LMEDIX RC-S8 Defibrillator Monitor S8

Service Manual

Lottie's Marketing

Directory

Chapter 1 Safety

1.1 safety information

⚠WARNING

- You may be prompted serious consequences, endanger the safety or adverse events Case. Failure to follow the warning will result in death or serious personal injury or property damage to the user or patient.

⚠CAUTION

- Indicates a potentially hazardous or unsafe operation that, if not avoided, could result in minor personal injury, product malfunction, damage, or property damage, and may result in more serious injury in the future.

⚠PAY ATTENTION TO

- important precautions, provide instructions or explanations to make better use of this product.

⚠WARNING

- **This defibrillator is intended for use in clinical patient care and only allows trained physicians and nurses to use the defibrillator.**
- **Before use, the user should check that the instrument and its accessories are working properly and safely.**
- **The alarm volume and alarm upper and lower limits should be set for different patients. When monitoring a patient, do not rely solely on the audible alarm system to monitor the patient. If the alarm volume is set too small or completely turned off, the alarm may be invalidated and the patient's safety may be compromised. The most reliable method of patient monitoring should be to pay close attention to the actual clinical condition of the patient.**
- **This device can only be connected to a power outlet with protective grounding. If the power socket is not connected to a grounding wire, do not use the socket and use a rechargeable battery device to supply power.**
- **Do not open the case of the instrument to avoid possible electric shock hazards. Any repairs and upgrades to the monitor must be performed by a service person trained and authorized byComen.**
- **When handling packaging materials, they should be disposed of in accordance with local laws and regulations or the hospital's waste disposal regulations. Packaging materials must be placed out of reach of children.**
- **Do not use the instrument in a location where flammable materials such as anesthesia are placed to prevent an explosion or fire.**

- **Carefully install the power cord and various accessory cables to avoid patient entanglement or suffocation, cable entanglement, or electrical interference.**
- **Do not use a mobile phone near the monitor. The mobile phone generates an excessive radiation field and interferes with the monitor's function.**
- **For patients with pacemakers, the heart rate monitor may pulse pacemakers during cardiac arrest or arrhythmia. Do not rely solely on the heart rate monitor alarm. Patients with pacemakers should be closely monitored. Refer to the monitor's instruction manual for the ability of the device to suppress the pacemaker.**
- **During defibrillation, the operator should not touch the patient, the table and the instrument. Check that the function is normal before using these cables again.**
- **The interconnecting device with the monitor should form an equipotential body (the protective ground is effectively connected).**
- **When the monitor is shared with the electrosurgical device, the user (doctor or nurse) should ensure the patient's safety.**
- **The physiological waveforms, physiological parameters and alarm information displayed by the monitor are for medical reference only and cannot be directly used as clinical treatment basis.**
- **Electromagnetic fields can affect the performance of the instrument, so the use of other Instrumentsin the vicinity of the instrument must meet the**

appropriate EMC requirements. For example, mobile phones, X-rays, or MRI devices can all be sources of interference because they emit high-intensity electromagnetic radiation.

- **This is not a treatment device.**
- **After defibrillation, the recovery time of ECG is not more than 10s, and the recovery time of other parameters is not more than 5s.**
- **To prevent burns to the patient when the monitor is used with a high frequency surgical device, avoid any conductive connections between the sensor and cable and the high frequency surgical device.**

⚠**CAUTION**

- **To install or carry the instrument properly to prevent the instrument from falling, colliding, being subjected to strong oscillations or other mechanical external forces.**
- **Before the device is powered on, please confirm that the power supply used meets the requirements of the instrument's nameplate label or the power supply voltage and frequency specified in the instruction manual.**
- **When the instrument and accessories are about to expire, they must be disposed of in accordance with relevant local laws and regulations or the hospital's rules and regulations.**

- **Disposable accessories can only be used once, and repeated use can result in performance degradation or cross-contamination.**
- **If the monitor will not be used for a long time, remove the battery and keep it in a safe place.**
- **Defibrillation recovery time of less than 10s**

⚠**PAY ATTENTION TO**

- **Install the instrument in a location that is easy to observe, operate, and maintain.**
- **This instrument cannot be used at home.**
- **The instrument is limited to one patient at a time.**
- **The life of this monitor is 5 years.**

1.2 Symbol Description

(1) Instrument Symbol

	Note!	 2015R124-44	measuring instrument type approval mark and number
	refer to the operation manual	 Guangdong 00000700	manufacturing measuring instrument license mark and number
	BF type application part, with anti-defibrillation function		main menu
	CF type application part, with anti-defibrillation function	IPX1	waterproof level
	open, shutdown Key		production date mark
	use battery work light	SN	sequence number mark
	AC power indicator light		equipotential symbol
	VGA interface		network connection symbol
	multi-function interface		USB interface
	manufacturer		input port
	output port		

Table 1-1

(2) packaging symbol

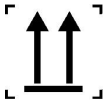
	up		stacking layer limit
	fragile goods		rainproof

Table 1-2

Chapter2 Warranty

2.1 Warranty Terms

Comen provides a 24 month (host) warranty or a 6 month (accessory) warranty for all licensed products, starting with the customer's purchase date. If your product is determined to be defective and promptly notified to us during the warranty period, Comen will repair the product or replace it with a new product or accessory.

2.2 Exclusion of warranty

The Comen warranty will not apply to the following:

- Unreasonable use or damage caused by man
- Damage caused by unstable voltage or super normal range voltage
- Damage caused by irresistible factors, such as fires and earthquakes
- Damage caused by unreasonable operation or repair by an unauthorized maintenance organization or individual
- Damage caused by attachments that are not approved by Comen.
- The product serial number is not clear.
- Other damage caused by the instrument or the component itself.

2.3 Maintenance procedures

2.3.1 Fill in the Customer Complaint Form (SCF)

Fill in the customer complaint form in detail: model number, serial number (SN) and problem description.

Without this information, Comen will not be obliged to accept this complaint. Customers can apply for a complaint form from Comen's after-sales department if needed.

Figure 2-1

2.3.2 Submit a customer complaint form and choose a solution

Once the after-sales department receives the customer complaint form, the engineer will provide the customer solution within three days. And deal with it according to the following two situations:

- **Warranty period:**

There are two options:

1) After receiving the Return Authorization Form (RMA) from the After-sales Department, the customer can return the defective part and inform the delivery number. We will send a new part with the loading invoice to your address as soon as possible.

2) You can also send the signed statement to us by mail or fax. The statement has the legal effect to ensure that the customer or the end customer will send the faulty part to Comen

in time. In this case, we will send the replacement parts and loading invoices in a timely manner.

⚠Caution

- **Once the customer complaint form has been confirmed, Comen engineers will provide you with a return authorization and declaration form.**
- **The customer is responsible for shipping, insurance and customs fees for the shipment of the product to Comen.**

➢ **The warranty period has expired:**

After receiving the return authorization form, the customer will send the faulty part to Comen. Our engineers will analyze the faulty parts and negotiate with the customer to repair or replace the faulty parts. After the maintenance fee has been paid, we will send out new replacement parts as soon as possible.

⚠Caution

- **The customer is responsible for all costs (including freight, insurance and customs fees) during the transportation process.**

2.3.3 RMA Form

Before returning the goods, the customer will receive an RMA Form (Return Authorization Form) provided by our after-sales department, which includes the RMA number, a brief description of the returned parts and shipping instructions. When shipping, please indicate the RMA number on the box.

⚠Caution

- **In the absence of a notice to the Comen after-sales department, we will not be obligated to process returns from the terminal or customer. And the shipper is responsible for all possible expenses.**

2.3.4 Return

Please follow the steps below

- When disassembling the instrument, use an anti-static requirements. Do not touch the instrument directly with your hands.
- Pack the parts carefully before shipping.
- Please indicate the RMA number on the package.
- When describing the product, please use the "*** sample" format to reflect the total value on the invoice and mark "sample, no commercial value". .
- Before returning, please check with Comen (for example: total amount, address and other necessary information on the invoice).
- After receiving confirmation from Comen, please return the faulty part.

Chapter 3 Introduction to Principles

3.1 Overview

Figure 3-1

3.1.1Introduction to Defibrillator

S-Series defibrillation monitors can monitor ECG, RESP, SpO2, NIBP, Invasive Blood Pressure (IBP), Carbon Dioxide (CO2), Body Temperature (TEMP), etc. Vital sign parameters. This product is suitable for manual defibrillation, AED defibrillation, pacing and vital signs monitoring.

3.1.2 System Composition

The defibrillator monitor consists of a host, a battery, a defibrillation electrode plate (defibrillation external electrode plate, and a defibrillation internal electrode plate) and corresponding functional accessories. Mainly achieve the following functions:

1. Defibrillation monitor defibrillation release energy accuracy;
2. Pace frequency accuracy;

3. Pace current accuracy;

4. Heart rate detection accuracy;

5. Respiratory measurement accuracy:

6. Body temperature measurement error;

7. Non-invasive blood pressure measurement accuracy:

8. Invasive blood pressure measurement accuracy;

9. Blood oxygen saturation measurement accuracy;

10. Pulse rate measurement accuracy.

CO2 measurement accuracy:

3.1.3 System structure diagram

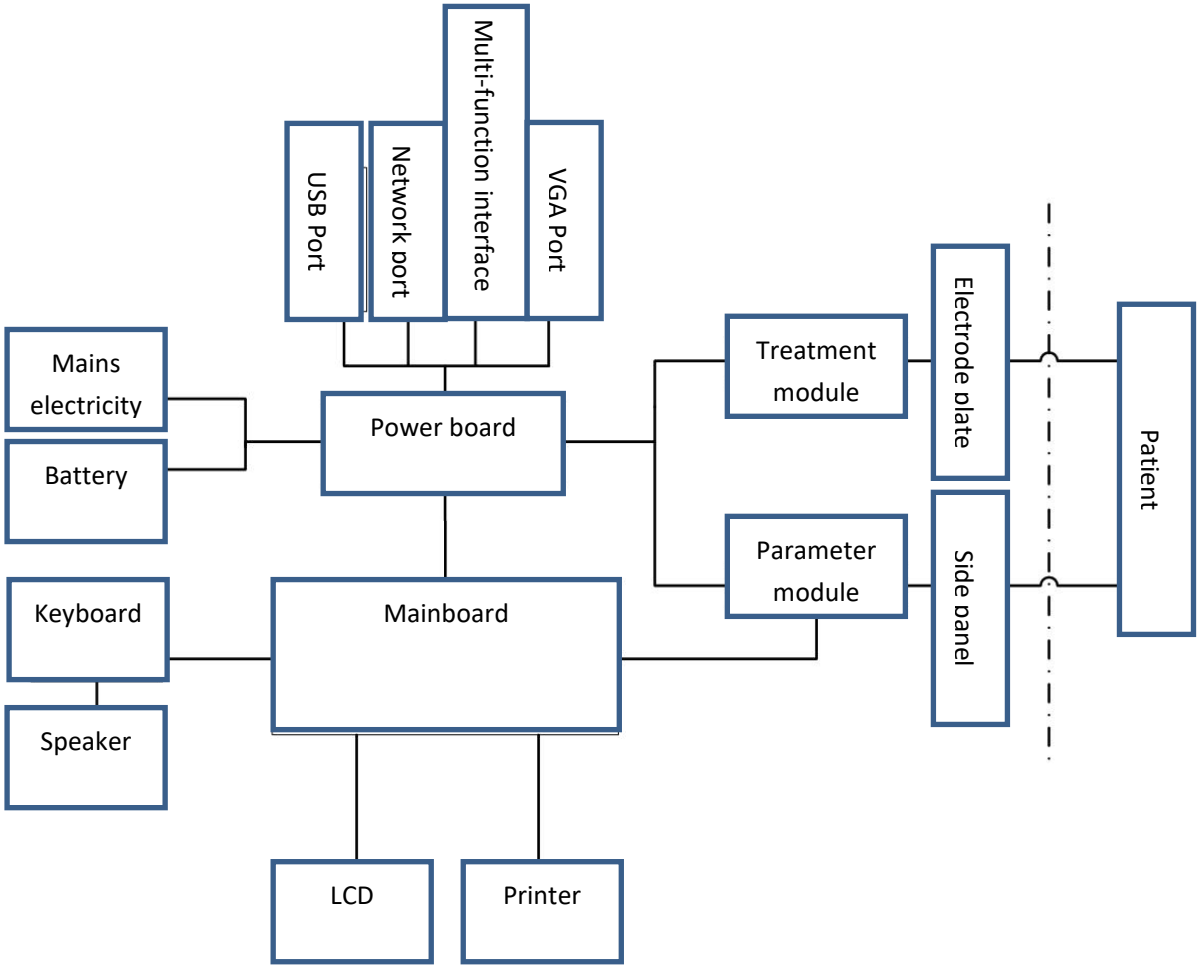


Figure 3-2

3.2 Module Introduction

3.2.1 Main control board

The main board is the core of the entire monitor, responsible for processing: input and output control, data storage and processing, display, system control, communication management and more.

Main control board functional block diagram:

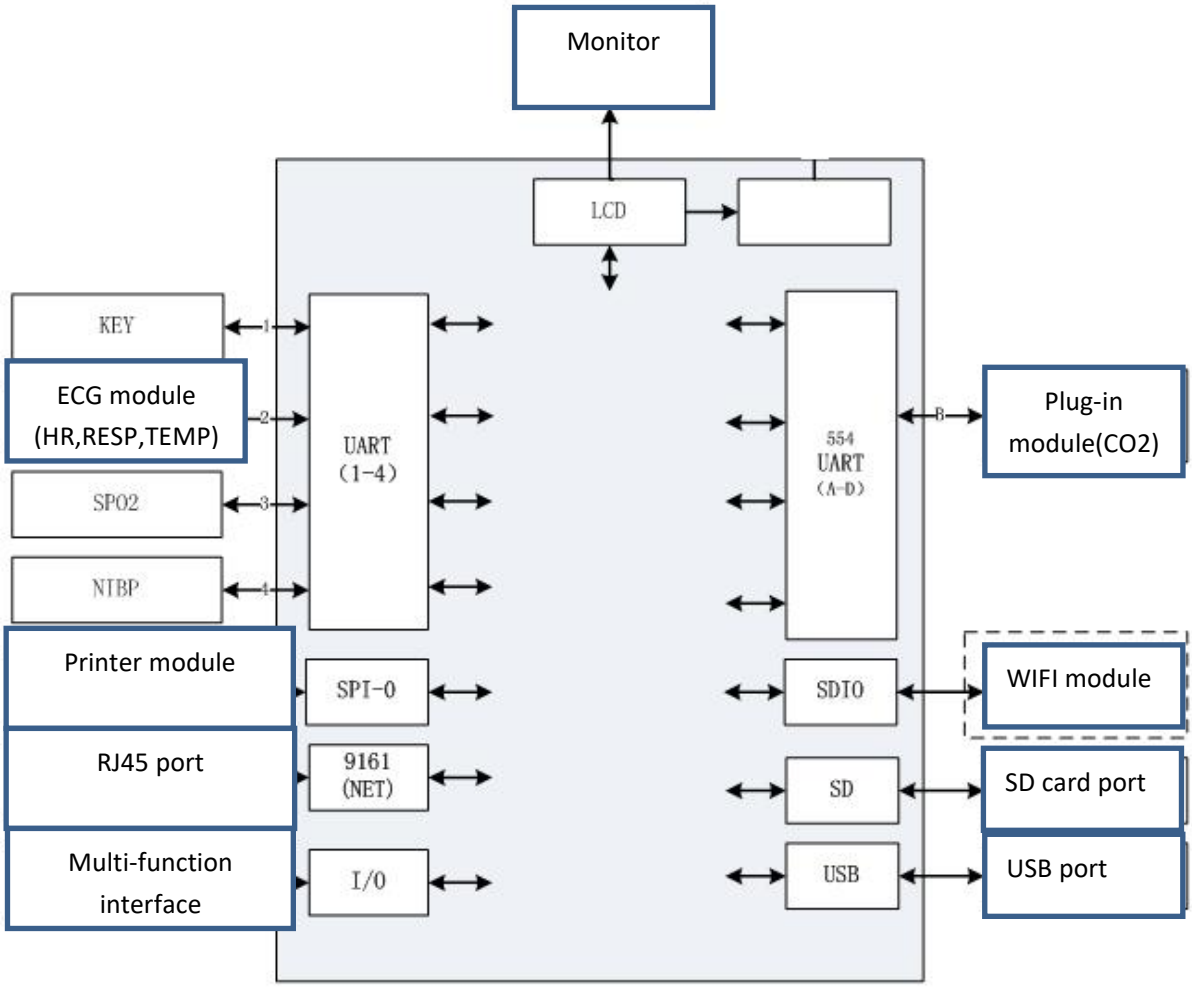

Monitor
LCD
KEY
ECG module
(HR,RESP,TEMP)
SPO2
NIBP
Printer module
RJ45 port
Multi-function
interface
UART
(1-4)
SPI-0
9161
(NET)
I/O
554
UART
(A-D)
SDIO
SD
USB
Plug-in
module(CO2)
WIFI module
SD card port
USB port

Figure 3-3

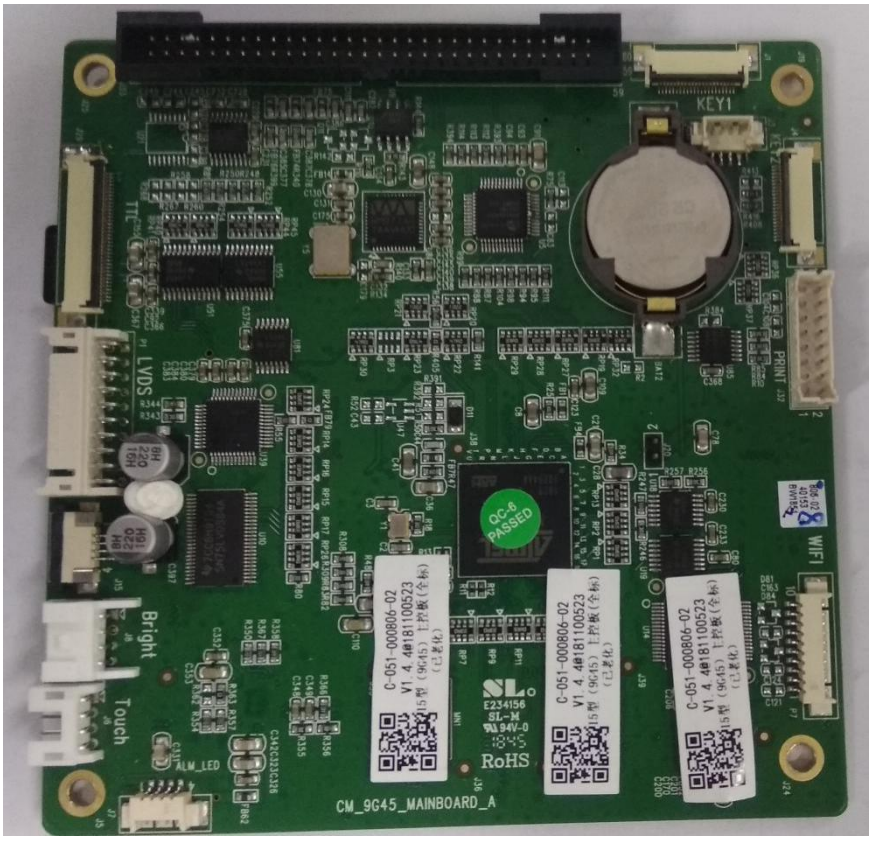


Figure 3-4

socket	description	working voltage
J3	4pin, connection button board	/
J4	22pin, connection button board	5V
J7	4pin, connection alarm light	5V
J8	4pin, connect LCD screen	/
J32	16pin, then the printer	18V60pin,
J33	5V,connected to AC-DC power board	
5V, 12V, 18V P1 (8000F	connected to the LCD screen	5V, 12V, 3.3V

table 3-1

3.2.2 AC power board

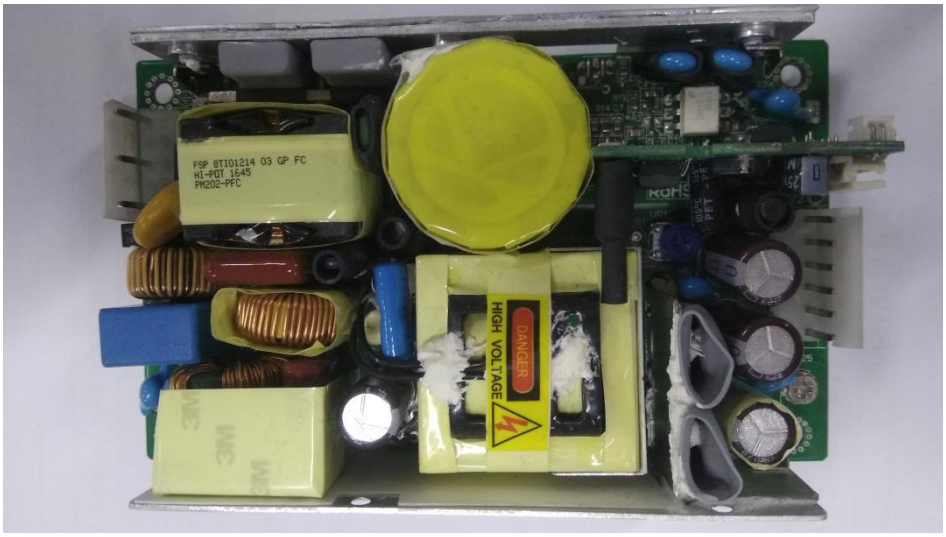


Figure 3-5

socket	description	working voltage
P1	5pin, connect AC power supply	100-240V AC
P2	6pin, connect AC-DC power supply board	18V

table 3-2

3.2.3 Keyboard

The keypad is located in the front of the monitor. Through the MCU processing on the keypad, the signal can be transmitted to the main board, as well as the display of the power indicator, AC indicator and charging indicator.

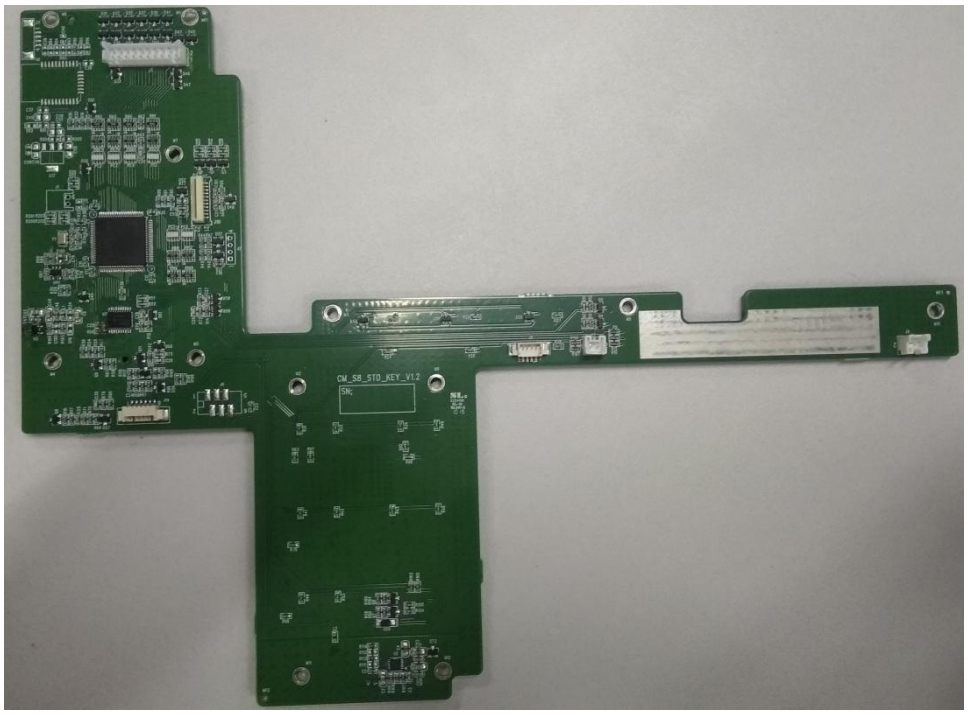


Figure 3-6

socket	description	working voltage
J5	20pin, connection dial board	/
J8	4pin, connect main control board	/
J9	2pin, connect speaker	/
J10	22pin, connect main control board	5V
J13	2pin, printer keypad	/
J14	6pin, connected to the shuttle board	/

Table 3-3

3.2.4 DC power board

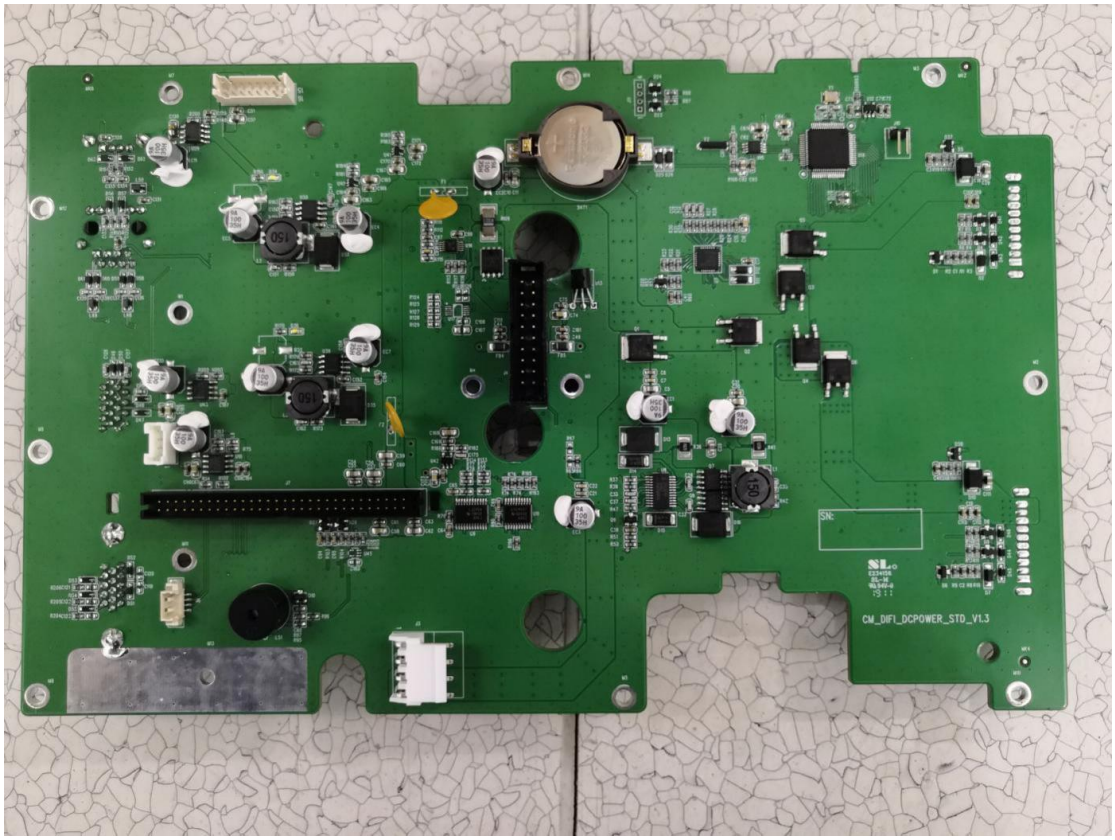


Figure 3-7

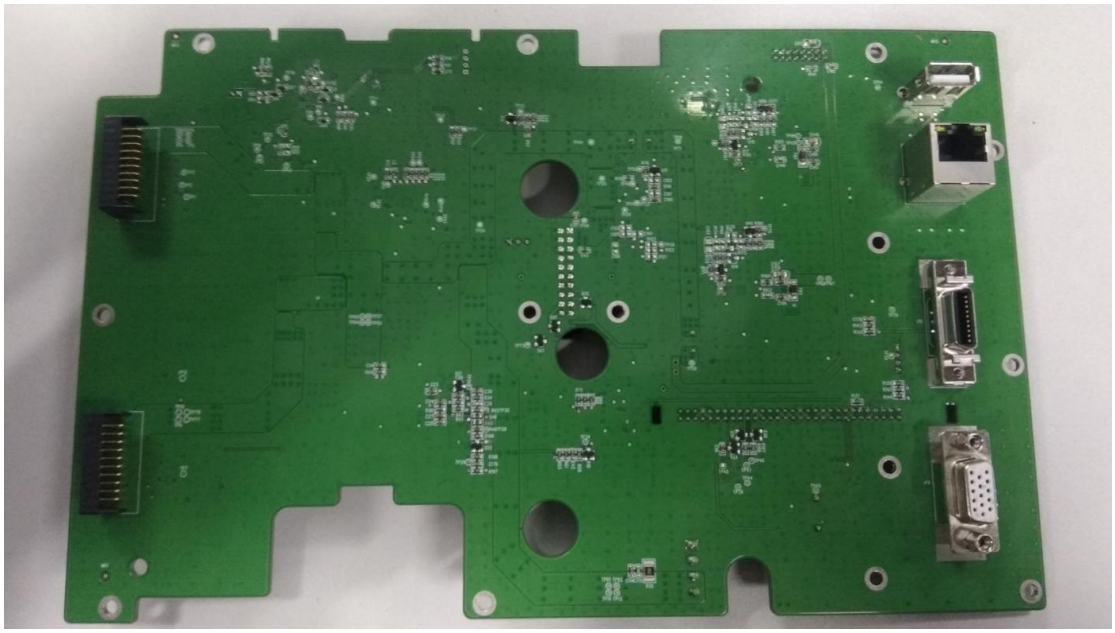


Figure 3-8

socket	description	working voltage
J1	10pin, battery A	/

J2	10pin, battery B	/
J3	4pin AC switching power supply	18V
J4	20pin, connected to the treatment module	5V, 12V, VBUS
J7	60pin, connected to the main control board	3.3V, 5V, 12V, V_PRINT
J8	16pin, connected parameter module	5V, 12V
J9	4pin, connected side panel	5V
J12	20pin, Multi-function interface	5V
J13	15pin, VGA interface	/
J14	16pin, network port	/
J15	6pin, USB port	5V

table 3-4

3.2.5 Treatment module

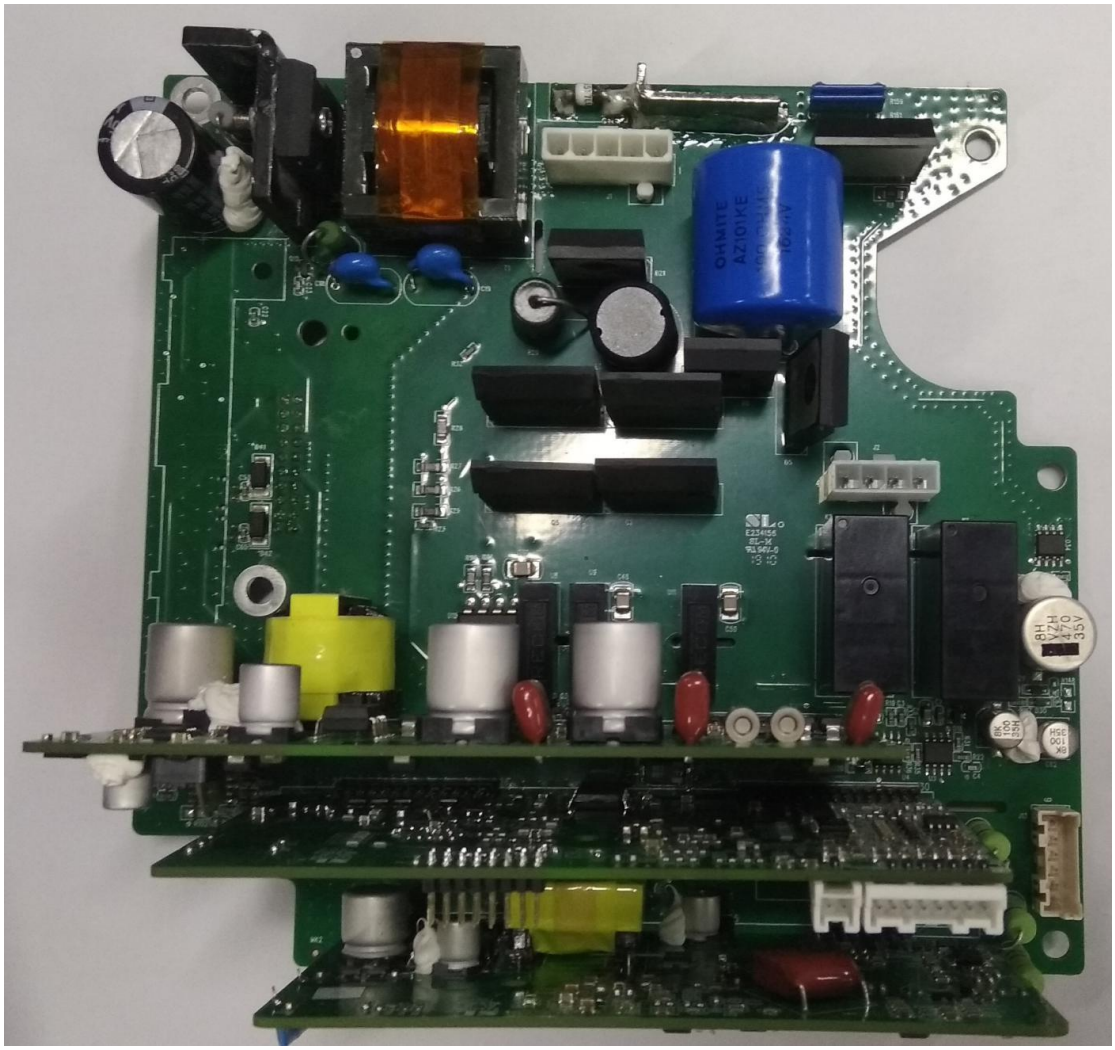


Figure 3–9

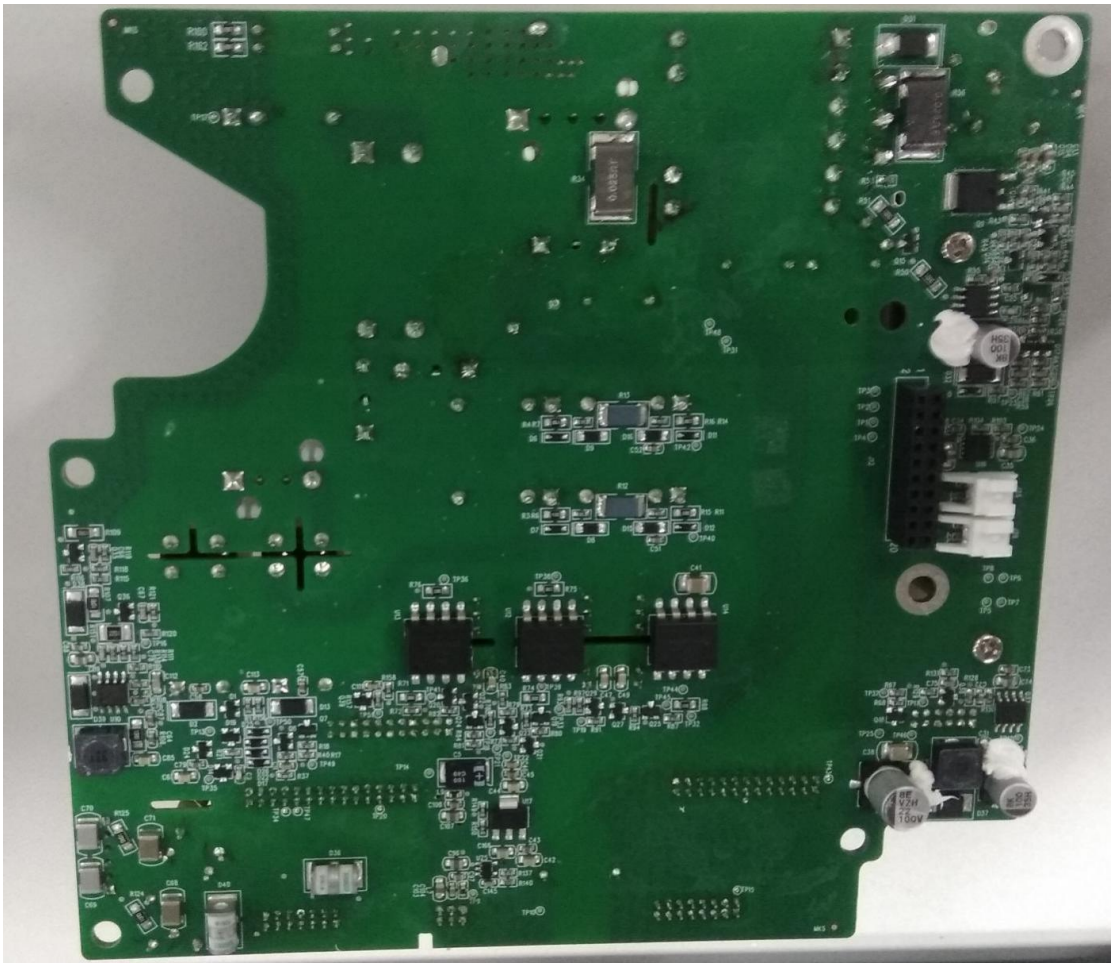


Figure 3-10

socket	description	working voltage
J1	5pin, connection Charging capacitor	/
J2	4pin, connect the internal cable	5V
J4	2pin, connect the micro switch	/
J8	8pin, connect the internal cable	/
J12	20pin, connect the power supply board	5V, 12V
J13	6pin, connect the internal cable	/
J25	2pin, Connect the cooling fan	12V
J26	2pin, connect the cooling fan	12V

table 3-5

3.2.5.1 Treatment module pacing board

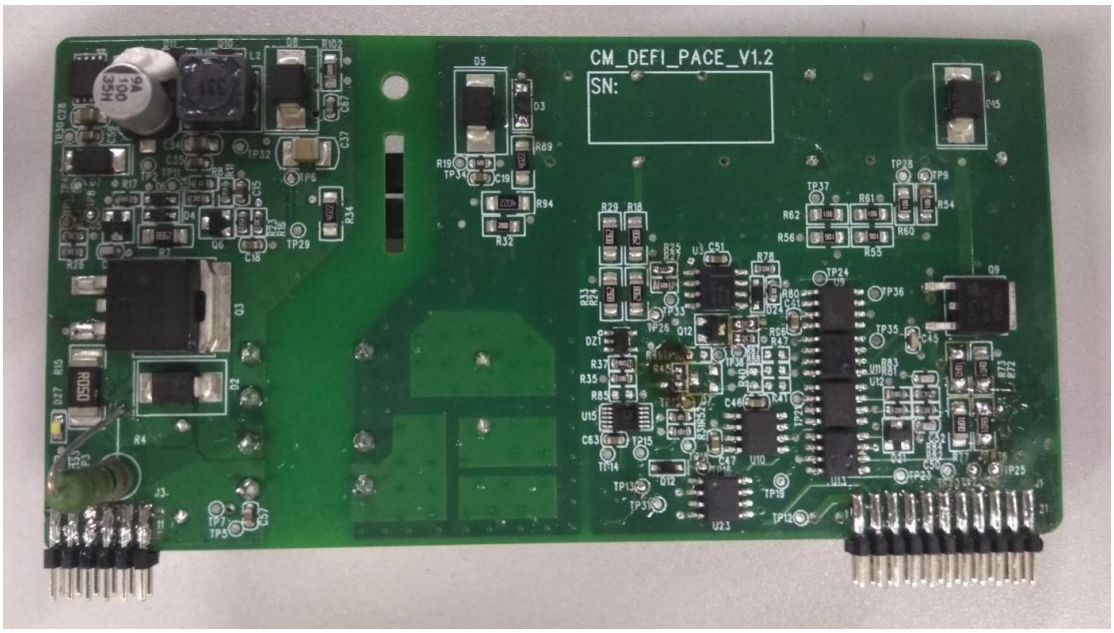


Figure 3-11

Socket	description	working voltage
J3	12pin, docking high voltage board J11	/
J1	22pin, docking high voltage board J9	/

table 3-6

3.2.5.2 Treatment module main control board

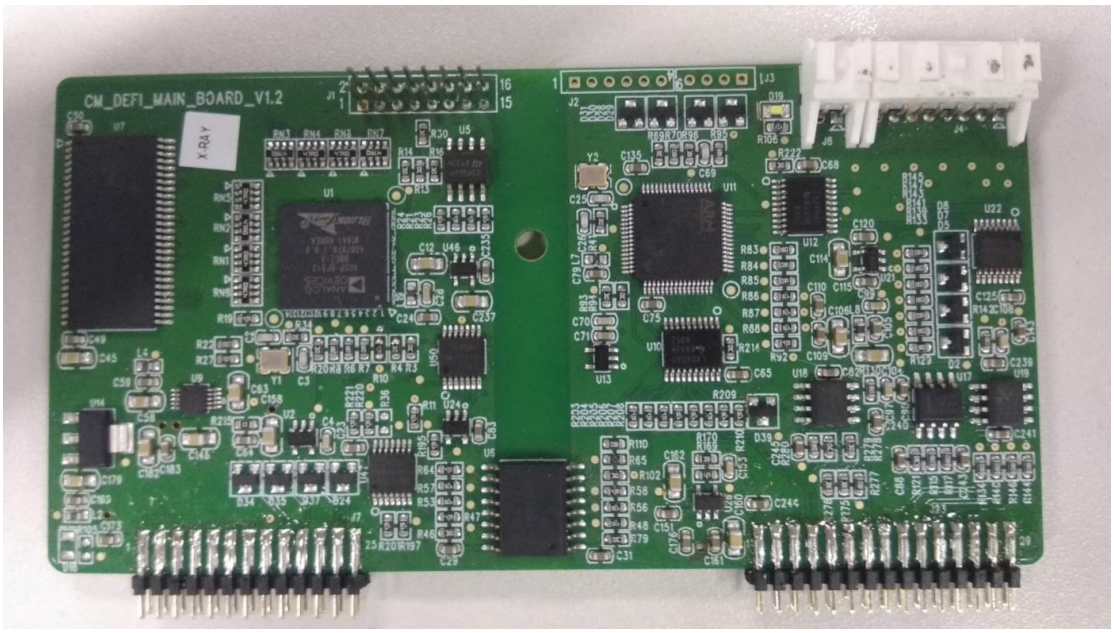


Figure 3-12

socket	description	working voltage
J4	8pin, connecting machine inside	/
J7	26pin, docking high voltage Board J8	/
J8	2pin, connected micro switch	/
J23	30pin, docking high voltage board J9	/

table 3-7

3.2.5.3 Treatment module ECG board

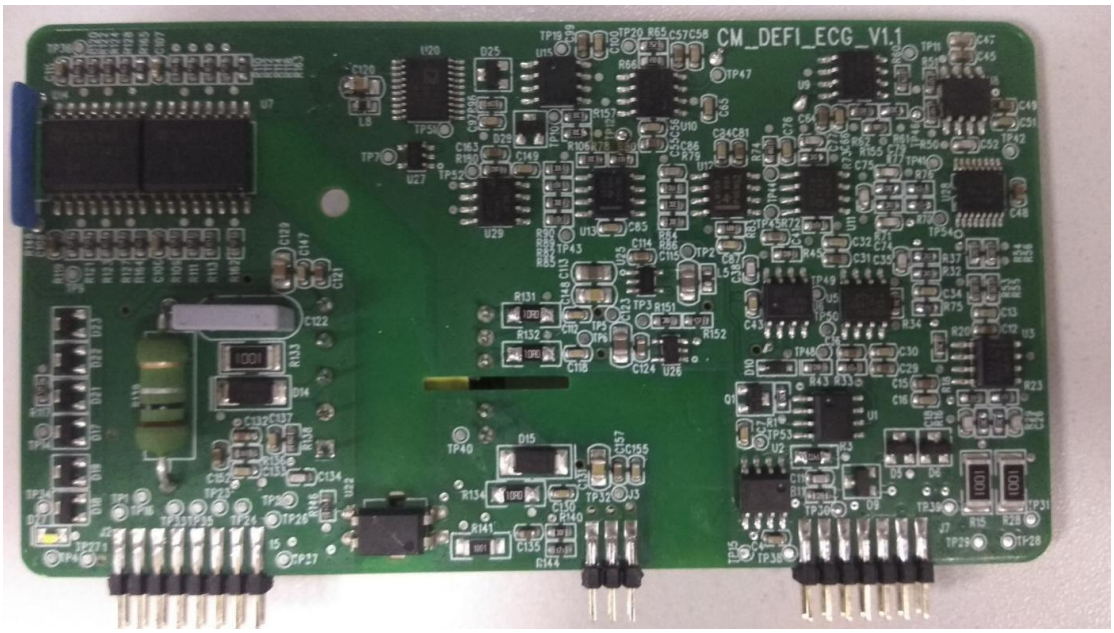


Figure 3-13

socket	description	working voltage
J2	16pin, docking high voltage board J6	/
J3	6pin, docking high voltage board J7	/
J7	14pin, docking high voltage board J5	/

table 3-8

3.2.5.3 Treatment module high pressure plate

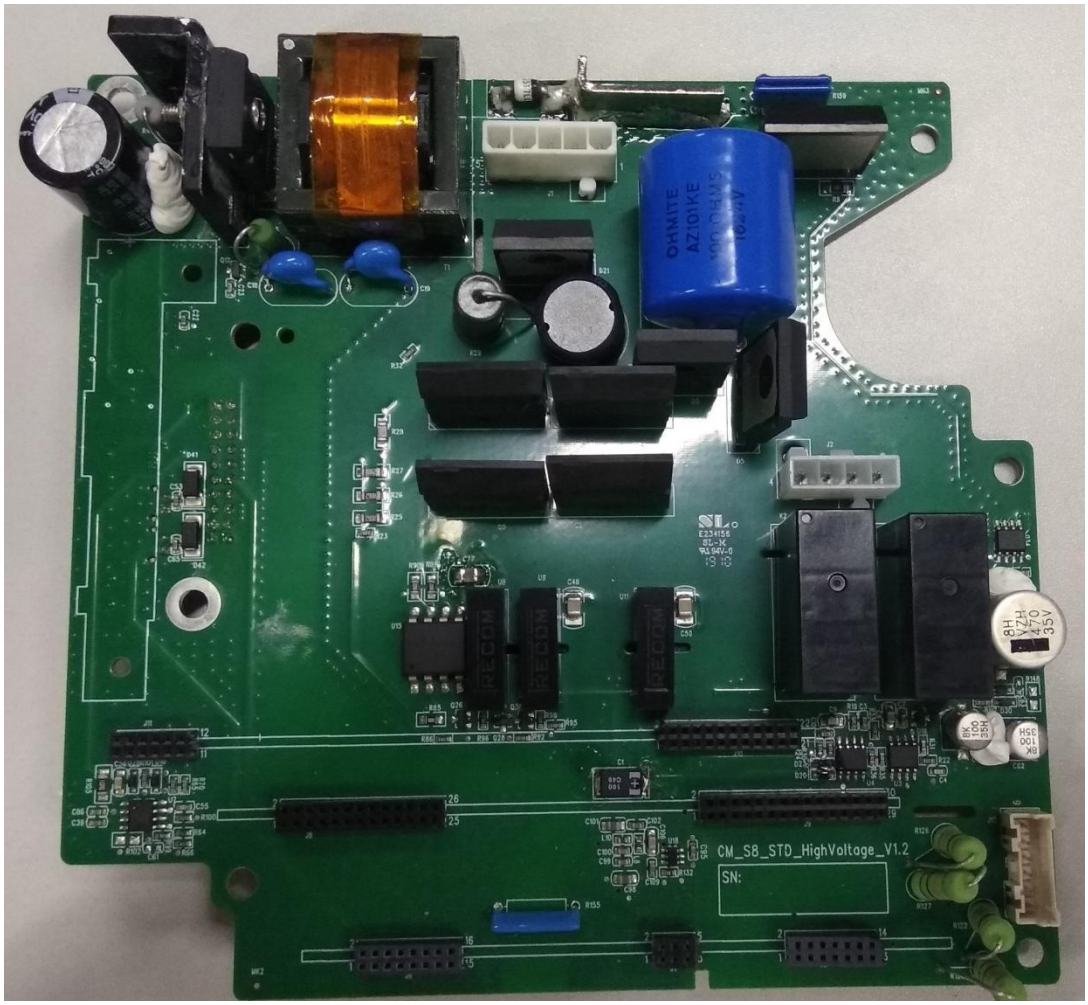


Figure 3-14

socket	description	working voltage
J1	5pin, charging capacitor socket	/
J2	4pin, connecting machine inside	/
J5	14pin, Treatment ECG socket	/
J6	16pin, treatment ECG socket	/
J7	8pin, treatment ECG socket	/
J8	26pin, treatment main control panel socket	/
J9	30pin, treatment main control panel socket	/
J10	22pin, treatment pacing plate socket	/

J11	12pin, treatment pacing board socket	/
J13	6pin, connecting machine inside	/

table 3-9

3.2.6 Side panel

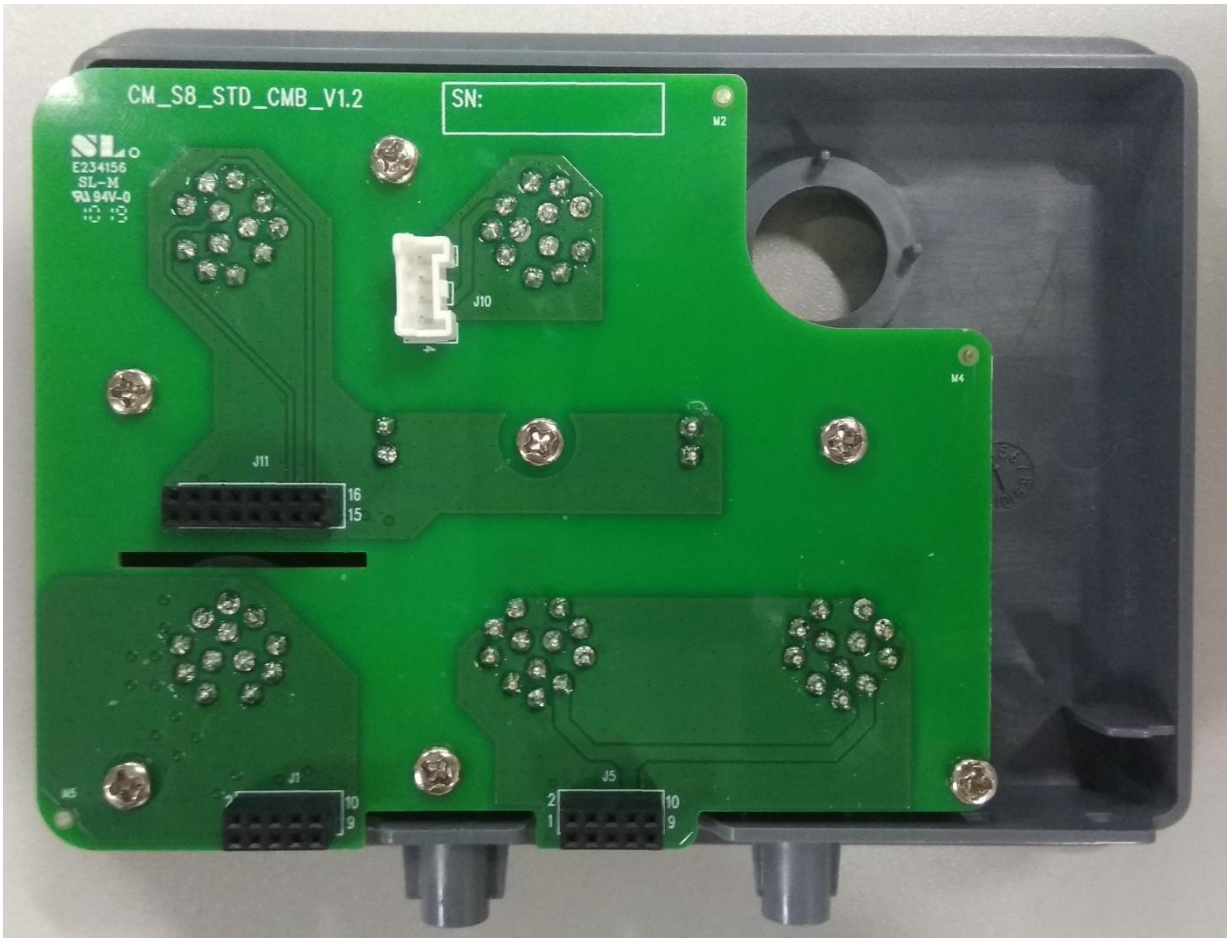


Figure 3-15

socket	description	working voltage
J1	10pin, SPO2 socket docking parameter module	/
J5	10pin, IBP socket docking parameter module	/
J10	4pin, CO2 Socket docking power supply	5V

J11	16pin, ECG, TEMP parameter module docking socket	/

table 3-10

3.2.7 NIBP module

The NIBP module is responsible for blood pressure pumping, pressure detection, and overvoltage protection.

NIBP module function box Figure:

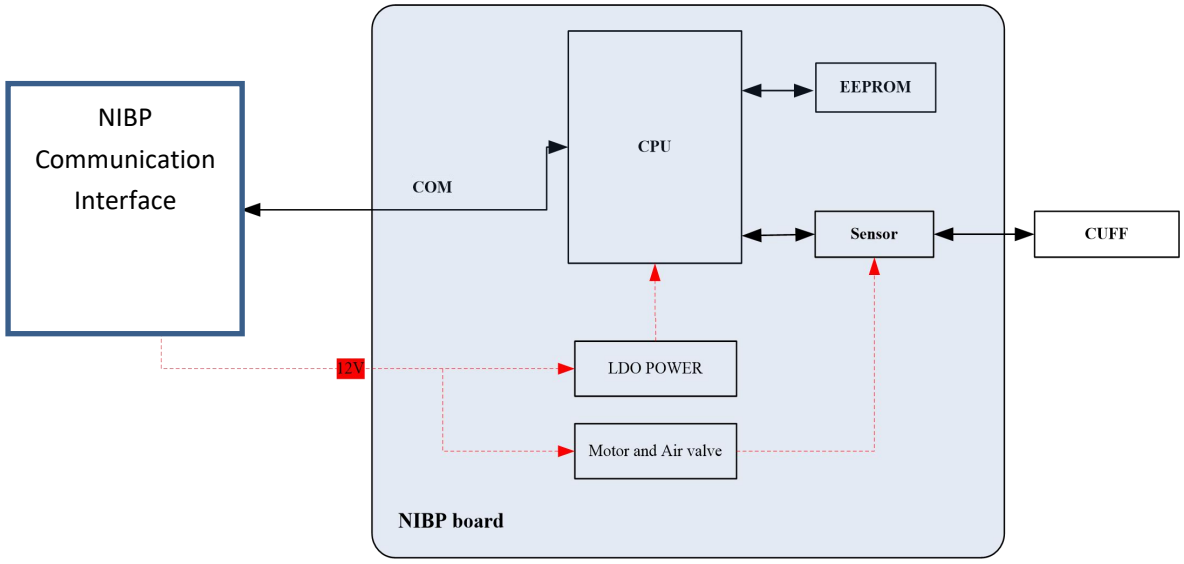


Figure 3-16

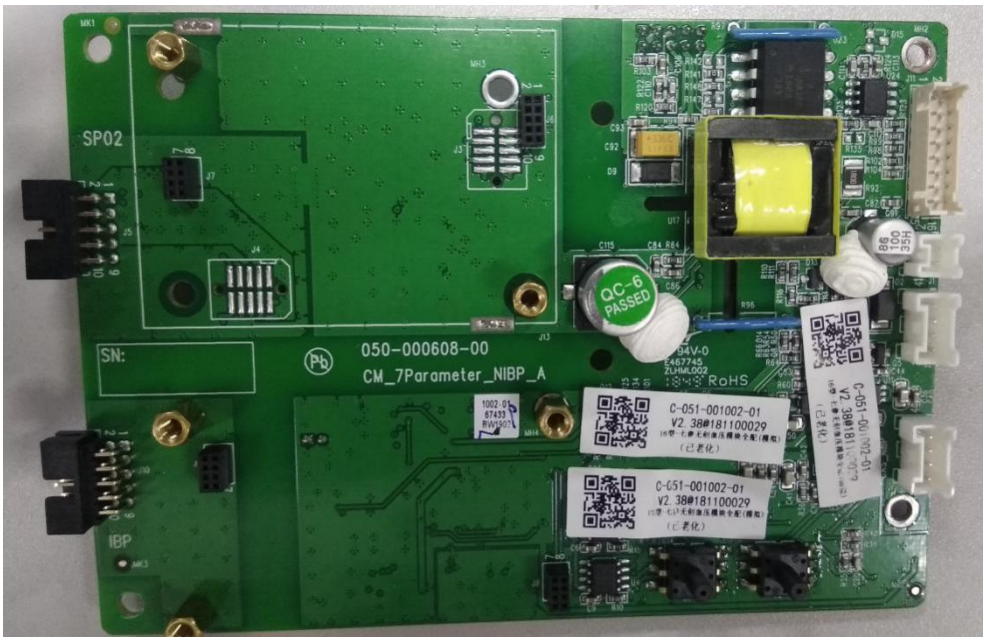


Figure 3-17

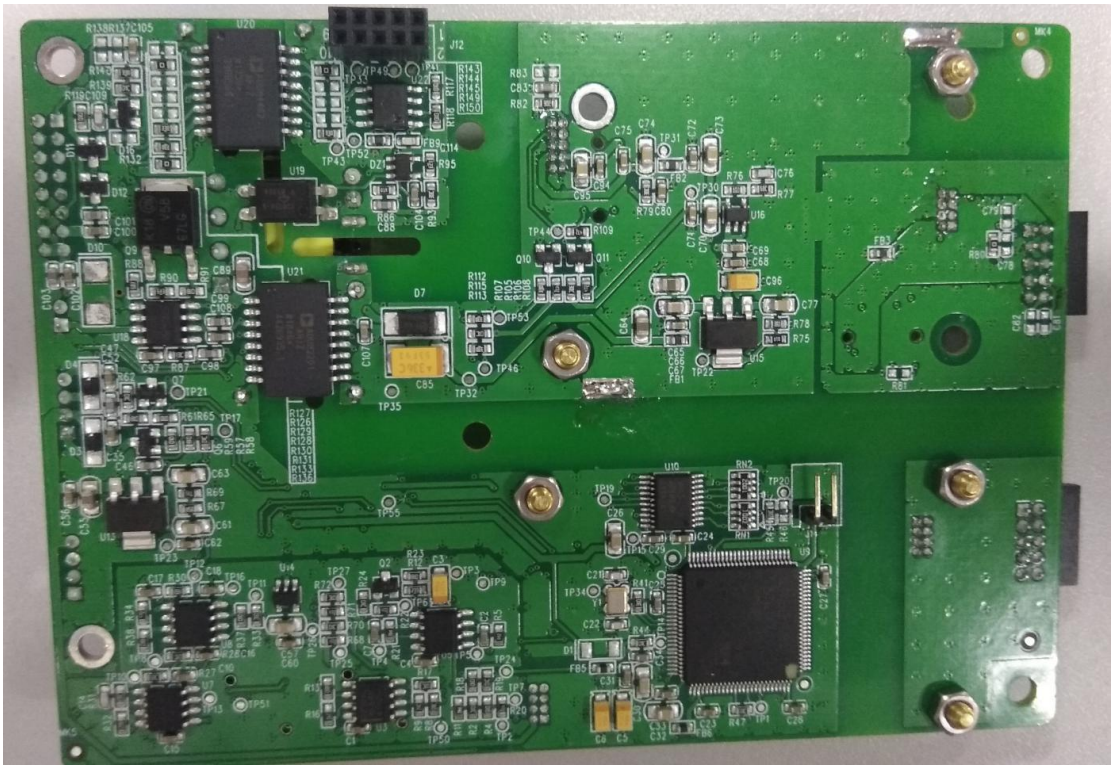


Figure 3-18

Socket	description	working voltage
J1	2pin, connecting air pump	12V

J2	4pin, connecting valve	12V
J3	10pin, docking Masimo oximeter	3.3V
J4	10pin, docking Masimo oximeter	/
J5	10pin, docking side panel	3.3V
J6	10pin, docking simulation / Digital/Nellcor oximeter	3.3V
J7	10pin, docking analog/digital/Nellcor oximeter	/
J8	10pin, docking IBP board	5V
J9	10pin, docking IBP board	5V
J10	10pin, docking side panel	/
J11	14pin, connecting seven ginseng blood pressure board	5V, 12V
J12	10pin, connected to ECG board	/

table 3-11

3.2.8 IBP module

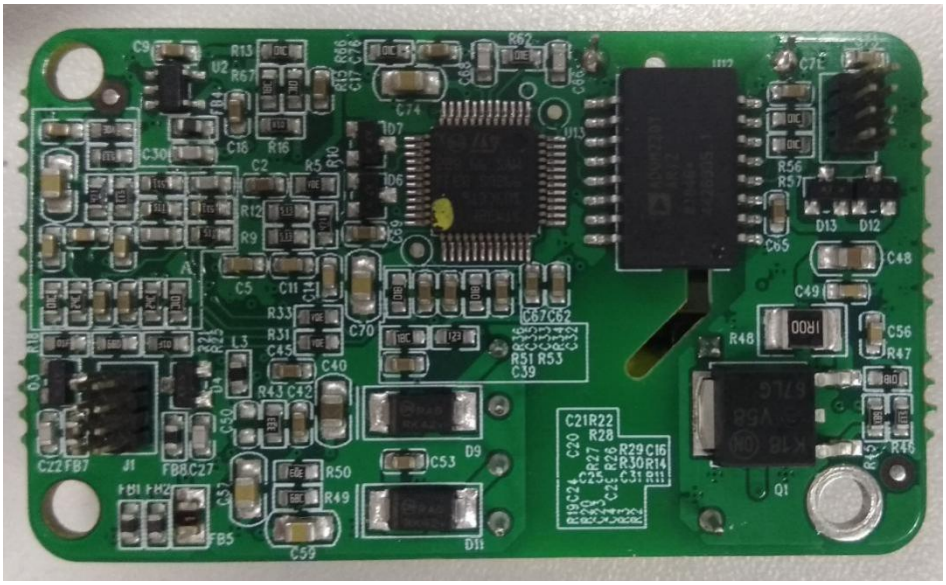


Figure 3-19

socket	description	working voltage
J1	connection IBS socket IBP socket J8/J9	5V
J2	connection IBS socket IBP socket J8/J9	5V

table 3-12

3.2.9 ECG Module

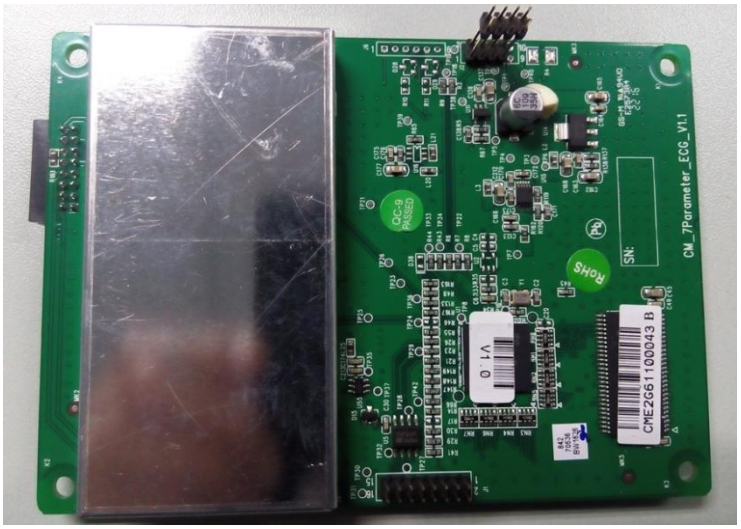


Figure 3-20

Socket	Description	Operating Voltage
J2	Connection NIBP Module	6.6V, 5V, 3.3V
J3	Connection Side Panel	5V

Table 3-13

3.2.10 SPO2 Module

Three Blood Oxygen Modules: COMEN Blood Oxygen, Masimo Blood Oxygen and Nellcor Blood Oxygen

The oximeter is mainly used for the collection of blood oxygen signals, amplification simulation, and conversion and processing of electrical signals.

During the monitoring process, the pulse amplitude of the optical signal also changes. By calculation, blood oxygen parameters, pulse rate signals and volume waves can be obtained. This data is then transferred to the main board via a special communication protocol.

3.2.10.1 COMEN SPO2 Module

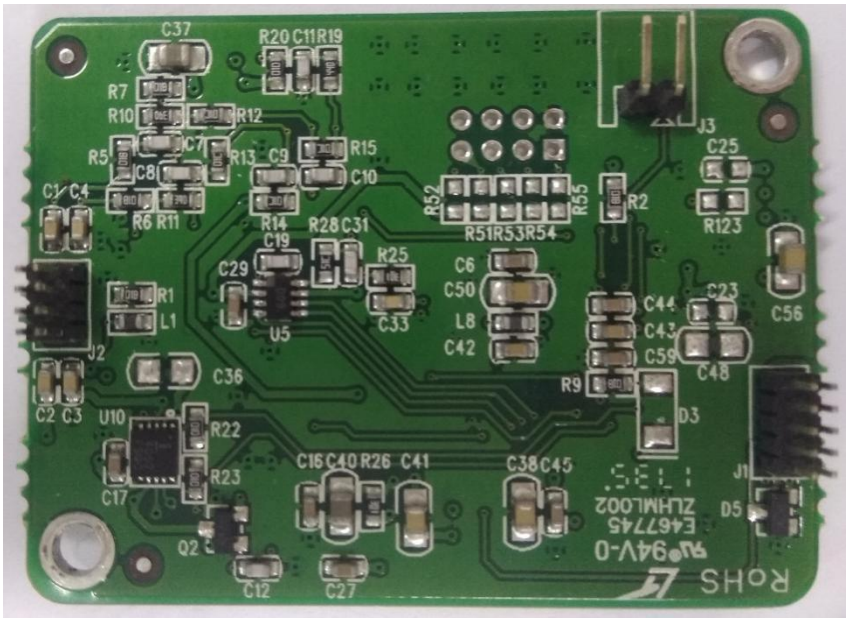


Figure 3-21

serial number	description	working voltage
J1	2*5pin, SPO2Module Communication Interface	3.3V
J2	2*4pin, SPO2Module Measurement signal input interface	/

table 3-14

3.2.10.2 MASIMO SPO2Module

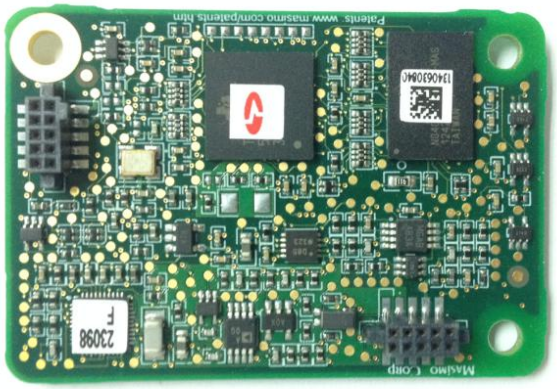


Figure 3-22

serial number	description	working voltage
J1	2*5pin , SPO2Module Communication Interface	3.3V
J2	2*5pin , SPO2Module Measurement signal input interface	/

table 3-15

3.2.10.3 NELLCOR SPO2 Module

Figure 3-23

serial number	description	working voltage
J1	2*5pin, SPO2Module Communication Interface	3.3V
J2	2*4pin , SPO2Module Measurement signal input interface	/

table 3-17

Chapter 4 Troubleshooting

4.1 Introduction

In this chapter, some common faults and troubleshooting methods for defibrillation monitors are introduced. If your fault is not listed, please contact Comen's after-sales service department.

4.2 Replaceable parts

The main components and components in the monitor PCB are replaceable. If a separate PCB board is faulty, follow the instructions for “Assemble and Disassemble”, replace it with a brand new PCB board, and finally check if the monitor's performance is restored. If the problem persists, reinstall the faulty PCB and continue troubleshooting according to the instructions in this section. You can also send the PCB back to Comen for repair.

4.3 Checking the monitor

In troubleshooting, some require you to check the hardware version of the monitor and the status of the instrument.

4.4 Checking the software

In troubleshooting, some require the customer to check the monitor's configuration and software version.

View the system configuration and software version: After booting the self-test (heep beep), press Main Menu -> Monitor Maintenance -> Monitor Information to view the system running time, system software version and hardware version.

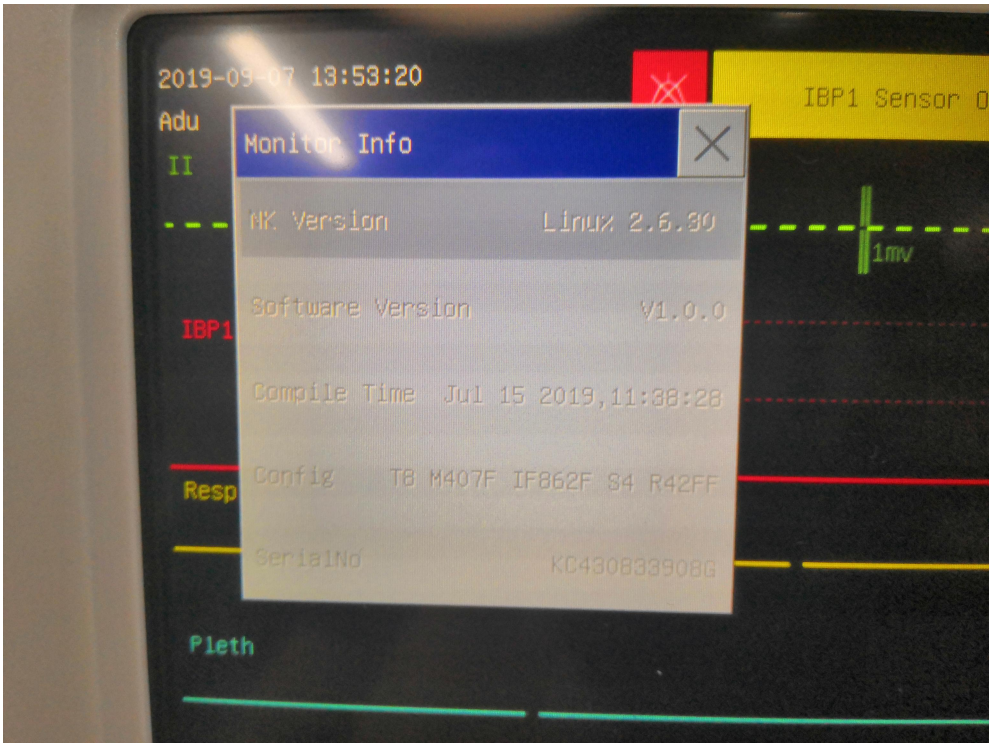


Figure 4-1

Figure 4-2

4.5 Check the error message prompt

Check the error message prompt area of the monitor before troubleshooting. If there is an error message, remove the alarm first according to the instruction manual.

4.6Troubleshooting

4.6.1 Electricity failure

phenomenon	reason	measure
The monitor does not start	Dish is damaged	Check if the dial cable is damaged or not connected. Replace the dial.
	The power cable is not connected properly.	Check the connection of the power cord
	battery is low	Check battery level
	Boot button board is damaged	Replace the power button or keypad
	Poor wiring contact	Check the cable from the keypad to the main control board, and connect the power cable to the main control board. Check whether the wiring is damaged.
	The keypad is damaged	Replace the keypad
	AC power module is damaged	Replace the AC power module
	Power board damage	Replace the power board
	Main board damage	Replace the main board

Table 4-3

4.6.2Display failure

phenomenon	reason	measure
The monitor works normally and the display is blank.	Poor contact or damage to the wiring	Check the LCD cable to the main control board cable, check the power board to the main control board cable, check the button board to the main control board cable; check the wiring and interface for damage.
	Display module damage	Replace the display module
	main board damage	Replace the main board
	keyboard damage	Replace the keyboard
The monitor works normally, the display is lacking color or the screen is	Broken wiring or poor contact	Check the wiring of the keypad and the main board; check the LED Screen and main control board wiring
	main board damage	Replace the main board
	Display module damage	Replace the display module
Display blinks	Broken wiring or poor contact	Check the wiring of the keypad and the main board; check the LED screen and button board wiring
	keyboard damage	Replace the keyboard
	main board damage	Replace the main board
	Display module damage	Replace the display module
Uneven display brightness	Broken wiring or poor contact	Check the wiring of the keypad and the main board; check the LED screen and button board wiring

	Display module damage	Replace the display module

Table 4.4

4.6.3Battery failure

phenomenon	reason	measure
Battery cannot be charged	Poor or damaged battery and machine connection	Reinsert the battery; models with dual battery can be charged for another channel; replace the battery
	Power board damage	Replace the power board
Battery cannot be powered	Battery damage	Use the universal table to measure the voltage and observe whether the voltage range is normal. For specific voltage values, please consult Comen after-sales personnel; reinsert the battery; models with dual batteries can be exchanged for another battery channel; replace the battery
	Power board damage	Replace the power board

Table 4-5

4.6.4 SPO2 failure

phenomenon	reason	measure
No SPO2 value	SPO2 probe is damaged	Replace the SPO2 probe
	SPO2Module has poor contact with the side	Check the cable or socket of the SPO2Module and the side interface, and

	interface	check New connection
	Seven ginseng blood pressure plate is in poor contact with SPO2Module	Check if the connection between the seven-parameter blood pressure plate and the SPO2Module is normal.
	SPO2Module is damaged	ReplaceSPO2Module
	SPO2Module type is not set (default analog SPO2)	Change SPO2 type
SPO2 value is incorrect	Probe does not match patient type	Replace the correct type of probe
	The patient's long-term blood pressure measurement or other conditions such as shock or low temperature	Measuring SPO2 under normal conditions
	SPO2Moduleis damaged	Replace SPO2Module

Table 4-6

4.6.5 NIBP failure

phenomenon	reason	measure
Uninflatable	Blood pressure catheter is not connected well	Check the interface of the catheter
	NIBP Module has poor contact with the side panel	Check the blood pressure Module and the air connection at the side interface and reconnect
	NIBP Module is damaged	Replace NIBP Module
Repeated inflation (no blood pressure)	Patient type error	Check if the patient type is consistent with the cuff in the patient type display area
	Accessories leaking	Check cuffs, cuffs and connectors
	Blood pressure pump leaks	The inflation has a numerical value, but the value is very unstable. It can be seen that the value has a falling condition.
	NIBP Module is damaged	Replace NIBP Module
Wrong blood	Patient type error	Check if the patient type is consistent with the cuff in the patient type display

pressure		area
	Blood pressure accessories leak	The cuff is too tight or too loose; the cuff is leaking or is damaged; the blood pressure trachea is leaking
	NIBP Module is damaged	Replace NIBP Module

Table 4-7

4.6.6 TEMP Module failure

phenomenon	reason	measure
The host has no temperature value display	Lead off	Please make sure the lead wire is connected.
	ECG Module's temperature function is damaged	Replace ECG Module
	Host display failure	Please press 4.6.2 to check and replace

Table 4-8

4.6.7Key failure

phenomenon	reason	measure
Button does not work	Connection is damaged or bad contact	Check if the connection between the keypad and the motherboard is normal.

	Keyboard failure	Replace the keyboard

Table 4-9

4.6.8Software upgrade failure

phenomenon	reason	measure
Program upgrade failed	main board damage	Replace the main board
	U disk is not inserted	Check the USB flash drive on the USB
	Download the wrong upgrade package	Please use the correct upgrade package

Table 4-10

4.6.9Technical alarm information

Please refer to the user's instruction manual.

4.6.10Electrode piece cable connection failure

phenomenon	reason	measure
Defibrillation (please connect the treatment	Poor contact or is damaged	Check if the electrode cable is connected; check if the inner wire

cable), pacing or AED (please insert the electrode cable)		of the high voltage machine is connected; check if the treatment socket is damaged; Replace the electrode cable.

Table 4-11

4.6.11Treatment Module failure

phenomenon	reason	measure
Defibrillation Instrument failure	Poor contact or is damaged	Check whether the docking of the treatment Module and the power board is well connected; check whether the power board is connected to the main control board; replace the main control board; Replace the Module.
Pacemaker Instruments malfunction, pacing abnormal stop or defibrillation/pacing Instrument failure	Poor contact or is damaged	Check whether the docking plate and the high pressure plate are in good condition; check whether the treatment main control board is well connected; Replace the main control board; Replace

		treatment Module
Charging failure or charging cancellation	Treating high voltage board is damaged	Replace high voltage board; Replace treatment Module
Timed self-test failed	Poor contact or is damaged	Check whether the electrode plate is homed; check the electrode cable connection; check the connection between the treatment module and the power board; check the power board and the main control board; check whether the high voltage machine is connected properly; check whether the charging capacitor is connected; Replace treatment Module
User detection failed	The user did not follow the instructions on the screen, the contact was bad or damaged	Refer to the on-screen instructions for testing; check if the electrode plate is homed; check if the electrode plate cable is connected; check if the connection between the

		treatment module and the power supply board is in place; check the connection between the power supply board and the main control board; Replace Treatment Module

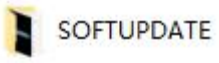
Table 4-12

Chapter 5 software upgrade

System software upgrade can be achieved through U disk

5.1Upgrade Preparation

1.Before upgrading, please check the version of the software (for details, please refer to section 4.4).

2.Put the folder 

on the computer (the folder name is SOFTUPDATE, you can't change the file name, otherwise you can't complete the upgrade). The whole copy is in the root directory of the U disk (that is, open the U disk directly)

5.2 System software upgrade

After preparing for the work, perform the following software upgrades:

1) Press the power button and the machine starts:

2) The machine will automatically enter the upgrade interface, please wait for the machine upgrade to complete:

3) Wait a few minutes to upgrade, the screen appears "system update successed, please restart", you can reboot.

⚠Caution

- **Please check with Comen after-sales personnel to see if the upgrade software meets your instrument.**
- **Do not connect the monitor to the patient during the upgrade.**
- **The upgrade process will last for 30 seconds - 2 minutes. Please ensure that there is sufficient battery power or AC power.**
- **The upgrade of the program can only be operated by professional after-sales personnel.**
- **Do not remove or insert a USB flash drive while the software is being upgraded.**

Chapter 6 Performance Verification

6.1 NIBP test

6.1.1 NIBP Air leak test

requirements：

- Adult non-invasive blood pressure cuff
- Suitable catheter
- Cylinder

Please follow the steps below to do the performance test:

1) Connect the cuff to the NIBP air vent of the monitor.
2) Wrap the cuff around a suitably sized cylinder.
3) Select [NIBP] in the parameter area, and select [Leakage Detection] in the [NIBP Settings] menu that pops up.
4) At this time, “leakage detection...” will be displayed below the NIBP parameter area on the screen, and the table system will start to perform air leak detection.
5) The system is automatically inflated to a pressure of 180 mmHg.
6) After about 20 seconds, the system will automatically open the bleed valve to mark the completion of the leak measurement.

If there is no prompt information in the NIBP parameter area, the table shows that there is no air leakage. If “Pump leak...” is displayed, there may be a leak in the gas path. At this point, the operator should check whether the entire connection is loose. After confirming that the connection is correct, perform another leak detection. If there is still a fault indication, please contact the manufacturer for repair.

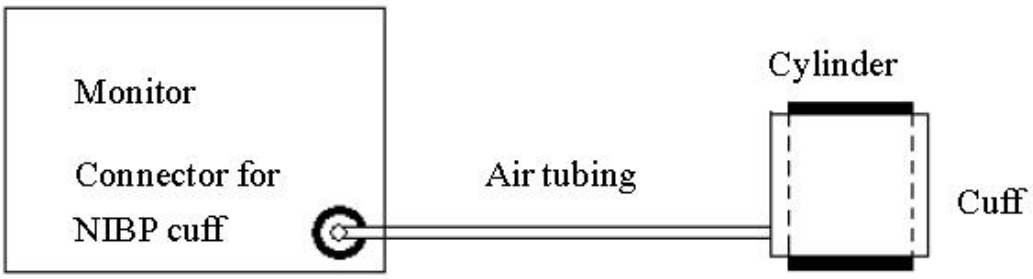


Figure 6-1

6.1.2 NIBP Pressure calibration

requirements：

- T-type interface
- suitable trachea
- ball type air pump
- Metal container: 500 ± 25 ml
- Sphygmomanometer (for reference): use a calibrated pressure gauge with an accuracy greater than 1mmHg

Please follow the steps below to do the performance test:

1. Connect the monitor, pressure gauge, spherical air pump and metal container (instead of the cuff) as shown in the figure below。

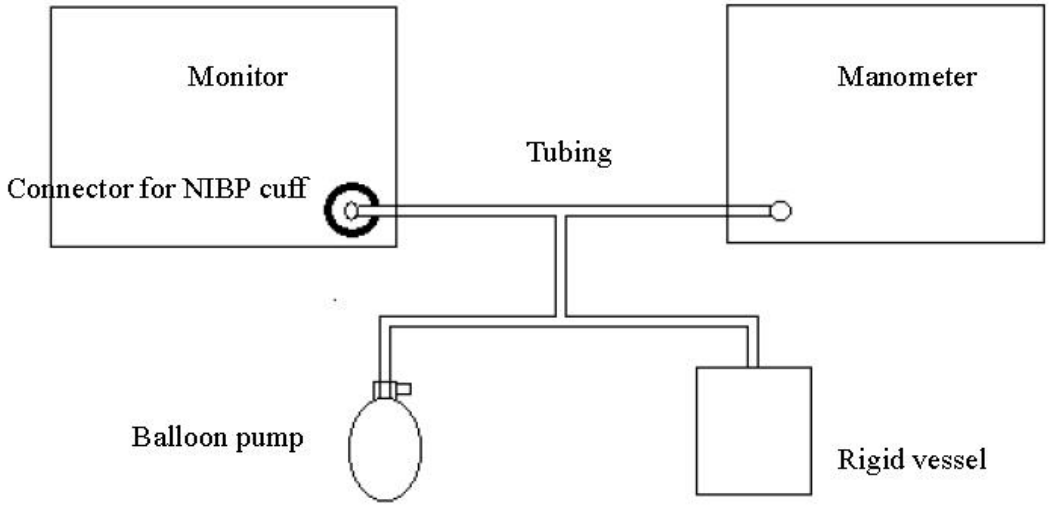


Figure 6-2

2. The pressure gauge reading should be zero before inflation. If it is not zero, open the ball pump valve so that the entire gas path leads to the atmosphere, and then close the valve after the standard pressure gauge reads zero.

3. In the [Monitor Maintenance] menu, select [User Maintenance], enter the password and enter the [User Maintenance] menu, select [NIBP Check], and set the monitor to "Check" mode.。

4. The pressure in the metal container was inflated to 0, 50 and 200 mmHg by a ball type air pump. The difference between the value of the standard pressure gauge and the pressure indicated by the monitor should be within 3 mmHg. Otherwise, please contact the Comen service engineer.。

6.2 IBP test

Test requirements：

Invasive blood pressure simulator, IBP accessory.

Please follow the steps below to do the performance test:

1. Connect the invasive pressure simulator and monitor through the accessory, set the output static pressure of the invasive pressure simulator to 0mmHg (0kPa), change the current IBP channel pressure name in the monitor to ART and zero, the system should prompt the school Zero success, and the average pressure value is also shown as 0 mmHg (0 kPa).

2. Set the static pressure value of the artificial pressure simulator to 100mmHg, 200mmHg, dynamic pressure value 120/80mmHg, the pressure display range of the current channel should be (0~1mmHg, 98~102mmHg, 196~204mmHg, (118~122) / (79 ~ 81) mmHg).

3. Repeat the above steps for IBP channels 2, 3, and 4.

6.3 ECG test

Test requirements:

ECG lead, heart" simulator.

Please follow the steps below to do the performance test:

Use ECG lead and ECG simulator to connect one by one. After the ECG simulator is powered on, press the “NSR” button of the ECG simulator to observe the HR value of the simulator screen and the ECG waveform of the monitor. After stabilization, the HR value of the instrument screen is ±1% or ±1bmp.

6.4 SpO2 test

requirements requirements:

SPO2 probe

Please follow the steps below to do a performance test:

1. Connect the SPO2 probe to the monitor. Set the patient type to adult.

2. Test SPO2 on your finger. (assuming you are in good health)

3. Check the volumetric and pulse rate readings to ensure that the SPO2 value is in the range of 95%-100%.

4. Remove the SPO2 sensor from your finger and the value and waveform gradually become zero.

6.5 TEMP test

requirements requirements:

Constant temperature water bath, standard mercury thermometer with a graduation value of 0.05 °C.

Please follow the steps below to do a performance test:

The standard mercury thermometer with a graduation value of 0.05 ° C and the monitor body temperature sensor are closely attached together, and the thermostatic water bath is placed at the same time, and the water temperature of the constant

temperature water bath is adjusted. Compare the measured value of the monitor with the standard thermometer degree. In order to ensure the reliability of the test, the volume of water is required to be not less than 2L, the water depth is not less than 10cm, and the water temperature is uniform after being fully stirred. Using a constant temperature water bath and a standard thermometer, select the temperature point of 0 ° C, 37 ° C, 50 ° C, the monitor body temperature probe and thermometer are simultaneously put into the water bath for testing, the test results should be displayed in the following range: 0 ~ 0.1 ° C, 36.9 ~37.1 ° C, 49.9 ~ 50.1 ° C

Chapter 7 Disassembly Procedure

The following section describes the disassembly and reassembly procedures for the monitor and its components.

7.1 Who Should Perform Repairs

Only qualified service personnel (biomedical engineers or technicians) should open the monitor housing, remove and replace components or make adjustments. If your medical facility does not have qualified service personnel, contact *COMEN* or your local *COMEN* representative.

 **Caution**

High-Voltage – Voltages dangerous to life are present in the instrument when it is connected to the mains power supply. Do not perform any disassembly procedures with power applied to the instrument. Failure to adhere to this warning could cause serious injury or death.

Tools required:

- Screwdrivers
- Small flat head screwdriver
- Needle Nose Pliers
- ESD mat and wrist strap
- Cleaning Agent
- Tweezer

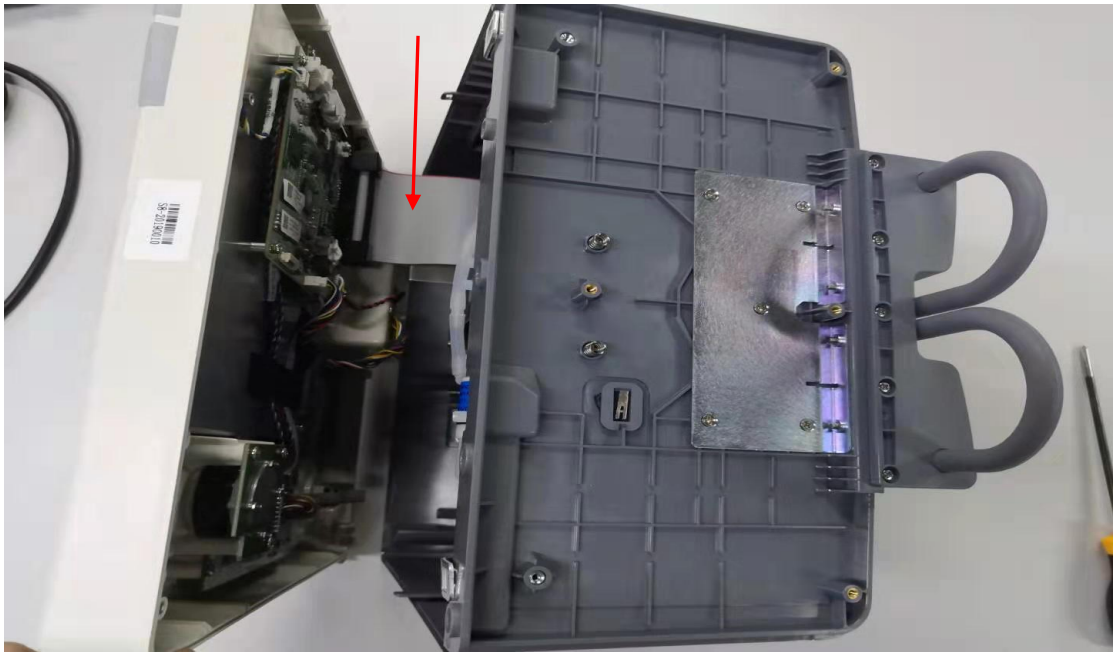
7.2 Separating the Front and Rear Housing

1. Unscrew the **6** PB3×10mm screws and remove the handle assembly.

2. Unscrew the **5** PB3×10mm screws.

3. Unscrew the **5** PB3×10mm screws.

4. Unplug the cables that connect to the front panel to separate the front panel & rear housing



7.3 Removing the Printer

1. Open the print cap then remove the two PWM 3.0×4mm screws;

2. Remove the printer cable which connects to main board (socket: J32)

7.4 Removing the Main Board

1. Unscrew 4 M3.0×6.0mm screws to remove the main board;

7.5 Removing the Screen bracket and Screen.

⚠**Caution:**

- **Do not touch the LCD**
- **Disassemble the LCD in an environment as dust-free as possible**

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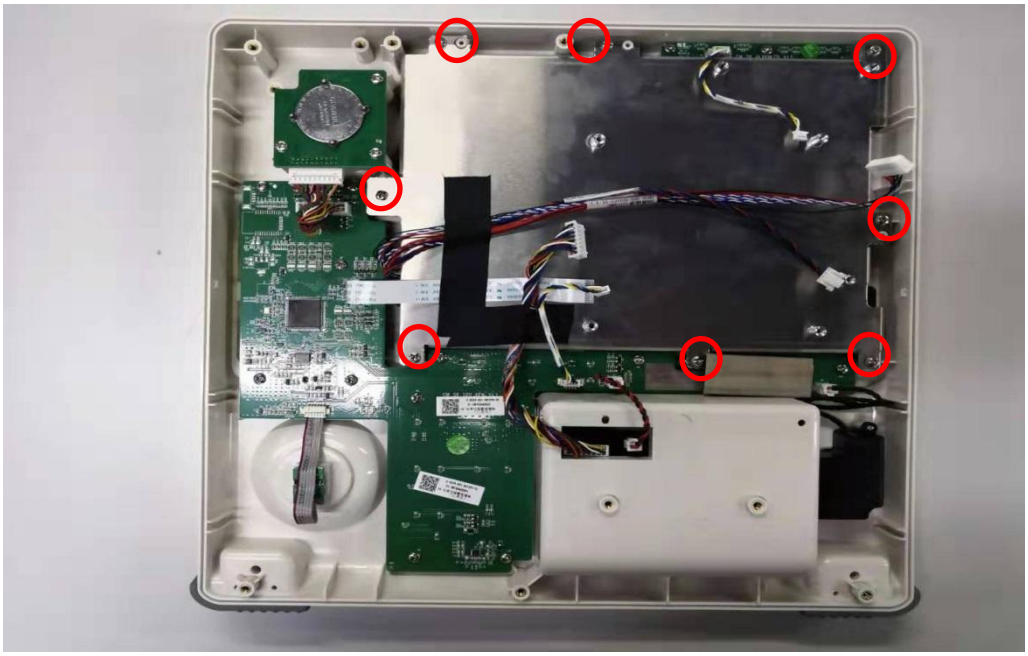
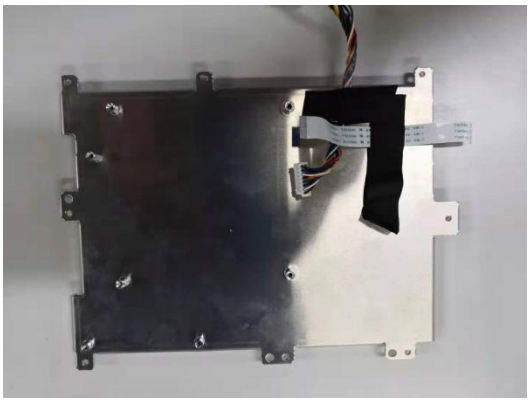
1. Disconnect the cables that connect between the Mainboard and screen.
2. Unscrew 8 M3.0×6.0mm screws to remove the Screen bracket;



3. Remove the screen bracket and screen.



7.6 Removing the Knob Encoder and keyboard

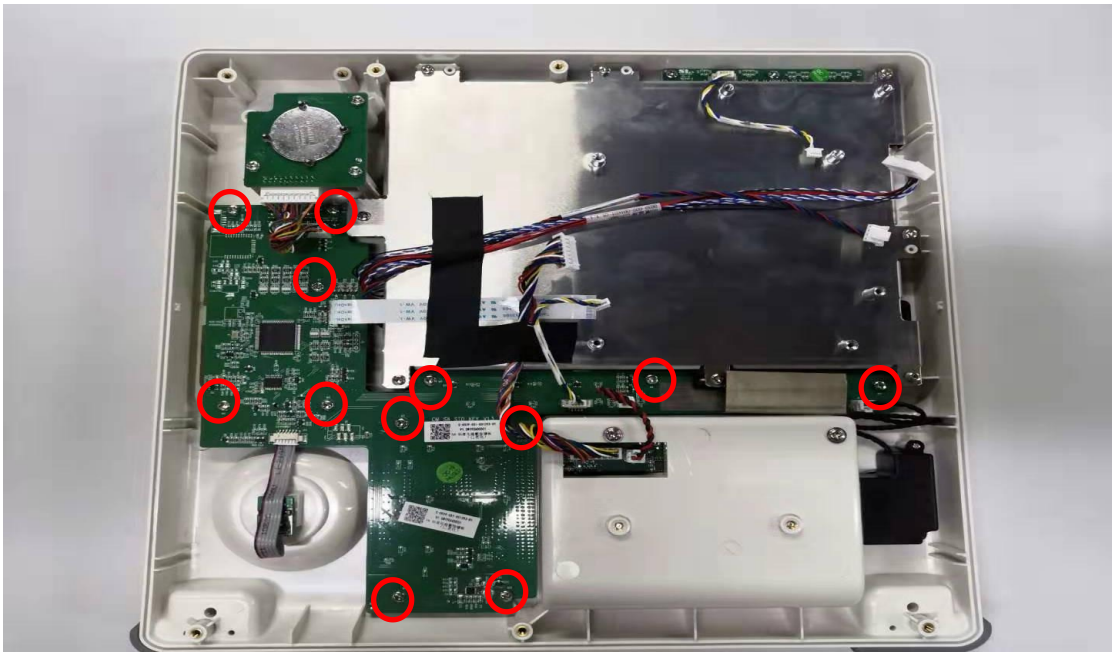
1. Unplug the cap of knob (tip: you may use tweezers or other tool to pick out the cap);

Plug out the knob cap

2. Unscrew the screw nut on the Knob Encoder;

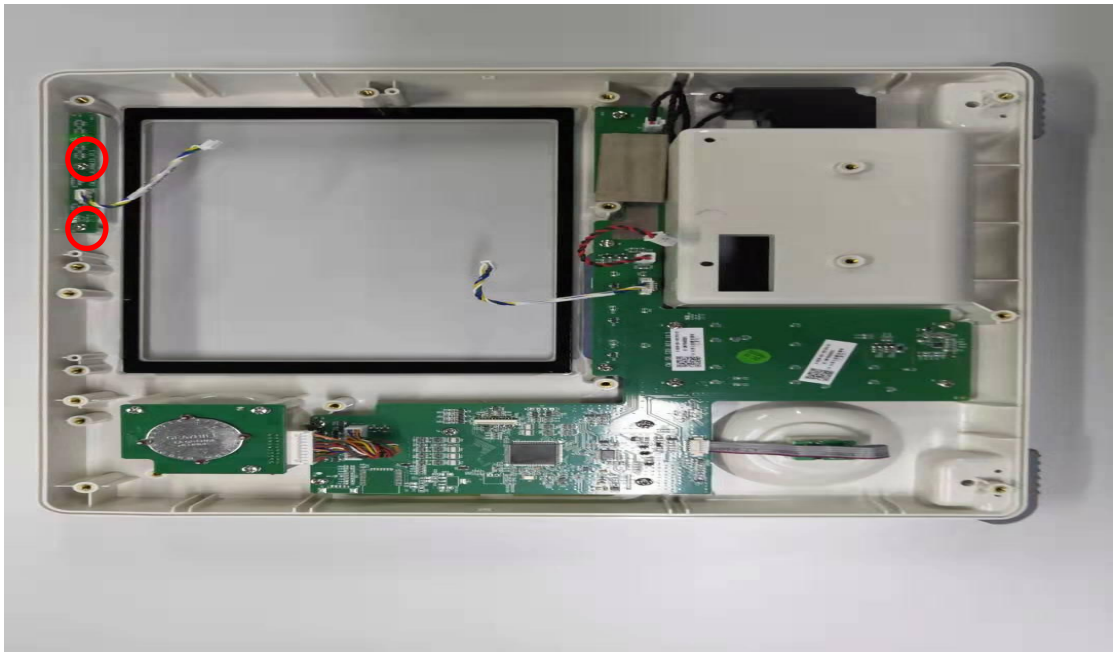
3. Remove the cable from keypad;

4. Remove the 12 PWA 3.0×5.0mm screws from keypad.



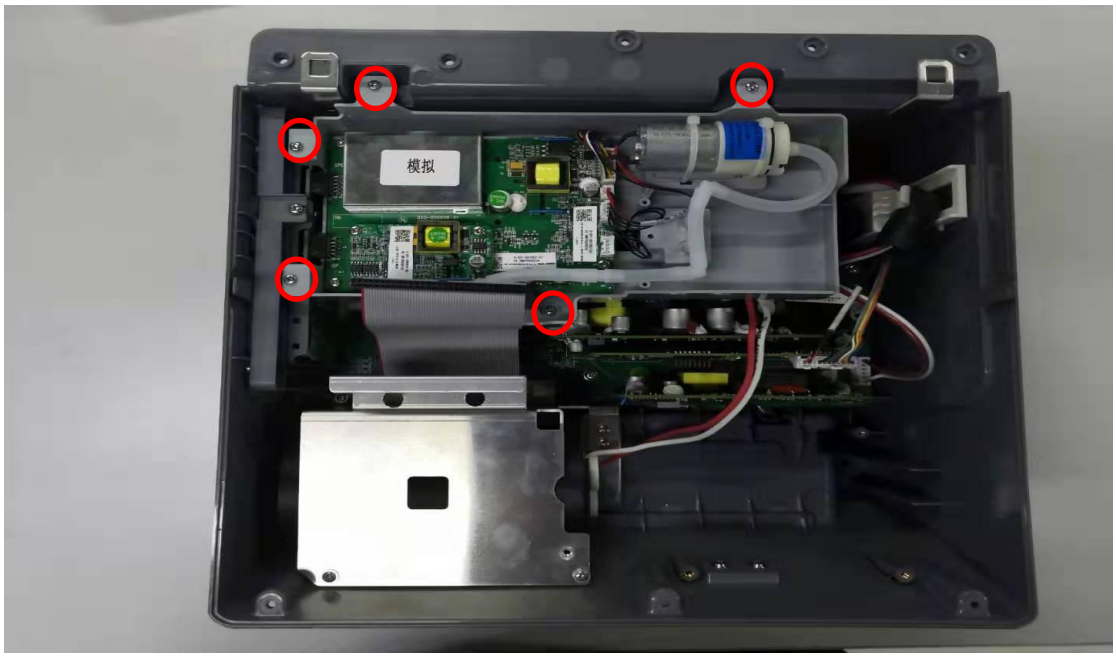
7.7 Removing the Alarm LED Board

1. Disconnect the cable that connects to the Alarm LED Board;
2. Remove the 2 PWA 3.0×5.0mm screws from keypad.

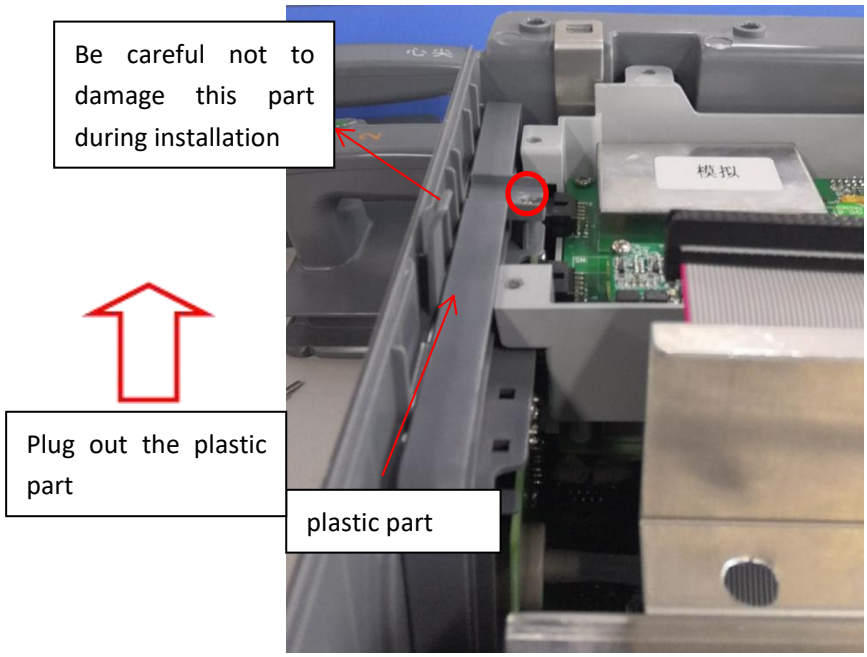


7.8 Removing 7-parameter Module & Side Panel Assembly

1. Disconnect cable on 7-Parameter module and CO2 cable from power supply board;
2. Unscrew 5 PA3.0×6.0mm screws to remove 7 parameter assembly

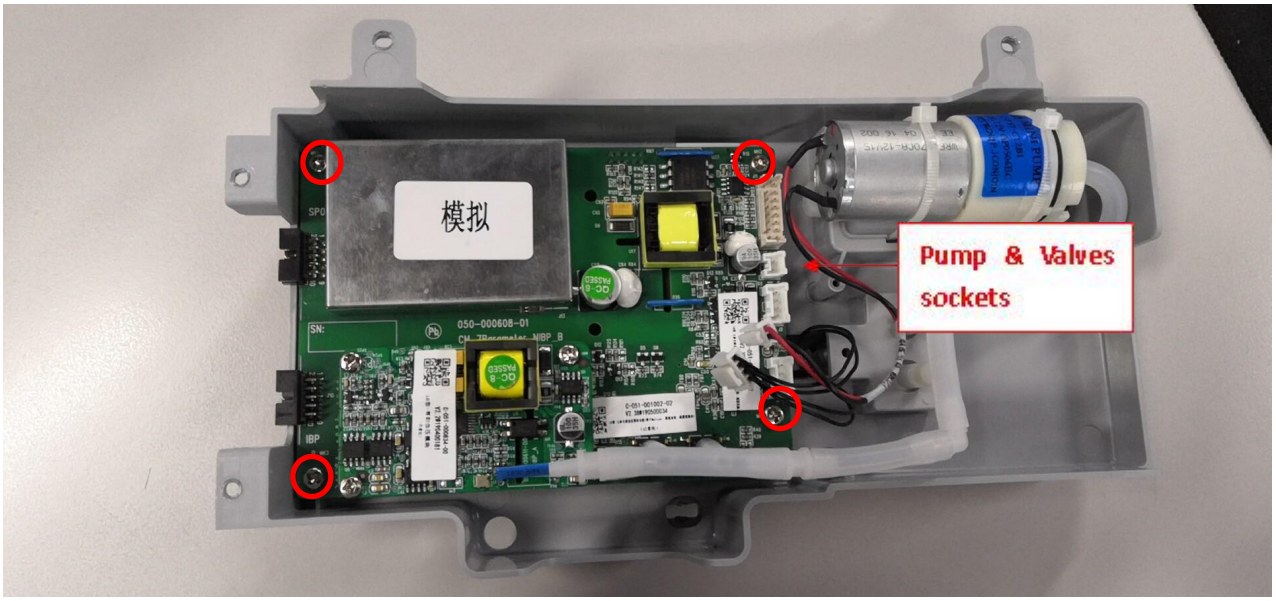


3. Unscrew the screw and plug out the plastic part to remove the side panel.



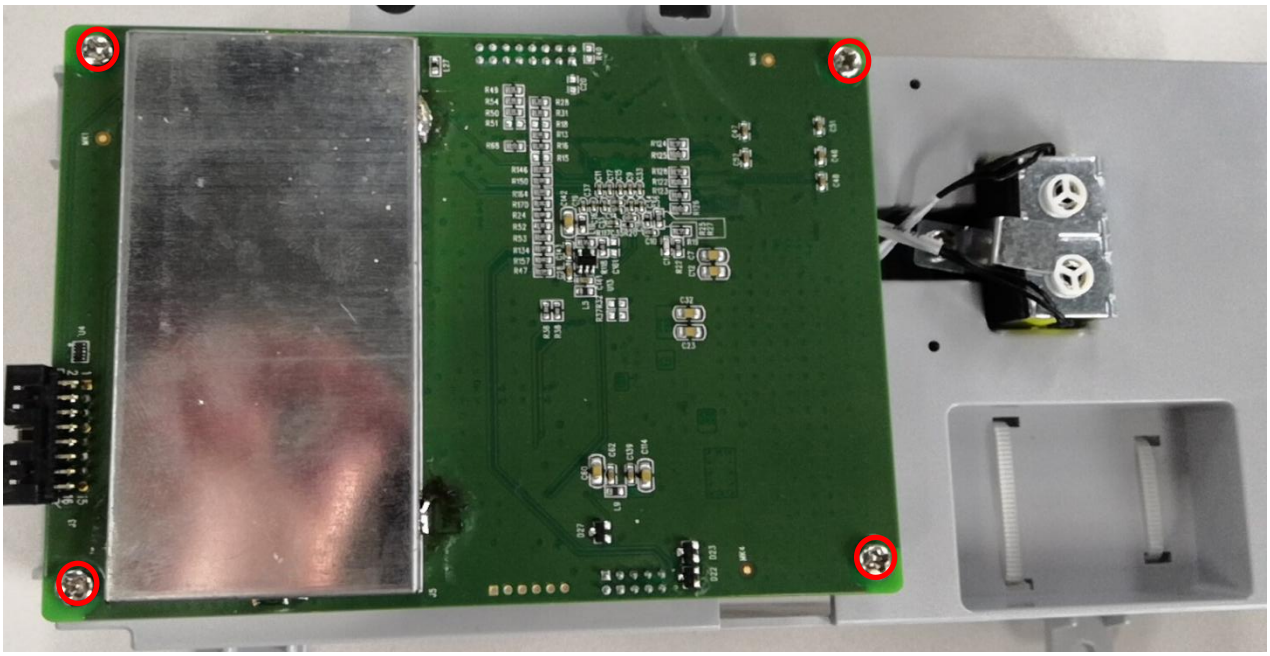
7.8.1 Removing 7-parameter NIBP board

1.Unscrew 5 PA3.0×6.0mm screws to remove 7 parameter NIBP board.



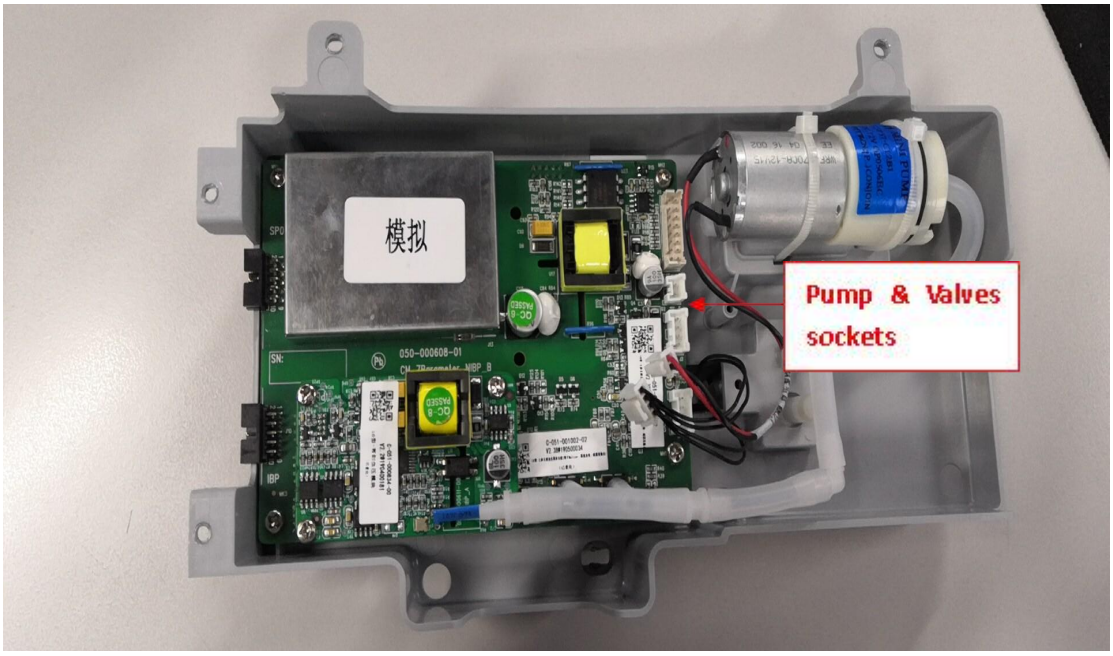
7.8.2 Removing 7-parameter ECG board

1. Unscrew 5 PA3.0×6.0mm screws to remove 7 parameter ECG board.

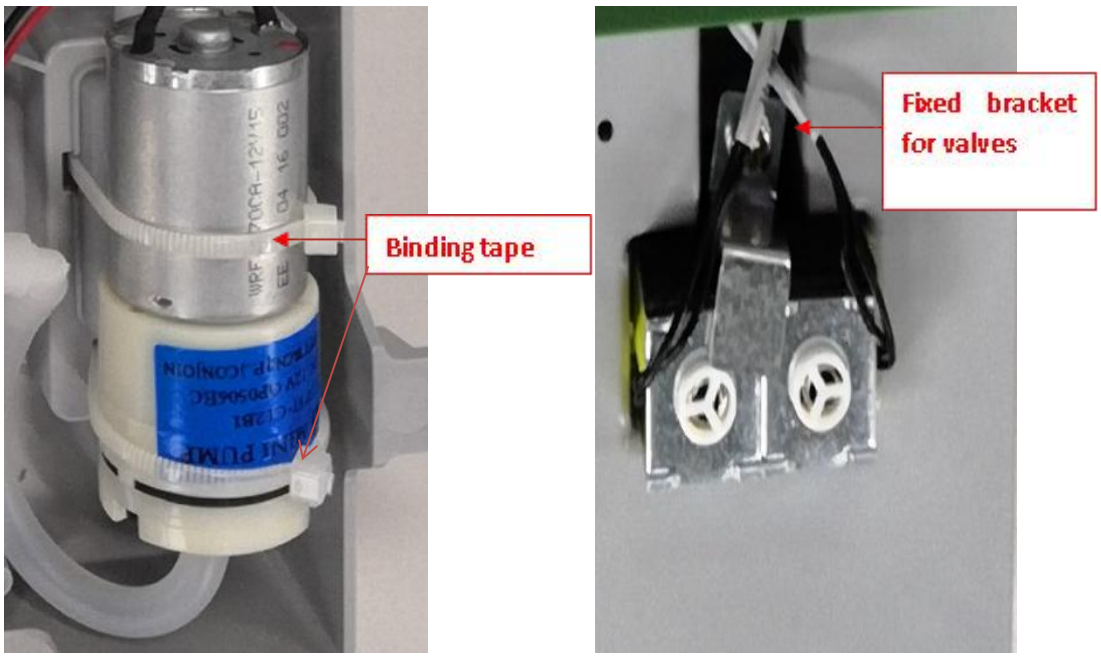


7.8.3 Removing NIBP Pump & Valves assembly

1. Disconnect the pump & valves cables from the socket as described above.



2. Cut off the two cables ties that tied on the pump to remove the NIBP pump;
3. Unscrew the one 3×6mm screws on the valves fixed bracket, then remove the 2 NIBP valves.



7.9 Removing IBP Board, Masimo/Nellcor/ Analog SPO2 Board

Remove 7-Parameter Board as described above;

7.9.1 Removing IBP board.

The IBP board is attached on the 7-parameter board, unscrew the 3 screws on the IBP board to remove it.

7.9.2 Removing Masimo/Nellcor/ Analog SPO2 Board

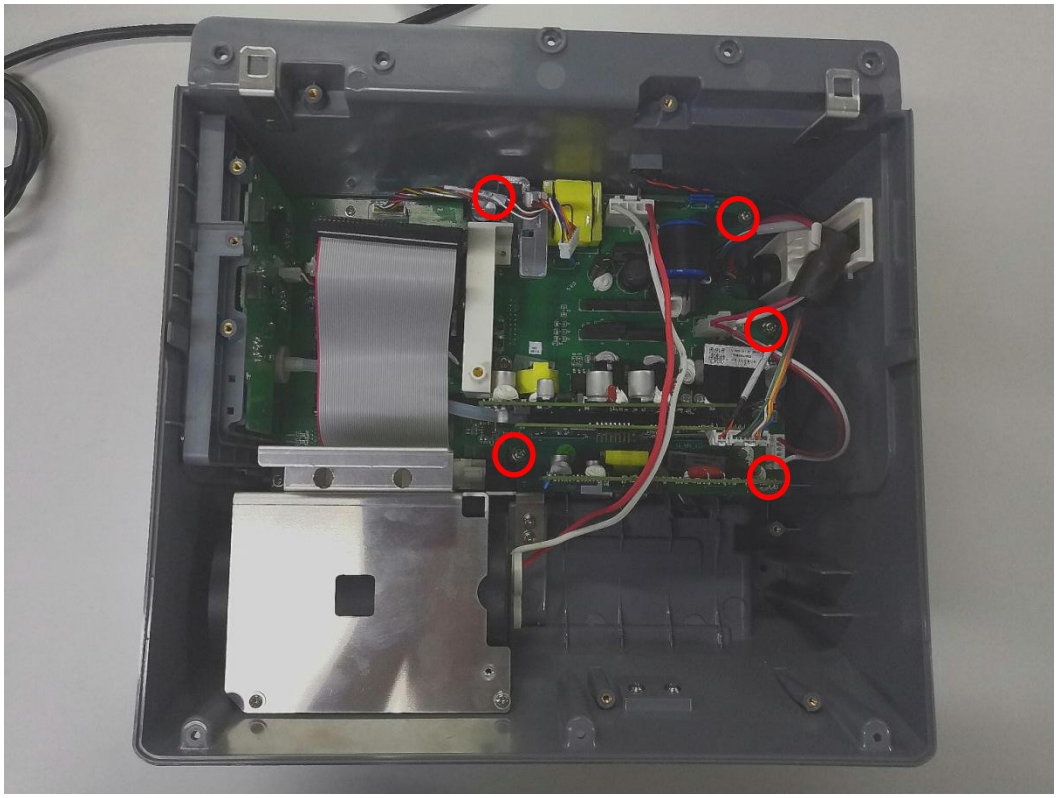
Remove 7-Parameter Board as described above;

1. Weld off the shield box ;

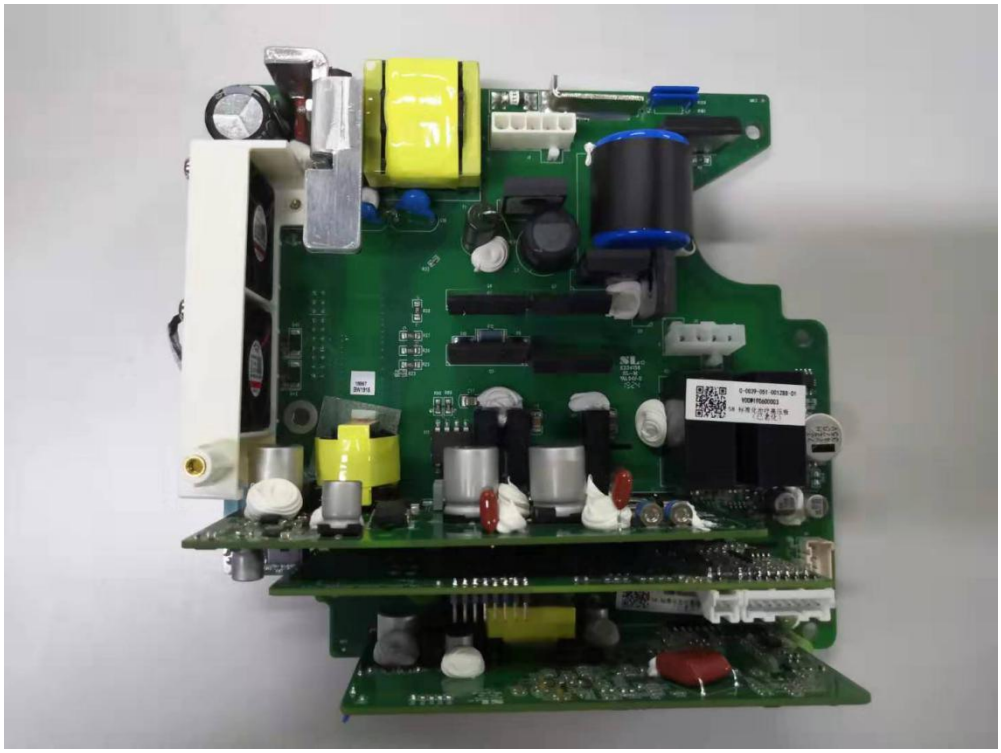
2. Unscrew the 2 screws on the SPO2 board to remove the board.

7.10 Removing Four-in-one treatment board

Remove the five screws in the figure below, and then remove the four-in-one treatment board

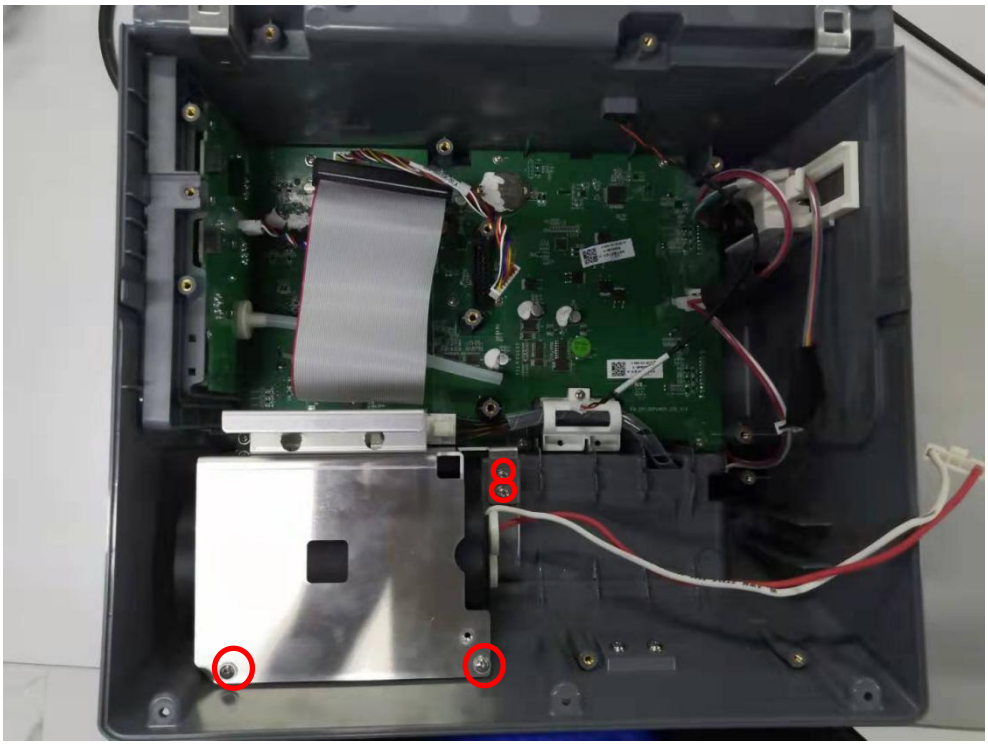


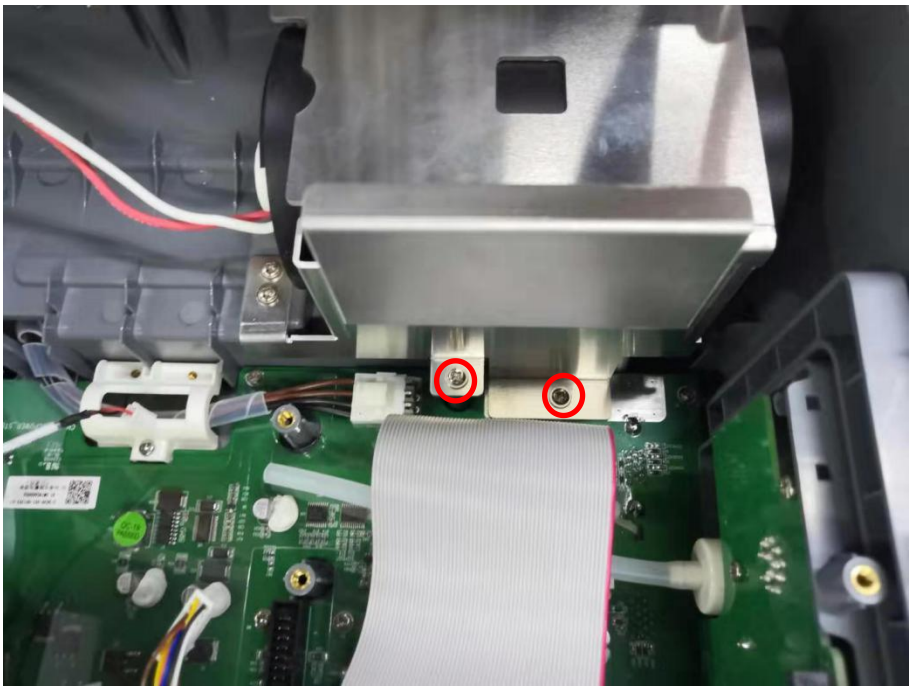
Four-in-one treatment board as shown below



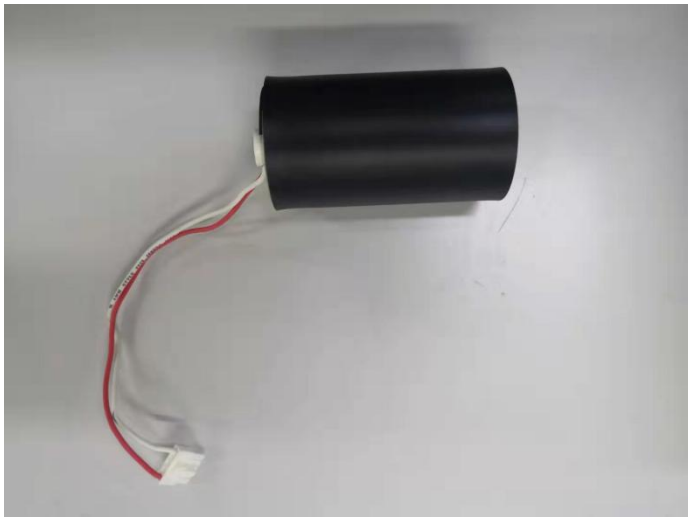
7.11 Removing the capacitor

1.Remove the screw and remove the holder



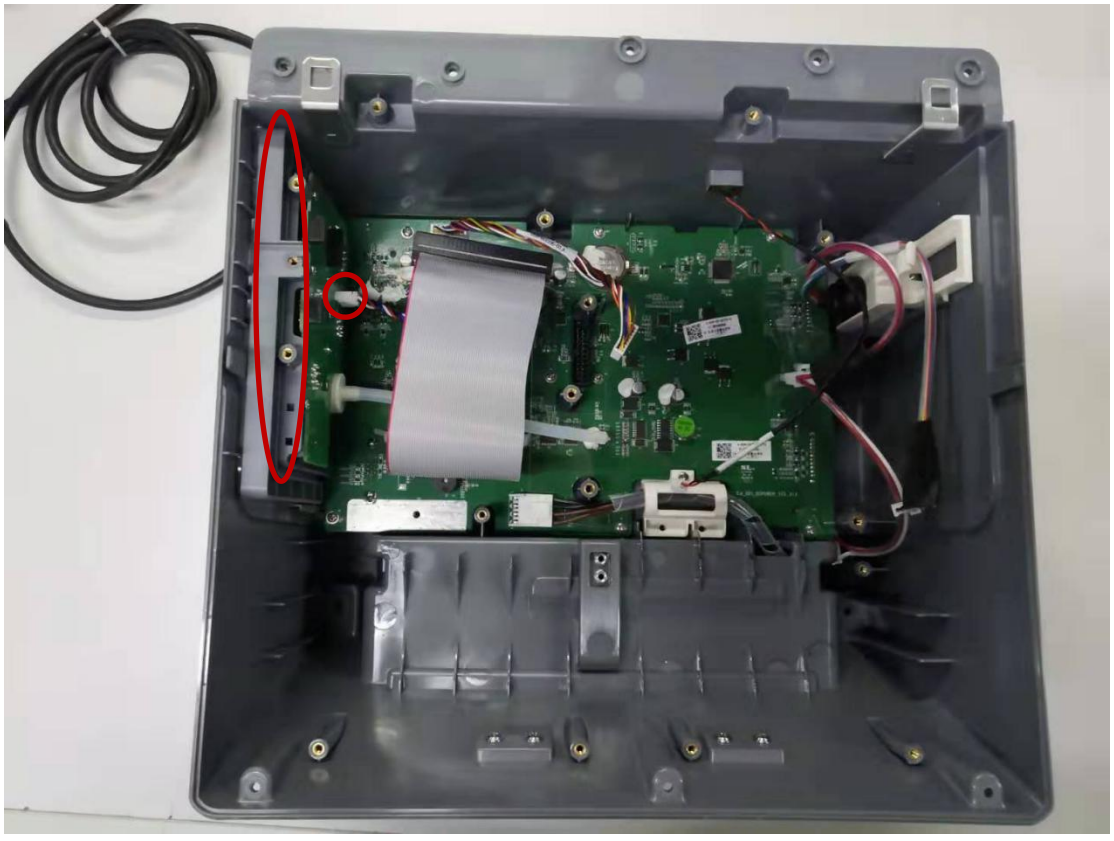


2.Take out the capacitor



7.12 Removing side panel

1. Pull out the side panel buckle and cable

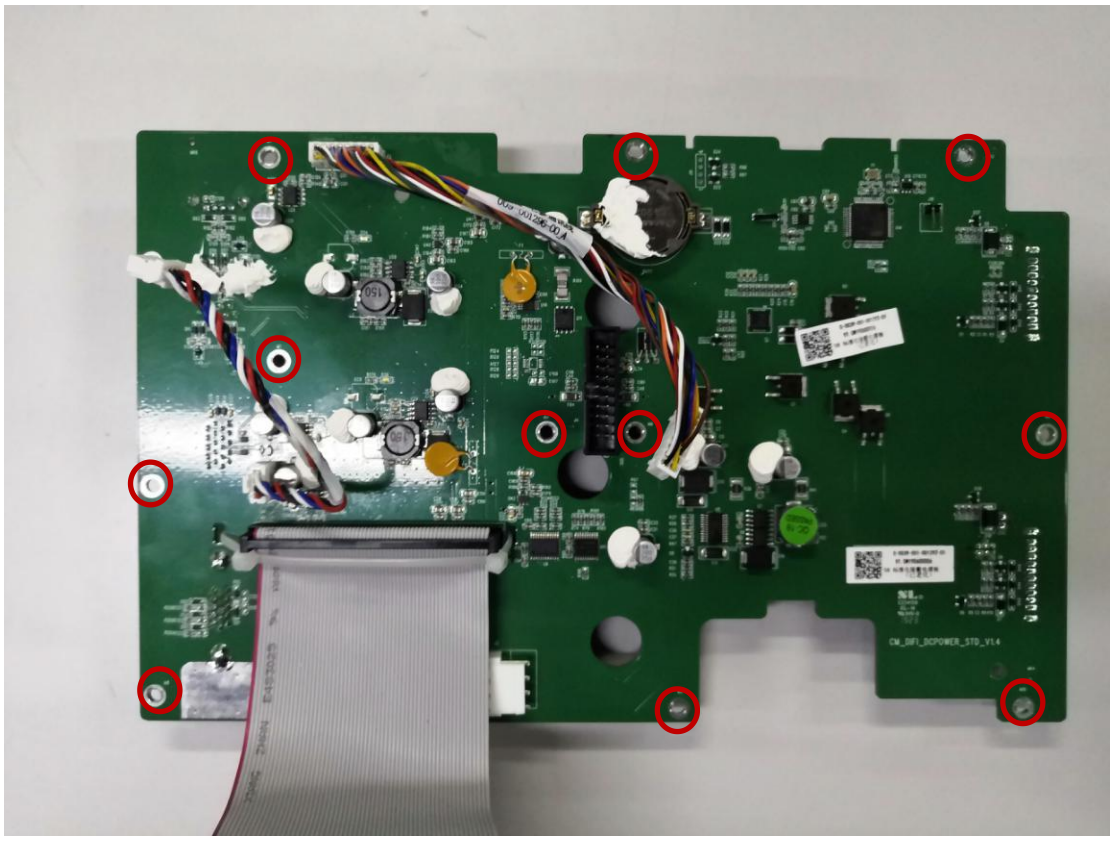


2. Remove the side panel from the side

7.13 Removing the DC Power Board

1. Pull out the electrode port buckle,remove the electrode port

2. Remove the 11 screws in the figure below, and then take out the DC power board.



7.14 Removing the AC Power Board

Remove the four screws as shown and remove the AC power board box from the back.(Note: you need to pass the cable through the hole in the back shell)