilloscope and sends analog signals.

* Nurse call output interface: It can be connected with the hospital's call system, which, in case of an alarm, sends out a nurse call signal to alert the nurses.

2.1.4 Design Principle

Schematic diagram:



2.2 Accessories

2.2.1 General Accessories

General accessories mostly contains ECG cable,SpO2 sensor, NIBP cuff, Temperature probe, in addition, it contains mainstream CO2 measurement groupware, micro stream CO2 measurement groupware, C.O. interface cable and pulmonary

artery catheter. More than this, the monitor also could install trolley, wall mount, and rechargeable lithium.

1. ECG cable

12PIN 3-lead ECG cable (IEC)
(15-031-0013)

12PIN 5-lead ECG cable (IEC)
(15-031-0002)

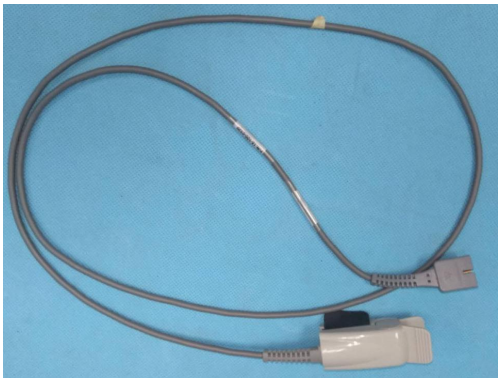
12pin12-lead ECG cable (IEC)
(15-031-0001)

2. SpO2 probe and extension

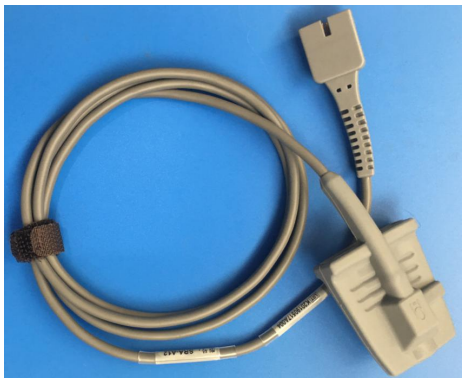
analog SpO2 adult reusable sensor
（15-100-0358）

analog SpO2 adult soft reusable sensor
（15-100-0359）

analog SpO2 extension cable
（15-100-0357）



analog SpO2 adult reusable sensor (9pin)
（15-100-0320）



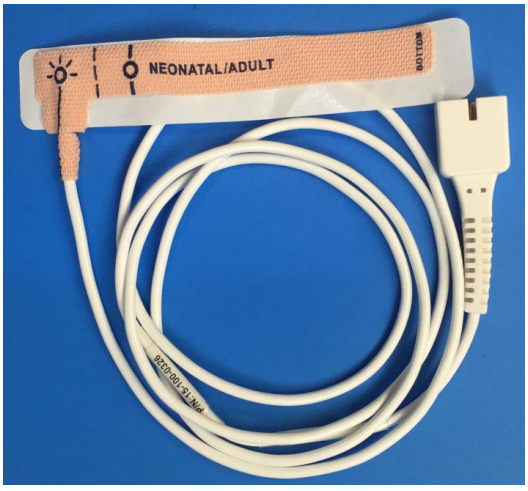
analog SpO2 adult soft reusable sensor(9pin)
（15-100-0321）

analog SpO2 pediatric reusable sensor(9pin)
（15-100-0322）

analog SpO2 pediatric soft reusable sensor(9pin)
（15-100-0360）

analog SpO2 neonatal reusable sensor (9pin)
（15-100-0324）

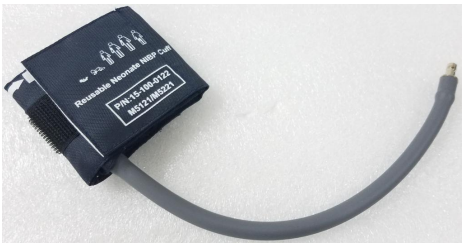
analog SpO2 reusable Y multi-site sensor(9pin)
（15-100-0353）



analog SpO2 neonatal/adult disposable sensor (9pin)
（15-100-0326）

3. PVC tube & Cuff

NIBP PVC tube
(15-031-0008)



Neonatal Cuff M5121（6cm-11cm）
（15-100-0122）

Infant Cuff（M5122-2)(10cm-15cm)
(15-100-0155)

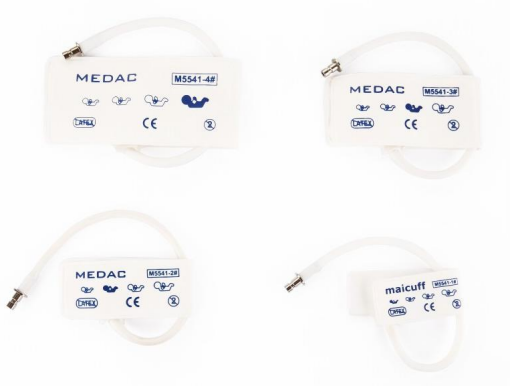
Child Cuff　(M5122-1)(14cm-20cm)
（15-100-0154）

Pediatric Cuff　M5123（18-26cm）
（15-100-0121）

Adult Cuff　M5124(25cm-35cm)
（15-100-0118 ）

Large Adult Cuff M5125（33cm-47cm）
（15-100-0120）

Adult Thigh Cuff M5126（44cm-53cm）
（15-100-0142 ）



Neonatal disposable Cuff pack M5541(1#,2#,3#,4#)
（15-100-0104/105/106/107）

4. TEMP sensor

TEMP skin probe
（15-031-0005）

TEMP Rectal/ Esophageal probe
（15-031-0015）

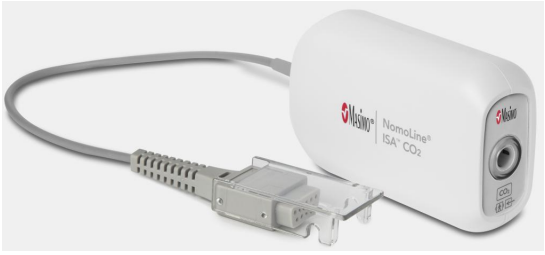
5. IBP interface cable

IBP transducer interface cable（UTAH）
（15-100-0029 ）

IBP transducer interface cable（BD）
（15-100-0032）

4 pin to 6pin IBP extension connector (15-031-0023)

6. CO2 sensor (Masimo)



ISA CO2 sensor（Masimo）
16-100-0116

CO2 extension cable（Masimo）
15-031-0010

NomoLine Nasal CO2 Cannula (3830)

NomoLine Airway Adapter Set (3827)

IRMA CO2 sensor（Masimo）
16-100-0017

Airway adaptor(Adult / Pediatric)
15-100-0039

Airway adaptor (Neonatal/Infant)
15-100-0040

7. CO2 sensor (BLT)

Capno-M CO2 sensor
15-100-0199

CO2extension cable
15-031-0011

Airway adaptor(Adult / Pediatric)
15-100-0212

Capno-S CO2 swnsor
15-100-0185

CO2 filter T4F
15-100-0354

CO2 Nasal Cannula - Adult
15-100-0187

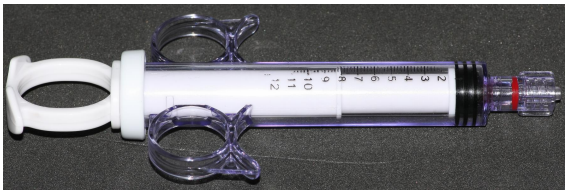
Sampling line (15-100-0035)

3 way airway adapter (15-100-0074)

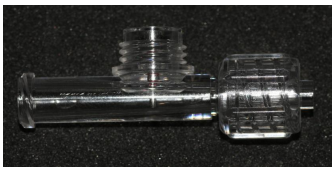
8. C.O.

Cardiac output cable
15-100-0148

In-line Injection temperature probe (SP4042)
15-100-0147



Control Syringe(12ml)
15-100-0169



In-line Injection temperature probe housing(BD SP5045)
15-100-0146

9. DM module (Drip Monitor Module)

DM module

10. Others

Wall mount
20-100-0029

Trolley
20-100-0028

Rechargeable lithium battery(2.5A/5A)
12-100-0031/32

2.2.2 Management and Maintenance of Accessories

Refer to the User's manual.

Chapter 3 Testing

3.1 Brief Introduction

To ensure the long-term and stable working of the monitor, maintenance personnel need to conduct regular checks, maintenance and testing on it. This chapter provides the basic testing methods of the monitor and recommends the applicable testing frequency and testing tools, and the maintenance personnel are requested to conduct maintenance and testing on the monitor according to actual demands and choose applicable testing tools.

The testing and verification methods provided by this chapter are mainly used for verifying whether the monitor's performance has reached the specification requirements. During the tests, if the test results can not reach the requirements, it indicates the monitor or a certain function module of the monitor has failures and they need to be repaired or replaced. If you have any query, please contact the after-sale department of our Company.

Caution:

- **All the testing must be done by qualified service personnel.**
- **When setting up and changing the contents in the two menus of 【Config Manage】and【Maintenance】, please be cautious, otherwise it might cause data loss.**
- **Prior to executing tests, the service personnel are kindly requested to ensure the applicability of the testing tools and cables and service personnel shall be familiar with the use of these testing tools.**

3.2 General Testing

3.2.1 Visual Check

Visual check is mainly for overall appearance check on the monitor, and if the monitor has no obvious physical damage, visual check is qualified.

Check items are as follows:

1. Whether the host monitors' enclosure, display screen or keys have any physical damage.
2. Whether accessories have any physical damage, any wear or tear, whether the

connector pins have any loosening or distortion.

3. Whether the peripheral interface of the monitor has any loosening or pin distortion.

4. Whether the safety labels or name plates are legible.

3.2.2 Startup Testing

Startup test is used to verify whether the monitor can be normally started to work, and if the monitor can accomplish startup according to the following procedures, the startup test is qualified. The procedures are as below:

1. Connect the monitor to the AC power. AC power indicator lights up.

2. Press the power switch, the technical alarm indicator lights up in blue, and the physiological alarm indicator lights up in yellow and red in turn and then goes off, the screen displays the startup image.

3. After the startup image disappears, the system produces a “dang” sound and goes into the main screen; at the same time, the technical alarm light goes off.

4. The monitor goes into the system’s main screen and normal startup is completed.

Warning:

If the monitor is mechanically damaged, or if it is not working properly, do not use it for any monitoring procedure on a patient. Contact your service personnel.

Caution:

- **The monitor does not have mains switch. The monitor is switched completely only by unplugging the power cable from the AC power source. In order to unplugging and plugging it, the socket on the wall must approximate to monitor.**
- **For measurements in or near the heart we recommend connecting the monitor to the equipotential grounding system. Use the green/yellow equipotential grounding cable and connect it to the terminal labeled with the symbol ⏚ .**

3.3 Performance Testing

3.3.1 ECG Testing

Testing tool: ECG Simulator

1. connect the ECG lead wire to the simulator and monitor.

2. The setting of the simulator is as follows: HR 80 bmp, gain selection is 10mm/mV.

3. Observe whether the monitor displays correct ECG waveforms and HR.

4. Adjust the ECG gains and HR values and verify whether the monitor's ECG waveforms and HR values have relevant changes.

3.3.2 NIBP Testing

Testing tool: BP simulator

1. Insert the NIBP pvc tube plug into the NIBP socket of monitor and make sure in good contact.
2. Connect the other side of the tube to the simulator, and the simulator's configuration: preset: 120/80 (93), cuff: internal Adult.
3. Measure blood pressure; observe whether the measured value and the set value of the simulator. (generally within 3mmHg).

3.3.3 SpO2 Testing

Testing tool: SpO2 simulator

1. Plug the SpO2 sensor tightly into the SpO2 socket of the monitor.
2. Connect the other side of SpO2 probe to the simulator.
3. The parameter setup in the simulator is as follows: SpO2 is 96%; pulse rate is 80 bpm.
4. Observe whether the monitor displays correct SpO2 waveforms and pulse rate.

3.3.4 TEMP Testing

Testing tool: resistance box

1. Connect the TEMP socket of monitor to two sides of the resistance box with two cables.
2. The setup of resistance box is 1354.9Ω (the corresponding TEMP value is 37℃).
3. Observe the monitor's display value shall not exceed 37±0.2℃

3.3.5 Resp Testing

Testing tool: ECG simulator

1. Connect the ECG cable to the simulator.
2. The setup of the simulator: base resistance is 1000 Ω； variable resistance is 1Ω； Resp rate is 30 rpm.
3. Observe whether the Resp waveform displayed by the monitor is normal. Resp value shall not exceed 30±2 rpm.

3.3.6 IBP Testing

Testing tool: IBP simulator

1. Connect the simulator with the IBP socket of the monitor.
2. Set the simulator to zero pressure.
3. Press the "zero" option of IBP menu to zero until the screen display "zero success".
4. Set the monitor's static pressure p= 200mmHg.
5. The display value of the monitor shall not exceed 200±4mmHg.
6. Set up the simulator IBP values as 120/80,120/25,120/0, 25/0, and observe whether the waveforms and values displayed by the monitor are correct or not.

3.3.7 Recorder Testing

1. Print the ECG waveform, the recorder shall print normally and the printing is clear and consistent.
2. In case of such failures as paper lack or paper jam, the screen shall have relevant indication and after restoration, it shall work normally.
3. Test alarm printing of parameters, turn on the alarm record switches of the parameters, set up different alarm limits, and in case of a parameter alarm, there shall be the relevant printout of the parameter alarm.

3.3.8 Mainstream CO2/Microstream CO2 Testing

1. Connect the sensor to the extension, and then connect the other side of the extension to the monitor; then the monitor will display sensor warnup
2. when the monitor display alarm message "check adapter", then pulgin the airway adapter （or sampling line）, then alarm message disappear. then put the sensor (or sampling line) in front of the nose and breathe, observe whether CO2 waveform and value appear on the screen, and then put the sensor （or sampling line）still in the air, and in 10s, the alarm message of "Apnea" is generated.
3. Remove the sensor, and the screen displays "CO2 sensor off".

3.3.12 C.O. Testing

Testing tool: FLUKE vital sign simulator

1. Connect one terminal of the "C.O. cable" to the monitor, the other terminal connect to the vital sign simulator, then select the simulator, enter 2.5L/min of the cardiac output wave, 24℃ of injection and 37℃of base temperature of blood;
3. Monitor select the C.O. parameter zone to enter into the menu of【**C.O. Setup**】, and select the 【**TI Source** 】to manual, select the 【**Setup TI**】to 24℃, select 【**Cath. Const**】to 0.595,

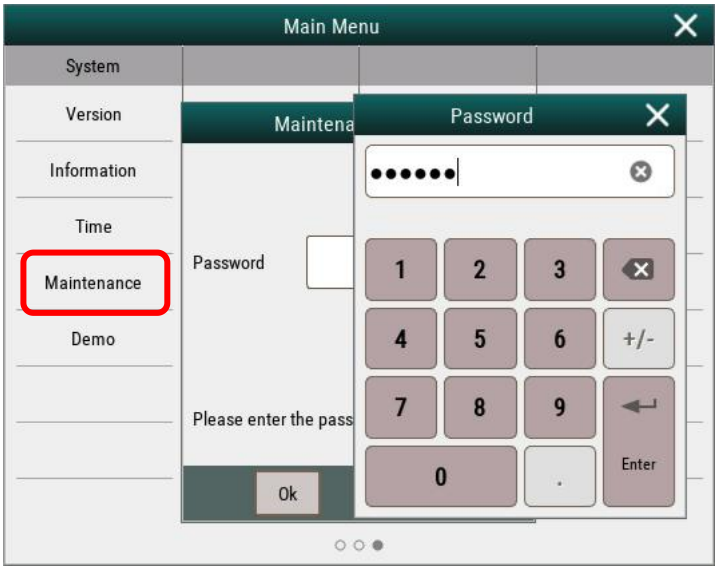
then close the 【**C.O. Setup**】menu.

4. Select 【**C.O. Measure**】， to open the C.O. measurement window, when the screen show that "Ready for new", select 【**Start**】to measure the C.O., when the screen show that "Injection now …", enter the start key of the simulator, observe the wave, waiting for the measured values.
5. Change the C.O. wave to 5 L/min， 10 L/min， then measure again and record the measured values.
6. The measured values compare to the value entered on simulator, the standard error shall be ±0.2L/m.

Chapter 4 Maintenance

4.1 Maintenance Menu

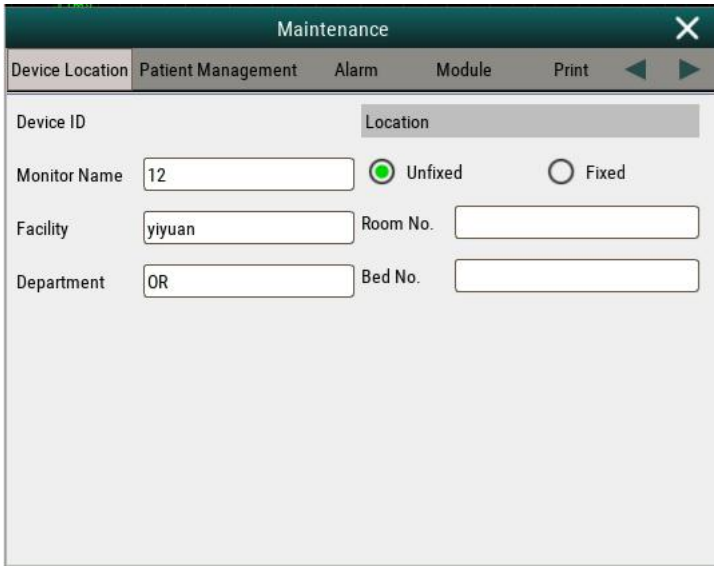
Enter 【main menu】， select【system】→【Maintenance】, input password: **785 623** , and then enter maintenance menu:



Demo password ： **888 888**

1. Device location

Device ID setup: set Monitor name, Unfixed or Fixed, Facility, Room No., Bed NO. and department of Hospital.



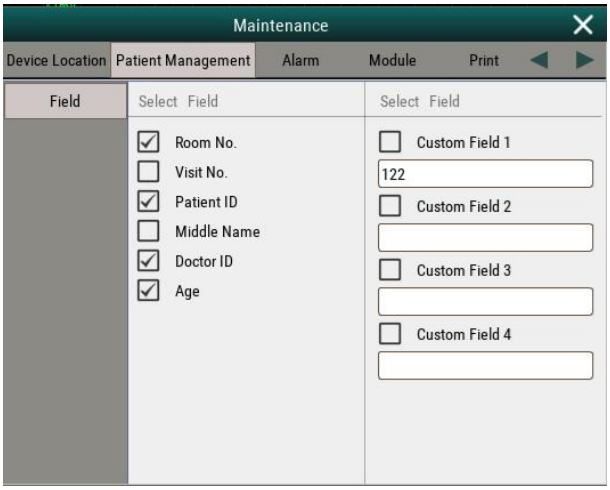
2 Patient Management

Set the field:

Select the items for the patient field (Room No., Visit No., Patient ID, Middle name, Doctor ID,

Age) to display on the patient info menu.

Custom fields: Users can define their own field, up to 4 types.

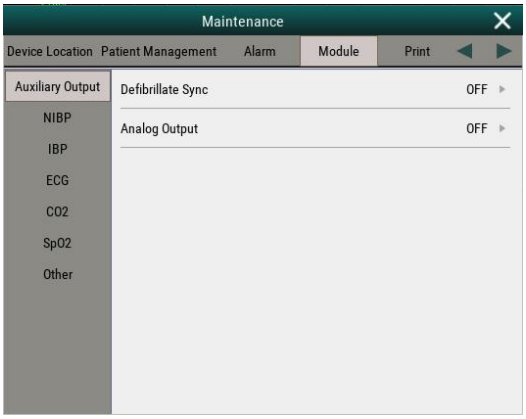


3 System alarm setup

1) Sound: sent the type of the sound and the alarm internal;
2) Pause/Reset: set alarm pause duration and alarm off reminder (interval);
3) Latching: set different level alarm to visible or audible;
4) Nurse Call: set the alarm type for the nurse call function;
5) Remote View: Set remote bed's alarms;
6) Other:set alarm delay, intubation duration, alarm level;
7) Note: This menu has been set in factory, do not change the settings without special requirements

4 Module

1) Auxiliary: Enable or disable Defibrillate Sycn. and Analog Output function ;
2) NIBP: for NIBP testing (Over pressure Test, Static pressure test, Pressure calibration), for NIBP maintenanve.
3) ECG: set ECG filter user mode, ECG standard, QTc formula or enable ECG gain 0.125; ECG calibrate is not available for user.
4) CO2: Set the CO2 sensor type, set Atm. Pressure, and CO2 calibration.
5) SpO2: enable or disable function "Use Soft Algorithm, Low confidence Display ? "
6) Other: Set NIBP or C.O. Invalid Time



5 Ptint

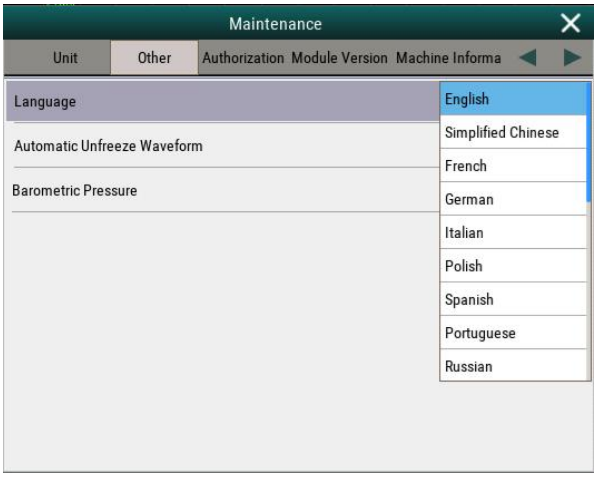
1) Active Grid print
2) Set the network printer service IP (network printer function is not available).

6 Unit

Set the unit for Height, Pressure and Weight

7 Other

1) Select different language menu （22 types）
2) Set the time of Automatic Freeze Waveform
3) Set the Barometric Pressure



8 Authorization

1) Set the Retention time
2) Set the password for alarm setup
3) Set the password for configuration setup

9 Module version

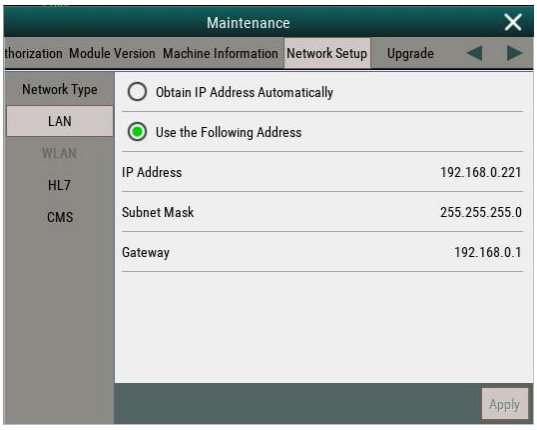
Check the hardware and software of every parameter

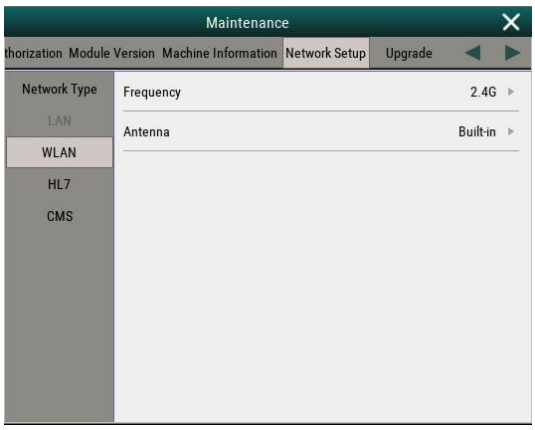
10 Machine Information

1) Check the battery voltage
2) Check the touch screen information
3) Statistics : only for R&D testing

11 Network setup

1) Network type : set the network type of the monitor to LAN or WLAN
2) LAN: Set the IP address of the monitor if the monitor need to connect to the central monitoring system with network cable. (Pic. LAN)





Pic LAN Pic WLAN

3) WLAN: Set the frequency of the wifi module, and set the type of the wifi module to external or built-in. This menu is for the wifi central monitoring system. (Pic. WLAN)

4) HL7: if monitor connects to HIS, then can set the data that send to the HIS. For the setting details, please contact to manufacturer directly.

5) CMS: if monitor connect to central monitoring system, then can set the the IP address of the CMS, and the device no. of the monitor.

12 Upgrade

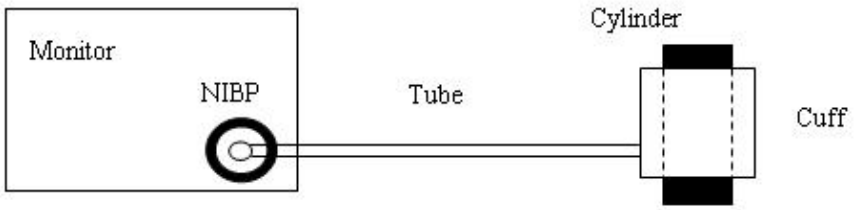
Enter this menu to upgrade the opening logo of the monitor.(refer to 4.3 software upgrade)

4.2 NIBP maintenance

4.2.1 NIBP leakage test

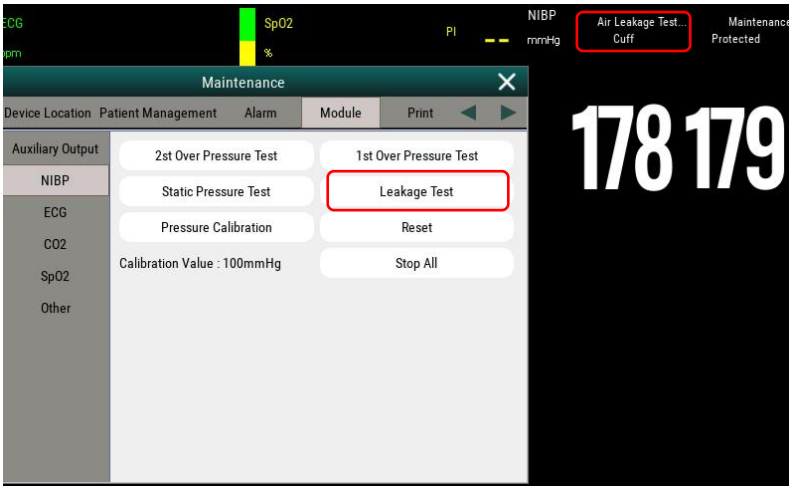
1. Plug the air pipe plug of cuff into the connector (NIBP) of monitor until the plug and socket contact well

2. Tie the cuff to a metal cylinder.



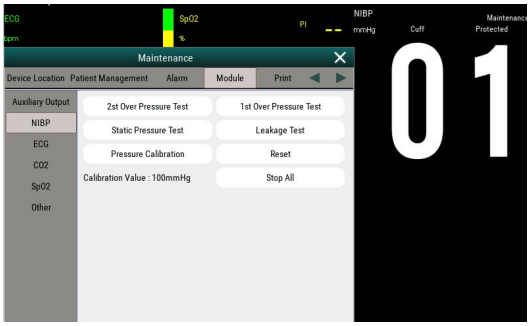
3,Select【Maintenance】→input password→【Module】→【NIBP】→【leakage Test】,Then the prompt "Air Leakage Test" will appear on the NIBP parameter area indicating that the system has started performing Air Leakage test.

The system will automatically inflate the pneumatic system to about 180mmHg.

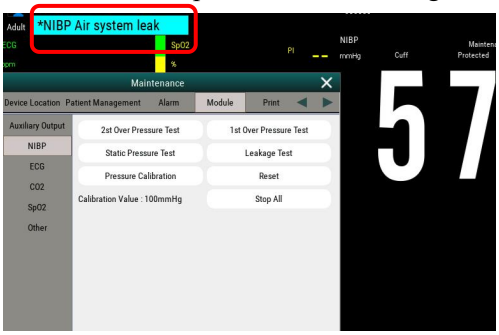


5. After 20 seconds or so, the system will automatically open the deflating valve, which marks the completion of an air leakage test.

6. If no error information displays on NIBP parameter area, it indicates that the airway is in good situation and no air leaks exist. However if the prompt "AIR SYSTEM LEAK" appears in the place, it indicates that the airway may have air leaks. In this case, the user should check for loose connection. After confirming secure connections, the user should re-perform the air leakage test.



Normal screen without error information



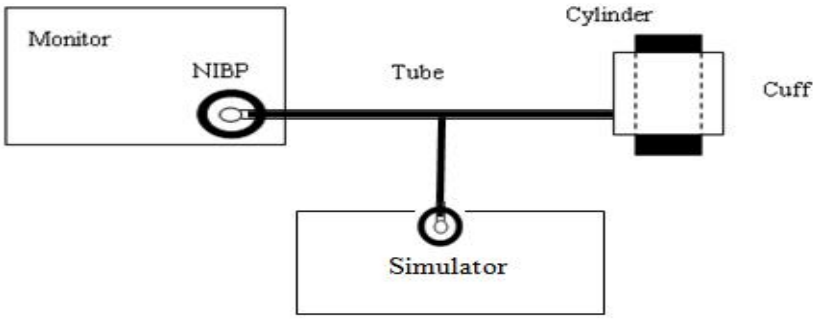
screen with message "Air System leak"

7. Press the stop key to stop air leakage test, leakage test compete.

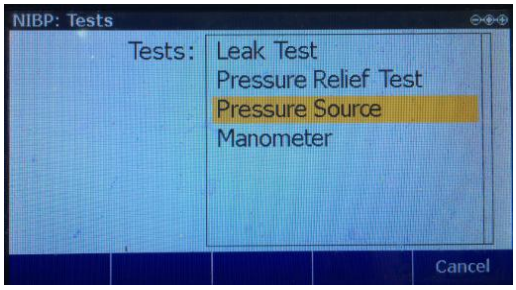
4.2.2 NIBP calibration

Procedure :

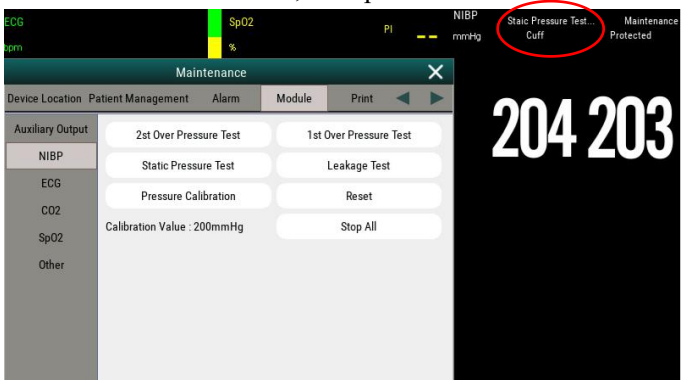
1) Connect the NIBP tube to the cuff, and then the cuff to a metal cylinder, connect the other side of the NIBP tube, monitor and simulator with a 3-way tube.



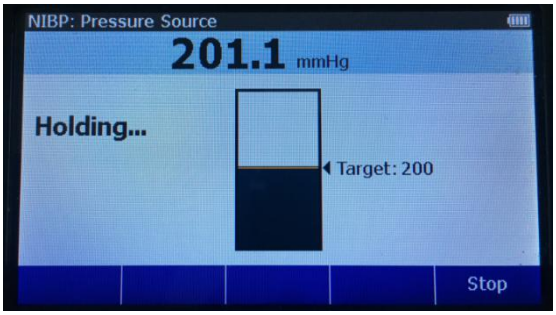
2) Setting the simulator: enter menu 【NIBP】→【Test】→【Pressure Source】, then set the value to 200mmHg;



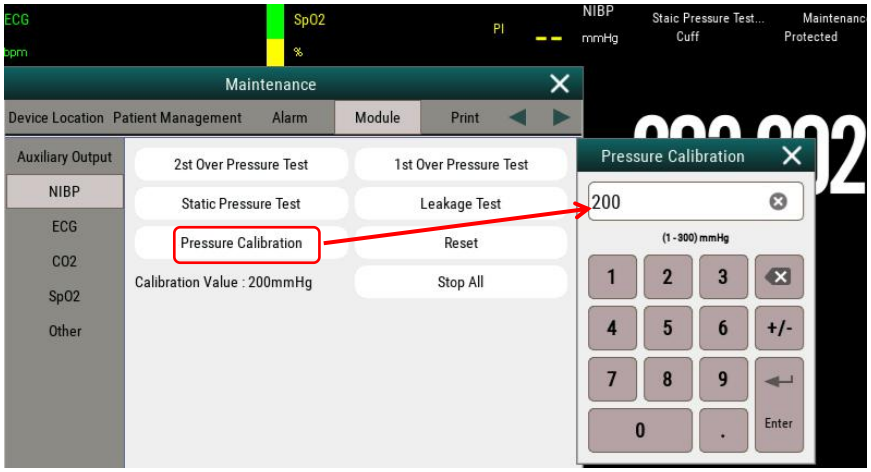
3) Enter menu : **【Module】→【NIBP】**, then press menu**【Static Pressure Test】**

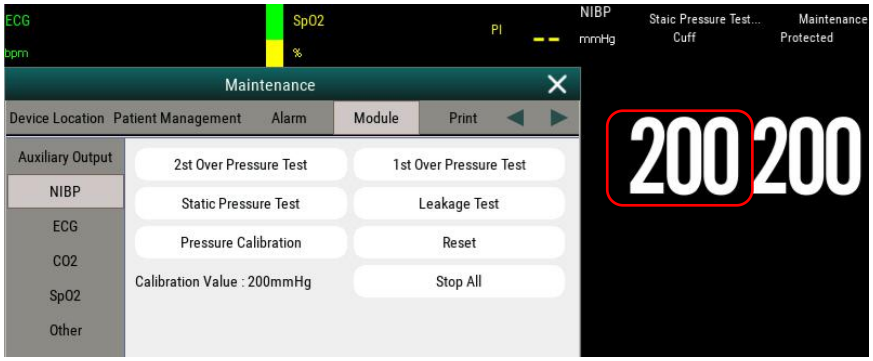


4) Start the simulator and the monitor to test, check the pressure values showed by monitor and simulator;



5) Check the pressures, if the gap is over 3 mmHg, enter menu **【Pressure Calibration】**, and input the value 200 mmHg, then "**Enter**" and exit the menu to save the setting.





6) Repeater step 3 and step 4, check if the pressure showed by monitor and simulator in a same value or less than 3mmHg, then calibration complete.

4.3 Software Upgrade

Software of this monitor can be upgraded by USB stick.

Caution:

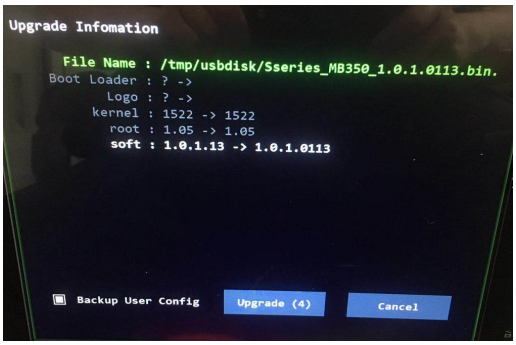
Please confirm the device was connected to the AC power before the upgrading, confirm the inside battery was full charged. The device out of power may leading the device unable to starting when at the upgraded process, then must send back to factory for maintain.

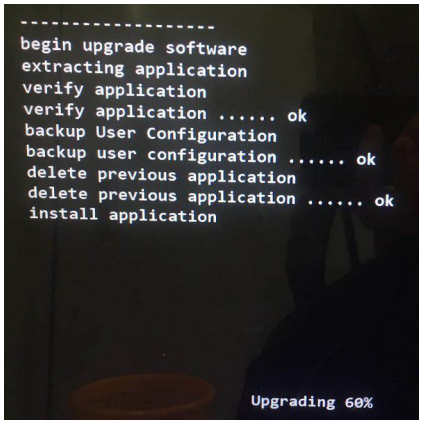
1. Main program upgrade:

1) Copy the main program software to a USB stick. Attention: file name cannot be changed in anyway.

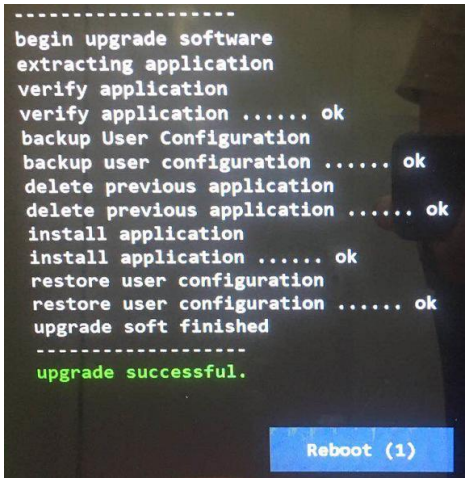
2) Switch on the monitor, and then plug the USB stick into the the monitor.

3) After plug in the USB stick, the monitor will automatically read the info of the USB stick and the monitor will automatically upgrade the software after 10 second or press the upgrade button to upgrade software directly.





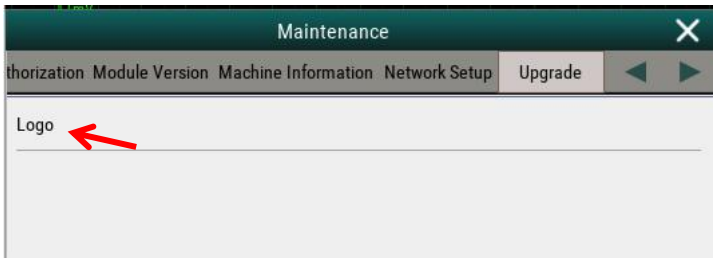
4) When the monitor's screen displays "Upgrade successful", then press the reboot button and unplug the USB stick, and then restart the monitor.



5) Software upgrade complete.

2. Change the opening Logo of the Monitor

1. Rename the logo software to logo.bin;
2. Copy the logo software to a USB Stick;
3. Plug in the USB disk to the monitor, and then witch on the monitor, and enter the upgrade menu: 【main】→【maintenance】→【Upgrade】→【logo】, then the monitor will upgrade automatically.



4. The monitor will reboot automatically when upgrade complete.

Note: Need to rename the logo software to "logo.bin".

Chapter 5 Troubleshooting

5.1 Overview

This chapter conducts categorization based on the failure type of the monitor, and for troubleshooting, please refer to the failure table and conduct checks according to the sequence.
The recommended solutions given in this chapter can solve most of the equipment failures, but may not necessarily cover all possible failures. In case of any failures not included in this chapter, please contact the after-sale service department of our Company.

5.2 Common Failure Analysis and Trouble-shooting

Phenomenon	Possible reason	Trouble-shooting
Monitor can be turned on, but LED or battery LED does not light up	AC power is not connected, or battery capacity is insufficient	Check whether the AC power is connected correctly, or whether the battery capacity is sufficient.
	Cable failure	1. Check whether the power switch and the cable from the indicator to the key board, the cable from key board to the main control unit and the cable from the power module to the main control unit are properly connected. 2. Check whether the cables and plugs are damaged.
	Power module is damaged	Replace the power module.
Battery cannot be recharged	Power module is damaged	Replace the power module.
	Battery failure	Replace the battery.
Blank screen, monitor runs normally	Cable failure	1. Check whether the cable from the LCD display screen to the main-board is properly connected. 2. Check whether cables and connectors are damaged.
	Main board is damaged	Replace the backlight board.
	LCD display screen is damaged	Replace the LCD display screen.
Touch screen has no response	Cable failure	Check whether the cable of the touch screen are properly connected. Check if the cable damaged. Re-connect the cable of replace a new touch screen.

	Screen failure	Check if the screen is damaged.
	Note: if replacing the touch screen, need to replace the whole set together with the front case.	
Recorder is unable to print	Recorder function is disable	1. Check whether the recorder indicator lights up. 2. If the indicator lights up, active the function of the recorder in the menu of 【Factory Maintenance】. If the indicator does not light up, it indicates that there are other failures.
	Printing paper is mounted reversely	Install the printing paper again.
	Cable failure	1. Check whether the cable from the recorder to the main-board is properly connected. 2. Check whether cables and plugs are damaged.
	Recorder failure	Replace the recorder.
USB equipment can not be used (peripheral equipment has no damage)	USB interface board is damaged	Replace the USB interface board.
	Main-board is damaged	Replace the main-board.

Chapter 6 Maintenance and Disassembling

6.1 Tool

During the process of disassembling and replacing the parts, you may need to use the following tools:

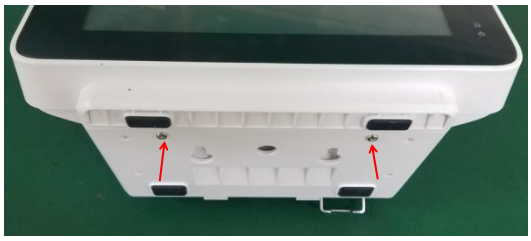
1. Cross screwdriver 2. Slotted screwdriver 3. Sharp-nose plier

6.2 Disassemble Procedure

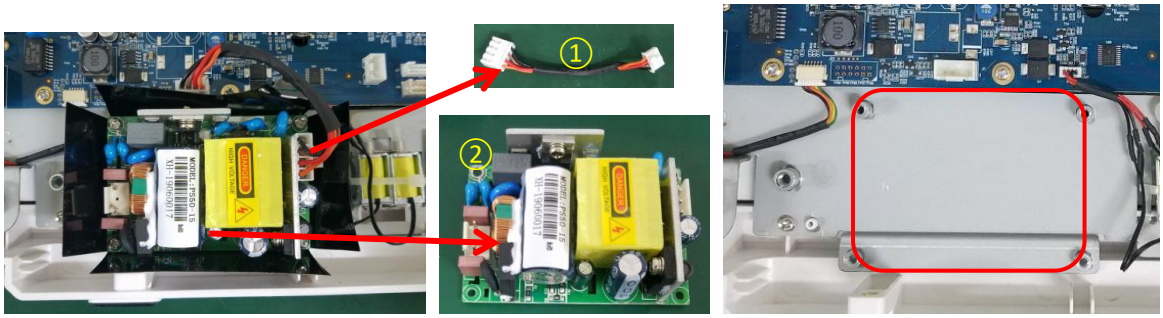
Note: Before disassembling the monitor, please unplug the power code and remove the battery from the monitor.

No.	Item	Material code	No.	Item	Material code
1	Lithium battery	1.12.06-11-5000-00	2	Battery cover plate	1.19.02-000044-0-1

1. Remove the screws that fix the front panel, then unplug the cables and separate the front panel from the monitors.

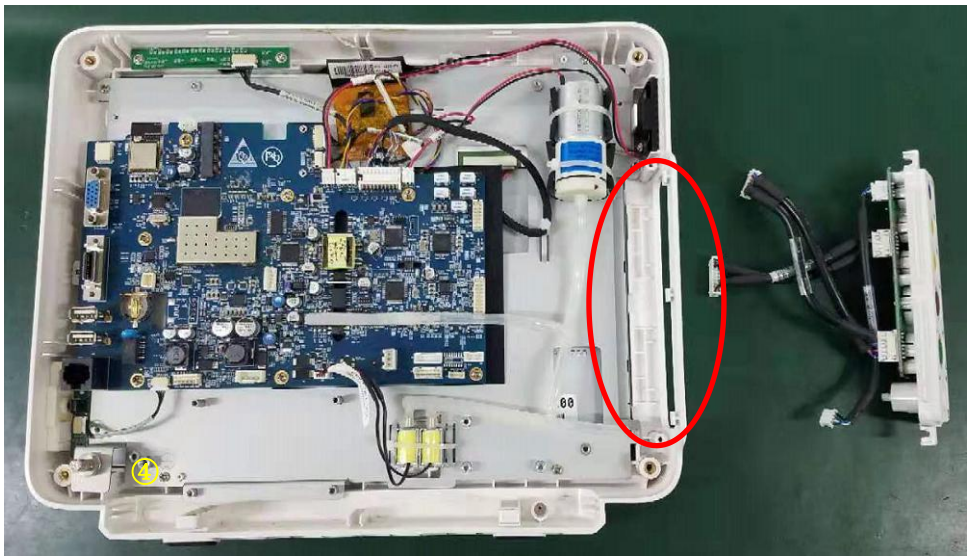


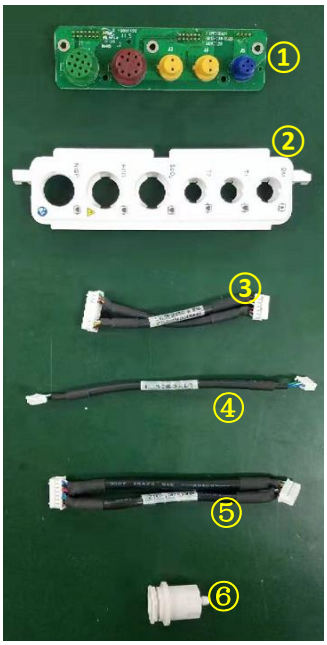
2. Unplug the cable that connect to the power supply board, then remove the screws, and then take out the power supply board;



No.	Item	Material code	No.	Item	Material code
1	SMPS wire	1.11.59-0000009-01	2	SMPS	1.15.01-0064-01-00

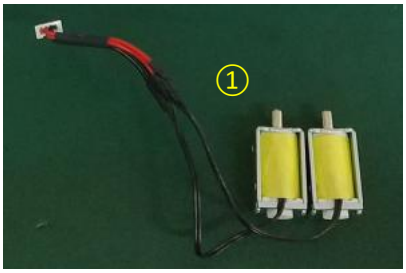
3. Remove the cables and screws, and then take out the connector panel set;





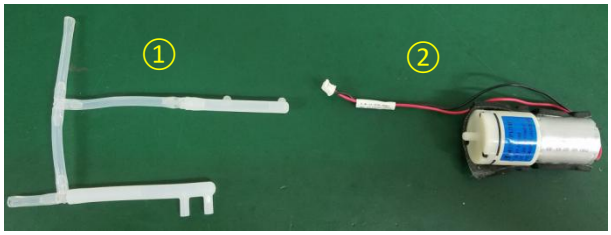
No.	Item	Material code	No.	Item	Material code
1	Connector panel A	2.02.0001-02-00	2	S12 connector fixing plate	1.19.02-000052-0-1
3	TEMP & SpO2 connector wire	1.11.59-0000005-01	6	NIBP connector	1.19.02-000013-0-1, 1.19.02-000014-0-1
4	DM module connecting wire	1.11.59-0000025-01	5	ECG connector wire	1.11.59-0000004-01
1-2	Connector PCB B	2.02.0001-03-00	2-2	S10 Connector fixing plate	1.19.02-000042-0-1

4. Remove the cable and cut the cable tie, then take out the valves;



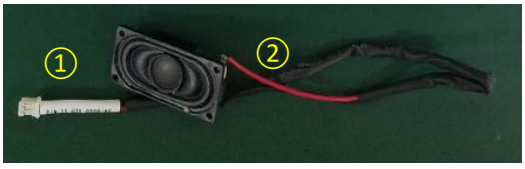
No.	Item	Material code	No.	Item	Material code
1	Valves set	1.15.20-0009-03-00			

5. Remove the cable and cut the cable tie, then take out the pump;



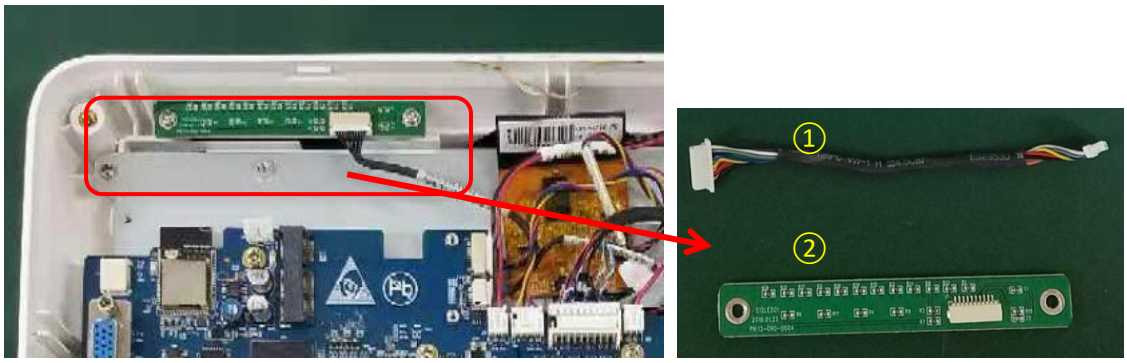
No.	Item	Material code	No.	Item	Material code
1	PVC tube	1.15.00-0033-01-00, 1.15.00-0033-02-00	2	NIBP pump	2.02.0001-20-00

6. Remove the cable and then take out the speaker;



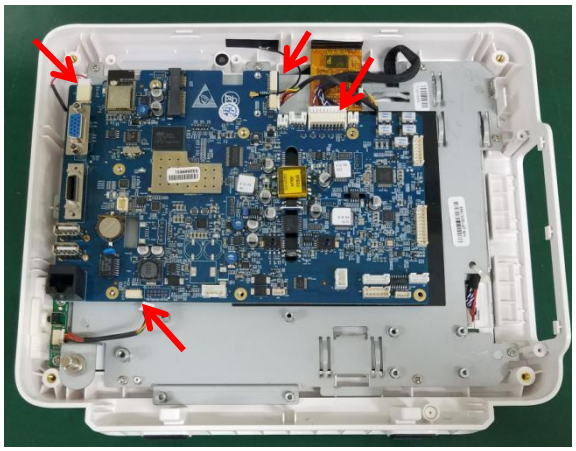
No.	Item	Material code	No.	Item	Material code
1	speaker	1.16.21-000018-010		Speaker wire	1.11.29-0000008-01

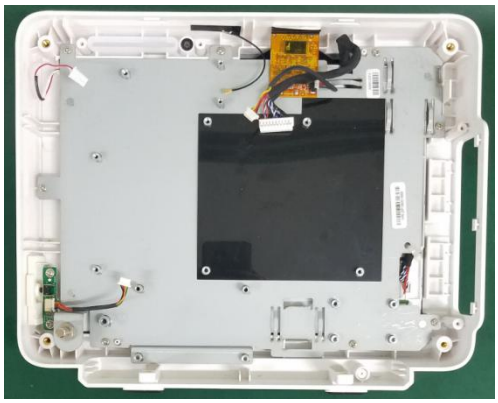
7. Remove the cable and screws, and then take out the alarm-light board;

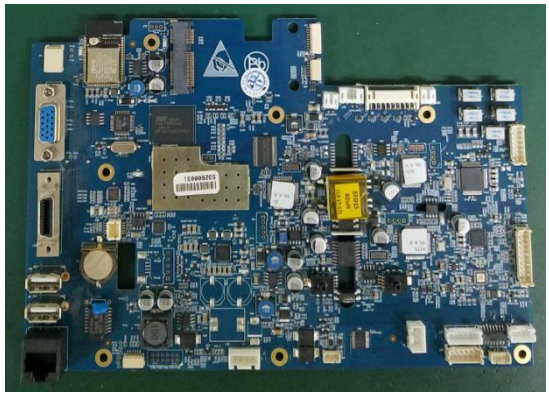


No.	Item	Material code	No.	Item	Material code
1	Alarm-light wire	1.11.59-0000001-01	2	Alarm-light PCB	2.02.0001-04-00

8. Remove the cables with connect to the mainboard, then release the screws that fix the mainboard, then take out the main board;



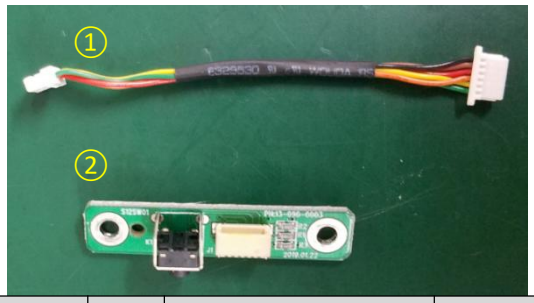




No.	Item	Material code	No.	Item	Material code
1	Main board (basic)	2.02.0001-01-05	2	Main board (wifi)	2.02.0001-01-08
3	Main board (VGA/Analog Output/Dysn/Nurse Call)				2.02.0001-01-10
4	Main board (VGA/Analog Output/Dysn/Nurse Call+wifi)				2.02.0001-01-13
5	Main board (VGA/Analog Output/Dysn/Nurse Call+wifi+ 12 leads)				2.02.0001-01-00

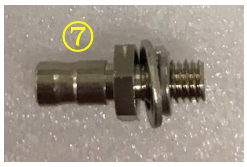
Note: Depends on different configuration of the monitors, there are different types of main boards.

9. Remove the cable and screws, and then take out the power switch board;

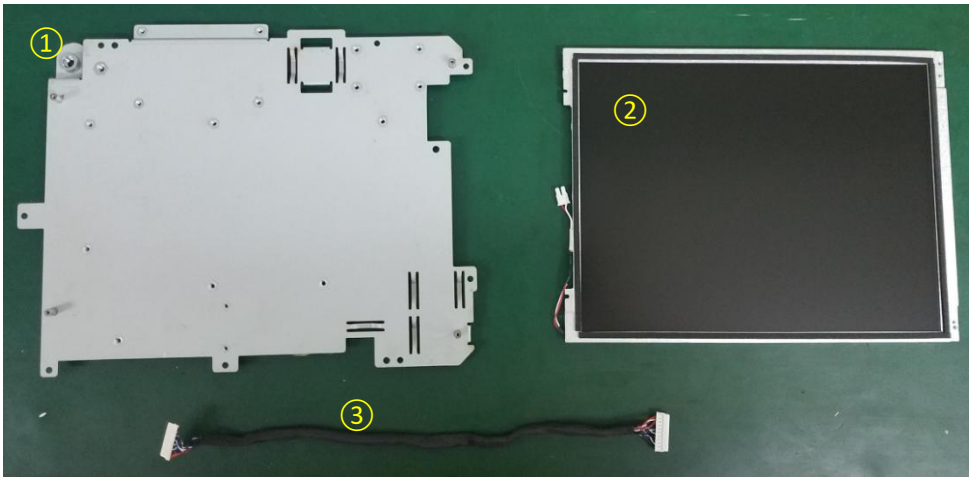


No.	Item	Material code	No.	Item	Material code
1	Power switch wire	1.11.59-0000002-01	2	Power switch PCB	2.02.0001-05-00

10. Remove the screws and unplug the LCD cable and backlight cable, and then take out the LCD panel;



11. Remove the screws, and then separate the LCD from the mounting plate;



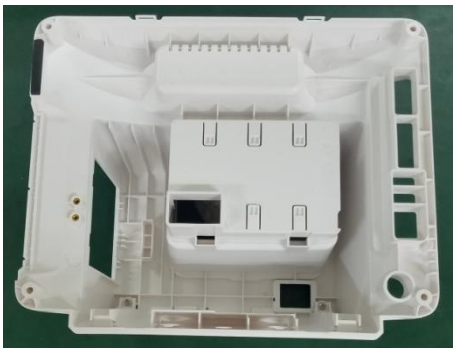
10.4' front panel:

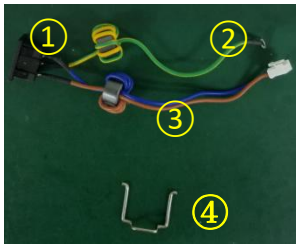
No.	Item	Material code	No.	Item	Material code
1	LCD mounting plate	1.20.02-000004-0-1	2	10.4' LCD	1.14.104-1704-01-1
3	LCD cable	1.11.59-0000015-01	4	10.4' touch screen	1.14.104-0012-00-1
5	S10 Front case	1.19.02-000040-0-1			
6	Touch screen wire	1.11.59-0000000-01	7	Grounding role	1.21.14-000005-005

12.1' front panel

No.	Item	Material code	No.	Item	Material code
1	LCD mounting plate	1.20.02-000003-0-1	2	12.1' LCD	1.14.121-0006-01-1
3	LCD cable	1.11.59-0000020-01	4	12.1' Touch screen	1.14.104-0012-01-1
5	S12 Front case	1.19.02-000050-0-1	6	Touch screen wire	1.11.59-0000021-01
7	Grounding role	1.21.14-000005-005	8	Backlight wire	1.11.59-0000021-01

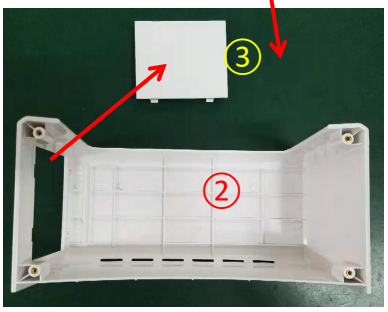
12. Remove the AC socket and the power code fixing bracket form the rear case.

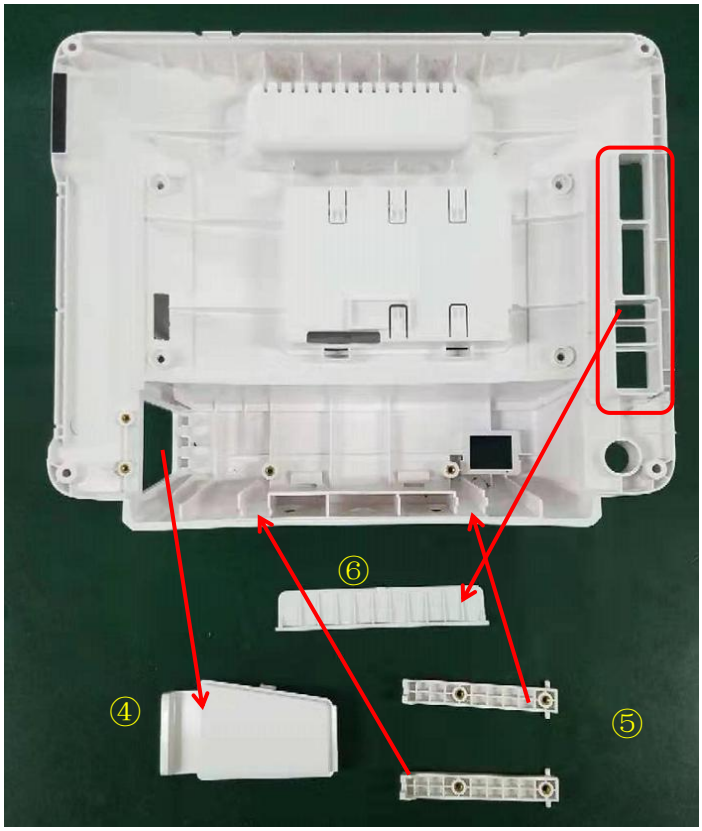




No.	Item	Material code	No.	Item	Material code
1	AC connector	1.10.00-0033-00-02	2	grounding wire	1.11.59-0000008-01
3	3PVH AC wire &	1.11.59-0000012-01	4	Power code fixing bracket	1.20.02-000002-0-1

13. Disassembling the rear case.

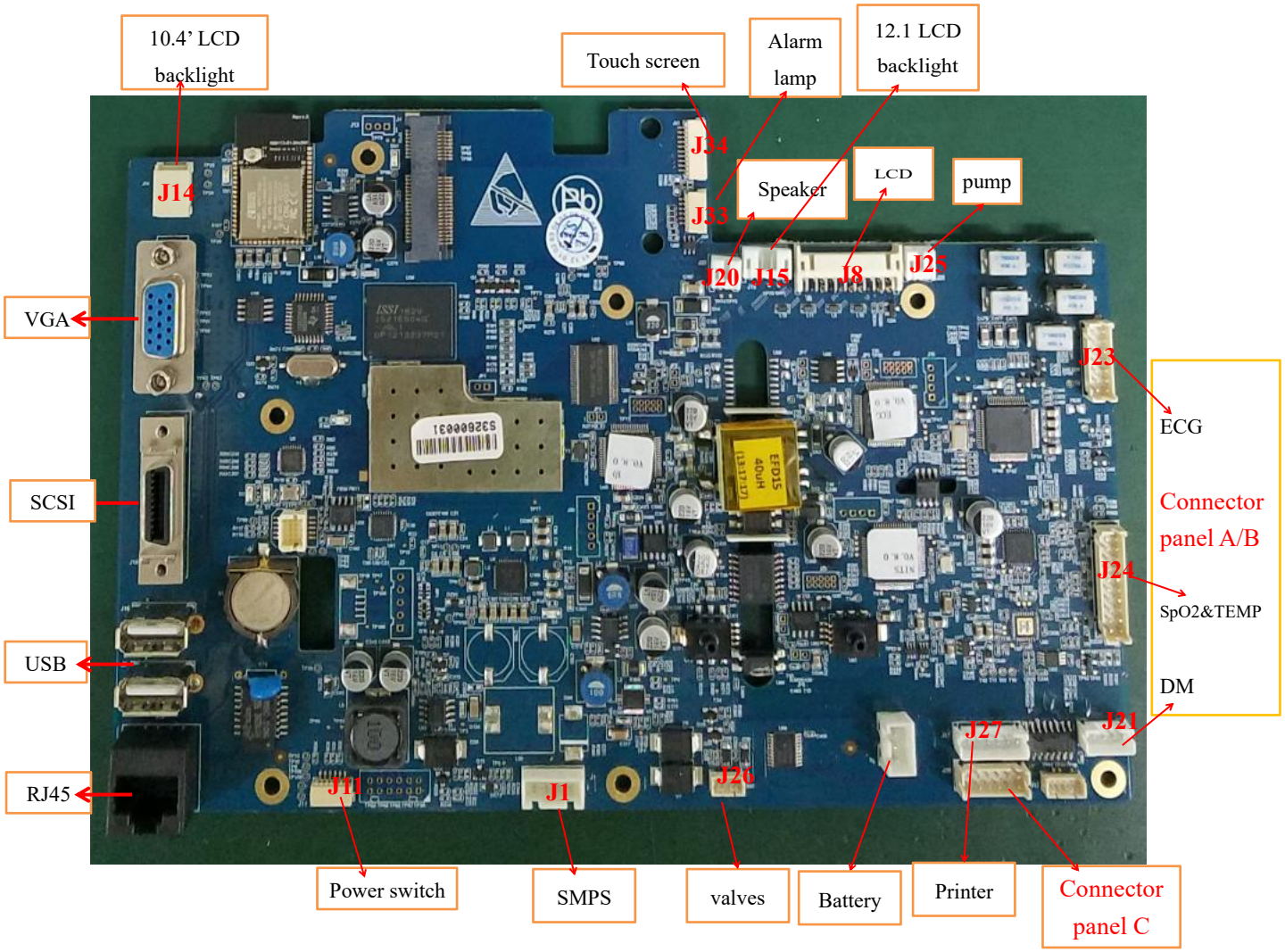




No.	Item	Material code	No.	Item	Material code

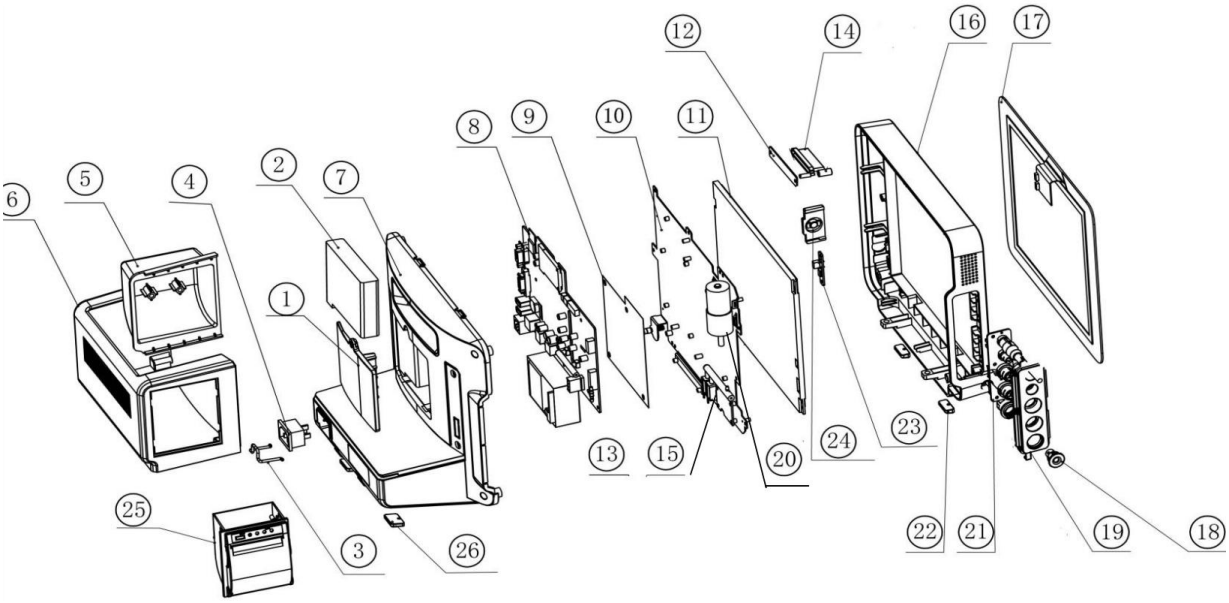
1	S12 rear case	1.19.02-000060-0-1	1	S10rear case	1.19.02-000030-0-1
2	S12 accessories slot	1.19.02-000061-0-1	2	S10 accessories slot	1.19.02-000031-0-1
3	Recorder cover plate	1.19.02-000015-0-1	4	S12connector cover plate	1.19.02-000057-0-1
5	Fixing plate	1.19.02-000010-0-1	6	Interface cover plate	1.19.02-000011-0-1

Main board interfaces



Appendix

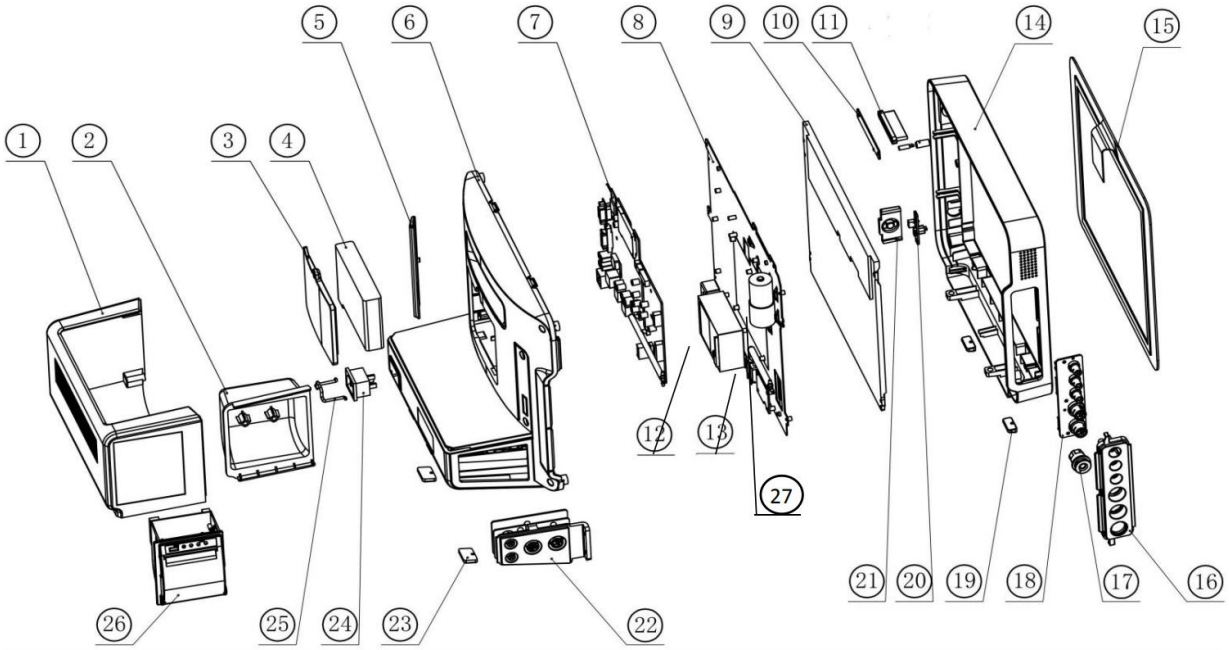
S10 Exploded view



Part list

No.	Material code	Material Name	No.	Material code	Material Name
1	1.19.02-000044-0-1	battery cover plate	2	1.12.06-11-5000-00	Lithium battery (11.1V/2.5Ah)
3	1.20.02-000002-0-1	power code fixing bracket	4	1.10.00-0033-00-02	power socket
5	1.20.02-000001-0-1	recorder mounting plate	6	1.19.02-000043-0-1	rear cover plate
7	1.19.02-000041-0-1	rear case	8	2.02.0001-01-05	mainboard（basic）
9	1.19.02-000027-1-1	mainboard insulation sheet	10	1.20.02-000004-0-1	LCD mounting plate
11	1.14.104-1704-01-1	10.4' LCD	12	2.02.0001-04-00	alarm lamp board
13	1.15.01-0064-01-00	power supply board	14	1.19.02-000022-0-1	light guide
15	1.15.20-0009-03-00	valves	16	1.19.02-000040-0-1	front case
17	1.14.104-0012-00-1	10.4' touch screen	18	1.19.02-000013-0-1	NIBP connector
19	1.19.02-000042-0-1	connector cover plate	20	2.02.0001-20-00	pump
21	2.02.0001-03-00	connector panel B	22	1.19.02-000026-0-1	rubber pad （front case）
23	2.02.0001-05-00	power switch board	24	1.19.02-000021-0-1	keypad
25	2.00.0059-11-10	recorder	26	1.19.02-000026-1-1	rubber pad （rear case）

S12 Exploded view



Part List

No.	Material code	Material Name	No.	Material code	Material Name
1	1.19.02-000043-0-1	rear cover plate	2	1.20.02-000001-0-1	recorder mounting plate
3	1.19.02-000044-0-1	battery cover plate	4	1.12.06-11-5000-00	Lithium battery (11.1V/2500mAH)
5	1.19.02-000011-0-1	interface cover plate	6	1.19.02-000041-0-1	rear case
7	2.02.0001-01-05	mainboard（basic)	8	1.20.02-000004-0-1	LCD mounting plate
9	1.14.104-1704-01-1	10.4' LCD	10	2.02.0001-04-00	alarm lamp board
11	1.19.02-000022-0-1	light guide	12	1.15.01-0064-01-00	power supply board
13	1.15.20-0009-03-00	valves	14	1.19.02-000040-0-1	front case
15	1.14.104-0012-00-1	10.4' touch screen	16	1.19.02-000042-0-1	connector cover plate
17	1.19.02-000013-0-1	NIBP connector	18	2.02.0001-02-00	connector panel A
19	1.19.02-000026-0-1	rubber pad （front case）	20	2.02.0001-05-00	power switch board
21	1.19.02-000021-0-1	keypad	22	2.02.0001-07-00	connector panel C
23	1.19.02-000026-1-1	rubber pad （rear case）		2.02.0001-06-01	optional parameters interface board
24	1.10.00-0033-00-02	power socket	25	1.20.02-000002-0-1	power code fixing bracket
26	2.00.0059-11-10	recorder	27	2.02.0001-20-00	pump

Product Model: S10/S12 Patient monitor

Product Name: Patient monitor

Manufacturer Name: Guangdong Biolight Meditech Co,.Ltd.

Address: No.2 Innovation First Road, Technical Innovation Coast, Hi-tech Zone, Zhuhai, P.R.China

Post code: 519085

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