BeneHeart D30 Series Defibrillator/Monitor

Service Manual

Version 7.0

P/N: 0656B-IS001

Table of Contents

1 Preface

1.1 Revision History

Document Version	Revision Date	Revision Description	Effective Date
7.0	2025-01-21	Update	
6.0	2024-07-22	Update	2024–07–26
5.0	2024-07-22	Update	Not effect, invalid
4.0	2024-07-19	Update	Not effect, invalid
3.0	2024-06-13	Change the CO2 maintenance description	Not effect, invalid
2.0	2023-09-14	Update	2024–1–10
1.0	2023–03–15	Initial version released.	2023–03–31

1.2 Intellectual Property Statement

Statement

Mindray has the final right to interpret this manual. Only when all of the following requirements are met, Mindray is responsible for the safety, reliability and performance of the product, namely:

- Assembly operation, expansion, readjustment, improvement, and repair are all carried out by professionals recognized by Mindray.
- All parts to be replaced during maintenance, accessories, and consumables used are original parts (original) of Mindray or approved by Mindray.
- The relevant electrical equipment complies with the national standards and the requirements of this manual.
- The product is operated as instructed in this manual.

1.3 Description

This manual provides detailed information about the hardware components, assembling, dissembling, testing and troubleshooting of this product and relevant accessories to support effective troubleshooting and repair. It is not intended to be a comprehensive, in-depth explanation of the product architecture or design principles. If you have any questions, please contact our Customer Service Department.

This manual is based on the maximum configuration. Therefore, some content may not apply to the products that you repair. If you have any questions, contact our Customer Service Department.

Read this manual carefully before you repair this product and ensure that you fully understand the content in this manual and can properly repair the product to prevent equipment damage and physical injury.

1.4 Applicability

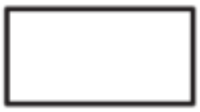
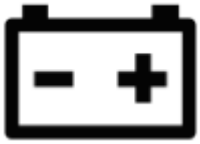
This manual is intended for professional biomedical engineers, authorized technicians or service representatives responsible for maintaining this product.

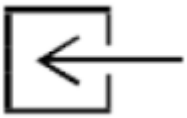
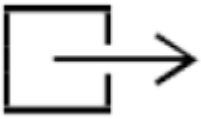
1.5 Password

A password may be required to access different modules of the equipment. The passwords are listed below:

- User maintenance: 888888
- Factory maintenance: 332888
- Configuration management: 315666
- Demo: 2088

1.6 Symbols on the Device

	**NOTICE** **Refer to the manual delivered with the system for details.**		Serial number
	Hazardous voltage		Electric shock key
	Manufacturer		Manufacture date
	Indicates alternating current.		DC
	Power indicator		Status indicator
	Battery		Computer network
	CF-type defibrillation prevention application		Defibrillation-proof type BF applied part

	Equipotentiality		Dustproof; prevent water splashing from all directions of the enclosure
	Unlocking		Stand-by
	USB port		Remove USB Flash drive
	Gas input		Gas output
	Humidity limit		Air pressure limitation
	Temperature limit		Non-ionizing radiation
	Maximum number of stack layers		To be protected from rain
	This way up		Fragile articles to handle with care

	Material identification mark		Environmental protection service life of electronic products (20 years)
	Authorized representative in the European Community		The CE marks indicates that the corresponding product model complies with the EU laws and regulations on medical devices.

NOTICE

Your device may not have all of the symbols above.

1.7 Safety

DANGER

Indicates an imminent hazard that, if not avoided, will result in death or serious injury.

WARNING

Indicates a potential hazard or unsafe practice that, if not avoided, could result in death, serious physical injury, or product/property damage.

CAUTION

Indicates a potential hazard or unsafe practice that, if not avoided, could result in minor physical injury or product/property damage.

NOTICE

Provides application tips or other useful information to ensure that you get the most from your product.

DANGER

- The equipment generates a high voltage during defibrillation, which may cause serious injury or death. Therefore, the equipment must be used by or under the instructions of clinical professionals. It must only be used by persons who have received adequate training in its use. Anyone unauthorized or untrained must not perform any operation on the equipment.
- Do not open the shells of the equipment, as you may suffer an electric shock. All servicing and upgrading operations of the equipment must be performed by the service personnel trained and authorized by our company only.
- To avoid explosion hazard, do not use the equipment in the presence of oxygen-rich atmospheres, flammable anesthetics, or other flammable agents (such as gasoline). Keep the equipment and the operating environment dry and clean.
- Defibrillation current can cause severe injury or even death to operators or bystanders. Keep a distance with the patient or metal devices connected to the patient during defibrillation.

⚠WARNING

- Before putting the system into operation, the operator must verify that the equipment, connecting cables, and accessories are in correct working order and operating condition.
- Make sure the synchronous input system is applied to this equipment and the input signal is correct if necessary.
- To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth. If the installation does not provide a protective earth conductor, disconnect it from the power cord and operate it on smart lithium-ion batteries.
- This equipment is used for a single patient at a time.
- This equipment is not suitable for use in a nuclear magnetic resonance (MR) environment.
- To avoid fire or explosion hazard, do not use the equipment in the oxygen-rich environment, or with the presence of flammable anesthetics, vapor, or liquids.
- Do not open the shell of the equipment, as you may suffer an electric shock. All servicing and upgrading operations of the equipment must be performed by the service personnel trained and authorized by our company only.
- Medical electrical equipment which does not incorporate defibrillator protection should be disconnected during defibrillation.
- Do not defibrillate a patient who lies on the wet ground.
- Set alarm volume and alarm limits based on the patient's actual condition. Do not rely exclusively on the audible alarm system for patient monitoring. Adjustment of alarm volume to a low level or off may result in a hazard to the patient.
- Do not perform any functional check if the equipment is connected with a patient; otherwise, the patient might be shocked.
- Remain attentive to the patient during applying therapy. Delay in delivering a shock may result in a rhythm that was analyzed as shockable converting spontaneously to non-shockable and could result in inappropriate delivery of a shock.
- For the treatment of patients with implantable pacemakers, place therapy pads or paddles away from internal pacemaker generator if possible to help prevent damage to the pacemaker.
- To avoid inadvertent disconnection, route all cables in a way to prevent a stumbling hazard. Wrap and secure excess cabling to reduce risk of entanglement or strangulation by patients or personnel.

- Do not touch device connectors, recorder thermal print head, battery connector or other live equipment if in contact with the patient; otherwise, patient injury may result.
- To ensure patient safety, use only parts and accessories specified in this manual.
- Package material may contaminate the environment. Properly dispose of the package material according to applicable waste control regulations and keep it out of children's reach.
- Do not touch the patient and live parts simultaneously.

⚠CAUTION

- **Use of Manual Therapy security password requires the clinician to know and remember the password. Failure to enter correct password will prevent the delivery of manual defibrillation, synchronized cardioversion, and pacing therapy.**
- **At the end of its service life, the equipment, as well as its accessories, must be disposed of in compliance with the guidelines regulating the disposal of such products to avoid contaminating the environment.**
- **Magnetic and electrical fields are capable of interfering with the proper performance of the equipment. For this reason, make sure that all external devices operated in the vicinity of the equipment comply with the relevant EMC requirements. Mobile phones, X−ray equipment or MRI devices are a possible source of interference as they may emit higher levels of electromagnetic radiation.**
- **Before connecting the equipment to the power cord, check that the voltage and frequency ratings of the power cord are the same as those indicated on the equipment's label or in this manual.**
- **Always install or carry the equipment properly to avoid damage caused by drop, impact, strong vibration or other mechanical force.**
- **Dry the equipment immediately in case of rain.**
- **Never charge and deliver shock frequently in non-clinical situations. Otherwise, equipment damage could occur.**
- **Do not mix electrodes of different types or brands. Mixing electrodes may lead to a great baseline drift or longer baseline recovery time after defibrillation.**
- **To avoid polluting or infecting people, the environment, or other equipment, the equipment and its accessories that have reached the service life must be disposed of according to the relevant local regulations or the hospital system.**

NOTICE

- Put the equipment in a location where you can easily view, operate, and maintain the equipment.
- The equipment uses a mains plug as isolation means to the AC mains power supply. Do not locate the equipment in a place difficult to operate the mains plug.
- During normal use, the operator shall stand in front of the equipment.
- Keep this manual in the vicinity of the equipment so that it can be obtained conveniently when needed.
- If the equipment runs on a DC power supply, a DC/AC adapter supplied by our company should be used.
- This manual describes all features and options. Your equipment may not have all of them.

2 Product Knowledge

2.1 Whole Machine Introduction

2.1.1 Introduction

This product is intended for use in medical institutions.
BeneHeart D30 series include the following models: BeneHeart D30, BeneHeart D20, BeneHeart D20A, and BeneHeart D20C.
The BeneHeart D30 Defibrillator/Monitor provides manual defibrillation, AED, cardiac pacing, and monitoring functions, and can be used for first aid and monitoring in or out of a hospital.

Indications

Monitoring	Applicable to adults, pediatrics, and neonates.
Semi-automatic external defibrillation	Applicable to patients with all the following conditions: • Oblivion • No breathing • No pulse
Manual external defibrillation	Applicable to patients with ventricular fibrillation or tachycardia and no breathing and no pulse.
Synchronized cardioversion	Used to stop atrial fibrillation.
Cardiac pacing	Applicable to patients with bradycardia, and helpful to patients with cardiac arrest if used in time.

Contraindications

Monitoring	Unknown
Semi-automatic external defibrillation	Not applicable to patients with any of the following conditions: • Consciousness • Normal breathing • Pulses detected by touch

Manual external defibrillation	Not applicable to patients with any of the following conditions: • Consciousness • Normal breathing • Pulses detected by touch
Cardiac pacing	Not applicable to patients with ventricular fibrillation. Use the non-invasive cardiac pacing function with caution when the patient's temperature drops seriously.

2.1.2 Main Functions

The BeneHeart D30 Defibrillator/Monitor mainly provides the following functions:

- Manual defibrillation
  The manual defibrillation mode supports manual defibrillation and synchronized cardioversion. Manual defibrillation can be performed with external paddles, internal paddles, or multifunctional electrode pads.
  This mode provides a simple three-step defibrillation procedure. The operator needs to analyze the patient's ECG waveforms and perform the following steps:

1. Turn on the defibrillator and select the energy level.
2. Charge the defibrillator.
3. Deliver an electric shock to the heart of the patient.

- AED
  In AED mode, BeneHeart D30 automatically analyzes the patient's ECG waveforms and provides a suggestion on whether to deliver an electric shock. The operator can follow the voice and text instructions to complete the defibrillation procedure. In AED mode, if an electric shock is recommended, the defibrillator charges automatically, and the operator only needs to press the electric shock button. This button is highlighted by blinking backlight.
- Cardiac pacing
  The cardiac pacing mode provides the non-invasive cardiac pacing function. Pacing pulses are made in single-phase waveforms and transfer energy through multifunctional electrode pads.
- Monitoring
  The monitoring mode provides ECG monitoring as well as (optional) monitoring of SpO_2, NIBP, CO_2, and Resp. The monitor supports display, review, storage, and printing of monitoring information.

2.1.3 System Composition

The BeneHeart D30 Defibrillator/Monitor is composed of the main unit, accessories, and PC software. The main unit is the core of the system and provides the following functions:

- System control
- Power supply to the system

- Display
- Defibrillation and cardiac pacing
- AED
- User input
- Sound and light alarms
- Measurement of multiple parameters
- Interfacing and communication with other systems
- Record printing and data storage

Hardware Working Principles

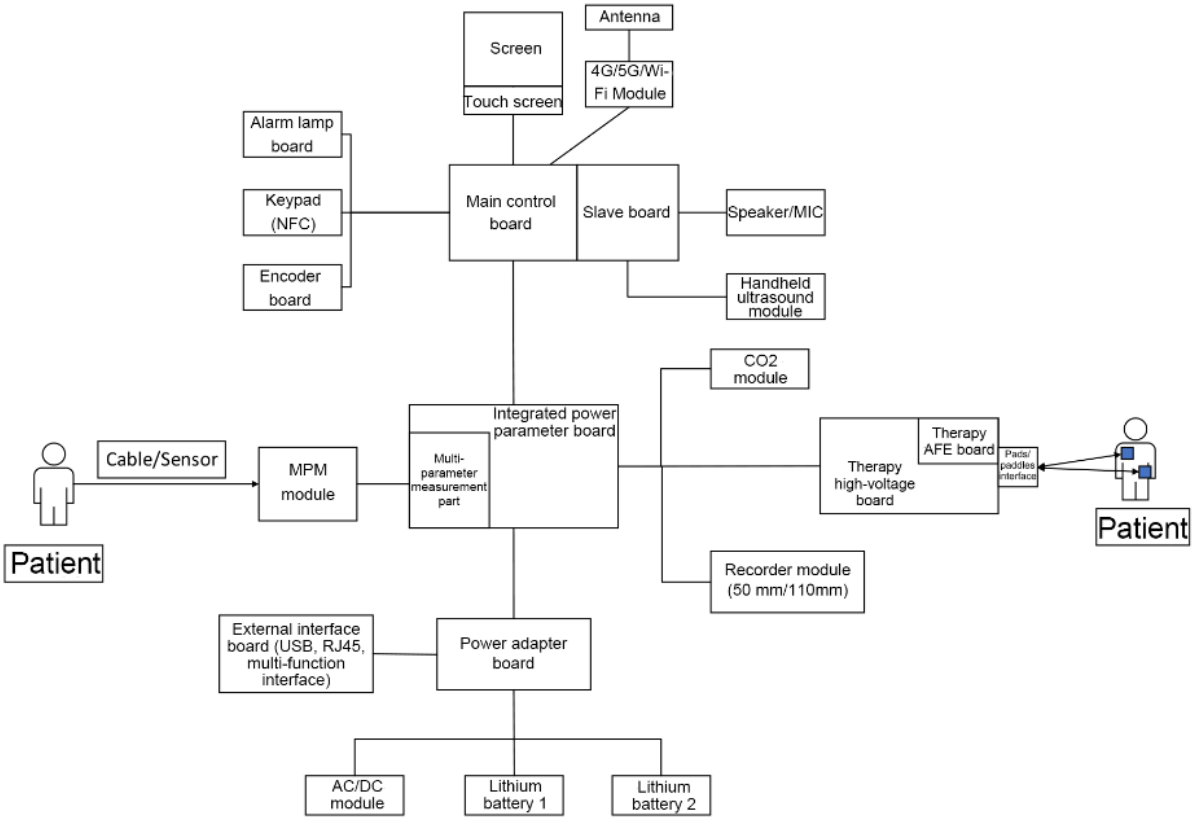
Hardware Working Principles Overview

The system structure is shown in the following figure. The front shell is carried by the main control board and secondary processor board. The 4G/5G/Wi-Fi module, encoder board, keypad, alarm LED board, touch screen, display, and speaker are connected to the main control board with cables. The main control board and secondary processor board are the core components for system control, and provide human-machine interfaces for system control, voice prompt, display, and button control. The 4G/5G/Wi-Fi module is connected to the main control board to provide information for pre-hospital emergency care (such as parameters, waveforms, and reports), send system self-test results, and support remote device management through wireless communication.

The power & parameter board and therapy board are the core of the rear cover. The patient (monitored) is connected to the multi-parameter measurement part of the power & parameter board through the cable/sensor and MPM module for vital sign measurement and monitoring. The multi-parameter measurement part can also measure ECG, SpO2, NIBP, and Resp. The CO2 module, recorder module, power adapter board, and therapy board are connected to the non-parameter part of the power & parameter board to implement their functions. The CO2 module measures sidestream parameters. The recorder module prints measurement records on 50-mm-wide paper tape. The power adapter board provides external interfaces and connections with lithium batteries and the AC/DC module, and works with the power part of the power & parameter board to implement system power switching control, system power monitoring, and battery charge/discharge management. The therapy board connects to the patient (under treatment) through the external/internal paddles and multifunctional electrode pads to measure ECG data, impedance, and other parameters, and provide defibrillation therapy.

Block Diagram of Hardware Working Principles

Figure2–1



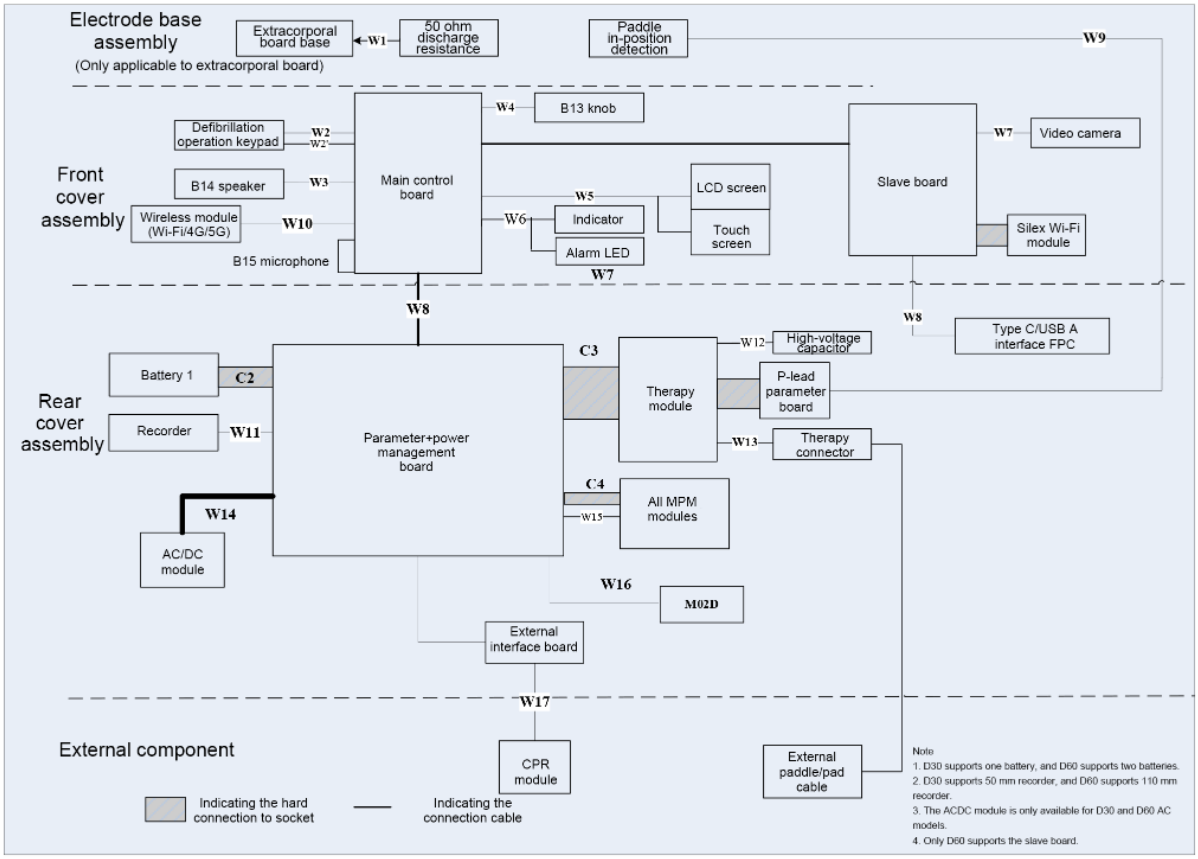
2.2 Main Unit Composition

2.2.1 System Structure/Connection Diagram

The main unit consists of the front cover assembly, rear cover assembly, and electrode base that holds external paddles.

- The front shell assembly consists of the following parts: LCD screen/touchscreen, keypad board, speaker, microphone, main control board, slave board (for D60 only), knob, alarm/indicator board, encoder board, Wi-Fi module (Wi-Fi, 4G, and 5G), and front shell.
- The rear shell assembly consists of the following parts: parameter and power management board, power interface board, external interface board, therapy module, high-voltage capacitor, parameter socket panel, therapy interface, recorder, CO2 module, AC/DC module, main bracket, and rear shell.
- The electrode base assembly consists of the contact resistor, top shell, and in-position detection connector. It holds a pair of external paddles.

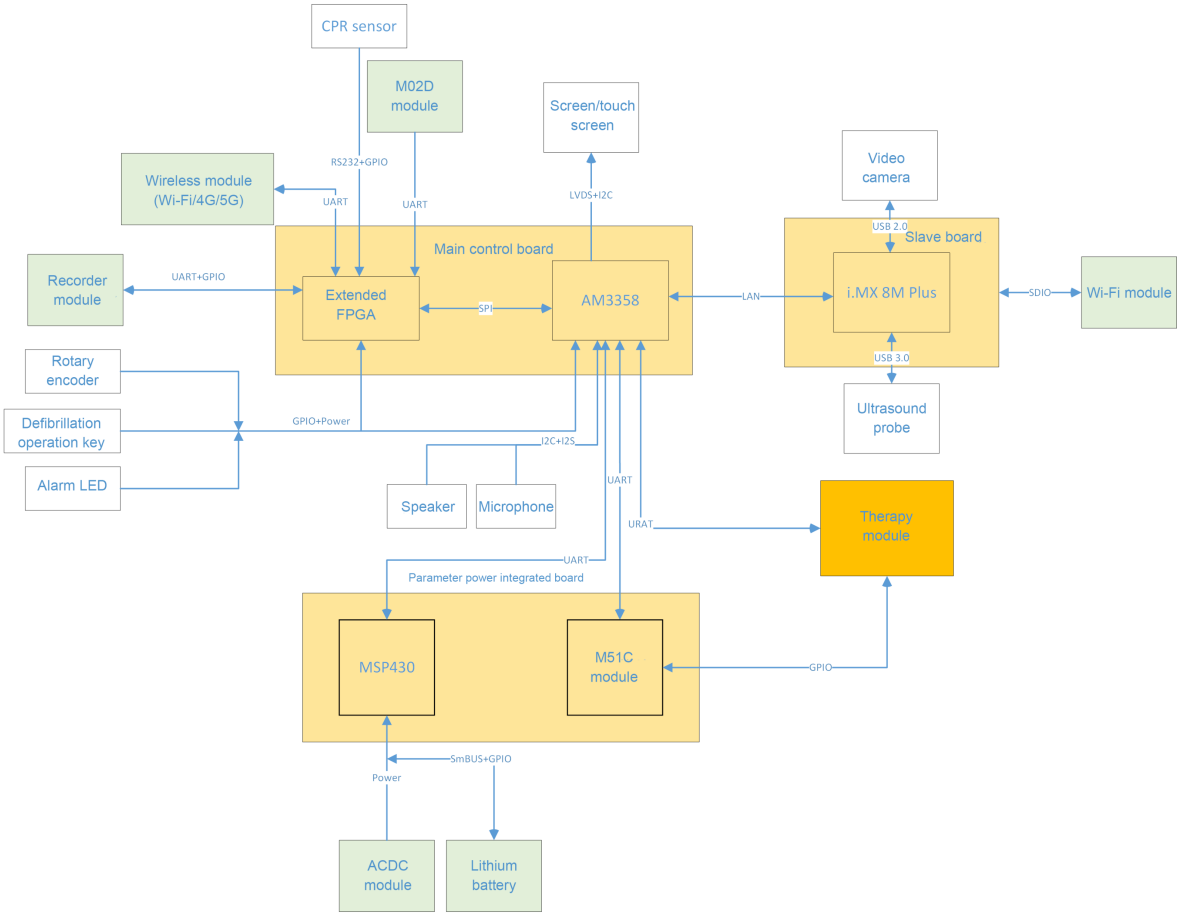
Figure2–2



2.2.2 System Signal Flow Diagram

The system uses the main control board as the core to control the power supply, therapy module, and multi-parameter module. The main control board uses AM3358 as the main processor, which supports peripherals by expanding through FPGA. For reliability purposes, peripherals related to core functions of the system, such as the therapy module, multi-parameter module, power management module, and speaker directly interact with AM3358. Other none-core modules such as the M02D module, recorder module, Wi-Fi module, and CPR sensor, interact with the expanded FPGA. Modules with a high failure rate such as keys and encoder are connected to both AM3358 and FPGA for redundancy design. The system can use the slave board to realize functions of the camera and wired hand-held ultrasound image module, and expands other wireless functions through the high-speed Wi-Fi module. The main control board interacts with the slave board through a LAN. See the following figure:

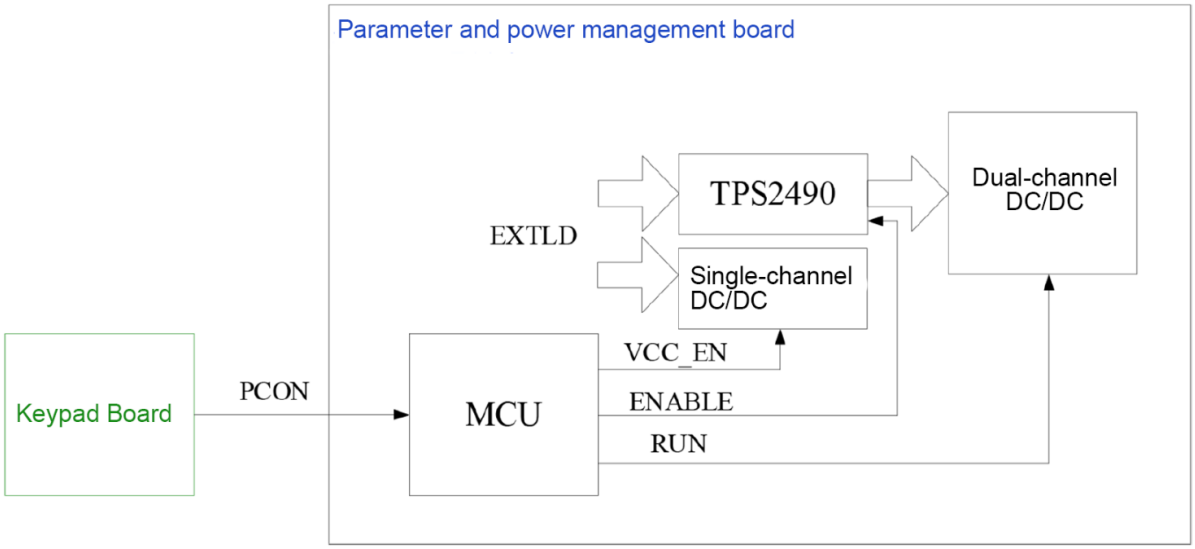
Figure2–3



2.2.3 Sequence of Power-On/Off Signals

The equipment is powered on and off by the power key on the front shell keypad board. The process is controlled by the power management processor as follows:

Figure2–4



Power-on: Press the power key on the front panel of the equipment. The PCON signal changes from 1 to 0. The MCU wakes up, immediately outputs an ENABLE signal to TPS2490 to enable VBUS, enables the RUN signal of the dual-channel DC-DC module, and then outputs 5 V (VBB) and 12 V voltages.

Power-off: Hold down the power key for more than three seconds until the PCON signal changes from 0 to 1. The MCU notifies the upper controller of the power-off operation after detecting the power-off signal. After receiving the power-off command from the host controller, the MCU outputs ENABLE=0 and RUN=0, and then turns off the VBUS and lower-level DC-DC module.

2.2.4 Front cover assembly

The front cover assembly consists of a display assembly, a keypad board, a main control board, a Wi-Fi module, a speaker, a microphone, a knob, an alarm board, an encoder board, and a front shell.

Knob

You can rotate the knob encoder clockwise or counterclockwise and then press it to confirm a selection. The knob encoder is connected to the main control board through the encoder board.

Keypad Board

The keypad board provides defibrillation buttons such as Energy+, Energy-, Charge, Discharge, and AED, and power-on and power-off buttons of the equipment.

Speaker

The speaker emits alarm tones, key-stroke tone, heart beats, and PR sound. It supports the functions of PITCH TONE and the multi-level volume. The speaker is connected to the main control board.

Microphone

It provides the function of voice recording.

Alarm lamp board

An alarm lamp board interface is provided. The alarm lamp transmits signals to drive the red and yellow alarm lamps. The drive current is 60 mA.

Wi−Fi Module

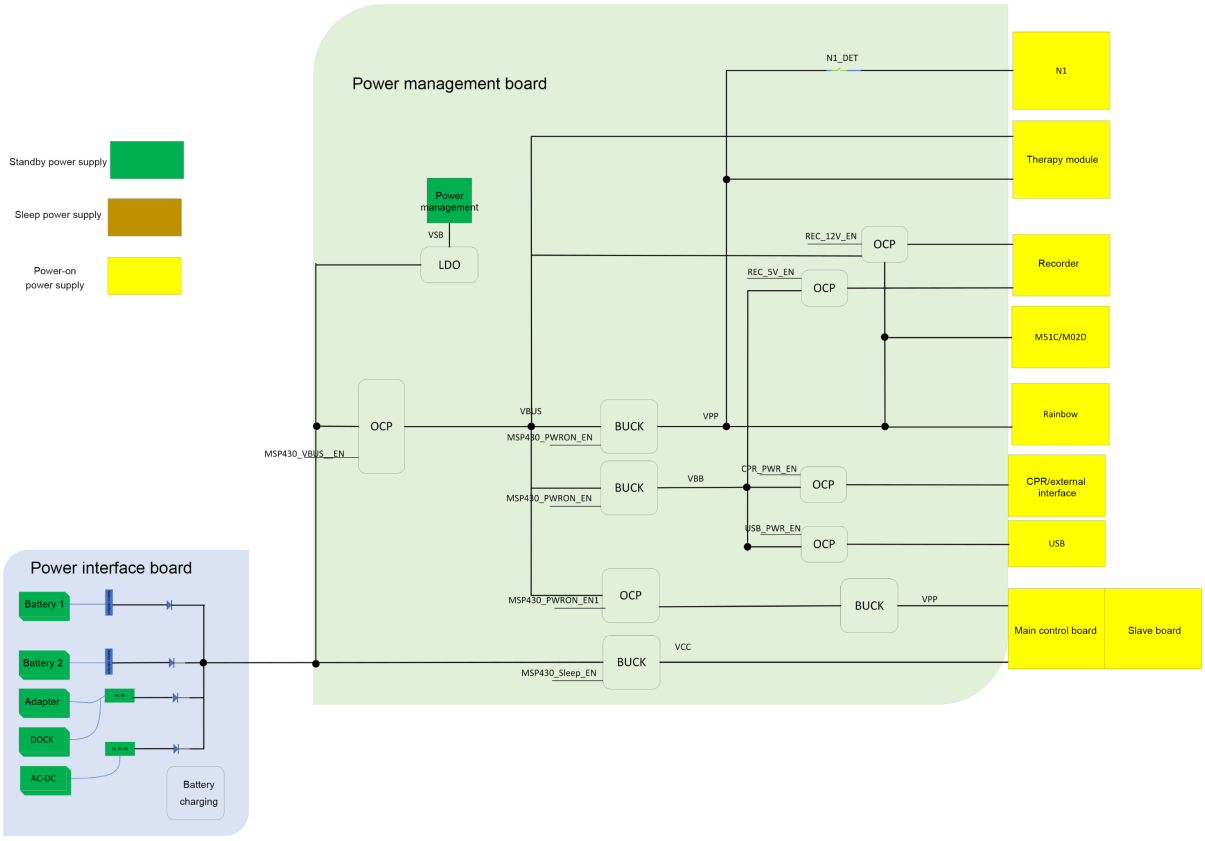
It supports wireless communication in Wi-Fi, 4G, or 5G mode.

2.2.5 Rear cover assembly

The rear shell assembly consists of the following parts: parameter and power management board, therapy module, high-voltage capacitor, recorder, AC/DC module, lithium battery, rear shell, parameter socket panel, and therapy interface.

Power System

Figure2–5



- AC/DC module
  The AC mains is the input, and the outputs is 18 VDC.
- Battery
  The rated voltage is 14.4 V, 4500 mAh.
- Parameter and power management board
  It manages the system power input, supplies different system power, and monitors the power status. The power management part implements battery charging and status information management.

The priority of system power supply is rated in the order of AC mains and battery.

— AC

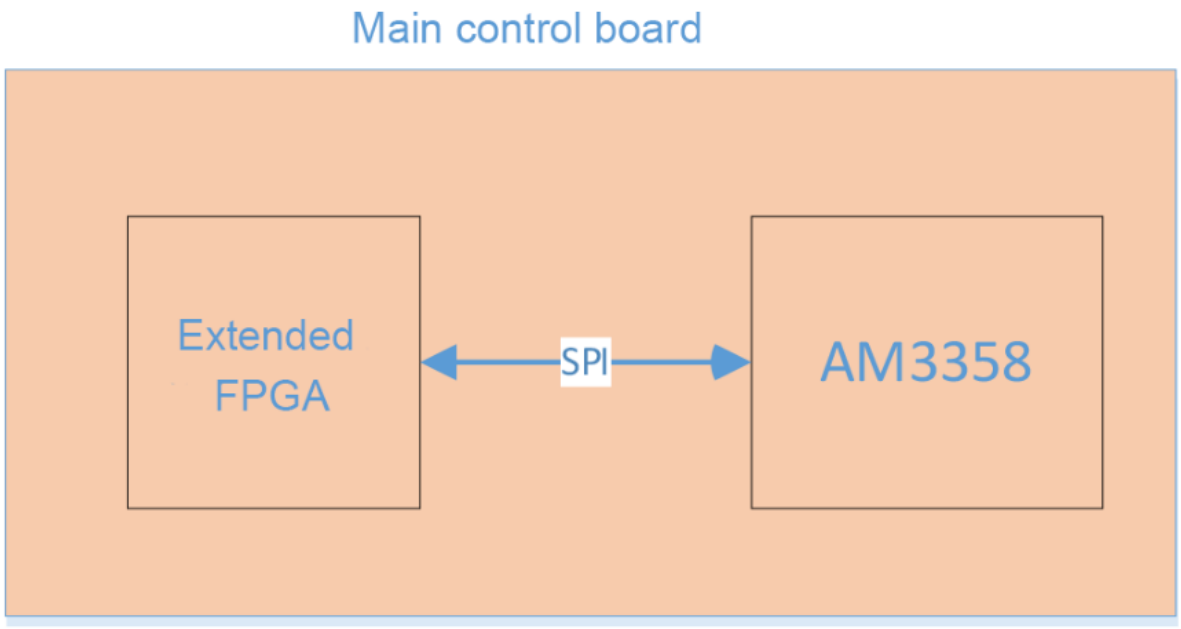
— Battery

When the AC power supply is not available, use the battery for power supply.

Main Control System

Using AM3358 as the main controller, the main control system controls system functions through expanded FPGA peripherals. Serving as the core of the system, the main control system implements functions such as man-machine interaction, page display, parameter storage, printing, and review, and parameter algorithm processing.

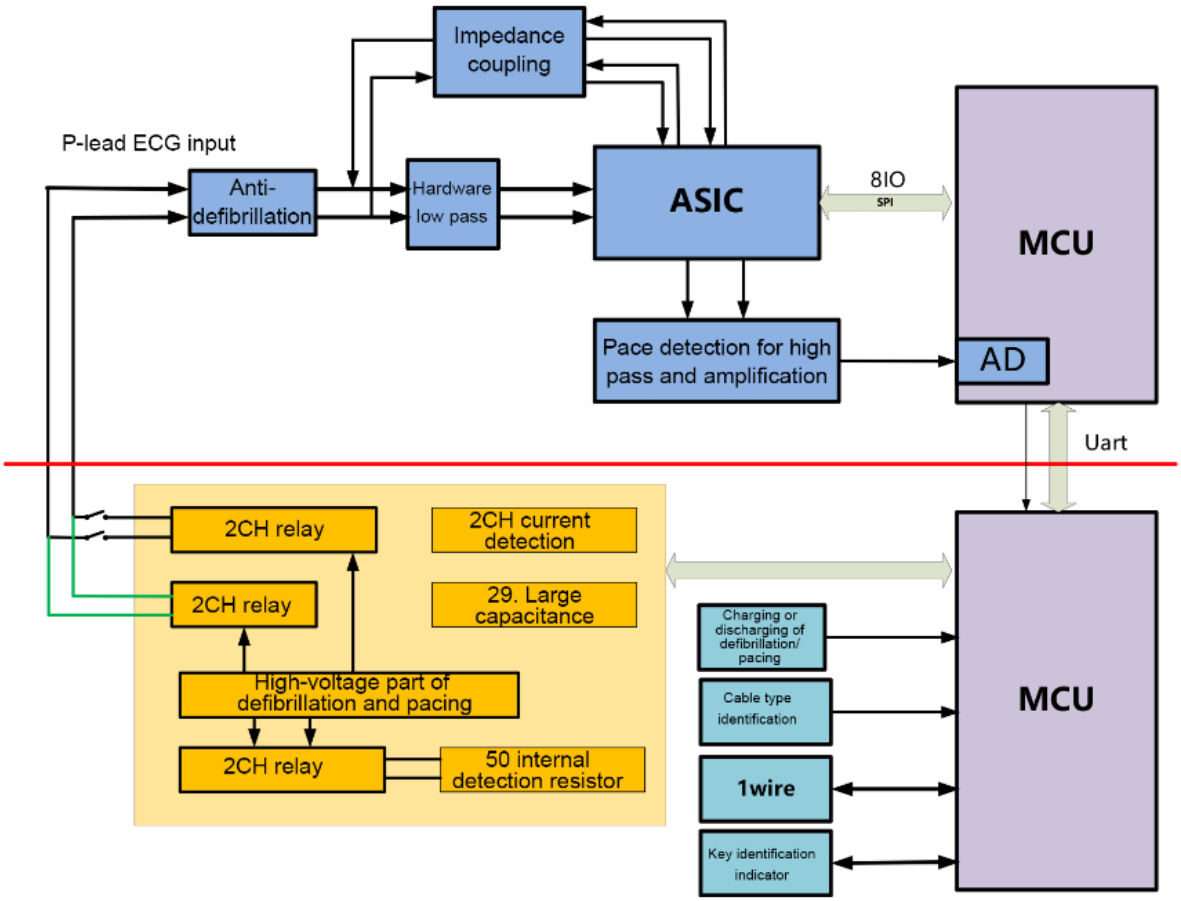
Figure2–6



Therapy System

The therapy system implements the measurement of P-lead input ECG and human body impedance, as well as the defibrillation and pacing functions.

Figure2–7

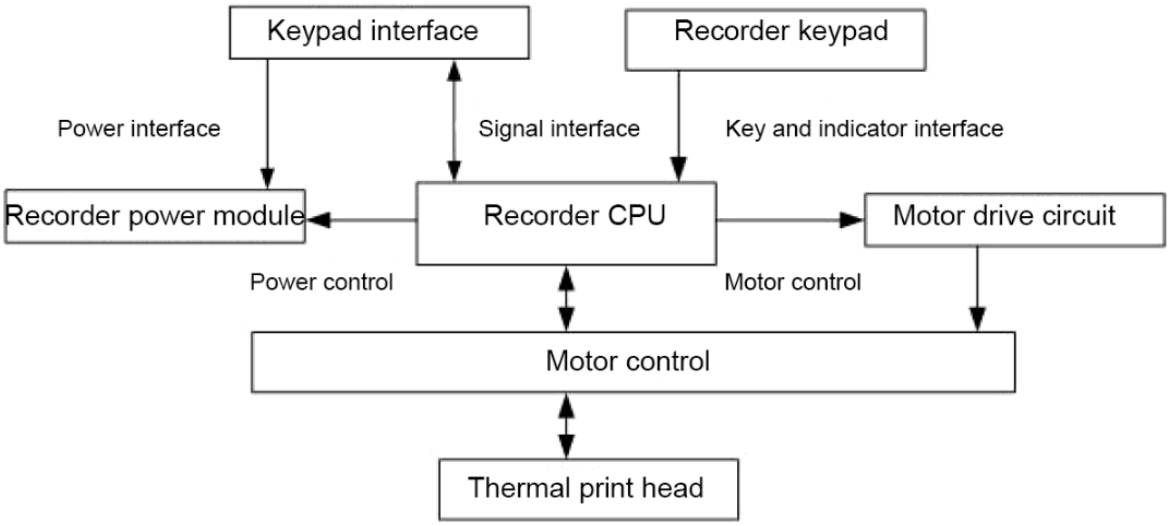


Recorder

The recorder implements parameter and waveform printing through the general TR6F recorder module or 110-mm recorder module.

The recorder receives data from the main control board and then transfers the data to the thermal print head to print the data. The recorder front panel has one key for starting or stopping the recording function and one green indicator which lights up when the recorder is normal. It connects to the keypad board through the TR6F recorder interface of the keypad board. The working principles and module functions of the recorder as shown below. Function modules:

Figure2–8



Parameter Measurement System

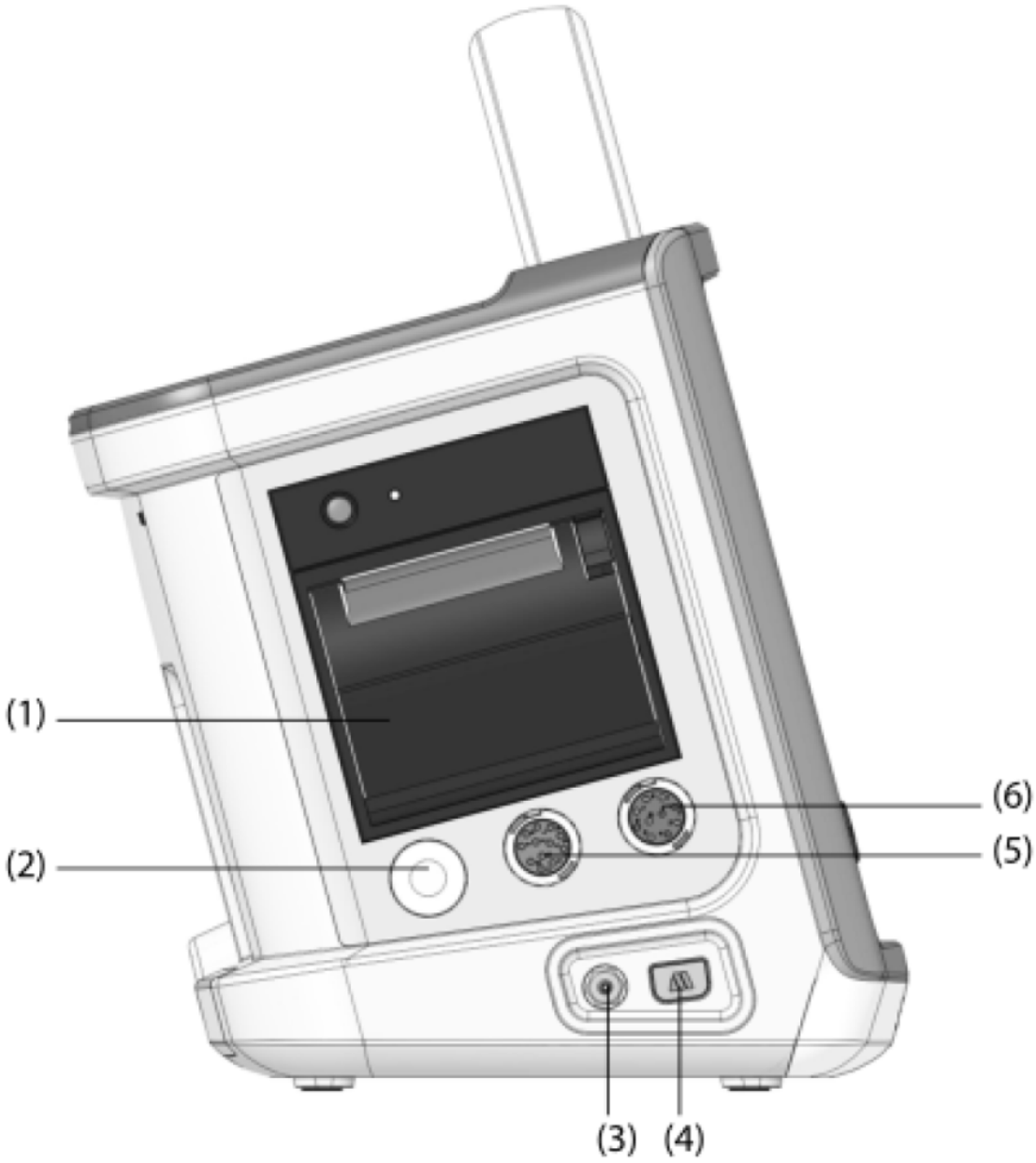
Parameter measurement is implemented by the online M51C multi-parameter module. The model can perform measurement such as 3/5-lead ECG, SpO2, NIBP, Resp, TEMP, and IBP.

2.2.6 Electrode Base

The electrode base holds paddles. The electrode base has a 50-ohm test load and an in-position detection switch. When the equipment runs self tests, test current will pass through the test load.

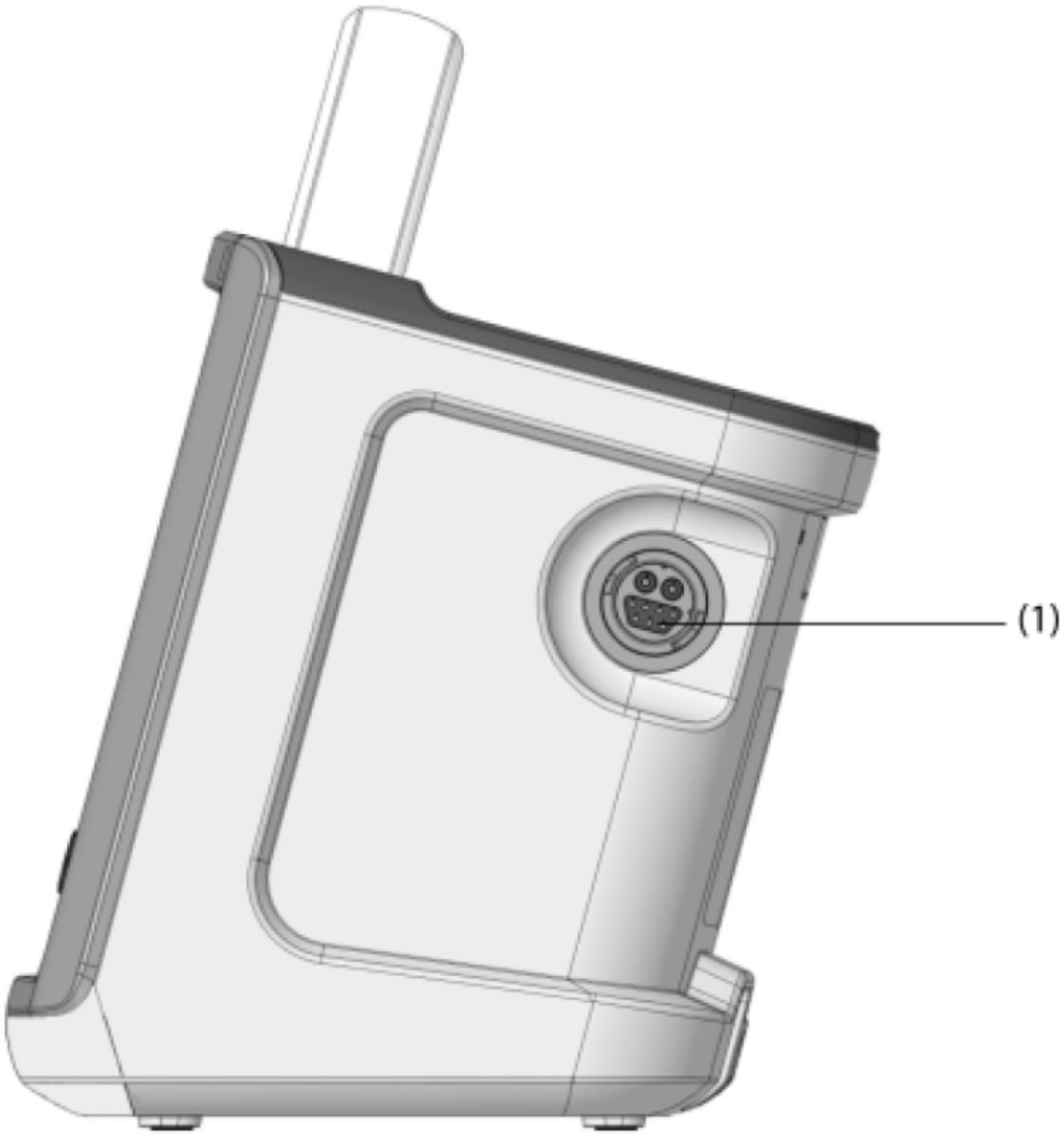
2.2.7 Ports on the Main Unit

Figure2–9



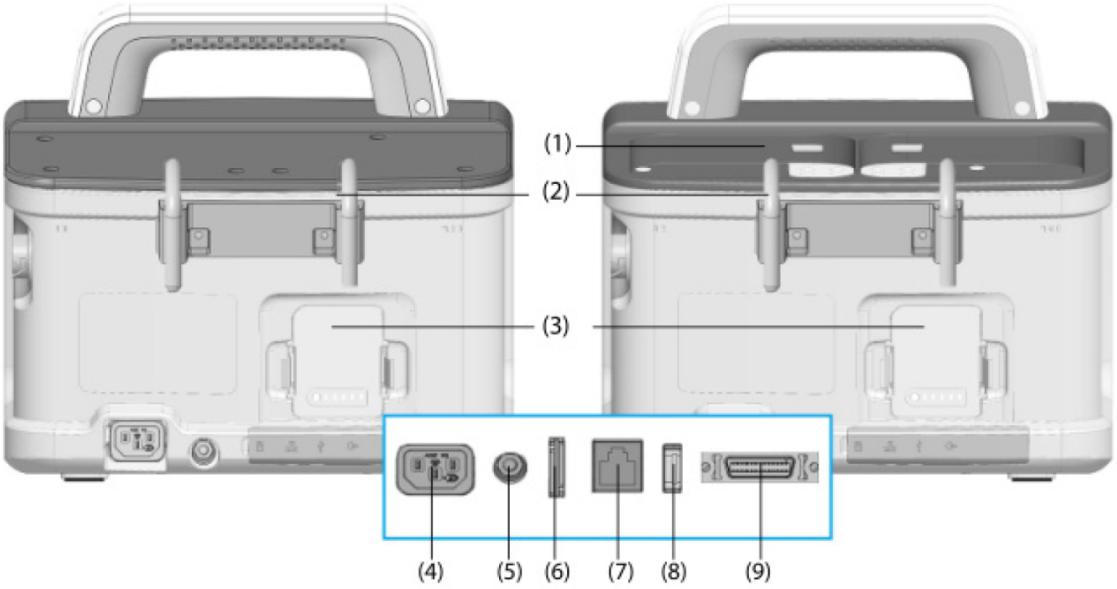
(1) Recorder
(2) NIBP cuff connector
(3) CO2 vent
(4) CO2 connector
(5) ECG cable connector
(6) SpO2 sensor connector

Figure2–10



(1) Therapy socket: Therapy cable interface

Figure2–11



(1) Paddle base: Place external defibrillation pad.
(2) Hook
(3) Battery
(4) Power interface: Connect to the external power supply
(5) Equipotential terminal: When another equipment is used together with this equipment, wires should be used to connect their equipotential terminals to eliminate the ground potential difference between different equipment and ensure safety.
(6) Cellular mobile network interface: Connected to the SIM card
(7) Network interface: Standard RJ45 interface
(8) USB interface: Connect to the USB flash drive
(9) Multi-functional interface: Connect to the CPR sensor, analog signal output cable or synchronized defibrillation input cable

3 Installation

3.1 Preparations Before Installation

3.1.1 Space Requirements

Accessories and Tools

No special accessories are required for installation.
Tools

- Crosshead screwdriver
- Tweezers
- Sharp nose pliers

Space Requirements

1. Ensure that the site meets all safety, environmental, and power requirements.
2. Check that required power sockets are available.
3. Check that a network connector is available if the defibrillator/monitor needs to be connected to network.

WARNING

Only power cables provided with the system can be used. For reasons of safety, power (mains) extension cables or adapters shall not be used.

3.1.2 Environmental Requirements

WARNING

To avoid explosion hazard, do not use the equipment in the presence of flammable anesthetics, vapors, or liquids.

CAUTION

The environment where the defibrillator/monitor will be used should be reasonably free from vibration, dust and corrosive substances. If these conditions are not met, the accuracy of the system may be affected and damage may occur.

The environmental specification is as follows:

Operating Environment	
Operating temperature	–20°C to 55°C (When configured with ECG and manual defibrillation, without batteries) 0°C to 50°C (When configured with all functions)
Operating humidity	5% to 95%, non-condensing
Atmospheric pressure	57.0 kPa to 106.2 kPa
Storage Environment	
Storage temperature	–40°C to 75°C
Storage humidity	10% to 95%, non-condensing
Storage atmospheric pressure	57.0 kPa to 106.2 kPa

3.1.3 Electrical Requirements

Check connection cables and power cable.

1. Check whether all system cables, the power plug and power cable are intact. Check whether pins of the power plug can move in the shell. If any cable or the power plug is damaged, do not use it.
2. Check the patient connection cable and leads to make sure their insulating layer is intact and connectors at both ends are securely connected.

WARNING

This machine must be connected to a power socket with protective earth contacts.

Power specifications:
Input voltage: 100-240 VAC (-15%, +10%)
Input current: 1.8-0.8 A
Frequency: 50/60 Hz (±3 Hz)

3.2 Equipment Installation

3.2.1 Unpacking

Unpacking the Equipment

1. After receiving the product, check the packing box immediately for any damage.

1) If the packing box is not damaged, sign your name and date on the bill of lading or air waybill to indicate that the product has been received intact.

2) If the packing box is damaged, accept the product conditionally and describe the damage on the bill of lading or air waybill. Both the carrier and the consignee must sign their name and date on the bill of lading or air waybill. Keep all damaged factory packages until Mindray gives further instructions. The consignee should contact Mindray customer service department immediately.

2. Cut the transparent tape with scissors and open the packing box.

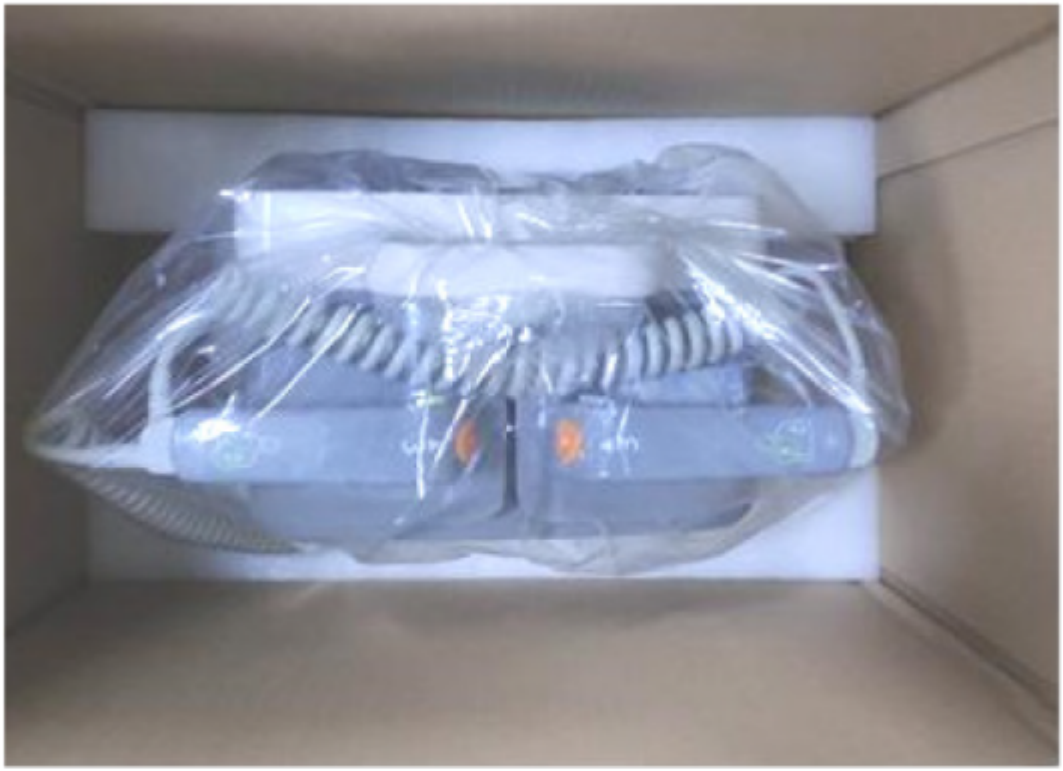
Figure3–1

3. Take out the accessory box and top foam.

Figure3–2

4. Take out the main unit.

Figure3–3



5. Open the accessory box and take out the accessories, including the battery, power cable, and ECG cable.

Figure3–4

1 Take out the battery.

3.2.2 Preparations for Power-On

Before connecting the machine to a power outlet, make sure that:

- The voltage is within the range specified for the machine.
- A three-pin power cable and a three-pin power socket are used to ensure reliable grounding of the machine. Do not use a two-pin AC power cable or two-pin power socket.
- When the machine needs to be used with another medical device, its equipotential ground terminal is reliably connected to the equipotential ground terminal of this device.
- The machine is not placed below the perfusion bag or where liquid is dripping, lest liquid should intrude into the machine.
- The battery has been mounted onto the rear cover and the power cable is connected.

Figure3–5

1 Battery

2 Insert the AC power cable

3.2.3 Switch-on Guide

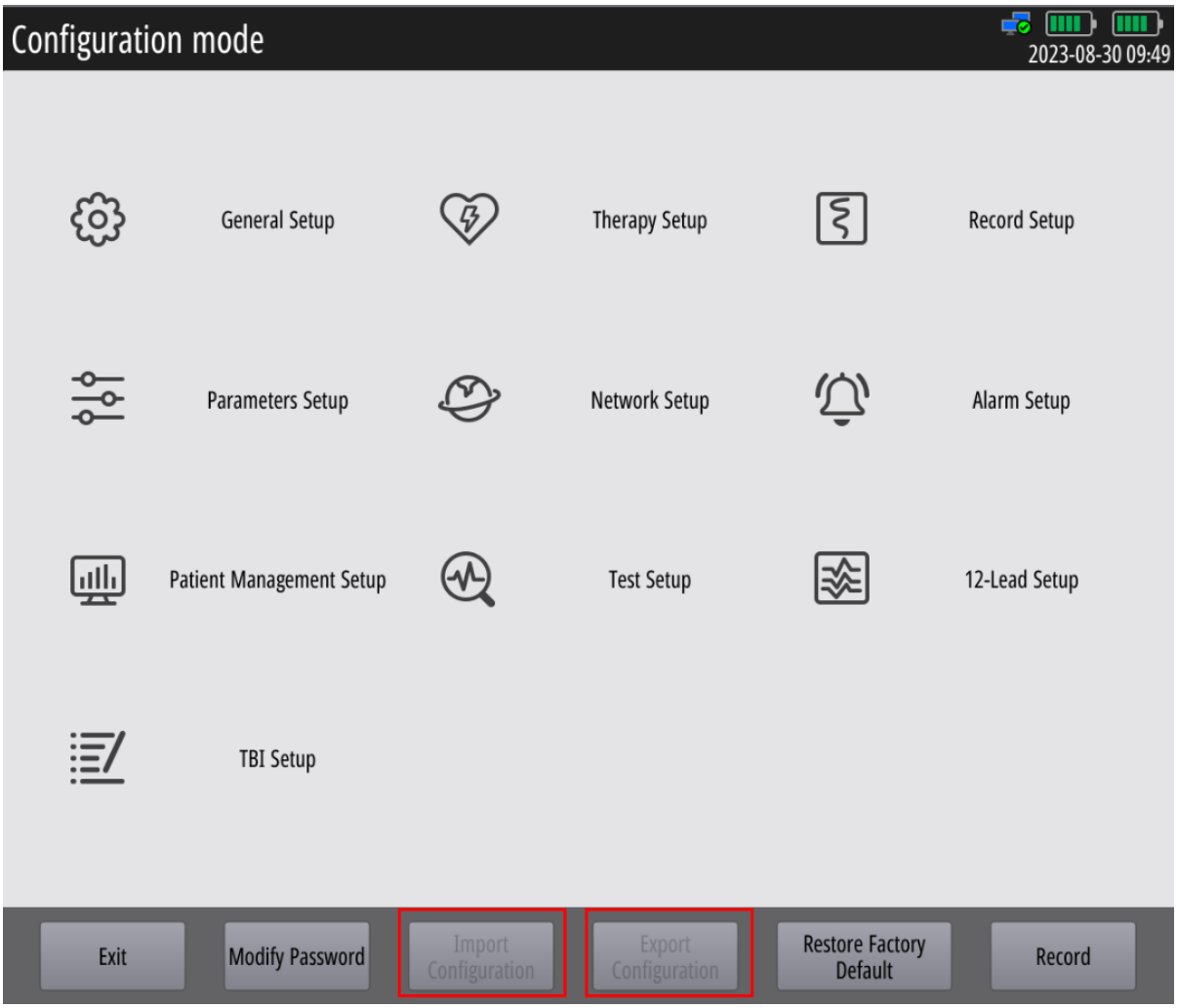
1. Check the indicators. The battery and power indicators are on. Press the unit switch. The equipment is turned on.
2. The equipment enters the installation wizard. If the equipment continues to be used in an emergency, you can click the emergency entry to skip the installation wizard. During the installation wizard process, you can choose to click the emergency entry to use the equipment at any time.
3. Click the installation wizard and set the language, time, and network in sequence. If you do not need to connect the equipment to the central monitoring system or the network environment has not been deployed, you can choose to skip this step. The equipment comes standard with a wired NIC. If the customer configures multiple network modules, it is recommended to select the automatic mode. When the current network is abnormal, the equipment can automatically switch to a network that is available.
4. Set the monitor name, hospital, bed No. and other information in More Settings.
5. In default boot mode, you can set the equipment to enter monitoring mode, manual defibrillation mode, and AED mode. You can also set the screen lock time, which is 5 minutes by default.

6. Connect the battery, paddle or test load according to the graphic guide (for the equipment configured with pads, it can only be connected to the test load).
7. After the accessories are connected, perform user test according to the graphic guide. If the user test fails, the reason for the self-test failure is displayed on the right side of the screen, and the user test will be processed again. The user test must pass during the installation process.
8. You can scan the QR code on the screen to get more services.
9. After you click Finish, the equipment restarts and the installation wizard ends.

3.2.4 Parameter settings

The installation wizard only guides the setting of some parameters. For more parameter settings, choose Main Menu Configuration to enter the configuration mode and set the parameters.

Figure3–6



NOTICE

When equipment is installed in batches and uses the same configuration, you can use the configuration export and import functions to improve efficiency.

3.2.5 Installing the Accessories

For the installation of the corresponding accessories, see the instructions of the corresponding accessories.

4 Network Connection

4.1 Installing the WLAN

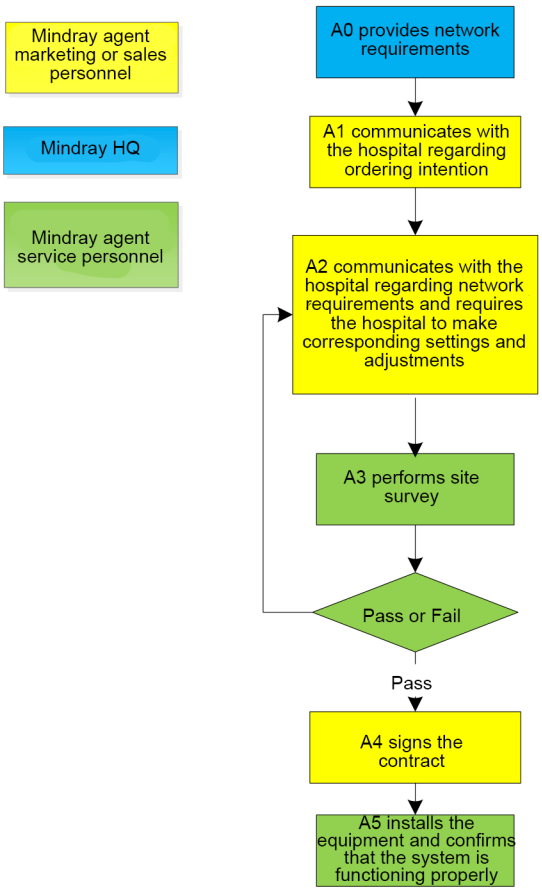
4.1.1 Introduction

This chapter describes how to install Mindray external defibrillation monitor using WLAN.

4.1.2 Network Deployment Procedure

If the hospital has an WLAN, the installation process is as follows:

Figure4–1 Network Deployment Flowchart

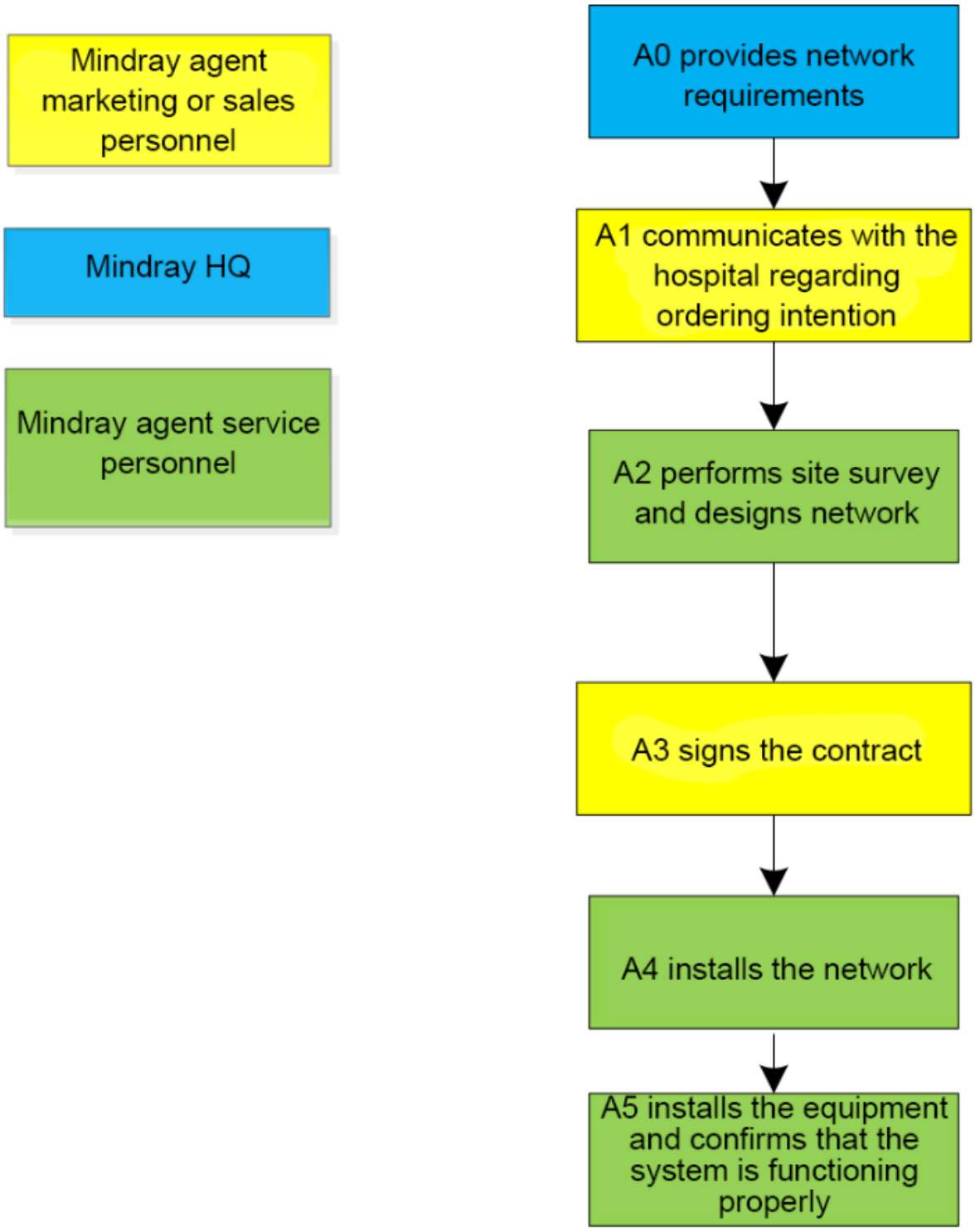


Output List

Operation	Output	Requirement	Template
A0	Wireless network requirements of Mindray external defibrillation monitor	Determine the wireless network deployment requirements of Mindray external defibrillation monitor.	Wireless network requirement form
A3	Network acceptance report	Through questionnaire investigation and measurement, check whether the customer network meets the requirements of Mindray external defibrillation monitor.	Wireless network acceptance form
A5	Installation confirmation report	Confirm the actual operation of Mindray external defibrillation monitor after installation.	External defibrillation monitor installation confirmation table

If the hospital plans to build a new WLAN for Mindray external defibrillation monitor, please ensure that there is at least one idle Wi-Fi channel. Otherwise, after the new WLAN is established, it cannot meet the requirements of Mindray external defibrillation monitor in terms of co-frequency interference. The installation process is as follows:

Figure4–2 New WLAN Installation Process



Operation	Output	Requirement	Template
A0	Wireless network requirements of Mindray external defibrillation monitor	Determine the wireless network deployment requirements of Mindray external defibrillation monitor.	Wireless network requirement form
A2	Network design documents and list of materials	/	/
A5	Installation confirmation report	Confirm the actual operation of Mindray external defibrillation monitor after installation.	External defibrillation monitor installation confirmation table

NOTICE

The network design and deployment project is very complicated and needs the help of professional IT engineers. This document does not contain these contents.

4.1.3 Network Requirements

Wireless networks need to meet the following requirements.

Table 4–1 Wireless network requirement form

No.	Item	Requirement
Wireless coverage requirements		
1	Wi-Fi coverage signal strength (RSSI)	-65 dBm RSSI is the value displayed on the external defibrillation monitor.
2	Co-channel interference	20 dB (the signal of co-channel interference AP is at least 20 dB lower than the signal of AP used by external defibrillation monitor)
3	Ping delay	The average delay of PC or mobile phone is less than 100

Table 4–1 Wireless network requirement form(continued)

No.	Item	Requirement
		ms, and the packet loss rate should be less than 1%.
AP capacity requirements		
1	AP capability	The expected number of devices connected to an AP must be less than 50% of the capacity of the AP. For example, in the coverage area of an AP, the number of devices connected to the AP is usually 16, so the nominal number of devices that can be connected to the AP at the same time must be greater than 32. The AP can create multiple SSID.
2	Device density	The maximum number of devices connected to an AP at the same time is 16, (including external defibrillation monitor (at most 3 devices) and other devices).
WLAN features		
1	AP channel width	Set the AP channel width to 20 MHz. Do not use HT40 or HT80.
2	802.11 protocol	WLAN cannot use protocols not supported by Mindray external defibrillation monitor, such as 802.11ac.
3	Safety Mode	WLAN cannot use safety modes not supported by Mindray external defibrillation monitor. WLAN cannot use safety modes not supported by

Table 4–1 Wireless network requirement form(continued)

No.	Item	Requirement
		Mindray external defibrillation monitor. WPA2-Enterprise or WPA2-PSK is recommended. Long password is recommended and should be modified frequently. If supported by the hospital network, WPA2-Enterprise can be used for higher security.
4	Private virtual LAN (VLAN)	The external defibrillation monitor needs to use a dedicated VLAN. Using VLAN can minimize broadcast or multicast data that may affect the stability of external defibrillation monitor.
Important settings		
1	DHCP	The DHCP server needs to reserve enough IP addresses to ensure that the external defibrillation monitor can obtain IP addresses.
2	IGMP snooping	If the external defibrillation monitor uses the multicast mode, the IGMP snooping function must be enabled.
3	Multicast	If the external defibrillation monitor uses the multicast mode, the network multicast function must be enabled.

Table 4–1 Wireless network requirement form(continued)

No.	Item	Requirement
4	Beacon and DTIM	AP DTIM = 1, Beacon = 100 ms
5	Service port	See Mindray External Defibrillation Monitor Network White Paper. The external defibrillation monitor network device is required to open some TCP/UDP ports.

4.1.4 Network acceptance

Tools and Resources

- Laptop with Windows 7 or later and wireless network card. It is recommended that the laptop be equipped with Intel Centrino wireless adapter. If your laptop is equipped with another wireless adapter, please ensure that the adapter has high accuracy.
- It is recommended to use professional network survey tools, such as Tamograph or Wirelessmon.
- Professional network engineer

NOTICE

Wi−Fi network survey personnel should be well trained in Wi−Fi. If there is no professional network engineer, please ask a third party for help.

Wi-Fi signal calibration

Before using the wireless network survey tool (running on the laptop) to test the network coverage, use the external defibrillation monitor to calibrate the RSSI of the wireless network survey tool according to the following steps.

1. Keep the external defibrillation monitor close to the wireless network survey tool. The distance between the external defibrillation monitor and wireless network survey tool is less than 30 cm, and the distance from human body is more than 50 cm. Move the external defibrillation monitor and wireless network survey tools at the same time (keep the previous distance).
2. When the external defibrillation monitor displays the following RSSI values: -50 dBm, -60 dBm, -70 dBm and -80 dBm, record the RSSI values read by the wireless network survey tool.
3. During field survey, calibrate the RSSI of the wireless network survey tool relative to the external defibrillation monitor (RSSI of the external defibrillation monitor is the criterion of wireless coverage).

Network acceptance procedure

Network acceptance can be done in two ways: First, complete the items that need self-inspection by the IT department of the hospital, as shown in the network acceptance form. Then, the service personnel or the authorized party conducts on-site tests to confirm the remaining contents, and finally fills the results in the network acceptance form. If any item found in the network acceptance do not meet the requirements, it should be adjusted before installing the external defibrillation monitor.

During the test, enable the broadcast function of the SSID of Wi-Fi network to ensure that the SSID of Wi-Fi can be scanned.

Table 4–2 Wireless network acceptance form

No.	Item	Requirement	Verification Method	Test Result
Wireless coverage requirements				
1	Received signal strength (RSSI)	≥ -65 dBm RSSI is the value displayed on the external defibrillation monitor.	Service personnel use network survey tools to perform tests. Ensure that all expected coverage areas (such as wards, corridors, toilets, stairs and elevators) are tested.	
2	Co-channel interference	-20 dB	Service personnel use network survey tools to perform tests. Ensure that all expected coverage areas (such as wards, corridors, toilets, stairs and elevators) are tested.	
3	Ping delay	The average delay of PC or mobile phone	Steps for service personnel to perform tests:	

Table 4–2 Wireless network acceptance form(continued)

No.	Item	Requirement	Verification Method	Test Result
		using a normal Wi-Fi module is less than 100 ms, and the packet loss rate should be less than 1%.	1. Connect a PC or mobile phone to an AP. 2. Connect another PC to the LAN port of the central monitoring system. 3. Run the command "ping –t –l 32 –w 1000 IP address-of -cellphone" for 10 minutes. 4. Run the command "ctrl +c".	
AP capacity requirements				
1	AP capability	The expected number of devices connected to an AP must be less than 50% of the capacity of the AP. For example, in the coverage area of an AP, the number of devices connected to the AP is usually 16, so the nominal number of devices that can	Service personnel obtain AP model from relevant hospital personnel or through direct observation. Get the AP data sheet according to the model to confirm the AP's related capabilities.	

Table 4–2 Wireless network acceptance form(continued)

No.	Item	Requirement	Verification Method	Test Result
		be connected to the AP at the same time must be greater than 32. The AP can create multiple SSID.		
2	Device density	The maximum number of devices connected to an AP at the same time is 16 (including external defibrillation monitor (at most 3 devices) and other devices).	Check with the hospital IT whether this requirement is met.	
WLAN features				
1	AP channel width	Set the channel width to 20 MHz. Do not use HT40 or HT80.	Check with the hospital IT whether this requirement is met.	
2	802.11 protocol	WLAN cannot use protocols not supported by Mindray external defibrillation monitor, such as 802.11ac.	Check with the hospital IT whether this requirement is met.	
3	Safety Mode	WLAN cannot use safety modes not supported by Mindray external	Check with the hospital IT whether this requirement is met.	

Table 4–2 Wireless network acceptance form(continued)

No.	Item	Requirement	Verification Method	Test Result
		defibrillation monitor. WPA2-Enterprise or WPA2-PSK is recommended. Long password is recommended and should be modified frequently. If supported by the hospital network, WPA2-Enterprise can be used for higher security.		
4	Private virtual LAN (VLAN)	The external defibrillation monitor needs to use a dedicated VLAN. Using VLAN can minimize broadcast or multicast data that may affect the stability of external defibrillation monitor.	Check with the hospital IT whether this requirement is met.	
Important settings				
1	DHCP	The DHCP server needs to reserve enough IP addresses to ensure that the external	Check with the hospital IT whether this requirement is met.	

Table 4–2 Wireless network acceptance form(continued)

No.	Item	Requirement	Verification Method	Test Result
		defibrillation monitor can obtain IP addresses.		
2	IGMP snooping	If the external defibrillation monitor uses the multicast mode, the IGMP snooping function must be enabled.	Check with the hospital IT whether this requirement is met.	
3	Multicast	If the external defibrillation monitor uses the multicast mode, the network multicast function must be enabled.	Check with the hospital IT whether this requirement is met.	
4	Beacon and DTIM	AP DTIM = 1, Beacon = 100 ms	Check with the hospital IT whether this requirement is met.	
5	Service port	See Mindray External Defibrillation Monitor Network White Paper. The external defibrillation monitor is required to open some TCP/UDP ports.	Check with the hospital IT whether this requirement is met.	

4.1.5 Evaluating the Network Coverage

To confirm the coverage effect, perform the coverage test in the areas that patients often visit. Check whether the coverage meets the requirements by observing the signal strength (RSSI) displayed on the external defibrillation monitor and whether disconnection events occur.
If necessary, adjust the position of AP or add APs to ensure the coverage effect.
Follow these steps:

1. Set the external defibrillation monitor to access the central monitoring system.
2. Run the Ping command to the external defibrillation monitor on the central monitoring system (enter "ping -t -l 32 -w 1500 IP address" in the CLI window) (continue to run the Ping command to the external defibrillation monitor. The data packet length is 32 bytes, and the reply timeout is 1500 ms). Enter "ctrl + c" to enter the Ping command 10 minutes later. The average delay of PC or mobile phone is less than 250 ms, and the packet loss rate should be less than 1%.
3. Hold the external defibrillation monitor to avoid personnel blocking. Walk around the expected coverage areas (such as all corners of wards, toilets, smoking areas, corridors, and elevators).
4. The times of disconnection from the CMS should be less than 10% of the roaming times of the external defibrillation monitor, and the RSSI value displayed on the external defibrillation monitor should not be less than -65 dBm.
5. If the signal strength is lower than -65 dBm during walking, stop at this position and observe for 30s. If the RSSI value is not lower than -65 dBm for more than 66% of the time, the coverage requirement is met.

Table 4–3 External defibrillation monitor installation confirmation table

Test or observation items	Results (Pass, Fail or N/A)
Ping the external defibrillation monitor from the central monitoring system to ensure that the average delay is less than 250 ms and the packet loss rate should be less than 1%.	
Hold the external defibrillation monitor to move around in different AP ranges. After walking through the whole expected coverage area, observe the continuous waveform on the central monitoring system. The disconnection event time should be less than 10% of the external defibrillation monitor roaming time.	
In the position with the worst coverage effect, the signal strength displayed on the screen is higher than -65 dBm.	

NOTICE

If the evaluation monitor is only used permanently and will not roam between APs, it is not necessary to perform the walking test in the coverage area, but only need to place the monitor in the poorest signal position to confirm the signal strength and ping effect.

4.1.6 Recommended network devices

It is recommended to use the Cisco devices listed in the table below.

Device	Part No.
2500 wireless controller	AIR-CT2504-x-K9 or C9800-L-C-K9
2600 wireless access point	AIR-CAP2602I-x-K9 or C9120AXI-H

4.1.7 WLAN Parameter Settings

Configure the WLAN parameters of the external defibrillation monitor according to the following table:

Parameter	Recommended settings	Description
Main Menu> Configuration> Network Setup>WLAN		
Add WLAN	/	Add the required WLAN and set WLAN parameters in the pop-up menu.
Main Menu> Configuration > Network Setup> WLAN> Add WLAN> WLAN		
Name	Set the WLAN name	/
SSID	Set the actual network name used	/
Security	WPA2-PSK	It should be the same as the safety mode of the WLAN deployed for the external defibrillation monitor. If EAP is adopted, the safety mode is selected according to the WLAN deployment.
Security Key	Set the actual network password used	/
Main Menu >Configuration >Network Setup >WLAN> Add WLAN> WLAN Setup		

Parameter	Recommended settings	Description
WLAN Band	5G	Options are 2.4G, 5G, and Auto. 2.4G = Only use the 2.4 GHz band 5G = Only use the 5GHz band Auto = Use the 2.4 GHz band or 5 GHz band (5 GHz band preferred)
2.4G channel	Specified	Options are All, Specified, and None. The stability and roaming performance can be improved by limiting the channels to which the monitor can connect to a small number. For example, on a 2.4 GHz network, if the channel is set to 1, 6 and 11, the network card will not scan or connect to other channels. The 2.4G channel setting on the external defibrillation monitor must match the AP channel setting.
5G channel	Specified	Options are All, Specified, and None. The stability and roaming performance can be improved by limiting the channels to which the monitor can connect to a small number. The 5G channel setting on the external defibrillation monitor must match the WLAN AP channel setting.
Main Menu >Configuration >Network Setup >WLAN >Certificate Management		
Local	/	Display the existing EAP certificate in the external defibrillation monitor

Parameter	Recommended settings	Description
USB drive	/	Display the existing EAP certificate in the USB drive
Main Menu >Maintenance >Factory Maintenance> Setup> WLAN Setup		
Wireless Regulatory Area	/	Select the corresponding country or region. If unavailable, select Custom.
Trigger	-70	When the RSSI is lower than the roaming trigger value, the network card will try to roam.

The safety modes supported by the monitor are as follows:

Menu	Basic algorithm	Authentication mode
WPA-PSK	WPA	PSK
WPA-TKIP	WPA	EAP
WPA-PSK-AES	WPA	PSK
WPA2-PSK	WPA2	PSK
WPA-AES	WPA	EAP
WPA2-AES	WPA2	EAP

After EAP is selected, the system will display the corresponding configuration items. The following table lists the configuration items for different EAP methods.

EAP mode	Identity	Password	CA certificate	User certificate	Anonymous
PEAP-MsChapV2	Mandatory	Mandatory	Optional	Unnecessary	Support
EAP-TLS	Mandatory (no verification)	Unnecessary	Optional	Mandatory	Unsupported
EAP-TTLS	Mandatory	Mandatory	Optional	Unnecessary	Support

NOTICE

EAP-TLS forces authentication of identity information in Windows NPS servers and must be used correctly.

The meaning of each configuration item is shown below:

- Identity: User identity, which is the user name in AD, LDAP or local user management on the RADIUS server.

- Anonymous: This item does not affect the authentication process. The function of this item is to hide the real name (identity).
- Password: The password of the identity.
- CA certificate: Select the CA certificate from the imported certificates.
- User certificate: Select the user certificate from the imported certificates.

4.1.8 Troubleshooting

Symptom	Possible Causes	Recommended Action
The external defibrillation monitor cannot connect to the AP, and an X is displayed on the external defibrillation monitor's Wi-Fi signal icon.	The nearby AP is not turned on.	Ensure that the AP is turned on and belongs to the VLAN where the external defibrillation monitor is located.
	The external defibrillation monitor is not turned on in the AP coverage area.	Walk to the AP coverage area and turn on the external defibrillation monitor. Ensure that the signal strength displayed on the external defibrillation monitor is greater than -65 dBm. Ensure that the co-frequency interference meets the requirements.
	The SSID, IP address acquisition mode, and security mode are not correctly configured on the external defibrillation monitor.	Refer to this manual to reconfigure the information.
	The external defibrillation monitor is faulty.	Check if another external defibrillation monitor can be connected. If yes, restart the external defibrillation monitor and ensure that the configurations of the two external defibrillation monitors are the same. If the external defibrillation monitor still cannot be connected, return the external defibrillation monitor to Mindray for repair.

Symptom	Possible Causes	Recommended Action
The external defibrillation monitor can be connected to the AP, but it cannot be connected to the central monitoring system.	The external defibrillation monitor has not obtained permission to access the central monitoring system.	Allow the external defibrillation monitor to access the central monitoring system.
	The external defibrillation monitor cannot obtain any IP addresses, and the IP addresses in the IP address pool on the DHCP server have been used up.	Enable other network devices to connect to the central monitoring system to see if you can obtain an IP address. If the problem persists, contact the IT department.
	A static IP address conflict occurred.	Check whether a prompt indicating an IP address conflict is displayed on the external defibrillation monitor. If yes, ensure that all network devices have unique IP addresses.
	The network link is down.	Check whether the central monitoring system can be pinged after the PC or mobile phone is connected to the AP. If the problem persists, contact the IT department.
	The service port required by the external defibrillation monitor is not enabled on the hospital network.	Check whether the service port required by the external defibrillation monitor is enabled on the hospital network. If not, enable the function (such as some UDP ports and multicast function). If the problem persists, contact the IT department.
Intermittent disconnection of a single external defibrillation monitor occurred.	The external defibrillation monitor moves to the coverage blind area.	Check whether the Wi-Fi signal strength in the location of the disconnection is greater than -65 dBm.
	The external defibrillation monitor is faulty.	Check whether the external defibrillation monitor is easily disconnected at the same

Symptom	Possible Causes	Recommended Action
		location. If the problem persists after restarting the external defibrillation monitor, return the external defibrillation monitor to Mindray for repair.
	A static IP address conflict occurred.	Check whether a prompt indicating an IP address conflict is displayed on the external defibrillation monitor. Check whether one IP address is assigned to multiple devices.
Intermittent disconnection of multiple defibrillation monitors occurred.	APs in some areas are damaged.	Ensure that the AP is turned on and operating normally.
	The interference is strong in some areas.	Use network survey tools to check whether the interference is strong, and remove obvious sources of interference or adjust the WLAN deployment to meet Mindray's requirements.
	Signal coverage in some areas is insufficient.	Use network survey tools to check the signal coverage. If the signal coverage is insufficient in a certain area, adjust the location of the AP or add APs.
Intermittent disconnection of all external defibrillation monitors occurred.	The wired network is incorrectly configured.	Use a wired external defibrillation monitor to view the wired network configuration. Ensure that the WLAN bandwidth configured on the switch is sufficient, with a 50% surplus

Symptom	Possible Causes	Recommended Action
	There is radio interference.	Use network survey tools to check whether there is radio interference, and remove obvious sources of interference or adjust WLAN deployment to meet Mindray's requirements.

4.2 Cellular Network (4G/5G) Installation

4.2.1 Introduction

This chapter introduces how to install the Mindray external defibrillation monitor that uses cellular mobile networks (4G/5G). It transmits data to the cloud or local server through the 4G/5G cellular network. Users can view patient data (including physiological parameters, waveforms, etc.) on the central monitoring system (PC and mobile terminal), and perform remote diagnosis and on-site emergency therapy for patients, thereby improving work efficiency.

4.2.2 Connection to the Central Monitoring System

Connection Preparations

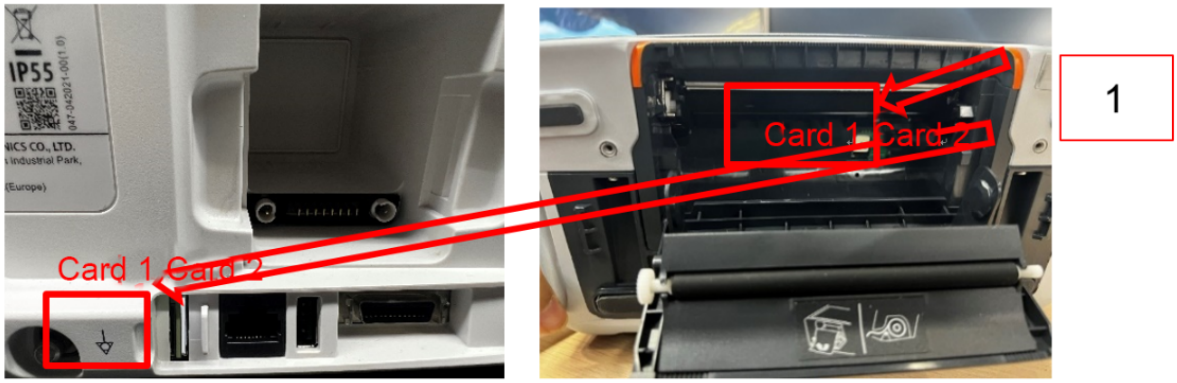
Prepare the following for establishing the connection to the central monitoring system:

1. MicroSIM card (purchase independently from China Mobile/China Unicom/China Telecom)
2. External defibrillation monitor
3. Central monitoring system (fixed IP address of the public network)

Procedures

1. Shut down the external defibrillation monitor. Open the recorder compartment door (D60/DX) at the bottom of the external defibrillator monitor or the rear bottom plug (D30) of the external defibrillator monitor, and select the MicroSIM card interface according to the silkscreen instructions (there are one SIM card interface on the left and right respectively).
2. Insert the 4G/5G MicroSIM card.

Figure4–3



1 There is one card slot on the left and right respectively, supporting up to two 4G/5G MicroSIM cards.

3. Set the external defibrillation monitor

1) Choose **Main Menu**→**Configuration**→Enter the password→**Network Setup**→**General Setup**→**Network Type**.

2) Choose **Auto** or **Mobile Network**.

3) Select **Mobile Network**:

- For 5G configuration, select **Enable 5G Signal**, and select **On** or **Off**. By default, it is set to **On**.

  — When On is selected and a 4G card is inserted into the 5G device, the device still uses the 4G network. When a 5G card is inserted into the 5G device but the 5G signal is weak, the device automatically switches to the 4G network.

  — When Off is selected, no matter whether a 5G card or a 4G card is inserted into the 5G device, the device can only access the 4G network.

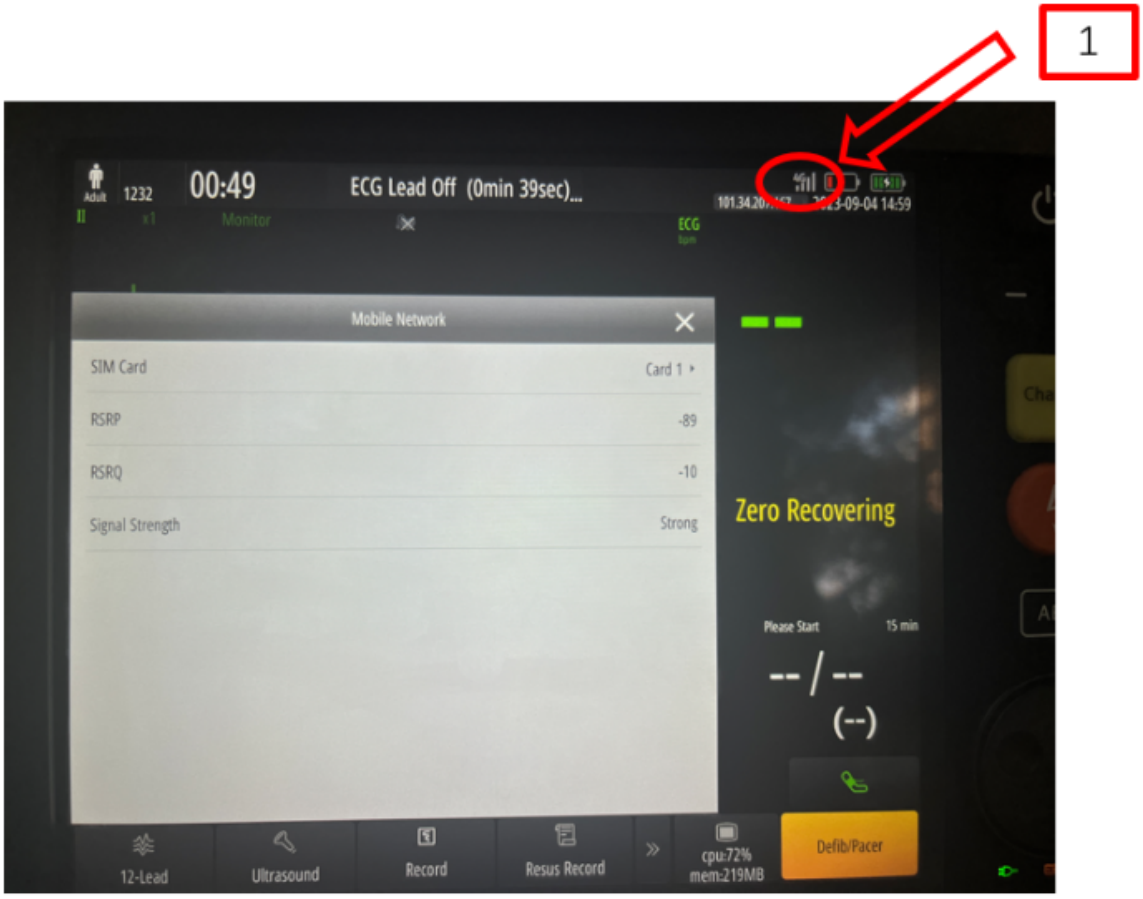
- Select the **SIM card slot** where the SIM card is inserted, which is card 1 or card 2.
- If access to the carrier network (usually an overseas carrier) requires APN, configure **APN Name**, **APN User Name** and **APN Password**.

4. Set the central monitoring system
   Choose **Main Menu**→**Configuration**→Enter the password→**Network Setup**→**Central Monitoring System**. Enter the name of the central monitoring system, department and server address (it must be a fixed IP address on the public network), and click Connection Test to check the network connectivity.
5. Network connection confirmation

1) Restart the external defibrillation monitor. When the defibrillation monitor is on, click the signal icon to observe the real-time signal strength, and manually switch to **Card 1** or **Card 2**

according to the network environment. It takes about 1 minute for the 4G/5G cellular mobile network to initialize and connect to the central monitoring system.

Figure4–4



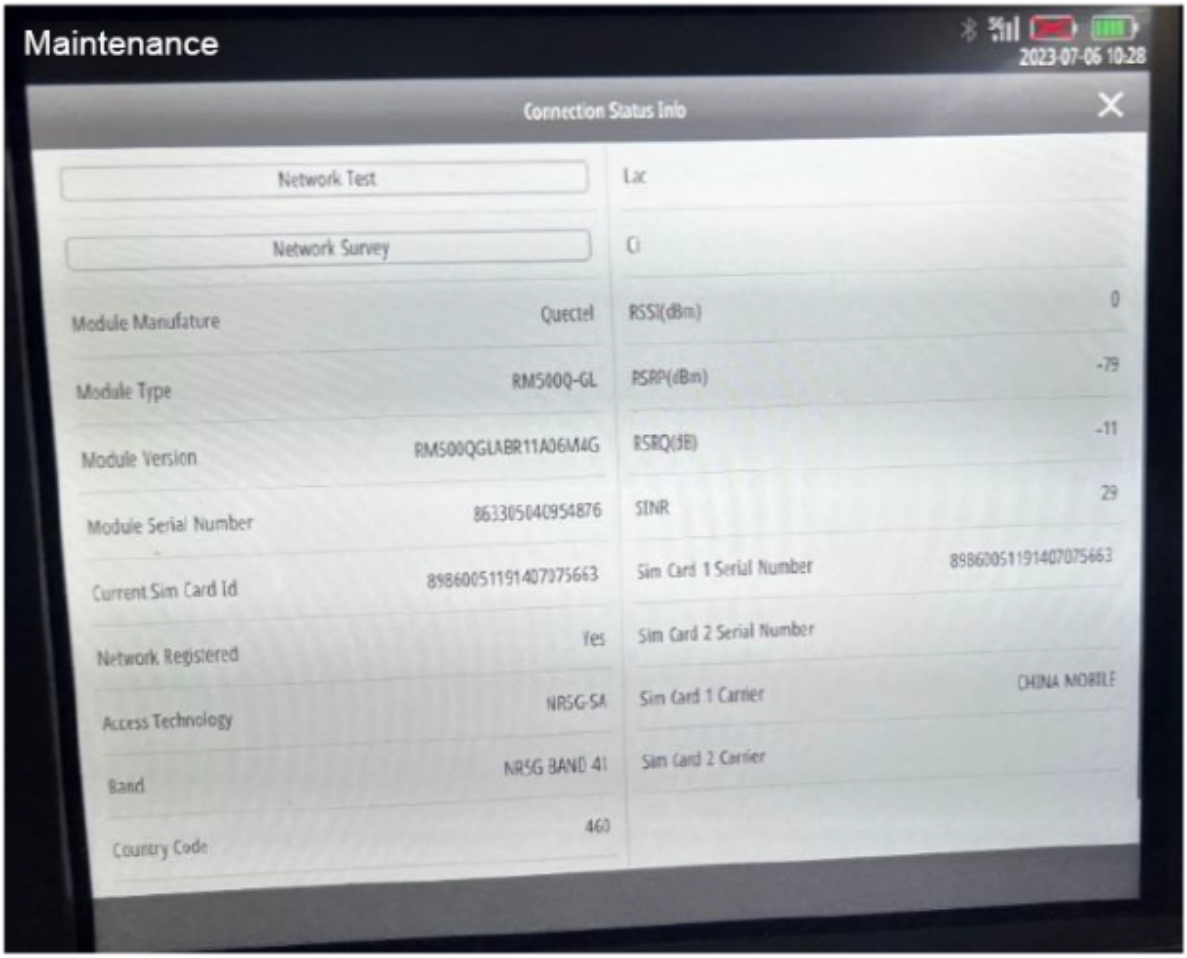
1 Click the 4G/5G signal icon to pop up the **Mobile Network** connection status, including the SIM card of the network application, RSRP, RSRQ, and signal strength. (Note: RSRP should be no less than -95 dBm.)

2) When the data from the monitor is displayed on the central monitoring system, it means that the network connection is successfully established.

Network diagnosis

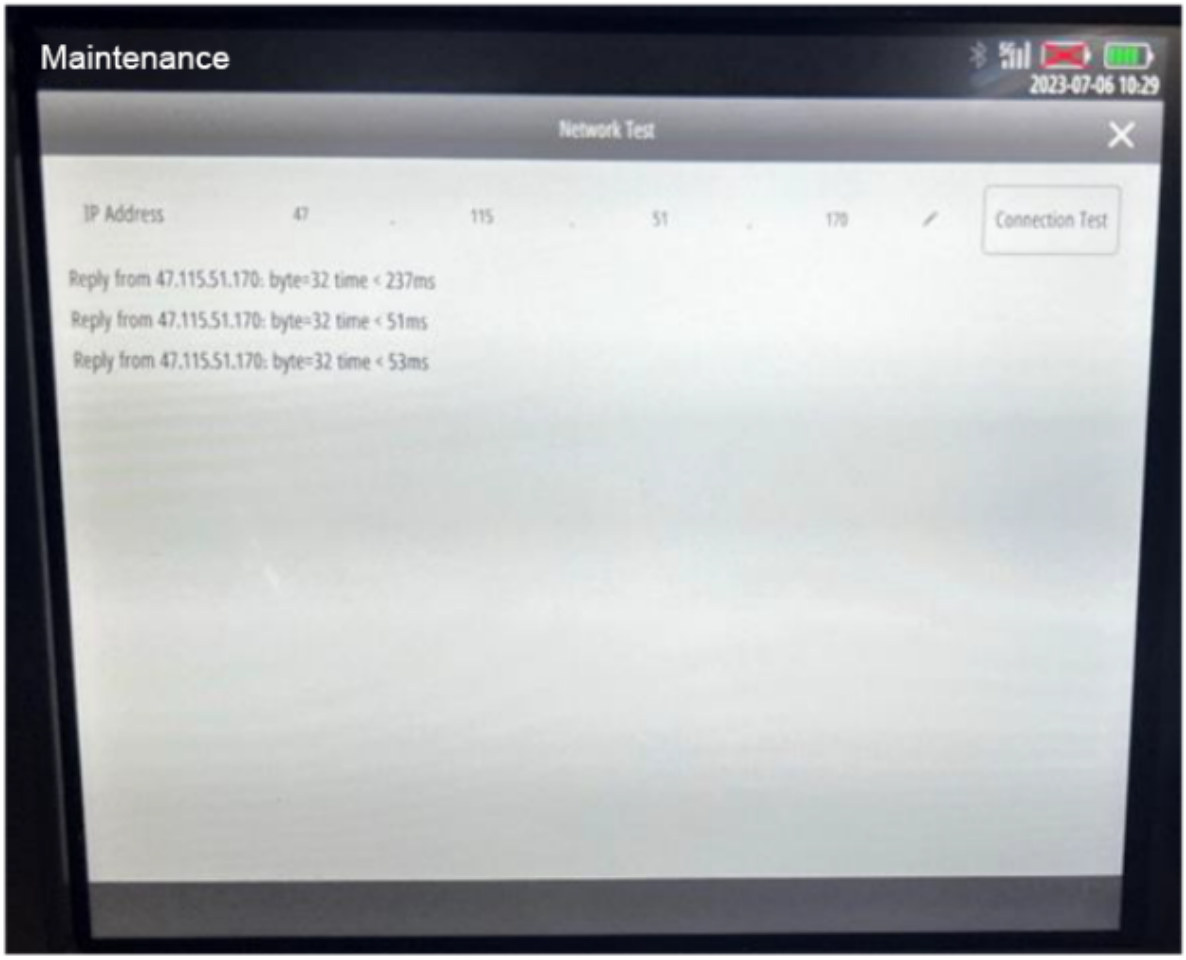
1. Choose **Main Menu**→**Maintenance**→Enter the factory maintenance password→**Factory Maintenance**→**Setup**→**Mobile Network**. View the connection status information. Check whether the module information, SIM card information, and network connection status information meet the installation requirements.

Figure4–5



2. Enter **Network Test**, enter the IP address of the central monitoring system, and click Network Test to diagnose network delay.

Figure4–6



3. Enter **Network Survey**. The screen can summarize and display the RSRP signal strength of external defibrillation monitor in the current period. Evaluate the stability of the network environment.

4.2.3 Network Environment Survey

When the external defibrillation monitor needs to be placed in a fixed position for a long time to transmit data with the central monitoring system, the cellular mobile network environment needs to be surveyed to ensure that the network signal status is stable and good.

Survey with mobile phone

When using a mobile phone to conduct network surveys, pay attention to the following requirements:

- Carrier: The SIM card network used for mobile phone signal survey must be consistent with that used by the hospital.

- Data network: NR or 5G is displayed under the 5G network, and LTE or 4G is displayed under the 4G network. When the mobile phone supports 5G network and the 5G network settings are turned on:
  - If LTE/4G is displayed, the 5G network is not connected and the 4G network is connected at this time.
  - If NR/5G is displayed, the 5G network is connected.
- RSRP: Select the **SS RSRP** tab to check the signal strength of the current network status. The signal strength represented by the RSRP range is shown in the table below:

RSRP range	Description
RSRP ≥ -85 dBm	The network is good and the 4G/5G network module works properly.
-95 dBm ≤ RSRP ≤ -85 dBm	There are certain risks in the network, and an external defibrillator monitor is required for network connection confirmation.
RSRP ≤ -95 dBm	The network is very poor and does not meet the working conditions of the 4G/5G network module. The carrier needs to optimize the network.

Using the Android mobile phone

Download **Cellular-Z** for free from your mobile phone's App Store.

Figure4–7

Using the iPhone

Charges may be required for mobile phone survey app in the App Store. It is recommended that you use your iPhone to dial
"*3001#12345#*" to check the signal strength in the background.
RSRP indicates the signal strength. You need to pay attention to the carrier and the current network system.

Figure4–8

4.2.4 4G/5G Traffic Usage

- Standby including sending the self-test report: 1 MB/1 day.
- 3/5-lead ECG monitoring report sent to the central monitoring system: about 200 MB/1 hour.
- 12-lead ECG monitoring report sent to the central monitoring system: about 300 MB/1 hour.
- Event reports, such as ultrasound reports and images: about 2 MB/1 time.

4.2.5 Troubleshooting

Symptom	Possible Causes	Recommended Action
The system prompts that the SIM card is not connected.	The SIM card connector and module cable are not connected properly.	Disassemble the front and rear shells and check whether the SIM card slot cable is inserted in place.
The external defibrillation monitor cannot be connected to the central monitoring system.	1. The monitor version/ settings do not meet requirements. 2. The SIM card account is in arrears. 3. The cellular network signal is too weak.	1. Choose **Factory Maintenance>Setup>Mobile Network**. Check the 4G/5G module and SIM card information. If the module and SIM card information can be read, there is no problem with the module communication. The monitor or central monitoring system may not be set as required. 2. Whether the SIM card account is in arrears shall be confirmed by the hospital. 3. Use survey software to confirm whether the cellular network signal strength is above -95 dBm. 1) If it is above -95 dBm, compare the signal strength difference between the survey software and the external defibrillation monitor. If the difference is more than 10 dB, check whether the antenna of the 4G/5G module is abnormal. 2) If it is not above -95 dBm, communicate with the hospital to change

Symptom	Possible Causes	Recommended Action
		the placement of the external defibrillator monitor or ask the carrier to optimize the network.
The central monitoring system is occasionally disconnected from the network.	The cellular network signal is too weak.	Use survey software to confirm whether the cellular network signal strength is above -95 dBm. 1. If it is above -95 dBm, compare the signal strength difference between the survey software and the external defibrillation monitor. If the difference is more than 10 dB, check the antenna connection status of the 4G/5G module. 2. If it is not above -95 dBm, communicate with the hospital to change the placement of the external defibrillator monitor or ask the carrier to optimize the network.

5 Maintenance

5.1 Maintenance Overview

5.1.1 Introduction

To ensure that the equipment always functions normally, qualified service personnel should perform regular inspection, maintenance, and test. This chapter provides a checklist of the testing procedures for the equipment with recommended test equipment and frequency. The service personnel should perform the testing and maintenance procedures as required and use appropriate test equipment.

The testing procedures provided in this chapter are intended to verify that the equipment meets the performance specifications. If the equipment or a module fails to perform as specified in any test, repair or replacement must be done to correct the problem. If the problem persists, contact our Customer Service Department.

⚠CAUTION

- **All tests should be performed by qualified service personnel only.**
- **Care should be taken to change the settings in Settings and Maintenance and Configuration menus to avoid loss of data.**
- **Before testing, service personnel should acquaint themselves with the test tools and make sure that test tools and cables are applicable.**
- **When testing monitoring parameters, move the Mode Select knob to Monitor to access the Monitor Mode.**
- **When performing therapy function tests, move the Mode Select knob to corresponding mode.**

5.1.2 Test Report

After completing the tests, service personnel can record test results as instructed in the Maintenance and Test Report at the end of this chapter and send the report to our Customer Service Department.

5.1.3 Recommended Frequencies

Inspection/Maintenance Item		Frequency
Visual Check		When the machine is installed for the first time or every time it is reinstalled
Power-on Test		1. When the machine is installed for the first time or every time it is reinstalled 2. Following any repair or parts replacement for the main unit
User Test		1. When the machine is installed for the first time or every time it is reinstalled 2. Following any repair or parts replacement for the main unit
Recorder test		1. When the recorder is repaired or replaced 2. Once every year
Manual Defibrillation Test	Charge/Discharge	1. After unpacking 2. When you suspect that the therapy function does not work properly 3. Once every year
	Energy release	
	Synchronized defibrillation	
Cardiac Pacing Test		1. When the functional module is repaired or replaced 2. Once every year
ECG test	Performance test	1. When you suspect that the measured values are inaccurate 2. When the ECG module is repaired or replaced 3. Once every year
	Module calibration	
Resp test		
SpO_2 test		
NIBP Test	Pressure calibration	
	Leakage test	
	Overvoltage protection test	
Sidestream CO_2 test	Leakage test	
	Performance test	

Inspection/Maintenance Item		Frequency
	Module calibration	
Impedance measurement test		1. When you suspect that the measured impedance values are inaccurate 2. When the therapy module is replaced 3. Once every year
Electrical Safety Test	Shell leakage current test	1. When the power module is repaired or replaced 2. Once every year
	Earth leakage current	
	Patient leakage current	
	Patient auxiliary current	

5.2 Visual Check

5.2.1 Visual Check

Inspect the equipment for obvious signs of physical damage. The test is passed if the equipment has no obvious signs of physical damage. Follow these guidelines when inspecting the equipment:

- Carefully inspect the shell, the display, and the buttons for physical damage.
- Inspect accessories for signs of damage.
- Inspect all external connections for loose connectors, bent pins, or frayed cables.
- Inspect all connectors on the equipment for loose connectors or bent pins.
- Make sure that safety labels and nameplates on the equipment are clearly legible.

5.3 Power-on Test

5.3.1 Power-on Test

This test is to verify that the defibrillator/ monitor can power on normally. The test is passed if the defibrillator/ monitor starts up by following this procedure:

1. Places paddles (if used) on the electrode base properly. Insert the battery to the equipment and connect the equipment to the AC power supply. The AC power indicator and battery indicator light up.
2. Set Mode to Monitor and check whether the equipment can pass self-test and start.
3. Check the battery capacity icon in the technical alarm area and information area and in the upper right corner to check whether the equipment is normal. If a failure occurs during power-on self-test, the status indicator flashes in red.

5.4 User Test

5.4.1 User Test

Follow this procedure to perform user test:

1. If you use external paddles, place them on the electrode base; if you use a pads cable, connect it to the 50 Ω test load.
2. Insert the battery into the equipment. Connect the AC mains if no battery is available.
3. Choose **Main Menu>Common>User test>User test**.
4. Perform operation as instructed.

When the test ends, the system displays the test report. Click **Record** to print the results of the current test.

Check whether the equipment is normal based on the test results. If the test failed, the status indicator flashes in red and the system prompts **Last User Test Failed** upon next power-on.

If the user test fails or the system keeps prompting **Therapy cable not connected** during the test, check whether the status of the paddles and pads cable.

5.5 Preventative Maintenance

5.5.1 Recorder Test

Perform the following steps:

1. Enter the monitor mode.
2. Print the ECG waveforms to check whether the waveforms printed are clear and correct. If yes, the recorder works normally.
3. Simulate errors by removing the recorder paper or loosening the recorder pin. Check whether the displayed information is correct. Ensure that the recorder can work normally after the failure cause is eliminated.

5.5.2 Manual Defibrillation Test

Test tools:

Defibrillator/pacer analyzer

Charge/Discharge

1. Remove the batteries and connect the equipment with AC mains. Turn the Mode Select knob to Manual Defib.
2. Connect the external paddles to the equipment and Remove the paddle from the paddle base. Place the paddle on the defibrillator/pacer analyzer.
3. Enter the Configuration-Main screen. In the **Record Setup** menu, set **Shock Event** to **On** so that shock events can be recorded automatically if happened.

4. Set the analyzer to Energy Measurement mode. In this case, the energy value should be displayed as 0 or blank.
5. Select the energy level to 1 J.
6. Charge/discharge the equipment to verify the energies measured by the analyzer meet the following accuracy:

Preset Energy (J)	Measured Value (J)
1	0 to 3
100	90 to 110
360	324 to 396

7. Set the energy to 100 J and 360 J respectively. Repeat step 6.
8. Run the equipment on fully charged battery. Move the Mode Select knob to Manual Defib. Repeat steps 5 to 7.
9. Use pads. Repeat step 5 to 7.
10. Verify that the equipment records the shock events automatically and correctly.

Energy release

1. Disconnect the AC power supply. Power the equipment with a fully charged battery.
2. Press the Defib mode key on the equipment panel.
3. Insert the pads/paddle cable to the therapy interface of the equipment, and connect the pads/external paddles correctly to the defibrillator/pacer analyzer.
4. Set the analyzer to Energy Measurement mode. In this case, the energy value should be displayed as 0 or blank.
5. Select the energy level to 360J.
6. Charge the defibrillator. Verify that the charge tone is issued during charging.
7. After the equipment is charged, click **Disarm** to discharge the energy.
8. Verify that a prompt **Charge Removed** appears and the charge done tone stops. Verify that the value measured by the analyzer is 0 J or blank.
9. Enter the Configuration Main menu, select **Manual Defib Setup**.
10. Set **Time to Auto Disarm** to **60s**.
11. Set the analyzer to Energy Measurement mode. In this case, the energy value should be displayed as 0 or blank.
12. Select the energy level to 360J.
13. Charge the defibrillator. Count time after charging is completed. Verify that the prompt Shock Removed appears on the equipment and the energy measured by the analyzer is 0 J or blank after 60 seconds.

Synchronized Cardioversion

1. Insert the pads/paddle cable to the therapy interface of the equipment, and connect the pads/external paddles correctly to the defibrillator/pacer analyzer.

2. Connect ECG cables with the equipment and connect the leads to the defibrillator/pacer analyzer.
3. Set the mode of the defibrillator/pacer analyzer to Synchronized Cardioversion and output normal sinus rhythms, e.g. amplitude value 1 mV and HR 60 bpm.
4. Enter the Configuration Main menu, and choose **Therapy Setup>Manual Defib Setup**.
5. Set **Sync After Shock** to **On**.
6. Select the energy level to 10J.
7. Press the **Enter Sync** soft key to start synchronized cardioversion. If **Remote Sync** is set to **On**, press the **Enter Sync** soft key, and then select **Local** in the menu displayed to start synchronized cardioversion.
8. Select **Pads** or **Paddles** as the ECG source and begin charging.
9. When charging finishes, hold down the Shock key to deliver a shock.

- Verify that synchronous discharge succeeds and the delivery energy measured by the analyzer is 10 J±2 J.
- Verify that the delay time of synchronous defibrillation measured by the analyzer is less than 60 ms.
- Verify that the synchronous discharge mark appears on the R wave.
- Verify that the prompt messages are correct during testing.

10. Select lead II as ECG source and perform charging. Repeat step 9.

5.5.3 AED Test

Test tools

Defibrillator/pacer analyzer

1. Connect paddles with the pads cable, insert the pads cable to the therapy interface of the equipment, and connect the pads correctly to the defibrillator/pacer analyzer.
2. Set the analyzer so that it outputs a V-Fib signal.
3. Access the **Config. Edit** page, and then select **AED Setup**. Set the electric shock energy to 200 J, 300 J, and 360 J, respectively.
4. Power off and then on the equipment and enter the AED mode again. Check whether the equipment can perform the rhythm analysis, charging, and discharging operations.
5. Check whether the accuracy of energy values measured by the analyzer meets the requirements in the table below:

Preset Energy (J)	Measured Value (J)
200	180 to 220
300	270 to 330
360	324 to 396

5.5.4 Cardiac Pacing Test

Test tools:

Defibrillator/pacer analyzer

1. Disconnect the AC power supply. Power the equipment with a fully charged battery.
2. Press the Pacing mode key on the equipment panel.
3. Set Pacer Mode to Fixed.
4. Connect the pads cable to the equipment, and place the pads correctly on the defibrillator/pacer analyzer.
5. Set the analyzer to the Pacing Measurement mode. Use the 50 Ω test load.
6. On the equipment, set **Pacer Rate** to **70 PPM** and **Pacer Output** to **30 mA**.
7. Press the **Start Pacing** soft key. Verify that the pacer rate measured by the analyzer is 70±1 PPM and the pacer output measured is 30±5 mA.
8. Press the **Stop Pacing** soft key, and then set **Pacer Rate** to **170 PPM** and **Pacer Output** to 200 mA.
9. Press the **Start Pacing** soft key. Verify that the pacer rate measured by the analyzer is 170±2 PPM and the pacer output measured is 200±10 mA.

5.5.5 ECG test

ECG Performance Test

Test tools: Patient simulator Medsim300B

1. Connect the simulator to the equipment's ECG connector with ECG leadwires.
2. Set the patient simulator as follows: ECG sinus rhythm, HR = 60 bpm with the amplitude as 1 mV.
3. Check that the ECG waves are displayed correctly without noise and the displayed HR value is within 60±1 bpm.
4. Disconnect the simulator from the equipment's ECG connector. Verify that ECG Lead Off alarm behaves correctly.
5. On the equipment, set **Paced** to **Yes**. The simulator is configured as pace signals. Verify that pace signals are detected and pace pulse marks are displayed.

ECG Calibration

Tool: Vernier caliper

1. Set the **Filter** of ECG to **Diagnostic**.
2. Access **ECG Setup**.
3. Click **Calibrate**. A waveform signal appears on the screen and the message **ECG Calibrating** is displayed in the technical alarm area in the lower left corner of the screen.
4. Compare the amplitude of the waveform with the wave scale. The difference should be within 5%.
5. After ECG calibration is completed, select **Stop Calibrating**.
   If needed, you can also print out the waveform and the wave scale to obtain the accurate error.

5.5.6 Resp Test

Test tools:
Patient simulator Medsim300B

1. Connect the patient simulator to the Resp connector on the module. Set the monitor lead to II.
2. Configure the simulator as follows: set Lead to II, base impedance line to 500 Ω, delta impedance to 1 Ω, and respiration rate (RR) to 20 RPM.
3. Check that Resp waveform is not distorted and the displayed Resp value does not exceed 20 ±1 RPM.

5.5.7 SpO_2 test

Tools required: None

1. Insert the adult SpO2 sensor to the SpO2 interface on the monitor, set **Patient Category** to **Adult**, and set **PR Source** to SpO2.
2. Measure the SpO2 of your finger by assuming that you are in a healthy state.
3. Check the SpO2 Pleth waveform and PR value on the monitor. The displayed SpO2 should be within the range of 95% to 100%.
4. Disconnect the SpO2 sensor from the finger and check whether the alarm SpO2 Sensor Off is reported.

Check the measurement accuracy:
The accuracy of the MPM SpO2 module has been confirmed in human experiments by comparing with the reference value of arterial blood samples measured by the CO-oxygen pressure meter. The measurement results of pulse oximeter accord with statistical distribution. Compared with the measurement results of the oxygen pressure meter, only two-thirds of the measurement results are expected to fall within the specified accuracy range.

NOTICE

The simulator cannot be used to verify the accuracy of the SpO2 monitor or sensor. It can only check whether the monitor works normally. The accuracy of the SpO2 monitor or sensor can be verified only by clinical data.

5.5.8 NIBP Test

Accuracy Test

Tools required:

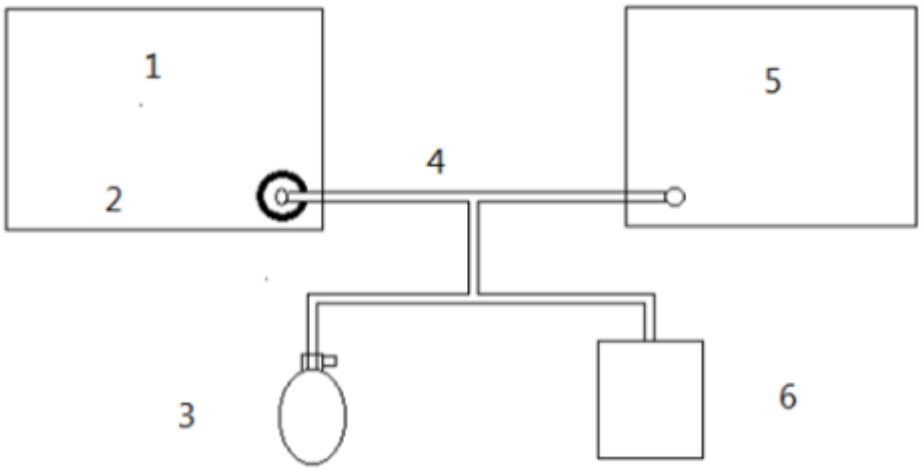
- T-shape connector
- Tubing
- Balloon pump
- Metal vessel with a volume of 500±25 mL

- Calibrated manometer for reference, accuracy not lower than 1 mmHg

To perform the accuracy test:

1. Connect the equipment as shown below.

Figure5–1



1	Defibrillation monitor
2	NIBP cuff connector
3	Balloon pump
4	Tubing
5	Manometer
6	Metal container

2. Before inflation, the reading of the manometer should be 0. If not, disconnect the airway and reconnect it until the reading is 0.
3. On the main screen of Maintenance, choose **Module>NIBP>NIBP Accuracy Test**.
4. Compare the value of manometer with the value displayed on the equipment's screen. The difference should be no greater than 3 mmHg.
5. Raise the pressure in the metal vessel to 50 mmHg with the balloon pump. Stop inflation and waits for 10s until the measured value becomes stable. Repeat step 4.
6. Raise the pressure in the metal vessel to 200 mmHg with the balloon pump. Stop inflation and waits for 10s until the measured value becomes stable. Repeat step 5.
   The accuracy test is completed. The result is displayed on the screen. If the error between the reading of the manometer and the reading on the equipment exceeds 3 mmHg, contact the service personnel.
   After **NIBP Accuracy Test** is selected, the key changes to **Stop NIBP Accuracy Test**. After **Stop NIBP Accuracy Test**, the accuracy test stops and the key **Stop NIBP Accuracy Test** changes to **NIBP Accuracy Test**.

Leakage test

The leakage test is used to check the airtightness of the airway. The NIBP leakage test should be performed once a year or when you think that the NIBP reading is inaccurate.

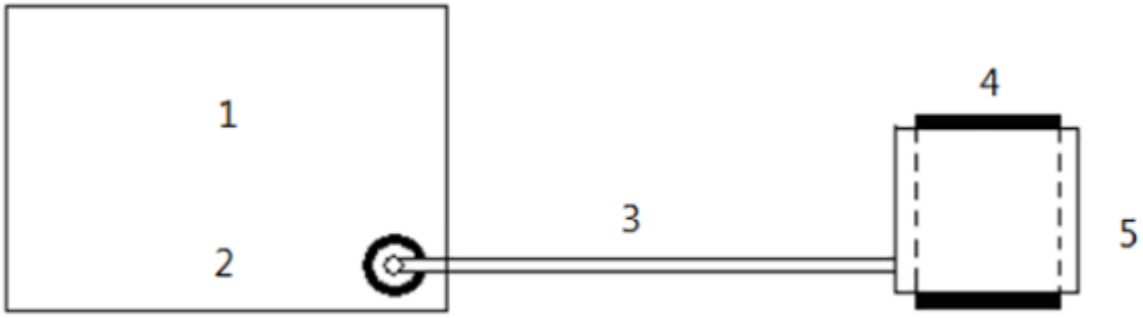
Tools required:

- An adult cuff
- An air tubing
- A correct sized cylinder

To perform the leakage test:

1. In the **Patient Info.** menu, set **Patient Category** to **Adult**.
2. Connect the cuff to the NIBP cuff connector on the equipment.
3. Wrap the cuff around the cylinder as shown below.

Figure5–2



1	Defibrillation monitor
2	NIBP cuff connector
3	An air tubing
4	A correct sized cylinder
5	Cuff

4. On the main screen of Maintenance, choose **Module>NIBP>NIBP Leakage Test**.

After about 20 seconds, the equipment automatically deflates. This means the leakage test finishes.

The leakage test is completed. The result is displayed on the screen. If the message "NIBP Pneumatic Leak" is displayed, it indicates that the NIBP airway may have leakage. Check the tubing and connections for leakages, and then perform a leakage test again.

After **NIBP Leakage Test** is selected, the key changes to **Stop NIBP Leakage Test**. After **Stop NIBP Leakage Test**, the leakage test stops and the key **Stop NIBP Leakage Test** changes to **NIBP Leakage Test**.

NOTICE

Before performing the leakage test, ensure that the accuracy test is performed and passed.

Overvoltage protection test

Tools required:

- T-shape connector
- Tubing
- Balloon pump
- Steel vessel with a volume of 500±25 mL
- Calibrated manometer for reference, accuracy not lower than 1 mmHg

1. Perform steps 1-4 in the section NIBP Accuracy Test.
2. On the main screen of Factory Maintenance, choose **NIBP>Overpressure Protection Circuit Test**.
3. On the **Overpressure Protection Circuit Test** page, set **Patient Category** to **Adu/Ped**, adjust the output pressure of the air pump to be within the range of 320-330 mmHg and wait until the output pressure becomes table. Click **Test**. The test starts. After the test is successful, the NIBP menu prompts **Test Successful**. If the pressure exceeds the range of 320-330 mmHg, the system prompts **Test Failed**.
4. On the **Overpressure Protection Circuit Test** page, set **Patient Category** to **Neo**, adjust the output pressure of the air pump to be within the range of 160-165 mmHg and wait until the output pressure becomes table. Click **Test**. The test starts. After the test is successful, the NIBP menu prompts **Test Successful**. If the pressure exceeds the range of 160-165 mmHg, the system prompts **Test Failed**.

5.5.9 Sidestream CO_2 test

Leakage test

1. Power on the equipment, make it enter the Monitor mode, and connect the accessories.
2. After the CO_2 module is warmed up, block the air inlet completely. The monitor prompts **CO2 Airway Occluded**. Block the air inlet for about 60 seconds. Select **Main Menu→Maintenance→enter the required password**→Module→**CO2**. Check whether the current flow rate is less than 10 mL/min. If yes, the module has no leakage. If the current flow rate is greater than or equal to 10 mL/min, the module has leakage.

Performance test

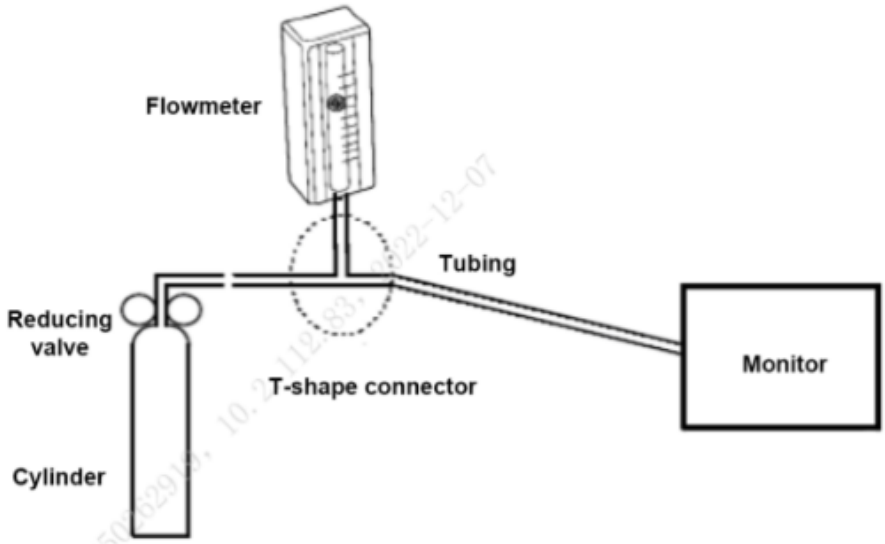
Test tools:

- Steel cylinder with CO2 gas of 3%-7% concentration, Accuracy: a/c≤ 0.01 (a: gas absolute accuracy, c: gas concentration), and N_2 as balance gas
- Steel cylinder with O_2 gas of > 40% concentration and N_2 as balance gas (applicable for sidestream CO_2 modules with an O_2 module)
- T-shape connector
- Tubing

- Flowmeter

1. Power on the equipment and connect accessories.
2. After the CO_2 module is warmed up, check the airway for leakage.
3. Choose **Maintenance>Module>CO2**.
4. Connect the test system as shown in the figure below.

Figure5–3



5. Turn on and adjust the reducing valve switch so that the flow reading on the flowmeter is within the range of 10-50 mL/min and kept stable.
6. Ensure that the error between the real-time CO2 concentration displayed in the Calibrate menu and the actual concentration is within the range of ±5% (relative value).

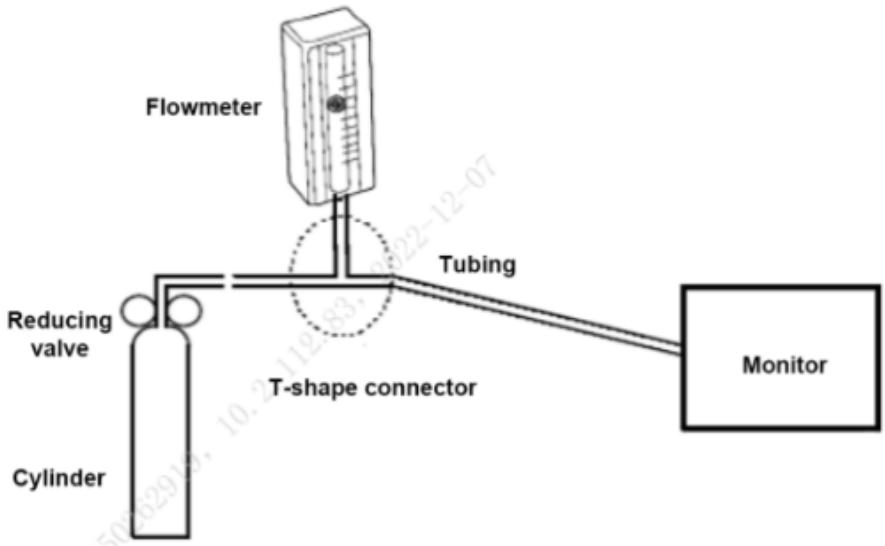
Module calibration

Test tools:

- Steel cylinder with CO_2 gas of 3%-7% concentration, Accuracy: a/c≤ 0.01 (a: gas absolute accuracy, c: gas concentration), and N_2 as balance gas
- T-shape connector
- Tubing
- Flowmeter

1. Ensure that the CO_2 module has been warmed up or started.
2. Check the airway for leakage.
3. Access the **CO2** menu, choose **Main Menu Maintenance, input the user maintenance password, and then choose** Module**CO2**.
4. In the **CO2** menu, click **Zero**.
5. After zeroing, connect the components as shown below.

Figure5–4



6. Turn on and adjust the reducing valve switch so that the flow reading on the flowmeter is within the range of 10-50 mL/min and kept stable.
7. In the **Calibrate** menu, input the CO2 concentration in the **CO2%** field.
8. In the **Calibrate** menu, the real-time CO2 concentration measured is displayed. After the measured CO2 concentration becomes stable, select **Calibrate** to calibrate the CO2 module. After the calibration is successful, the **Calibrate** menu will prompts **Calibration Successful**. If the calibration failed, the system prompts **Calibration Failed**. In this case, check the calibration operation and perform calibration again. If calibration failed for multiple times, return the equipment to the factory for repair.

5.5.10 Respiratory Impedance Test

Perform the following steps:

1. Check that the paddle cable is properly connected to the therapy interface of the equipment, and place the paddles correctly on the defibrillation pace analyzer.
2. If no paddles are connected to the equipment, connect the pads cable to the therapy interface first, and then connect the cable with the 50 Ω test load.
3. Power on the equipment and make it enter the Monitor mode. Press **-**, **+**, and **Discharge** on the panel in sequence. The Debug page is displayed.
4. Check whether the value of RT Imped is 500±75. If yes, the test is passed.
   If the value of RT Imped of connected paddles is not within this range, disconnect the adult paddles, and perform the test on pediatrics paddles again. If the test is passed, perform the test on adult paddles again. If the test also failed, replace all the paddles. If the test still failed after the pads cable and test load are connected or after all the paddles are replaced, replace the therapy module.

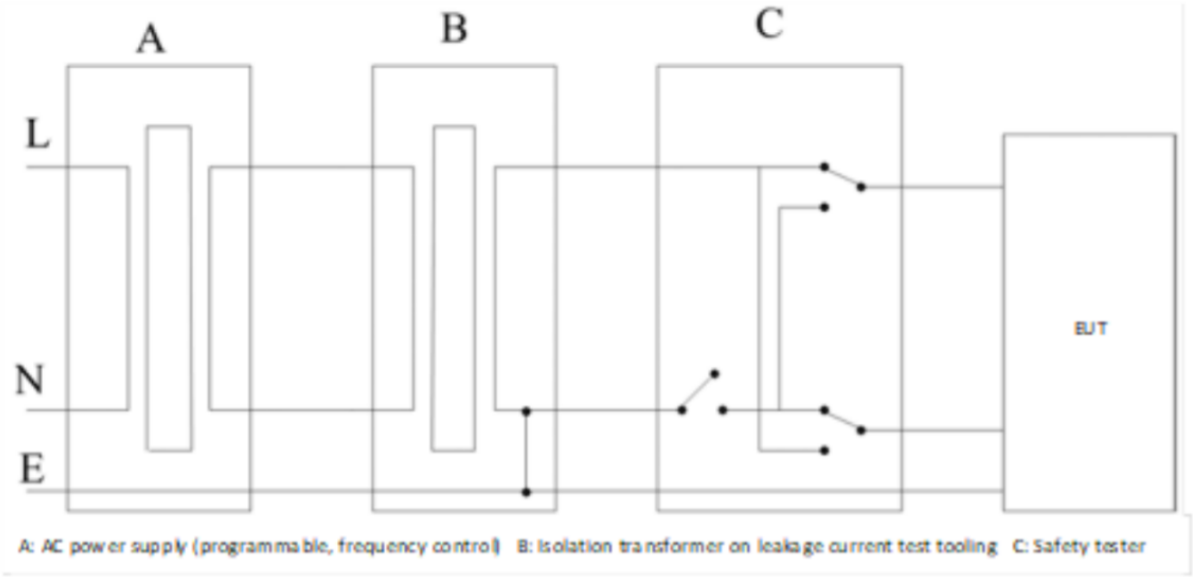
5.5.11 Electrical Safety Test

WARNING

- **Electrical safety test is a proven means of detecting abnormalities that, if undetected, could prove dangerous to either the patient or the operator.**
- **All tests can be performed using commercially available safety analyzer and other test devices. Maintenance personnel shall ensure the adaptability, functional completeness, and safety of the test devices, and be familiar with their usage.**
- **Electrical safety test shall comply with the following standards of the latest version: EN 60601−1 and UL60601.**
- **In case of other stipulations in local laws and regulations, implement electrical safety tests by following relevant stipulations.**
- **All devices driven by AC power and connected to medical instruments in patient zones must comply with the IEC 60601−1 standard. The electrical safety tests on these devices must be implemented in accordance with the test interval of the equipment.**

Electrical safety tests are used to timely detect potential electrical safety risks that might cause injuries to patients, operators, or maintenance personnel. Electrical safety tests must be carried out in the normal environment (including temperature, humidity and barometric pressure).
The electrical safety tests described in this section take the 601 safety analyzer as an example. The safety analyzer used in different regions may vary. Make sure that the electrical safety test protocol you adopted is applicable.
Equipment connection is shown in the following figure.

Figure5–5



Test tools:

- Safety analyzer
- Isolation transformer

Shell leakage current test

1. Connect the 601 safety analyzer to a 264 V AC, 60 Hz power supply.
2. Connect the equipment under test (EUT) to the safety analyzer through the applied part connection tooling, with the SUM end of the tooling connected to the RA end of the safety analyzer.
3. Use the power cord to connect the EUT to the auxiliary power output connector of the 601 safety analyzer.
4. Connect one end of the red test lead to the **Red input terminal** of the safety analyzer, and clamp the other end on the metal foil tightly attached to the surface of the EUT shell.
5. Power on the 601 safety analyzer, and press **5-Enclosure leakage** on the panel of the analyzer to go to the shell leakage current test page.
6. The shell leakage current is not more than 100 μA in the normal state or not more than 300 μA in the single fault state.

Earth Leakage Current

1. Connect the 601 safety analyzer to a 264 V AC, 60 Hz power supply.
2. Connect the equipment under test (EUT) to the safety analyzer through the applied part connection tooling, with the SUM end of the tooling connected to the RA end of the safety analyzer.
3. Use the power cord to connect the EUT to the auxiliary power output connector of the 601 safety analyzer.

4. Power on the 601 safety analyzer, and press **4-Earth leakage** on the panel of the analyzer to go to the earth leakage current test page.
5. The earth leakage current is not more than 300 μA in the normal state or not more than 1000 μA in the single fault state.

Patient Leakage Current Test

1. Connect the 601 safety analyzer to a 264 V AC, 60 Hz power supply.
2. Connect the equipment under test (EUT) to the safety analyzer through the applied part connection tooling, with the SUM end of the tooling connected to the RA end of the safety analyzer.
3. Use the power cord to connect the EUT to the auxiliary power output connector of the 601 safety analyzer.
4. Power on the 601 safety analyzer, and press **6-Patient leakage**.
5. Press **APPLIED PART** continuously to select the AC measurement and DC measurement. In DC mode, **DC** is displayed next to the limit.
6. The patient leakage current is not more than 10 μA in the normal state or no more than 50 μA in the single fault state.

Patient Auxiliary Current Test

1. Connect the 601 safety analyzer to a 264 V AC, 60 Hz power supply.
2. Use the power cord to connect the EUT to the auxiliary power output connector of the 601 safety analyzer.
3. Connect the sensor of the applied part to the applied part connection tooling, with the RA end of the 601 safety analyzer to the RA-P end of the tooling and the SUM end to the LA end of the 601 safety analyzer. Turn on the RA switch.
4. Power on the 601 safety analyzer, and press **8-Patient Auxiliary Current Test** on the panel of the analyzer to go to the patient auxiliary current test page.
5. Press **APPLIED PART** continuously to select the AC measurement and DC measurement. In DC mode, **DC** is displayed next to the limit.
6. The patient auxiliary current is not more than 10 μA in the normal state or no more than 50 μA in the single fault state.

5.6 Factory Maintenance

5.6.1 Entering Factory Maintenance Mode

Select **Main Menu**. On the third screen, select **Maintenance** from the **System** column. Enter the required password. Select **OK**. Select Factory Maintenance.

5.6.2 Monitor Information (Log Export)

Check whether the format of files in the USB flash disk is FAT32, and then connect the USB flash disk to the USB port of the monitor main unit,

NOTICE

instead of the USB port on the side of the equipment

Choose **Factory Maintenance>Monitor Information**. On the window displayed, you can view information of the monitor main unit, such as the Wi-Fi signal strength and hard disk capacity.
In the lower left corner of the window, click Export Log to export all the monitor logs.

5.6.3 Production Test

Access the **Production Test** menu, in which you can test basic functions related to hardware interfaces of the monitor.
Production test can be performed either in the man-machine interaction mode or single-test mode.

- Man-machine interaction: Click **Start**. The system performs all the tests automatically in the specified sequence.
- Single-test: Select a test and then perform the test.

5.6.4 Factory Configuration

Click **Installation Wizard**. After the equipment restarts, it enters the installation wizard screen.

5.6.5 Setup

Access the **Setup** menu, in which you can set ECG alarm parameters and other parameters.

5.6.6 Clinical Data Acquisition

Access the **Clinical Data Collection** menu, in which you can set parameters for clinical data collection.
When Clinical Data Location is set to **None**, the clinical data is saved on the monitor and can be exported to a USB flash disk by clicking **Export Log**.
When Clinical Data Location is set to **Udisk**, the clinical data is directly saved on the USB flash disk.

5.6.7 Debugging Mode

Access the **Debug** menu, in which you can set commissioning parameters.

5.6.8 Viewing Failure Codes

Select **Main Menu**. On the third screen, select **Maintenance** from the **System**column. Enter the required password. Select **OK**. Select Factory Maintenance. Enter **Failure Code**. For details, see *Failure Code.*

5.6.9 Function Setup

Click **Factory Function** to set relevant functions. Functions need to be set only when a module is upgraded or the main control board is replaced. Select functions you want to configure, click Back to exit the Factory Maintenance page, and restart the machine.

NOTICE

Check whether this function is supported by the machine configuration. If no, an alarm will be reported.

5.6.10 Impedance

The **Impedance** function is used for factory test only.

5.6.11 Paddle Open Display

Choose **Defibrillator Open Display**. This function is used for factory test only. Set this function to **OFF** when using the equipment.

5.6.12 Quick Start

Choose **Defibrillator>Fast Startup**. This function is used for factory test only. Set this function to **ON** when using the equipment.

5.6.13 CPR Analysis

Choose **DefibCPR Analysis**. The CPR analysis function is used for factory test only. Set this function to **OFF** when using the equipment.

5.6.14 Others-Regular Maintenance

The regular maintenance switch is on by default, the default maintenance cycle is 1 year, and the start time is the installation date.
The maintenance cycle can be set according to the hospital's maintenance plan.
When maintenance service expires, the equipment prompts **Equipment maintenance has expired**.

NOTICE

- **System logs (including alarm logs) stored on the equipment are retentive upon power failure, and power-on/off operations are also logged.**
- **Up to 50 MB of system logs (including alarm logs) can be stored on the equipment. Additional logs will overwrite old logs in the principle of First In First Out**

Maintenance Test Report

See the above sections for detailed test procedures and contents.

User name		
User address		
Maintenance personnel		
Maintenance company		
EUT		
EUT model		
EUT SN		
Hardware version		
Software version		
EUT	**Model/No.**	**Standard Validity Period**
Test Items	Test Records	Test Results (Pass/Fail)
Visual Check		
The shell, display, buttons, knob, modules, power cord, and accessories have no obvious signs of damage.		

The external connectors are not frayed and the connector pins are not loose or bent.		
The external connectors are not loose or their pins are not bent.		
The safety labels and nameplates are clearly legible.		
Power-on Test		
The power-on test is passed. The power indicator and alarm system work correctly. The equipment starts up properly.		
User Test		
The user test is passed.		
Performance test		
Recorder Test		
Print the ECG waveforms to check whether the waveforms printed are clear and correct. If yes, the recorder works normally.		
Simulate errors by removing the recorder paper or loosening the recorder pin. Check whether the displayed information is correct. Ensure that the recorder can work normally after the failure cause is eliminated.		
Manual Defibrillation Test		
When the equipment runs on AC mains and external paddles are used, the equipment can be properly charged and discharged; the energy delivered meets the		

requirement for accuracy, and the shock information is correctly recorded.		
When the equipment runs on a fully charged battery and external paddles are used, the equipment can be properly charged and discharged; the energy delivered meets the requirement for accuracy, and the shock information is correctly recorded.		
When the equipment runs on AC mains and multifunctional electrode pads are used, the equipment can be properly charged and discharged; the energy (1 J/100 J/360 J) delivered meets the requirement for accuracy, and the shock information is correctly recorded.		
When the equipment runs on a fully charged battery and pads are used, the equipment can be properly charged and discharged; the energy (1 J/ 100 J/360 J) delivered meets the requirement for accuracy, and the shock information is correctly recorded.		
When external paddles are used, the charge tone is correctly issued when the equipment is being charged. The prompt **Charger Removed** is shown on the screen and the charge done tone stops when **Disarm** is clicked. The equipment does		

not discharge externally. When **Time to Auto Disarm** is set to **60s**, the prompt **Charger Removed** is shown on the screen and the charge done tone stops after 60 seconds at the completion of charging. The equipment does not discharge externally.		
When pads are used, the charge tone is correctly issued when the equipment is being charged. The prompt **Charger Removed** is shown on the screen and the charge done tone stops when **Disarm** is clicked. The equipment does not discharge externally. When **Time to Auto Disarm** is set to **60s**, the prompt **Charger Removed** is shown on the screen and the charge done tone stops after 60 seconds at the completion of charging. The equipment does not discharge externally.		
When external paddles are used for synchronized cardioversion and the ECG source is paddles and lead II respectively, the prompt is correct and a Sync mark appears above each R wave. The delivered energy measured is 10 J±2 J and the synchronous shock is delivered within 60 ms of the peak of the R wave.		
When pads are used for synchronized cardioversion and ECG source is paddles		

and lead II respectively, the prompt is correct and a Sync mark appears above each R wave. The delivered energy measured is 10 J±2 J and the synchronous shock is delivered within 60 ms of the peak of the R wave.		
AED Test		
When the equipment runs on a fully charged battery and pads are connected to the defibrillator/pacer analyzer, the rhythms can be analyzed and the equipment can be properly charged and discharged. The energy (200 J/300 J/360 J) delivered meets the requirement for accuracy, and the shock information is correctly recorded.		
Cardiac Pacing Test		
When **Pacer Rate** is set to **70 ppm** and **Pacer Output** is set to **30 mA**, the pacer rate measured by the analyzer is 70 ppm±1 ppm, and the pacer output measured is 30±5 mA.		
When **Pacer Rate** is set to **170 ppm** and **Pacer Output** is set to **200 mA**, the pacer rate measured by the analyzer is 170 ppm±2 ppm, and the pacer output measured is 200±10 mA.		
ECG performance test		
The ECG waves are displayed correctly without		

noise and the displayed HR value is within 60±1 bpm		
The ECG Lead Off alarm behaves correctly.		
Paced signals are detected and pace pulse marks are displayed when Paced is set to ON.		
The difference between the amplitude of the ECG calibration square wave and that of the wave scale is not greater than 5%.		
Resp Test		
The Resp waveform is not distorted and the displayed Resp value does not exceed 20±1 RPM.		
SpO2 Test		
When the test is performed on a finger of a healthy person, the SpO2 Pleth waveform and PR value are displayed on the monitor. The displayed SpO2 should be within the range of 95% to 100%.		
The SpO2 Lead Off alarm behaves correctly.		
NIBP Test		
Connect the equipment, manometer, balloon pump, and metal vessel. Compare the value of manometer with the value displayed on the equipment's screen. The difference should be no greater than 3 mmHg.		
The leakage test is passed.		

The result of Calibrate Overpressure is Test Successful.		
TEMP test		
Test all temperature channels of the monitor and ensure that the temperature displayed on the monitor does not exceed 37°C±0.1°C.		
IBP Test		
The static pressure of each IBP does not exceed 200±2 mmHg.		
The displayed ART and LV waveforms of each IBP channel are correct.		
Mainstream CO2 Test		
The mainstream CO2 zeroing is successful, and the baseline of the CO2 waveform returns to the zero position.		
The CO2 Apnea alarm behaves normally.		
The displayed CO2 value is 45±2 mmHg.		
Sidestream CO2 Test		
Block the gas inlet of the watertrap. The sidestream CO2 flowrate is slower than 10 mL/min and an alarm of CO2 Airway Occluded is given. It indicates that there is no leakage.		
The displayed CO2 value should be 6±0.2%.		
IR Ear TEMP Test		
The temperature displayed on the monitor is consistent with		

the measured value of the ear thermometer.		
Camera Test		
The equipment displays the images in the correct color and resolution.		
Ultrasound Test		
The equipment displays ultrasound images normally.		
Impedance measurement test		
The value of RT Imped is 500±75.		
Electrical Safety Test		
The shell leakage current is not more than 100 μA in the normal state or not more than 300 μA in the single fault state.		
The earth leakage current is not more than 300 μA in the normal state or not more than 1000 μA in the single fault state.		
The patient leakage current is not more than 10 μA in the normal state or no more than 50 μA in the single fault state.		
The patient auxiliary current is not more than 10 μA in the normal state or no more than 50 μA in the single fault state.		

Tester:_____Date:_____

6 Upgrade

6.1 Hardware Upgrade

6.1.1 Upgrade FRU Kit

This monitor supports the upgrade of wireless functions (4G/5G/Wi-Fi).

No.	Upgrade Package	Upgrade Package Code	Remarks
1	WiFi Material Kit	115-084856-00	
2	4G Material Kit (EU)	115-097041-00	
3	4G Module (AU)	115-097042-00	
4	4G Upgrade Kit (CN)	115-097038-00	

6.1.2 Upgrade Procedure

For the wireless functions, see the upgrade kit removal and installation of WIFI Materlal Kit FRU **7.77.2** Disassembly and Assembly, 4G Module (AU) FRU **7.24.2** Disassembly and Assembly, 4G Material Kit (EU) FRU **7.25.2** Disassembly and Assembly and 5G Material Kit FRU **7.27.2** Disassembly and Assembly.

6.1.3 Test After Upgrade

After upgrading the equipment, perform tests according to the following table.

No.	Test Item	Remarks
1	Appearance check	
2	Power-on Test	
3	Detecting Performance	
4	Electrical Safety Test	

6.2 Software Upgrade

6.2.1 Tools for Upgrade over Network

Functions of this monitor and its peripheral firmware can be upgraded through a PC network or a USB flash disk.

- This monitor can be upgraded by using the Mindray monitor network upgrade software, which can directly run on a laptop or a desktop PC. Connect the monitor with the PC through a network cable or a crossover network and then upgrade the monitor programs.
- The monitor programs can also be upgraded by using authorized USB flash disk. The following programs of the equipment can be upgraded:

  — Linux kernel

  — System software

  — MPM software

  — CO2 module software

  — SpO2 module software

  — Recorder module software

  — SPI FPGA software

  — Bluetooth firmware

  — Wi-Fi firmware

  — Touchscreen firmware

  — Therapy module software

  — Power management board software

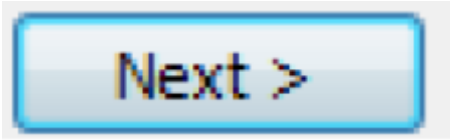
⚠CAUTION

- **Disconnect the equipment from the patient and ensure that important data are saved before upgrade.**
- **Do not shut down or power off the equipment when upgrading the boot program. Otherwise, the equipment may break down.**
- **Upgrade should be performed by qualified service personnel only.**
- **Crossover network cable shall be used if a PC is connected for equipment upgrade.**
- **To upgrade the equipment using a USB flash disk, ensure that the USB flash disk supports the format FAT32 and has a remaining capacity of at least 100 MB.**

NOTICE

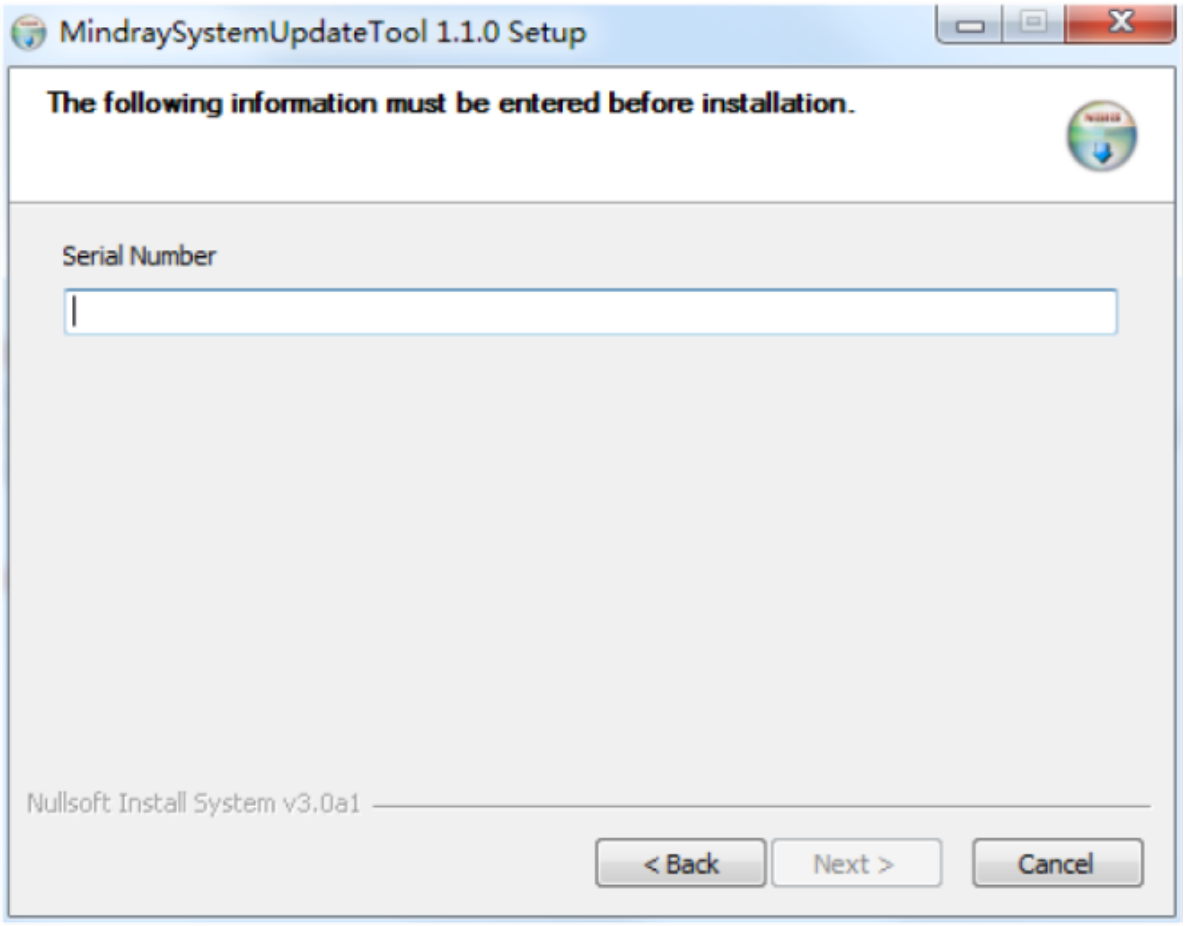
- **After the system software is upgraded, restart the equipment to confirm that the upgrade software version is correct and perform the power-on test and manual test.**
- **After the boot program is upgraded, the system program and other programs must be upgraded again to ensure compatibility among them.**
- **Before upgrading, ensure that the upgrade package is of the target version. To get the latest program upgrade package, contact our Customer Service Department.**

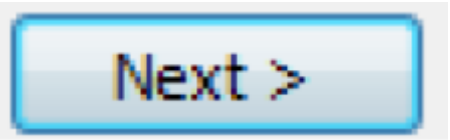
How to Install the Tool Software

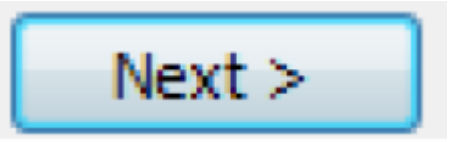
1. Click SystemUpdateTool.exe. On the wizard displayed, click 

to enter the **Serial Number** page.

Figure6–1



2. Enter the serial number, and click 

to enter the program installation path page. Select the installation folder, click 

, and perform following steps as instructed.

How to Connect the PC with the Monitor

Ensure that the PC has at least one NIC and the PC is connected with the monitor through the NIC.

1. Connect the PC to the monitor through a hub.

- To connect the PC with the hub through a network cable, connect one end of the network cable to the NIC slot of the PC and connect the other end of the network cable to a slot on the hub.

- Connect the hub to the monitor through a network cable in the same way. One hub has multiple slots and thus can be connected to at least 5 monitors at a time for upgrade.

2. Modify the IP address of the PC NIC.

NOTICE

To ensure successful upgrade, before running the upgrade program, set the IP address to 77.77.1.xx. There is no restriction on the gateway and DNS addresses. For example, you can set the IP address to 77.77.1.13 and the subnet mask to 255.255.255.0.

To enter the upgrade mode:
Connect the equipment to the PC through a network cable. Hold down **+ charge**, power on the equipment again, and wait until the equipment enters the upgrade mode.

Software Tool Upgrade

Set the software upgrade package of each product based on the above configuration requirements. The setting can only be made and managed by the administrator. Set the system software upgrade package as follows:

1. Download the Orbit system software package to the model package path, run the installed system or network upgrade tool software, and then click **Select A New Model Package**, select **Orbit.Tool** model package, **open it**, and then click **OK**.

Figure6–2

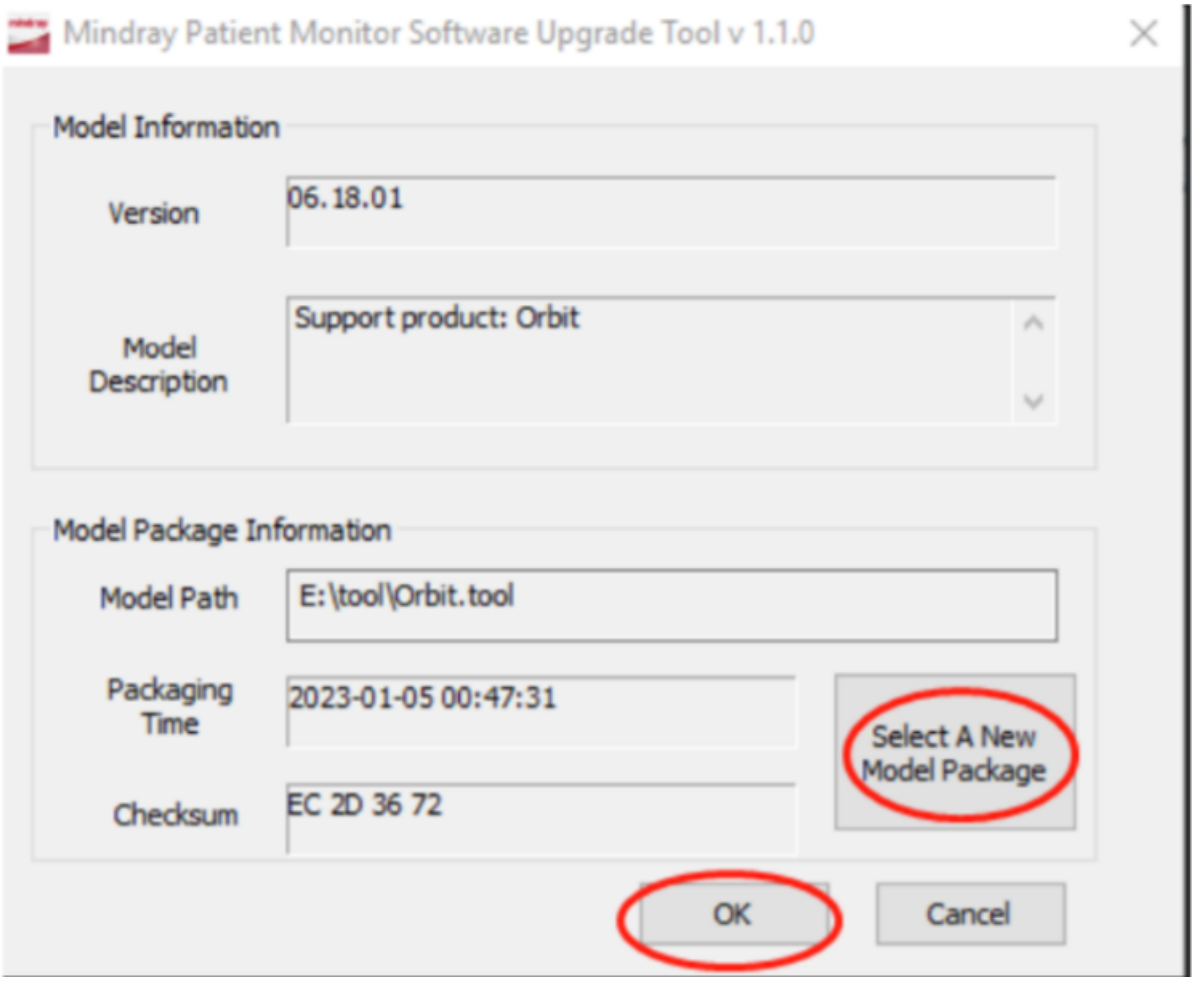
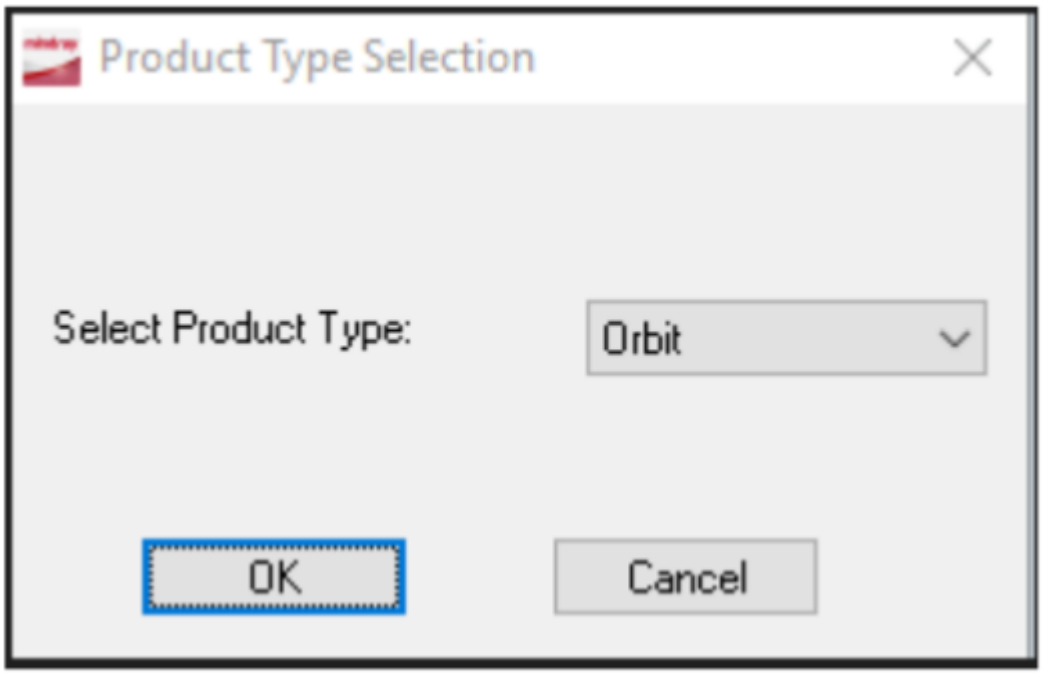


Figure6–3

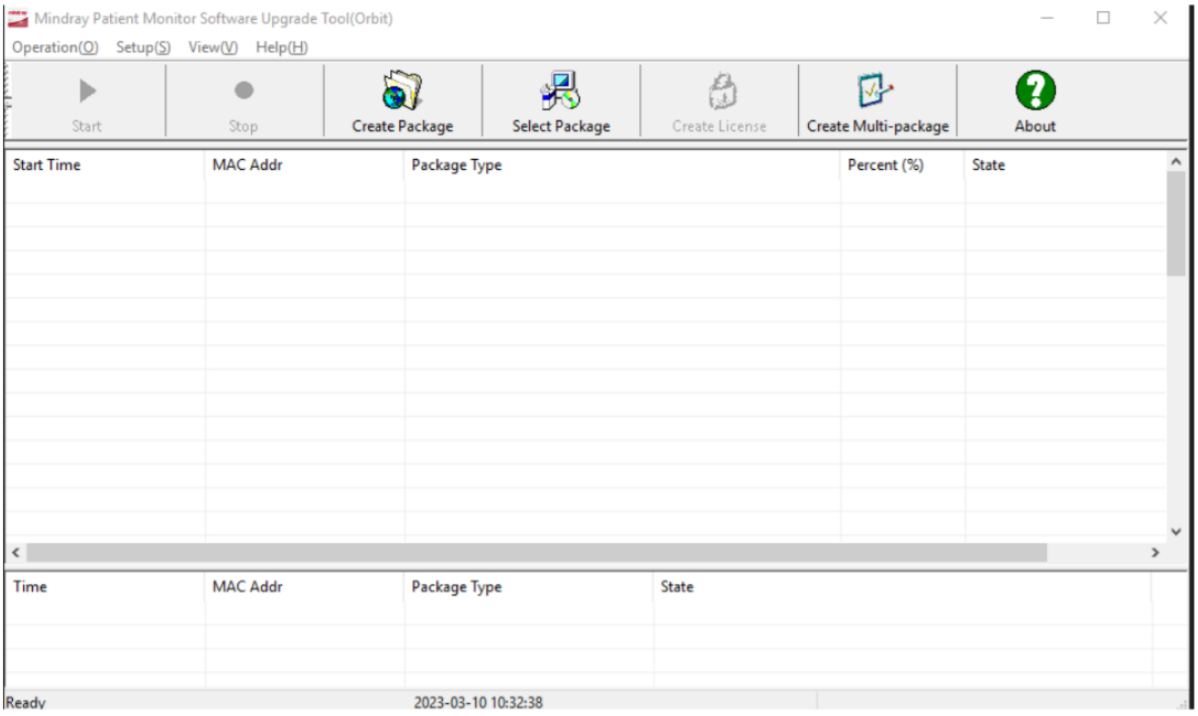
2. On the machine type selection page displayed, select **Orbit**

Figure6–4



The PC displays the following page:

Figure6–5



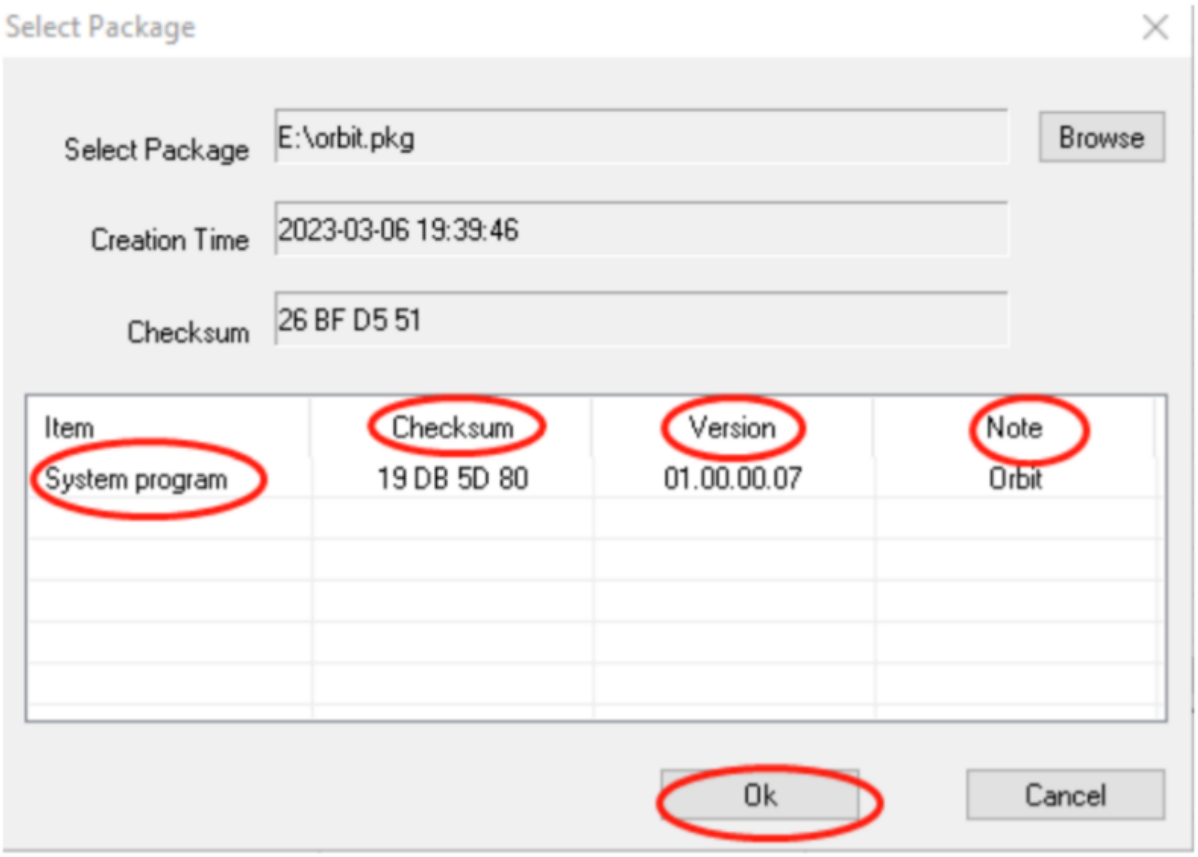
6.2.2 Software Upgrade Guide

System Software Upgrade Method

1. Enter the main interface for downloading of system upgrade, and click 

.
2. Select the prepared system software upgrade package file through browsing, check to ensure that the selected downloading content (including the information such as the upgrade item, check sum, version and description) is correct, and then click **OK**. Then the **Start** hot key in the main menu lights up.

Figure6–6



3. Ensure that the network cable is connected properly and the monitor is powered off, and click **Start** of the upgrade tool. The system downloads the software.

Module Software Upgrade

Upgrade the module program as instructed in the upgrade method of the system software above. After the program is upgraded, click Stop in the upgrade menu, disconnect the network cable, and power off and then on the monitor.

Restart the equipment. Choose **Main Menu Maintenance**, enter the factory maintenance password, and then click **Version**. Check the displayed version.
For details of upgrading a network program, see instructions and help information about the Mindray monitor network upgrade software, or consult Customer Service Department.

6.2.3 USB Upgrade Guide

Preparing the Upgrade Directory Structure of USB Flash Disk

Tools:
Prepare a common USB flash disk (Kingston, Netac and other models) of which the system capacity is larger than 2 GB and choose FAT.

1. Create a folder named UPGRADE_AMP\Orbit in the root directory of the USB flash disk.
2. Copy the upgrade boot program Orbit_Installer.pkg (do not rename the file) to the directory UPGRADE_AMP\Orbit.
3. Copy the upgrade file in the format of PKG or MPKG to the directory UPGRADE_AMP\Orbit.

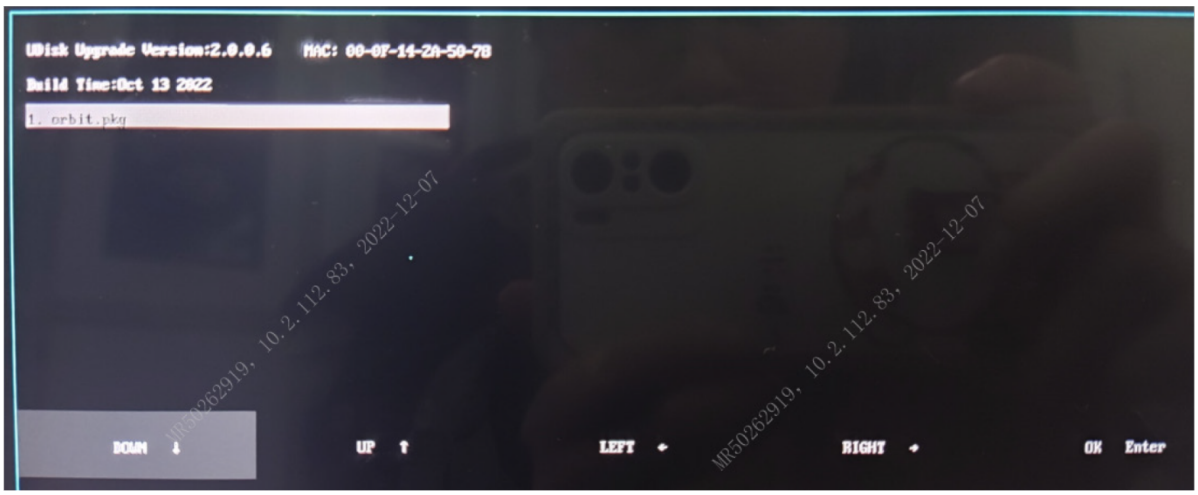
Inserting the USB Flash Disk to the USB Port of the Equipment

Insert the prepared USB flash disk into the USB port of the equipment.

Performing Upgrade

- Press the power button to turn on the equipment, and then turn it off.
- Upon shutting down (less than 10 seconds), press and hold **+** and **Charging** at the same time, and press the power button to turn on the equipment. During the power-on process, do not let go of **+** and **Charging** until the system enters the upgrade screen.
- Selecting the File

Figure6–7



- If the USB flash disk just contains the upgrade kit file, the file is selected by default. If multiple upgrade kits are available, up to 16 kits are displayed in two columns. You can press the direction key to select the target upgrade kit.
- Click the 

area on the touchscreen. The cursor moves downward, and you can select the upgrade program. You can also press ↓ on the keypad to select the upgrade program.
- Click the 

area on the touchscreen. The cursor moves upward, and you can select the upgrade program. You can also press ↑ on the keypad to select the upgrade program.
- Click the 

area on the touchscreen. The cursor moves to the left, and you can select the upgrade program. You can also press ← on the keypad to select the upgrade program.
- Click the 

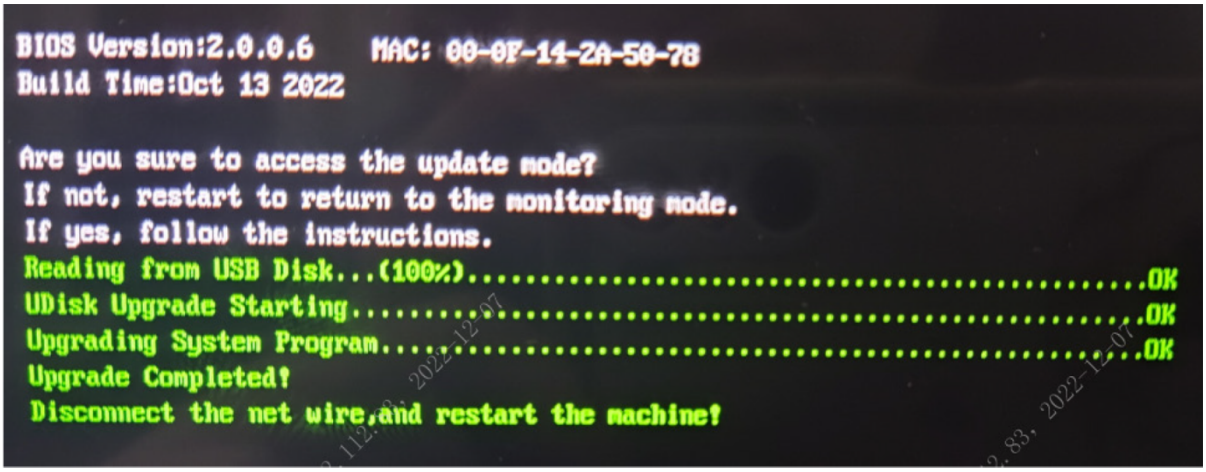
area on the touchscreen. The cursor moves to the right, and you can select the upgrade program. You can also press → on the keypad to select the upgrade program.
- Click the 

area on the touchscreen or press the **Enter** key on the keypad to confirm the selected upgrade program.

Completing Upgrade

When the following page is displayed, the program is upgraded. Restart the device to activate the new system software.

Figure6–8



⚠CAUTION

- **Disconnect the monitor from the patient and ensure that important data are saved before upgrade.**
- **Do not shut down or power off the equipment when upgrading the boot program and FPGA program. Otherwise, the equipment may break down.**
- **Upgrade should be performed by qualified service engineer only. A potential hazard or unsafe practice indicated by the system that, if not avoided, could result in minor physical injury or product/property damage.**

NOTICE

- After the boot program is upgraded, the system program and other programs must be upgraded again to ensure compatibility among them.
- Before upgrading, ensure that the upgrade package is of the target version. To get the latest program upgrade package, contact our Customer Service Department.

6.2.4 CAA License Upgrade

The following information is required for CAA license application:

1. Order number (with CAA functions to be applied for)
2. Model
3. SN
4. MID/MAC address (path: **Main Menu>System>License**)

Import and Upgrade the CAA License

1. Unzip the CAA license package PMLS.ZIP to obtain a folder named PMLS.
2. Copy the PMLS folder to the root directory of the USB flash disk.
3. Insert the USB flash disk with the PMLS folder to the USB port of the equipment.
4. On the equipment, choose **Main Menu>System>License>External**. On the page displayed, click Import.

NOTICE

- **Files in the USB flash disk should be in the format of FAT32#.**
- **The folder containing the CAA license must be PMLS and stored in the root directory of the USB flash drive. The file name cannot be modified.**
- **For more information, contact our Customer Service Department.**

7 FRU Replacement

7.1 Preparation Before Disassembly

Tools: Phillips screwdriver, tweezers, and needle-nosed pliers

Preparations:

Before disassembling the equipment, do the following:

- Stop patient monitoring and therapy, turn off the equipment, and disconnect all its accessories from external devices.
- Disconnect the AC power supply.

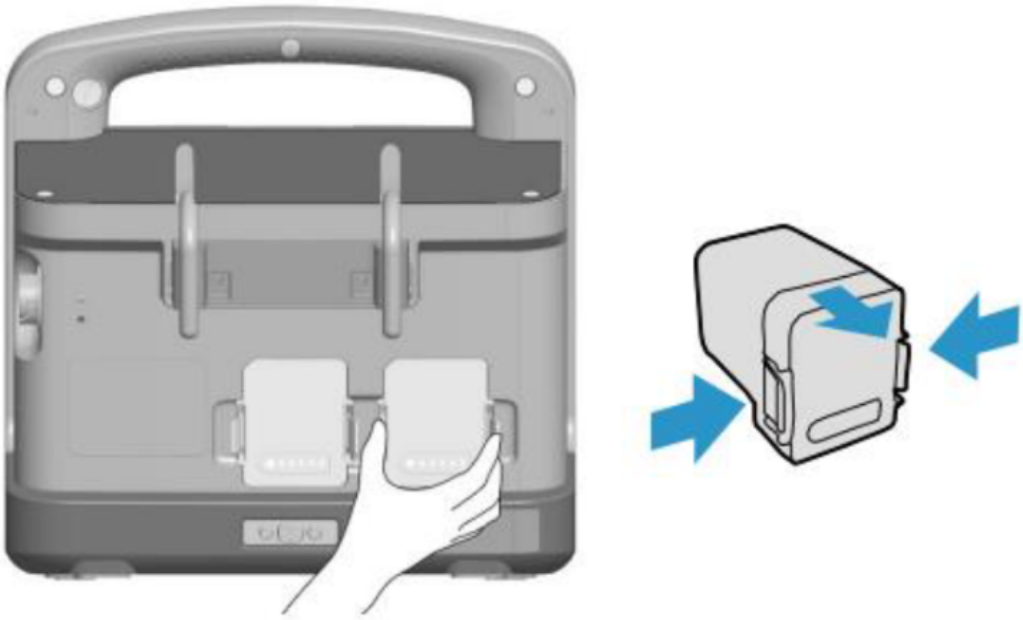
WARNING

- Take ESD precautionary measures before starting the disassembly. Be sure to wear the ESD bracelet or ESD gloves before touching the parts identified with the ESD warning symbol to avoid parts damage.
- When re-assembling the equipment, ensure that all cables are reliably connected. Place the connectors properly to avoid short circuit caused by crushing connectors.
- When re-assembling the equipment, ensure that right screws are used. Screwing improper screws by force may damage the equipment. Furthermore, using improper screws may cause the screws or parts fall off unexpectedly in use, hence leading to unforeseeable physical injury or property damage.
- Disassemble the equipment in the correct sequence. Incorrect disassembly by force may damage the equipment permanently.
- Before disassembling the components, ensure that all the connected parts have been disconnected. Exercise care during the disassembling process. Do not break the cables or damage the connectors.
- Be sure to classify the removed screws and parts and store them carefully for re-assembly. Do not damage, contaminate or lose any screw or part.
- Place removed parts by module to avoid mixing or missing during re-assembly.
- During re-assembly, assemble components before assembling the main unit. Insert the connectors and wire the cables properly.
- The equipment must be water-proofing. During re-assembly, check whether waterproof accessories such as the waterproof strips are assembled properly.

7.2 Capacitor Removal

Method 1

Disconnect the AC power cable and remove the battery. Leave the machine still for more than two hours before disassembling it.



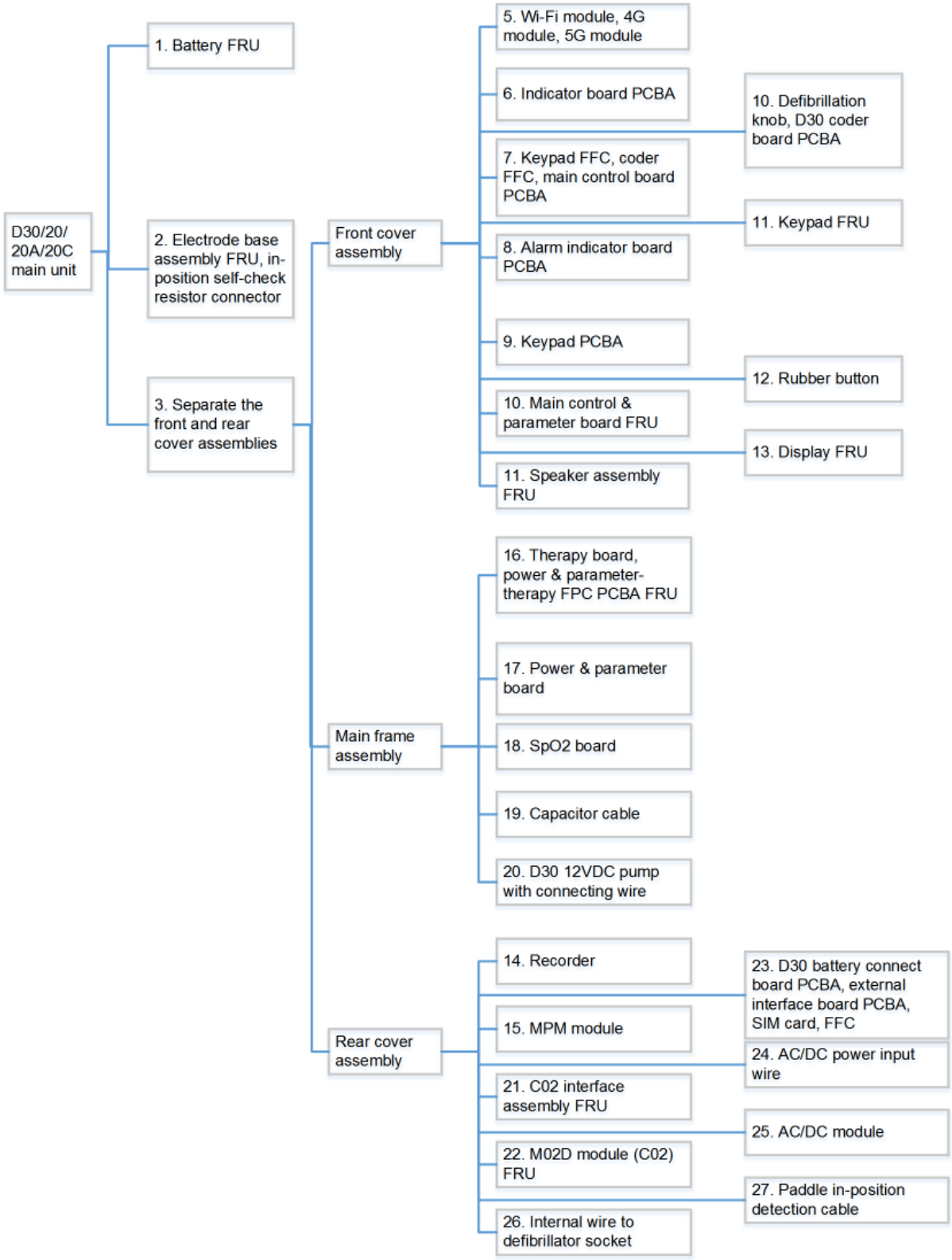
Method 2

Prerequisite: The machine can be turned on normally.

1. Enter **Main Menu>Maintenance>Version>Device Information**.
2. Check **Capacitor Voltage**.

3. If Capacitor Voltage shows safe, turn off the device, and disconnect the power cable. Then, you can disassemble the machine.
4. If Capacitor Voltage shows not safe, do not disassemble the machine. Refer to method 1.

7.3 Disassembly Flowchart



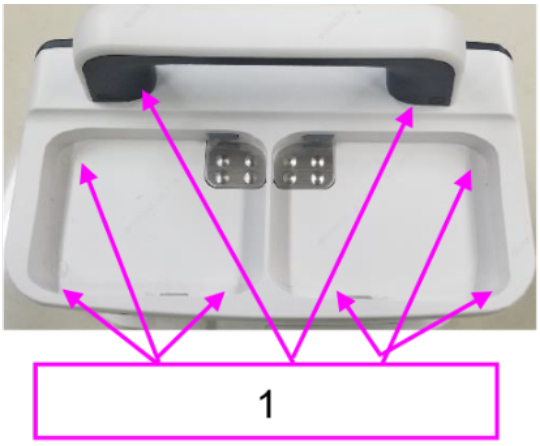
7.4 Main Unit Disassembly

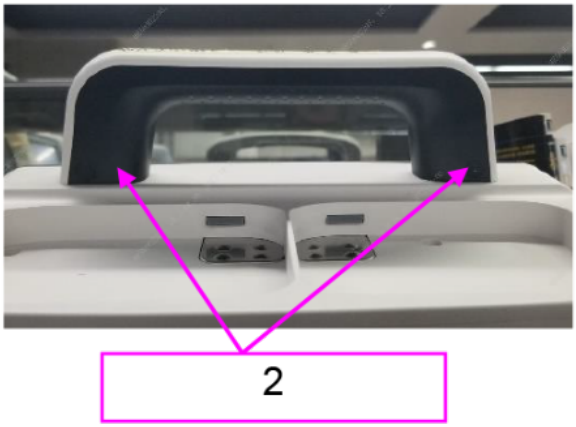
WARNING

- **To disassemble the defibrillator/monitor, remove the battery, handle assembly, electrode base assembly, and front cover assembly in sequence, and then remove the components or parts inside the machine.**
- **The recorder can be removed without removing other components.**
- **Place the removed components on a smooth plane without any objects that may scratch the anti-glare screen and touch screen or damage the knob. Protect the two buckles at the front of the rear cover.**
- **All operations must be performed by professionals. Wear insulating gloves during the operations.**
- **Remove the capacitor before removing the defibrillator module.**

Removing the Electrode Base Assembly and In-position Self-check Resistor Connector

1. Remove the six white screw plugs and two black handle screw plugs from the electrode base. Use a Phillips screwdriver to remove the two PT3X8 self-tapping screws from the handle screw holes.

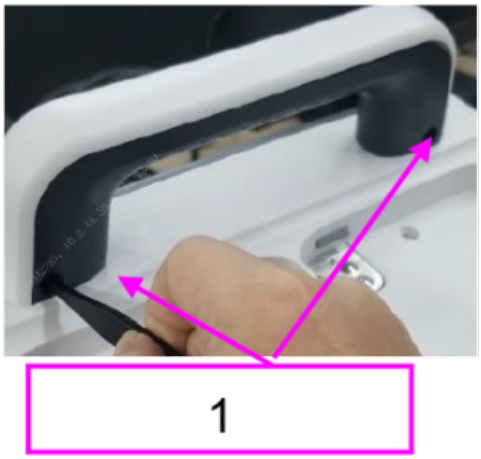


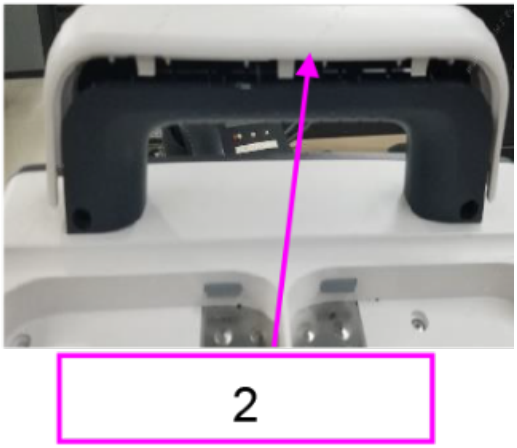


1 Six white screw plugs and two black handle screw plugs

2 Two PT3X8 self-tapping screws

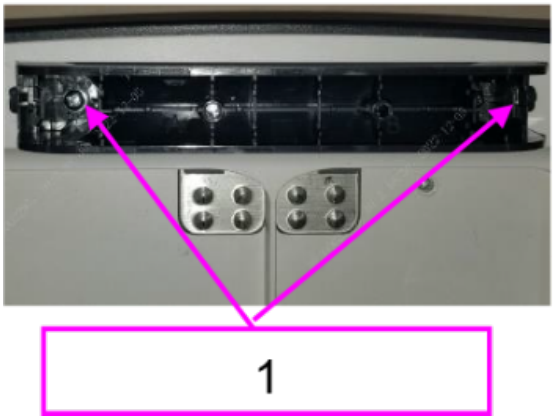
2. Put tweezers through a handle screw hole to push one side of the white handle cover up, and then put the tweezers through the handle screw hole on the other side to push the handle cover up. Remove the handle cover. Use a Phillips screwdriver to remove the two M4X20 pan head screws from the handle screw holes and the six PT3X8 self-tapping screws from the electrode base.

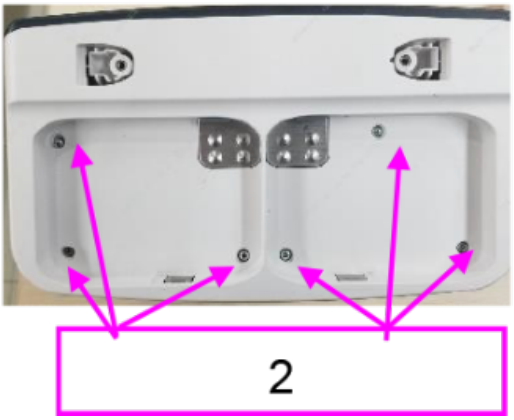




1 Screw holes on the handle

2 White handle cover

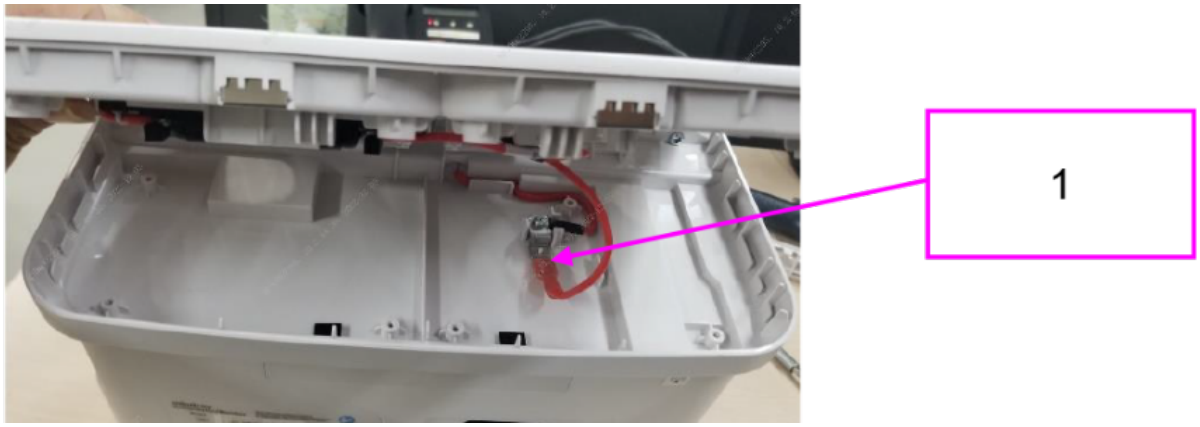




1 Two M4X20 pan head screws

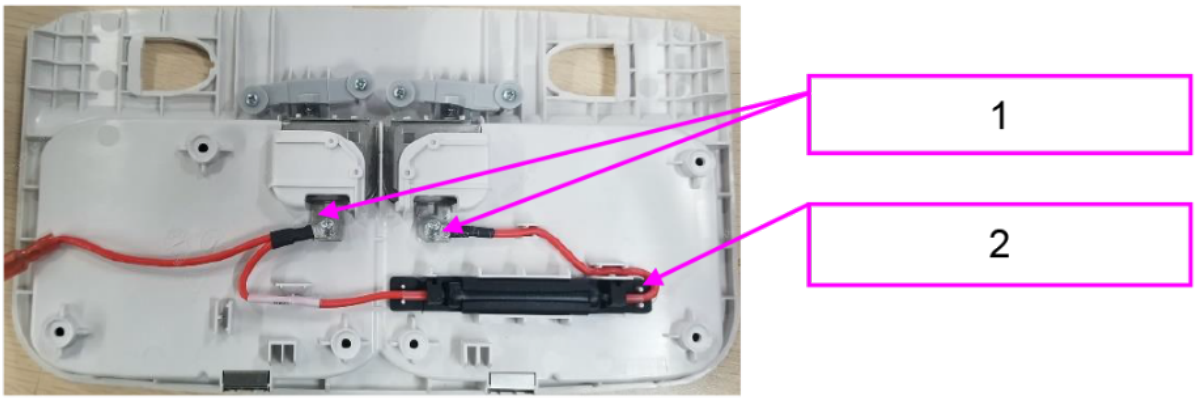
2 PT3X8 self-tapping screws

3. Lift the electrode base assembly gently, and then remove the cable connector from the in-position detection metal plate on the rear cover assembly.



1 Remove the electrode base cable

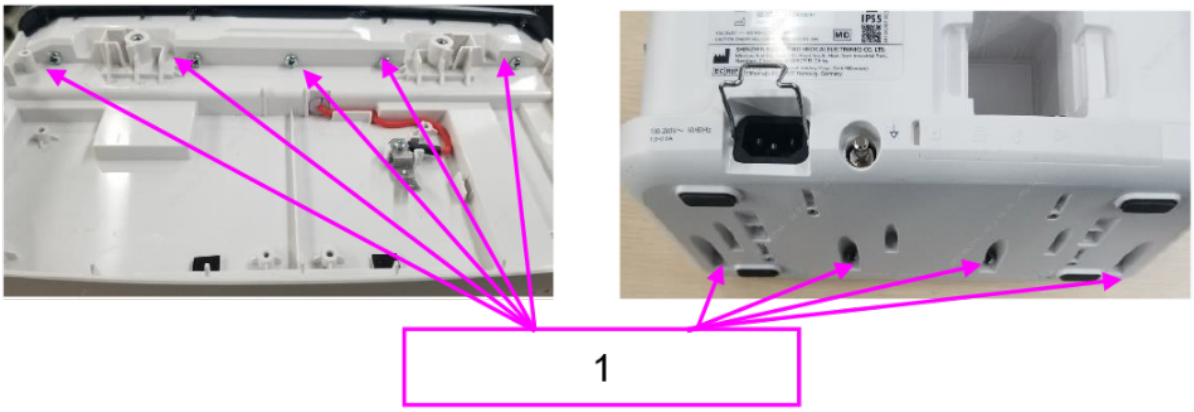
4. Remove and replace the in-position self-check resistor connector: Use a Phillips screwdriver to remove the two M3X6 combination screws. Remove the in-position self-check resistor connector from the silicone sleeve of the resistor and replace it.



1 Two M3X6 combination screws
2 In-position self-check resistor connector

Separating the Front and Rear Cover Assemblies

1. Use a Phillips screwdriver to remove the nine PT4X14 self-tapping screws on the back of the main unit.

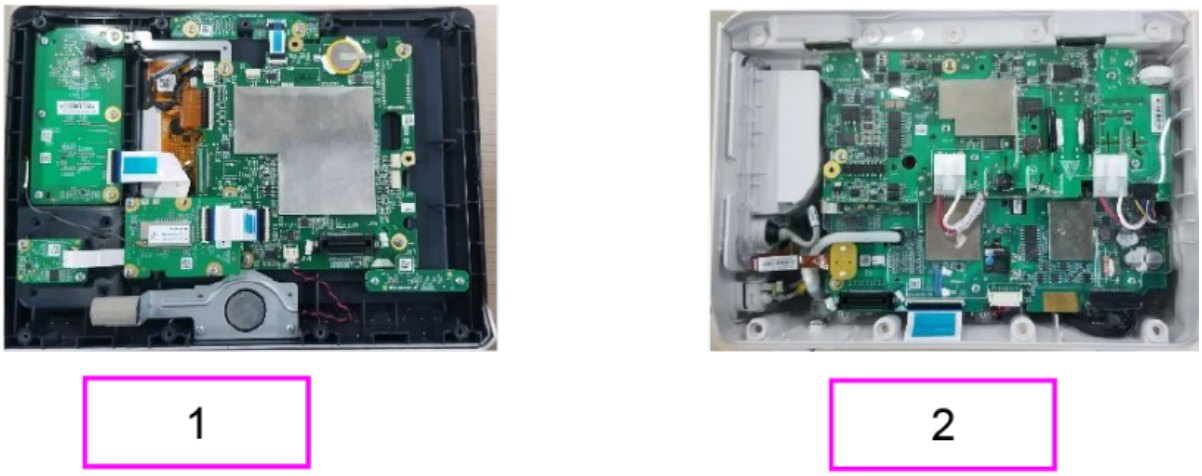


1 Nine PT4X14 self-tapping screws

2. Open the front and rear covers of the main unit, and then remove the four black nylon rivets, the two black power socket covers, and the front and rear cover connection strap in sequence to separate the front and rear cover assemblies.

1 Front and rear cover connection strap

2 Four black nylon rivets



1 Front cover assembly

2 Rear cover assembly

NOTICE

- **Before reassembling the main unit, check whether the waterproof strip is in position.**

7.5 0655 Large Capacitance

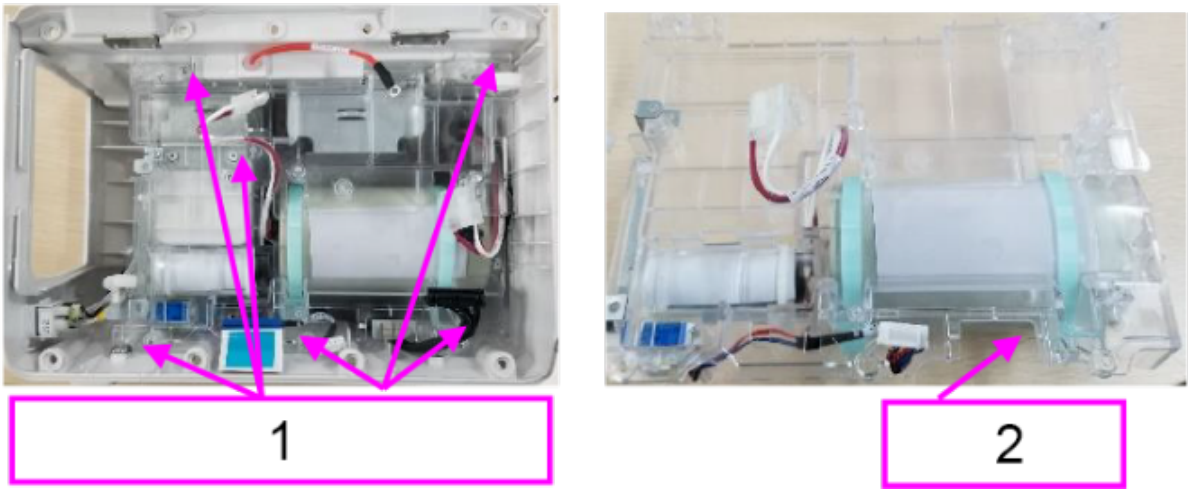
7.5.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-010141-00	0655 large capacitance	None	None

7.5.2 Disassembly and Assembly

Specific Steps

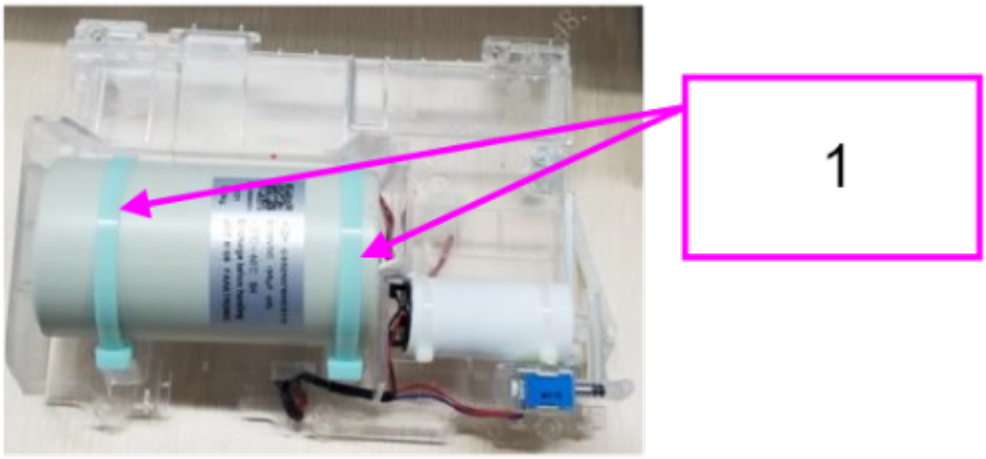
1. Before the disassembly, complete **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 parameter & power board (5-lead, MR/NC SpO2) according to **7.19.2** Disassembly and Assembly.
4. Remove the main frame: Use a Phillips screwdriver to remove the six PT3X8 cross recessed pan head self-tapping screws, and then take out the main frame.



1 Six PT3X8 cross recessed pan head self-tapping screws

2 Main frame assembly

5. Remove the capacitor cable: Cut the cable ties on the capacitor cable with combination pliers, and then remove and replace the inductor. (When binding the cable ties, place the joints beneath the capacitor, as shown in the following figure.)



1 Cut the cable ties on the capacitor cable

7.5.3 Commissioning and Verification

None

7.6 0655 Self Checking Resistor Connector

7.6.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-010207-00	0655 self checking resistor connector	None	None

7.6.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Remove the electrode base according to "Removing the Electrode Base Assembly and In-position Self-check Resistor Connector" in **7.4** Main Unit Disassembly.

7.6.3 Commissioning and Verification

None

7.7 0656 D30 Main-Power Board FPC PCBA

7.7.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-004647-00	0656 D30 main-power board FPC PCBA	None	None

7.7.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Remove the D30 main-power board FPC PCBA according to "Separating the Front and Rear Cover Assemblies" in **7.4** Main Unit Disassembly.

7.7.3 Commissioning and Verification

None

7.8 0656 D30 Keyboard (No NFC)

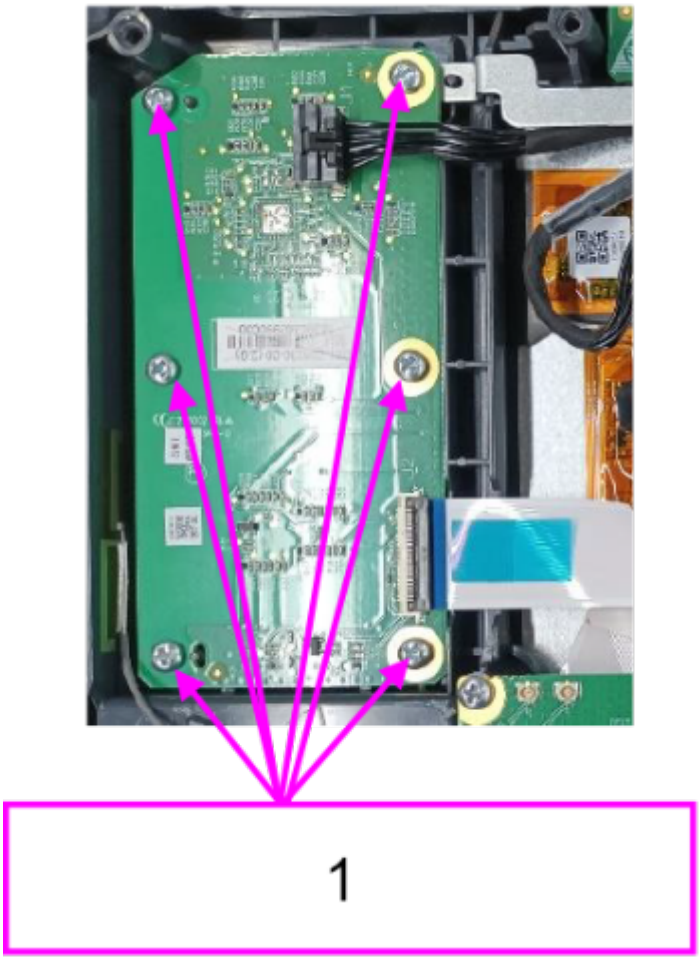
7.8.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-005230-00	0656 D30 keyboard (no NFC)	None	None

7.8.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Unplug the keypad backup connector and open the FFC clip on the keypad.
4. Use a Phillips screwdriver to remove the six PT3X8 cross recessed pan head self-tapping screws, and then remove and replace the keypad. Be careful not to touch the antenna during the operation.



1 Six PT3X8 cross recessed pan head self-tapping screws

7.8.3 Commissioning and Verification

None

7.9 0656 D30 Alarm PCBA

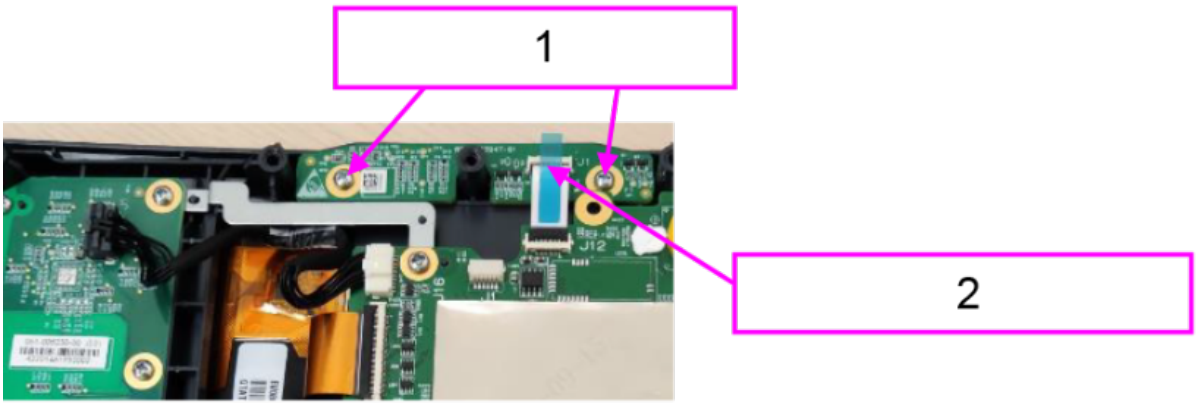
7.9.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-004640-00	0656 D30 alarm LED PCBA	None	None

7.9.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the 4G/5G/Wi-Fi module.
4. Remove the 0656 D30 indicator PCBA according to **7.12.2** Disassembly and Assembly.
5. Remove the 0656 mainboard PCBA (D30) according to **7.78.2** Disassembly and Assembly.
6. Open the FFC clip on the alarm LED board.
7. Use a Phillips screwdriver to remove the two PT3X8 cross recessed pan head self-tapping screws, and then take out the alarm LED board. After replacing the alarm LED board, insert the FFC cable back.



1 Two PT3X8 self-tapping screws

2 FFC clip on the alarm LED board

7.9.3 Commissioning and Verification

None

7.10 0656 D30 Battery Connect Board PCBA

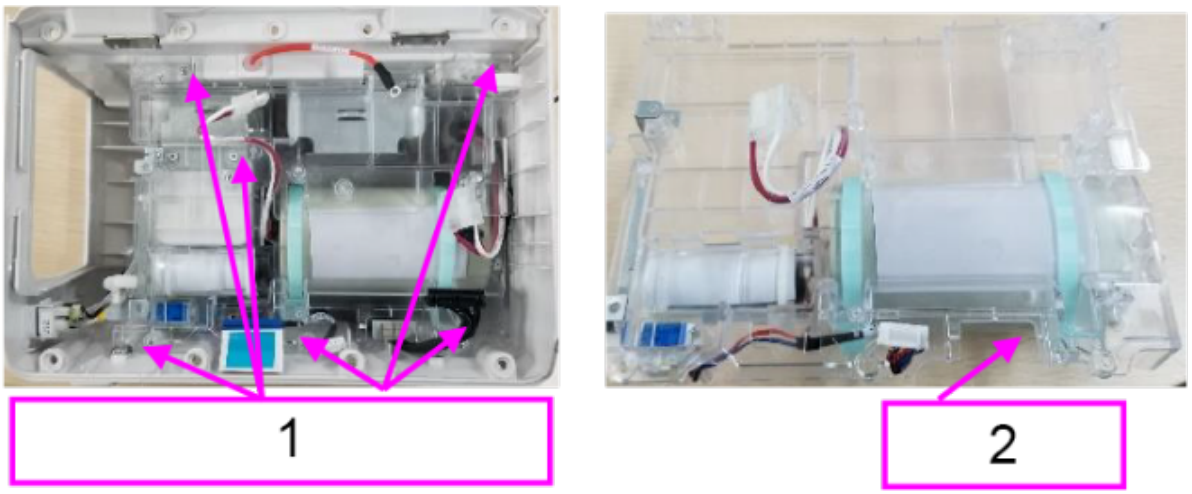
7.10.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-004639-00	0656 D30 battery connect board PCBA	None	None

7.10.2 Disassembly and Assembly

Specific Steps

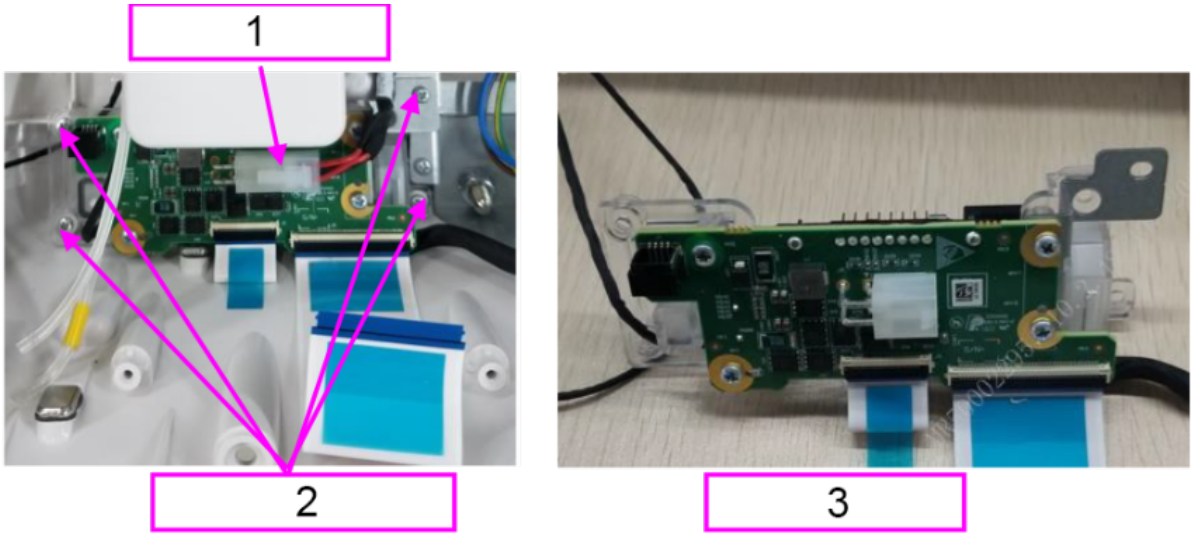
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 parameter & power board (5-lead, MR/NC SpO2) according to **7.19.2** Disassembly and Assembly.
4. Remove the main frame: Use a Phillips screwdriver to remove the six PT3X8 cross recessed pan head self-tapping screws, and then take out the main frame.



1 Six PT3X8 cross recessed pan head self-tapping screws

2 Main frame assembly

5. Unplug the defibrillation D30 AC/DC input wire, remove the four PT3X8 self-tapping screws with a Phillips screwdriver, and then take out the external interface board assembly.

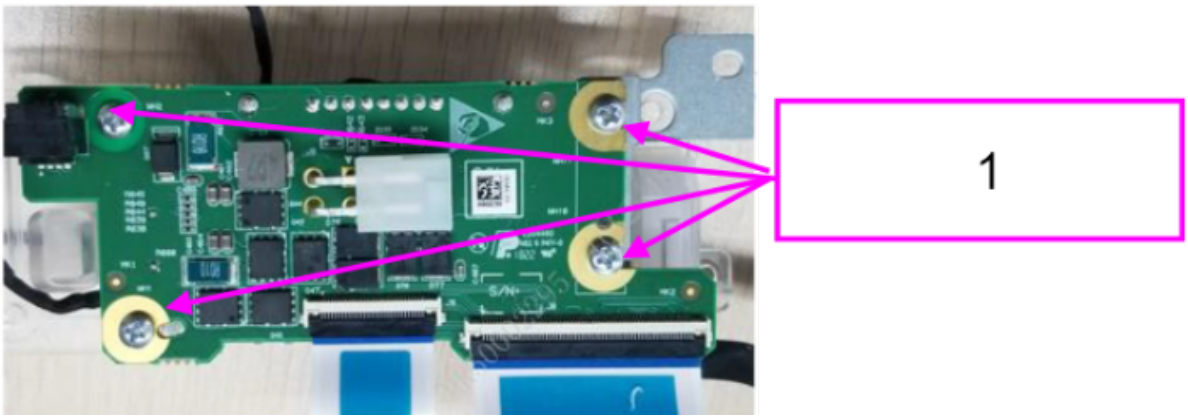


1 Output cable for ACDC module

2 Four PT3X8 self-tapping screws

3 External interface board assembly

6. Remove the D30 battery connect board PCBA: Use a Phillips screwdriver to remove the four PT3X8 self-tapping screws, and then remove and replace the D30 battery connect board PCBA.



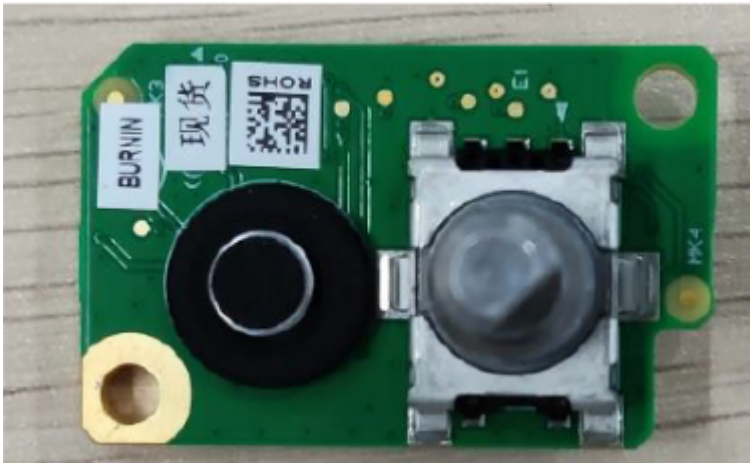
1 Four PT3X8 self-tapping screws

7.10.3 Commissioning and Verification

None

7.11 0656 D30 Coder PCBA

7.11.1 General Information



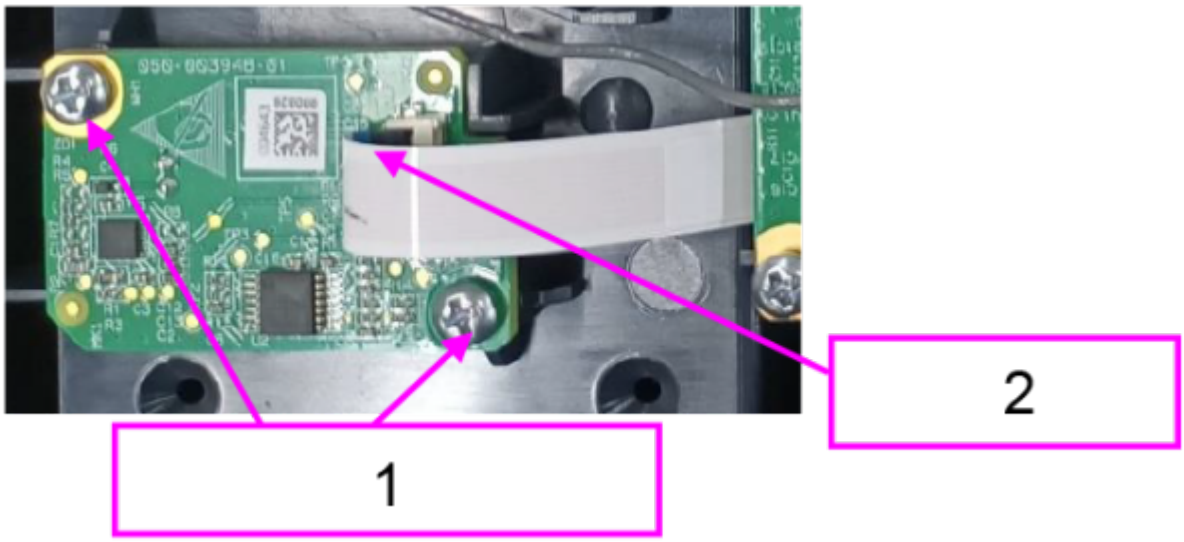
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-004643-00	0656 D30 coder board PCBA	None	None

7.11.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.

3. Remove the defibrillation knob according to **7.60.2** Disassembly and Assembly.
4. Open the FFC clip on the knob encoder board.
5. Use a Phillips screwdriver to remove the two PT3X8 cross recessed pan head self-tapping screws, and then take out the knob encoder board. After replacing the knob encoder board, insert the FFC cable back.



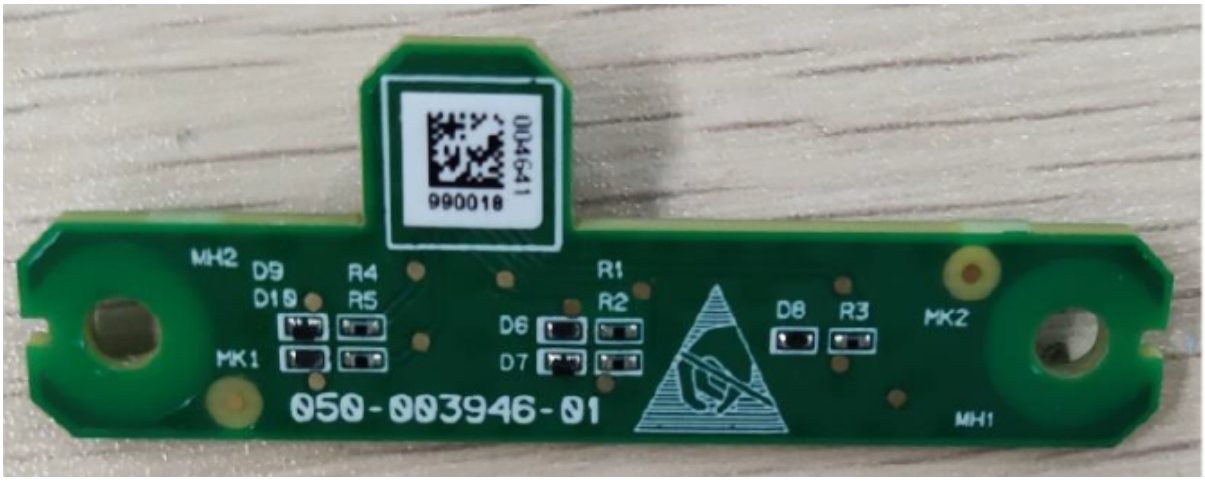
1	Two PT3X8 self-tapping screws
2	Open the FFC clip

7.11.3 Commissioning and Verification

None

7.12 0656 D30 Indicator PCBA

7.12.1 General Information

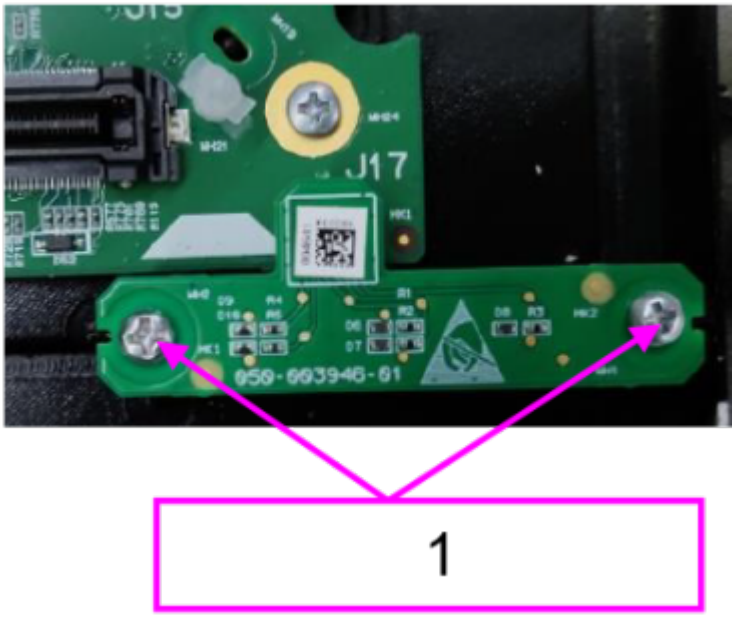


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-004641-00	0656 D30 indicator PCBA	None	None

7.12.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Use a Phillips screwdriver to remove the two PT3X8 cross recessed pan head self-tapping screws, and then remove and replace the status indicator board.



1 Two PT3X8 self-tapping screws

7.12.3 Commissioning and Verification

None

7.13 0656 ECG Front Panel FPC Board

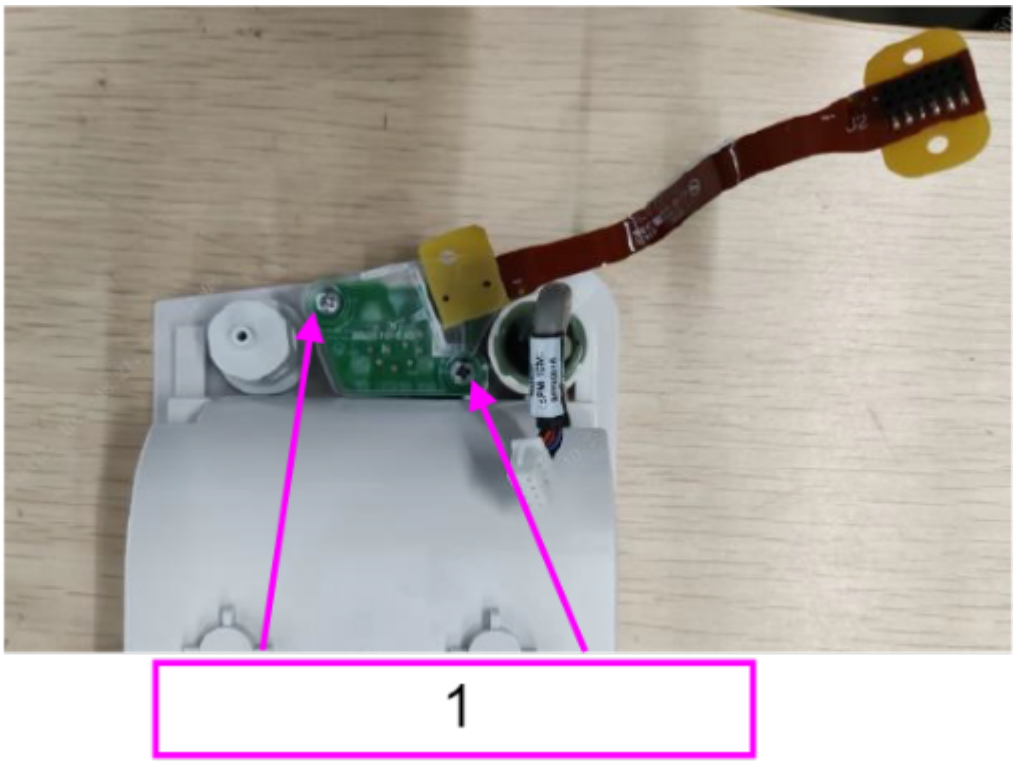
7.13.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-005191-00	0656 ECG front panel FPC board	None	None

7.13.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the MPM material kit (ECG+Nellcor SPO2+NIBP) according to **7.56.2** Disassembly and Assembly.
4. Use a Phillips screwdriver to remove the two PT3X8 cross recessed pan head self-tapping screws, remove the plastic cover, and then unplug the FPC cable from the board.



1 Two PT3X8 cross recessed pan head self-tapping screws

7.13.3 Commissioning and Verification

None

7.14 0656 NIBP Material Kit (FRU)

7.14.1 General Information

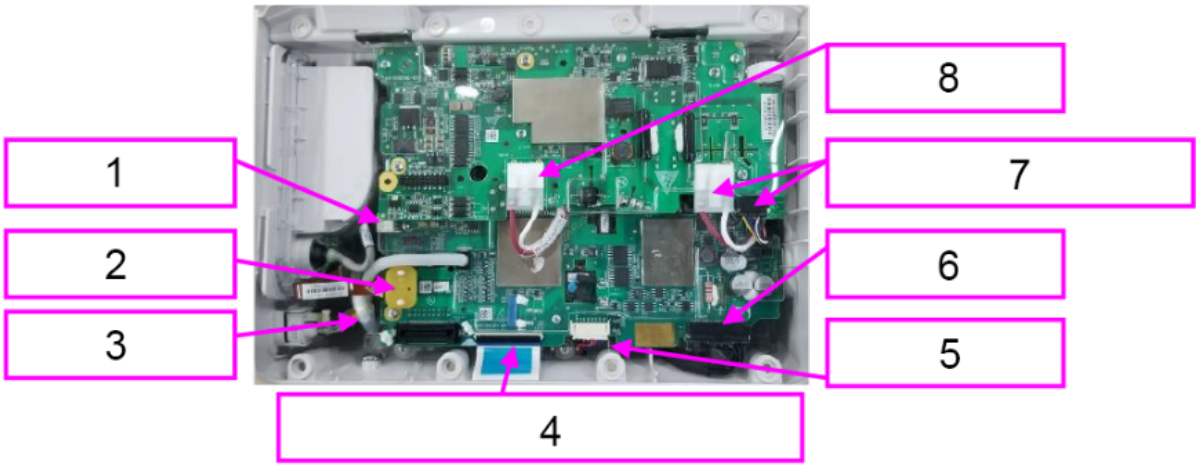
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090903-00	0656 NIBP material kit (FRU)	None	None

7.14.2 Disassembly and Assembly

Specific Steps

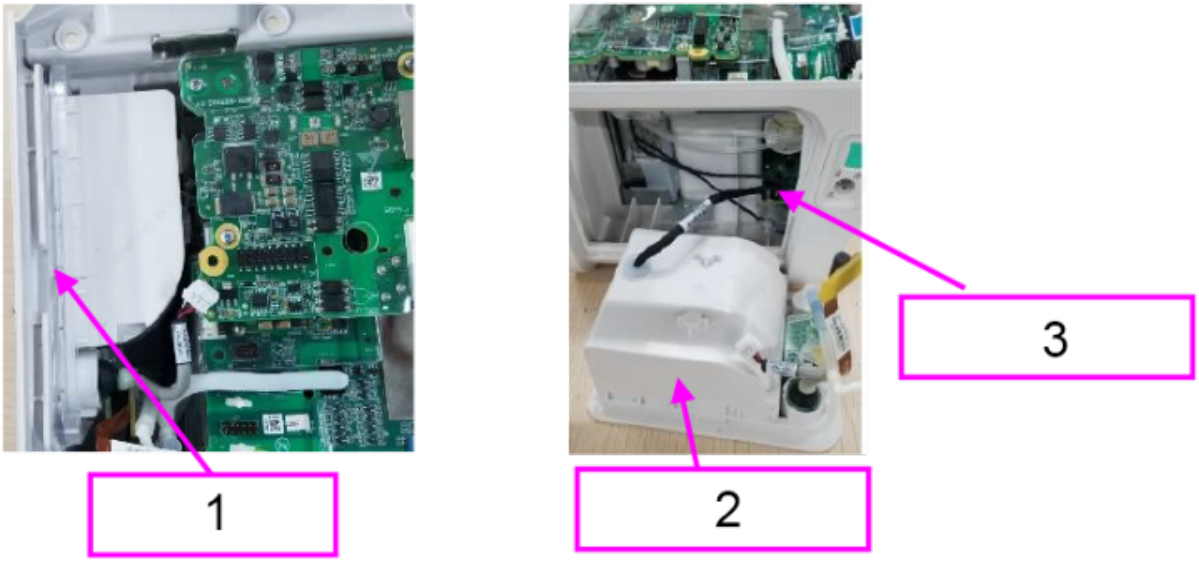
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the 50-mm recorder assembly according to **7.26.2** Disassembly and Assembly.
4. Remove the capacitor cable and internal wire to defibrillator socket from the 0656 therapy board. Remove the SpO2 cable connector, ECG FPC plate, NIBP gas supply pipe, FFC cable

to battery connect board, D30 12VDC pump with connecting wire, and D30 internal connecting wire from the 0656 parameter & power board.



1	SpO2 cable connector
2	ECG FPC plate
3	NIBP intake pipe
4	FFC cable to battery connect board
5	D30 12VDC pump with connecting wire
6	D30 internal connecting wire
7	Internal wire to defibrillator socket
8	Capacitor cable

5. Pull out the recorder pin, push the MPM module out, and unplug the recorder cable.



1	Recorder pin
2	MPM module
3	Recorder cable

6. Remove the cable stopper from the MPM module, and then remove the cable. Remove the gas pipe.

1 Cable stopper

2 Gas pipe assembly

7.14.3 Commissioning and Verification

None

7.15 0656 SIM Card Board PCBA

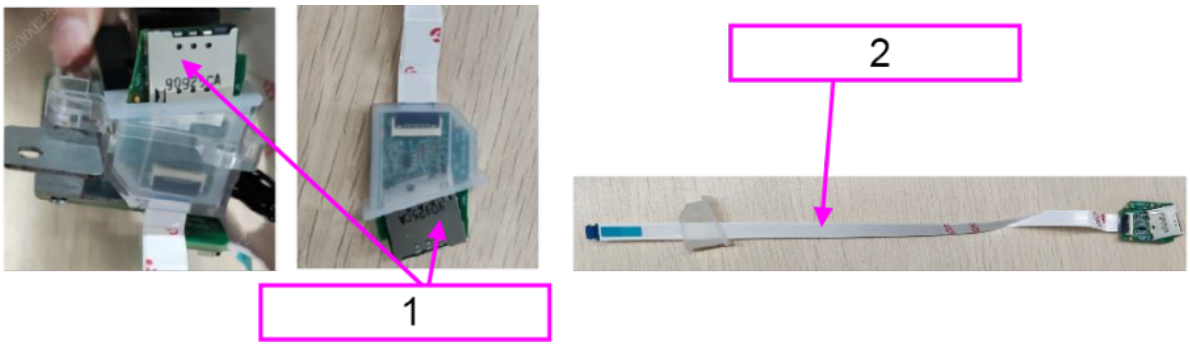
7.15.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-004705-00	0656 SIM card board PCBA	None	None

7.15.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 D30 battery connect board PCBA according to **7.10.2** Disassembly and Assembly.
4. Remove the SIM card board PCBA and SIM card FFC cable (009-013583-00): Take out the SIM card board PCBA and replace it. Remove the SIM card FFC cable and replace it.



1 0656 SIM card board PCBA
2 SIM card FFC cable

7.15.3 Commissioning and Verification

None

7.16 0656 Power & Parameter-Therapy FPC PCBA FRU

7.16.1 General Information

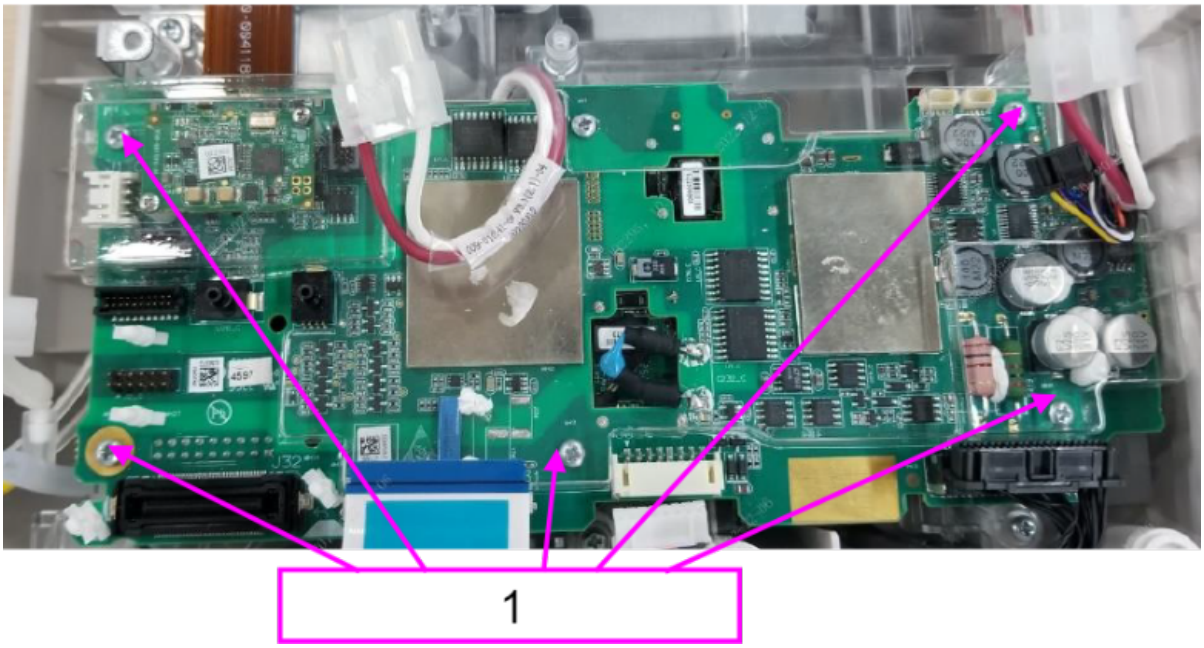
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090917-00	Power & parameter-therapy FPC PCBA FRU	None	None

7.16.2 Disassembly and Assembly

Specific Steps

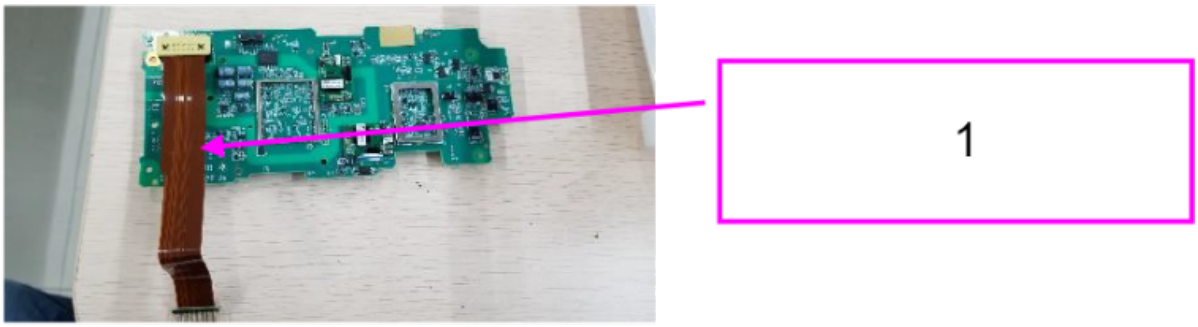
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the power management board insulation sheet according to **7.64.2** Disassembly and Assembly.

4. Use a Phillips screwdriver to remove the five PT3X8 cross recessed pan head self-tapping screws, and then take out the power management board insulation sheet.



1 Five PT3X8 cross recessed pan head self-tapping screws

5. Remove the FPC cable from the parameter & power board.



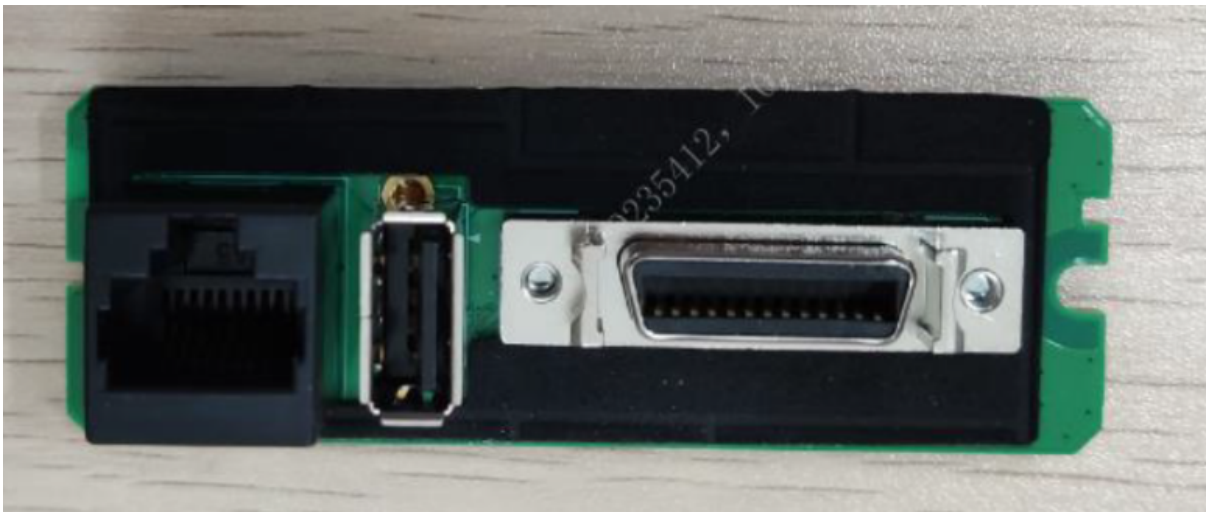
1 Power & parameter-therapy FPC PCBA FRU

7.16.3 Commissioning and Verification

None

7.17 0656 External Interface Board PCBA

7.17.1 General Information

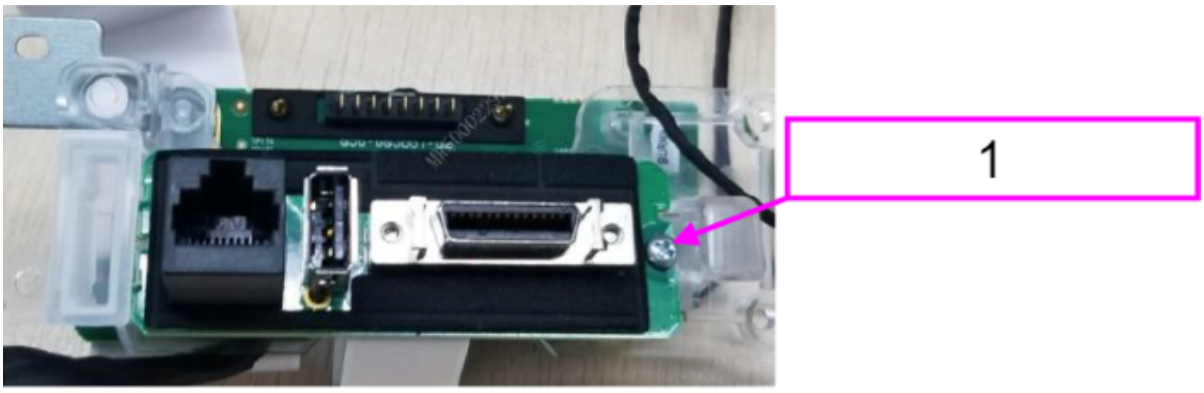


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-004644-00	0656 external interface board PCBA	None	None

7.17.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 D30 battery connect board PCBA according to **7.10.2** Disassembly and Assembly.
4. Remove the external interface board PCBA: Use a Phillips screwdriver to remove the PT3X8 self-tapping screw, and then remove and replace the external interface board PCBA.



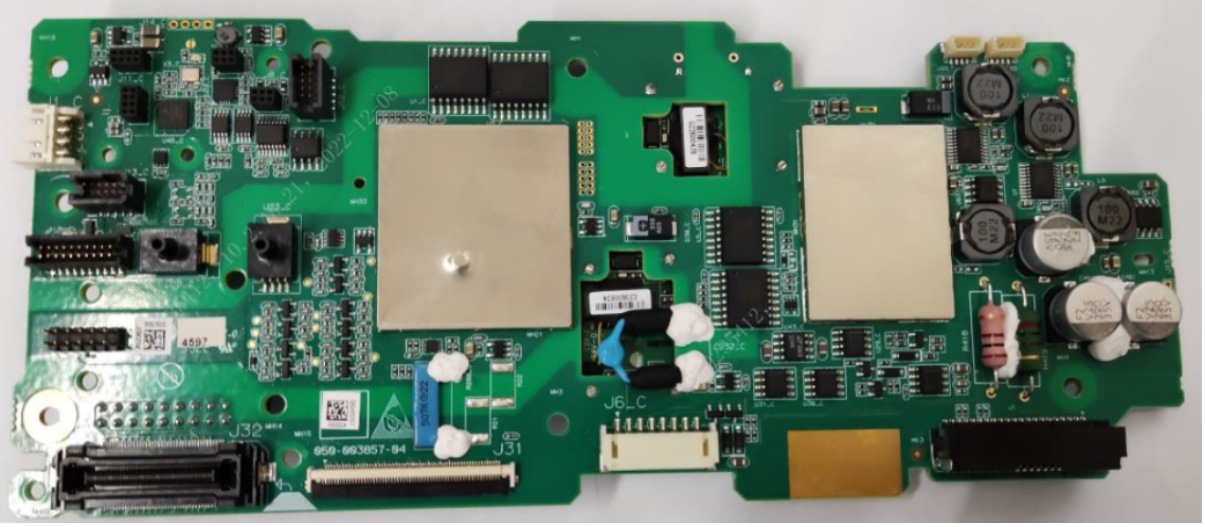
1 One PT3X8 self-tapping screw

7.17.3 Commissioning and Verification

None

7.18 0656 Parameter Power Integrated Board

7.18.1 General Information



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-004597-01	0656 parameter power integrated board	None	None

7.18.2 Disassembly and Assembly

Specific Steps

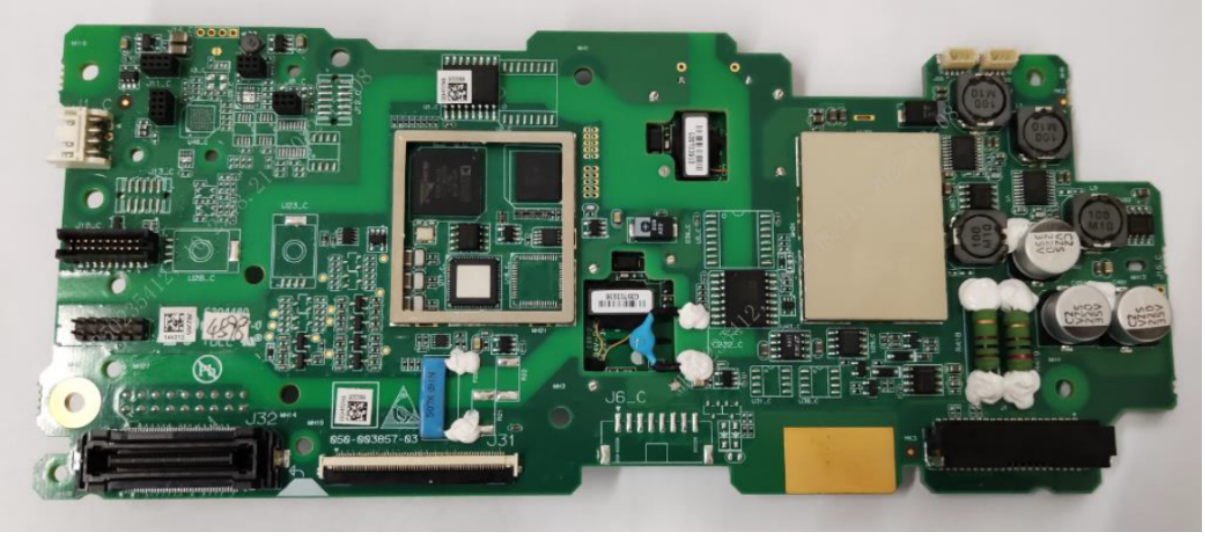
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 power & parameter-therapy FPC PCBA FRU according to **7.16.2** Disassembly and Assembly.
4. If the SpO2 module is configured, remove the Mindray SpO2 material kit according to **7.41.2** Disassembly and Assembly.

7.18.3 Commissioning and Verification

None

7.19 0656 Parameter (5lead)

7.19.1 General Information



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-004598-00	0656 parameter (5lead)	None	None

7.19.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 power & parameter-therapy FPC PCBA FRU according to **7.16.2** Disassembly and Assembly.
4. If the SpO2 module is configured, remove the Mindray SpO2 material kit according to **7.41.2** Disassembly and Assembly.

7.19.3 Commissioning and Verification

None

7.20 0656 Parameter (5lead, 3SpO2, NIBP)

7.20.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-005003-00	0656 parameter (5lead, 3SpO2, NIBP)	None	None

7.20.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 power & parameter-therapy FPC PCBA FRU according to **7.16.2** Disassembly and Assembly.
4. If the SpO2 module is configured, remove the Mindray SpO2 material kit according to **7.41.2** Disassembly and Assembly.

7.20.3 Commissioning and Verification

None

7.21 0656 Panel Label (Silkscreen)

7.21.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
047-040423-00	0656 panel label (silkscreen)	None	None

7.21.2 Disassembly and Assembly

Specific Steps

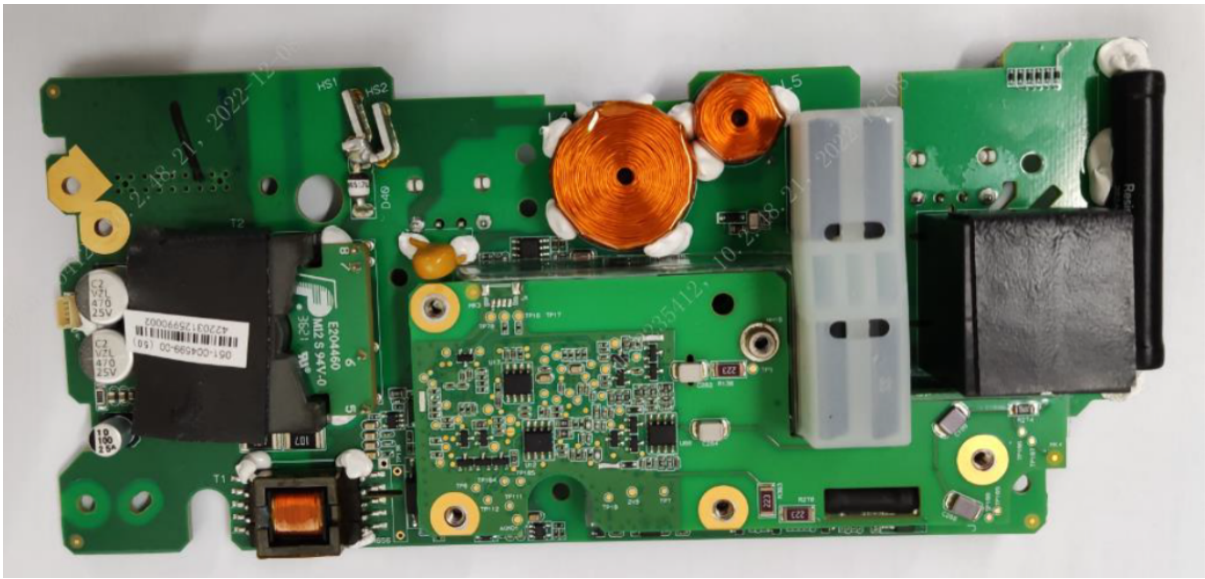
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Tear off the panel label from the machine and attach a new one.

7.21.3 Commissioning and Verification

None

7.22 0656 Therapy Board

7.22.1 General Information

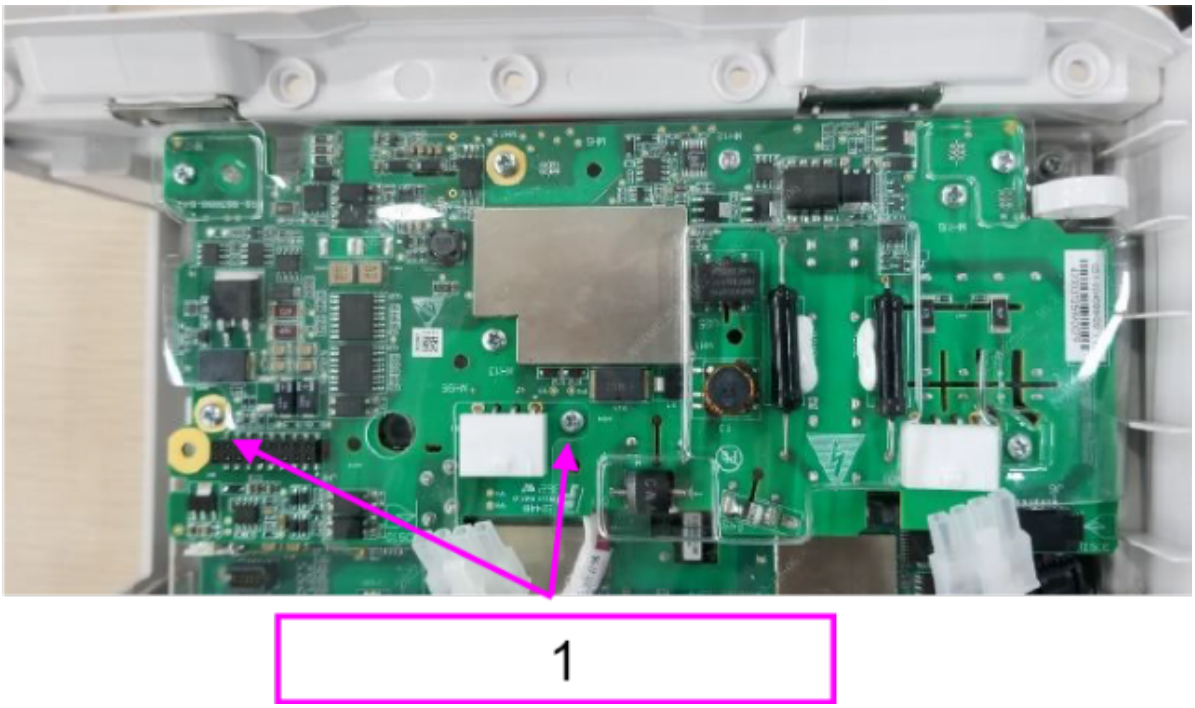


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-004599-00	0656 therapy board	None	None

7.22.2 Disassembly and Assembly

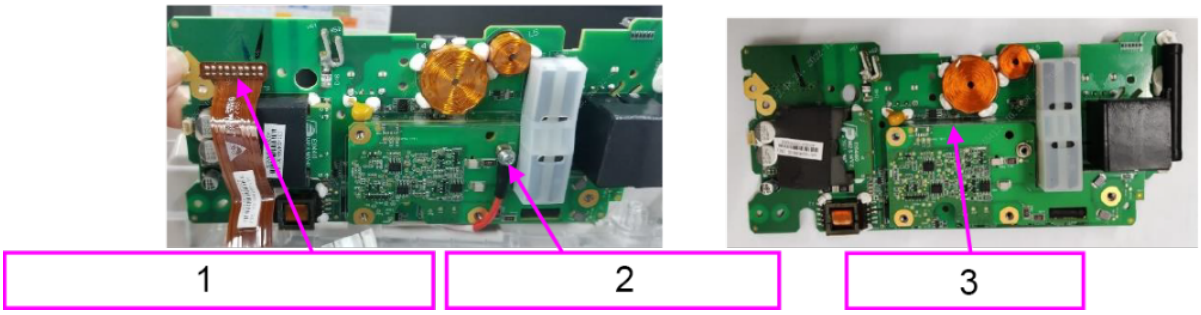
Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the therapy board insulation sheet according to **7.22.2** Disassembly and Assembly.
4. Use a Phillips screwdriver to remove the two PT3X8 cross recessed pan head self-tapping screws, and then take out the therapy board insulation sheet.



1 Two PT3X8 cross recessed pan head self-tapping screws

5. Remove the 0656 power & parameter-therapy FPC PCBA FRU from the 0656 therapy board. Use a Phillips screwdriver to remove the M3X6 cross recessed pan head combination screw, unplug the red in-position detection cable, and then take out the therapy board.



1 Power & parameter-therapy FPC PCBA FRU

2 One M3X6 pan head combination screw

3 Insulation sheet of therapeutic board

7.22.3 Commissioning and Verification

None

7.23 0656 Rubber Button Silkscreen

7.23.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
049-002624-00	0656 rubber button silkscreen	None	None

7.23.2 Disassembly and Assembly

Specific Steps

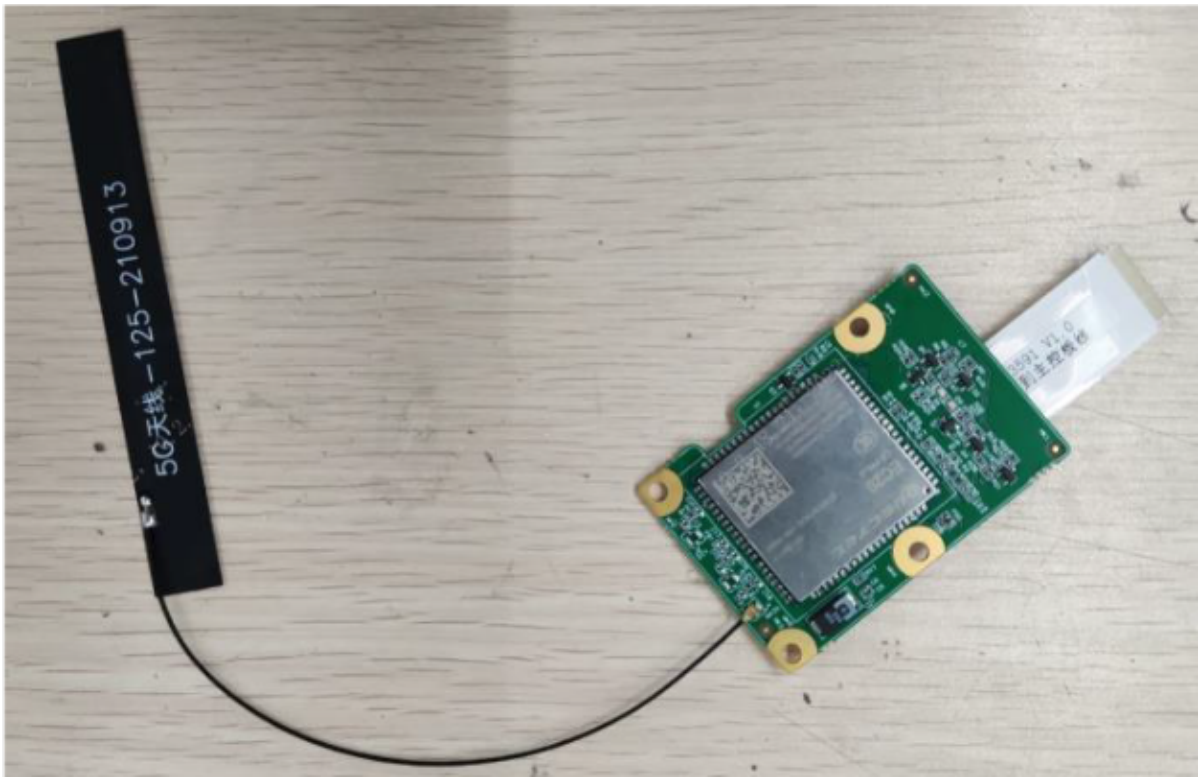
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Remove the defibrillation knob according to **7.60.2** Disassembly and Assembly.
3. Tear off the panel label and attach a new one.

7.23.3 Commissioning and Verification

None

7.24 4G Module (AU) FRU

7.24.1 General Information

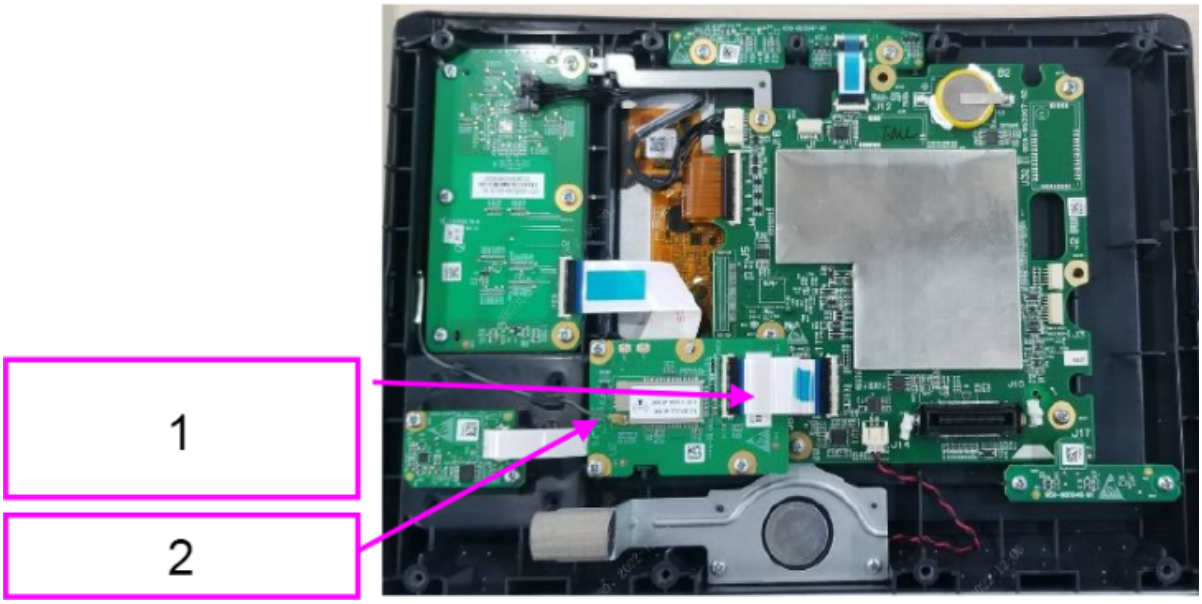


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090897-00	0656 4G module (AU) FRU	009-013591-00	Wire FFC 30pin pitch 0.5mm (same aide connection)
		009-013583-00	Wire FFC 12pin pitch 0.5mm (same aide connection)

7.24.2 Disassembly and Assembly

Specific Steps

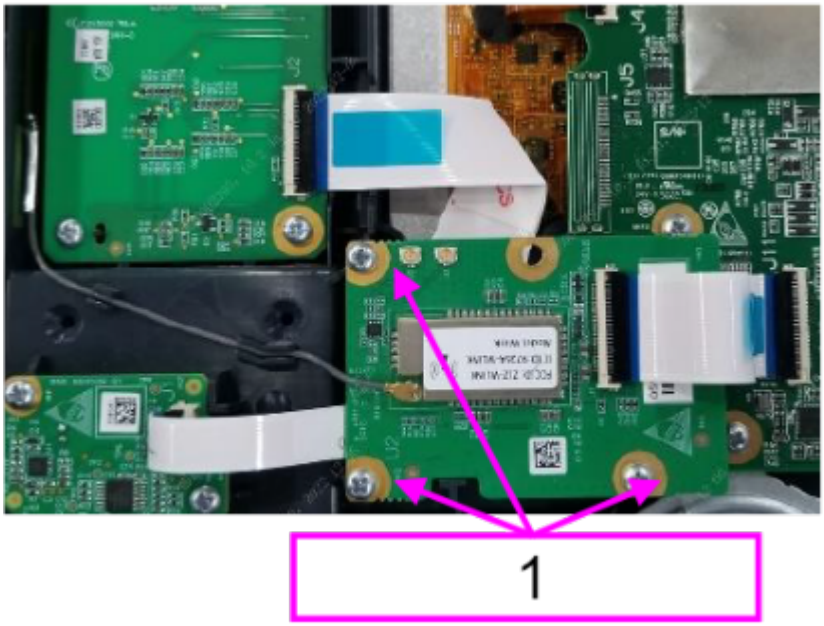
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove connecting wires from the front cover assembly: Unplug the Wi-Fi/4G/5G module connecting wire, and remove the antenna from the Wi-Fi module.



1 Wi-Fi/4G/5G module connecting wire

2 Antenna

4. Remove the Wi-Fi module: Use a Phillips screwdriver to remove the three PT3X8 cross recessed pan head self-tapping screws, and then remove the Wi-Fi PCBA (remove the 4G/5G module in the same way).



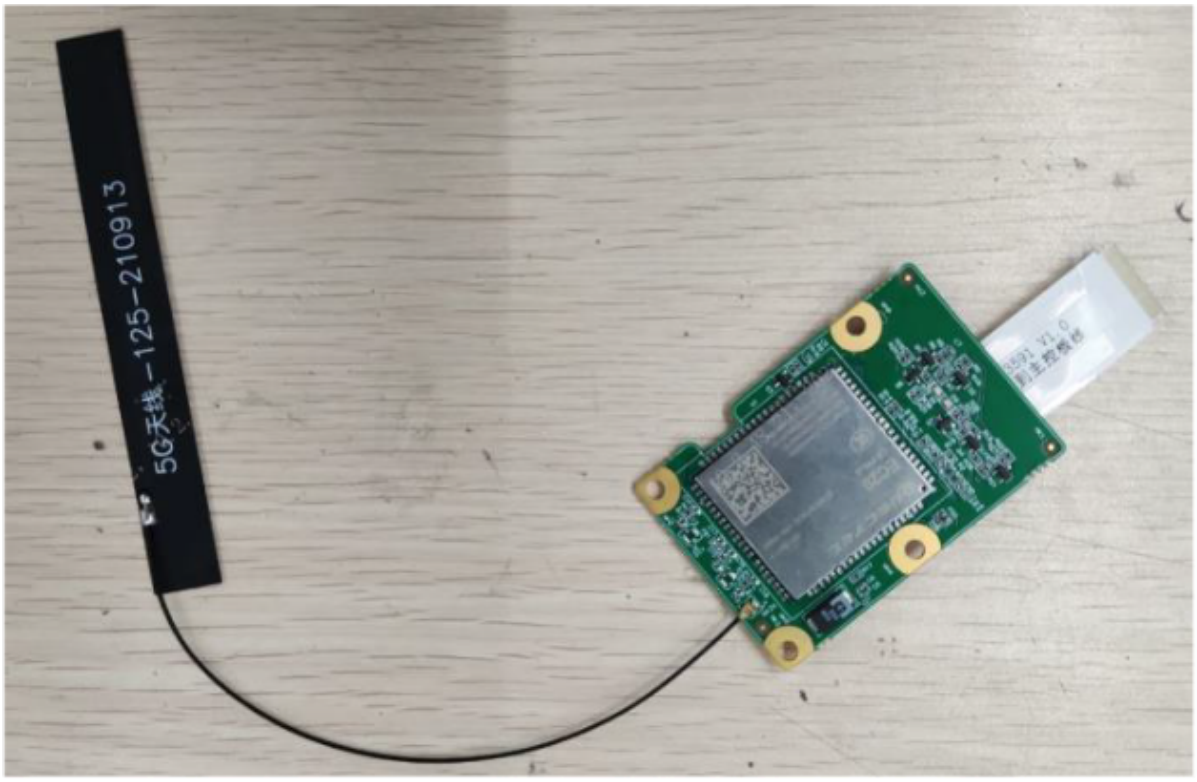
1 PT3X8 self-tapping screws

7.24.3 Commissioning and Verification

None

7.25 4G Material Kit (EU) FRU

7.25.1 General Information

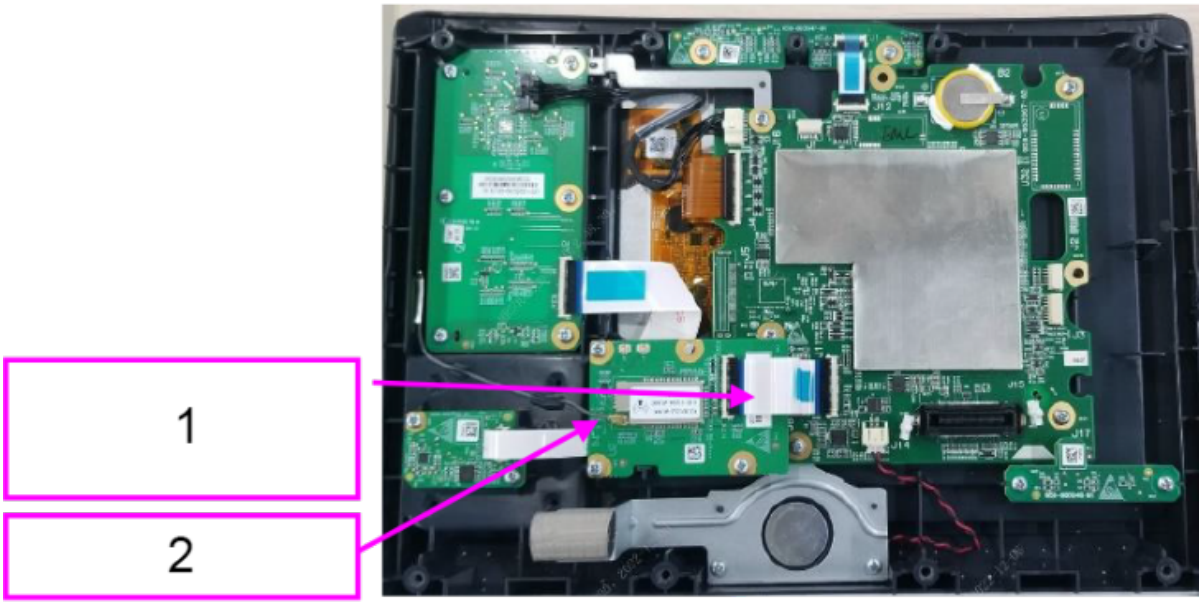


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090900-00	4G material kit (EU) FRU	009-013591-00	Wire FFC 30pin pitch 0.5mm
		009-013583-00	Wire FFC 12pin pitch 0.5mm

7.25.2 Disassembly and Assembly

Specific Steps

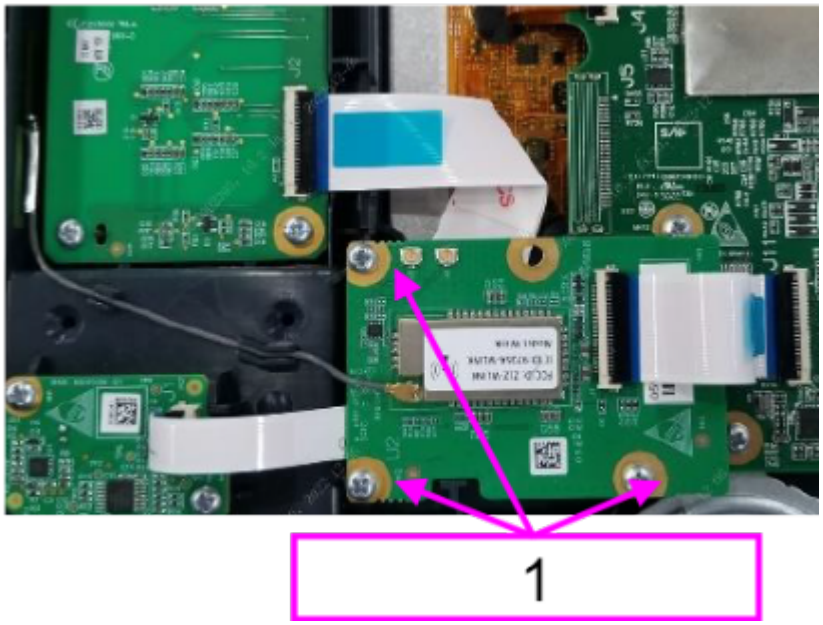
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove connecting wires from the front cover assembly: Unplug the Wi-Fi/4G/5G module connecting wire, and remove the antenna from the Wi-Fi module.



1 Wi-Fi/4G/5G module connecting wire

2 Antenna

4. Remove the Wi-Fi module: Use a Phillips screwdriver to remove the three PT3X8 cross recessed pan head self-tapping screws, and then remove the Wi-Fi PCBA (remove the 4G/5G module in the same way).



1 PT3X8 self-tapping screws

7.25.3 Commissioning and Verification

None

7.26 50mm Recorder

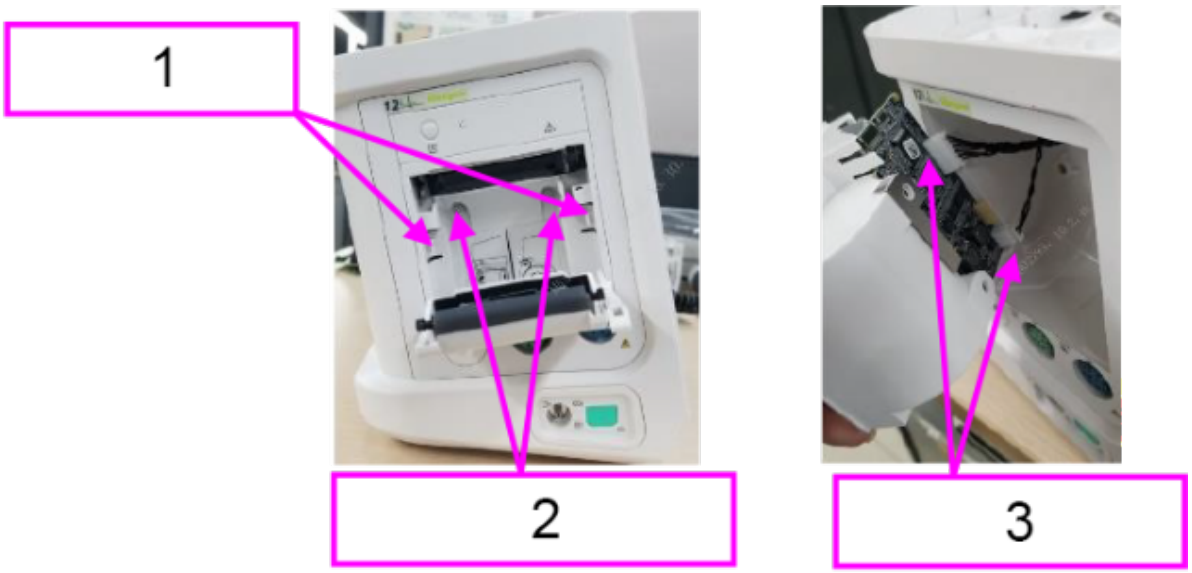
7.26.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-084837-00	50mm recorder	None	None

7.26.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Use a Phillips screwdriver to remove the two M3X6 cross recessed pan head screws. Pinch the clips at two sides of the recorder with fingers and take out the recorder assembly. Unplug the two cables from the recorder assembly, and remove the recorder assembly.



1 Recorder clips

2 Two M3X6 pan head screws

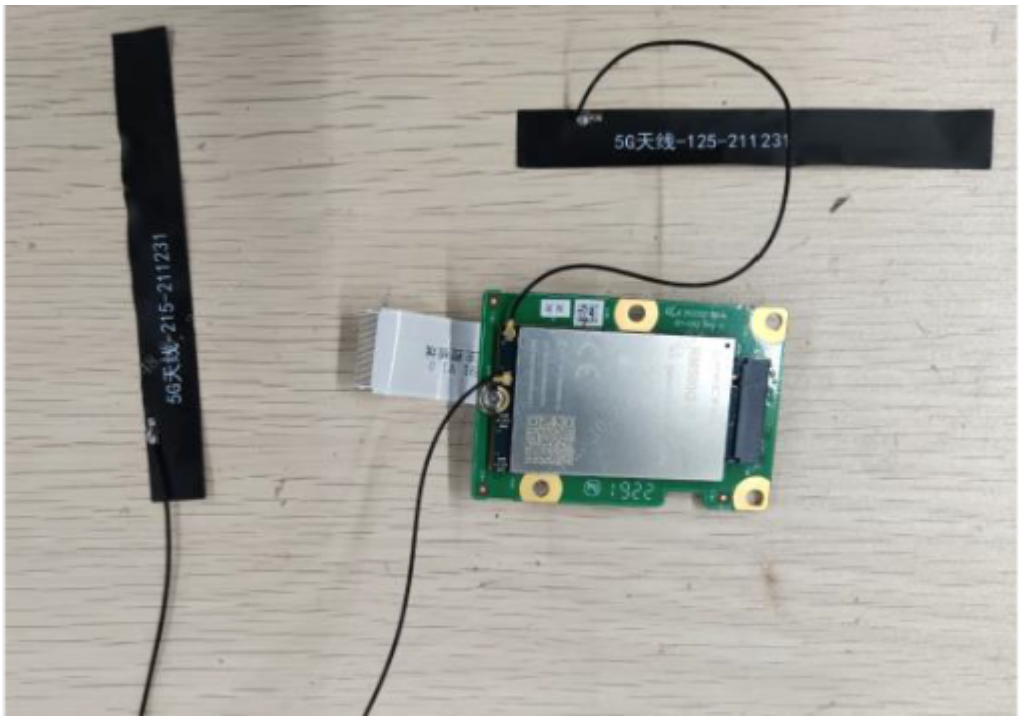
3 Recorder cable

7.26.3 Commissioning and Verification

None

7.27 5G Material Kit FRU

7.27.1 General Information

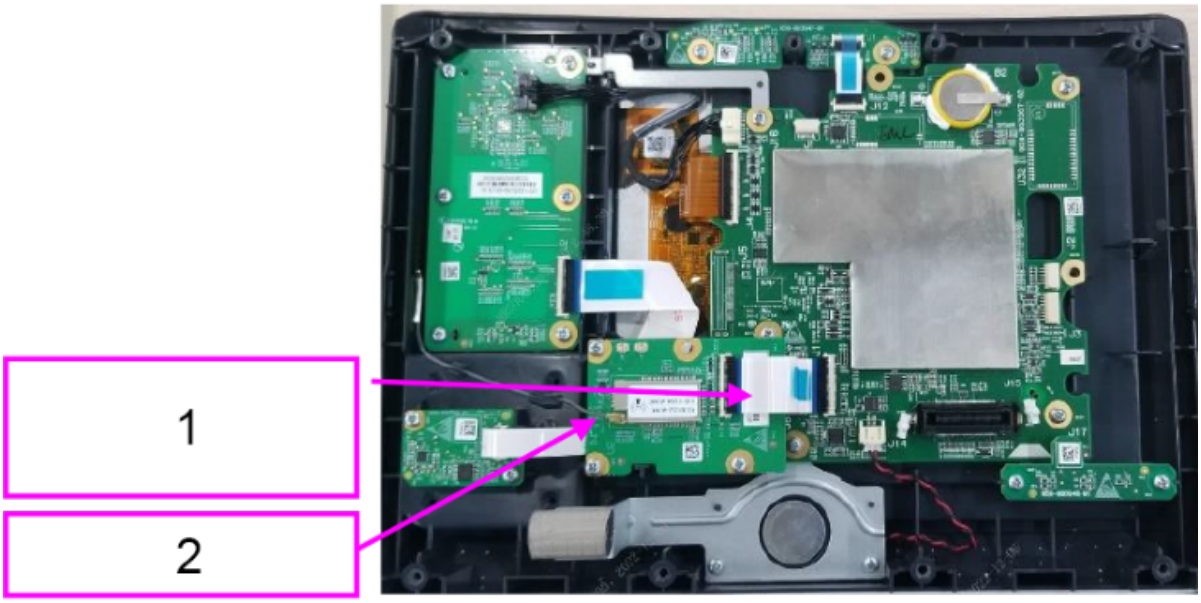


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090909-00	5G material kit FRU	009-013591-00	Wire FFC 30pin pitch 0.5mm
		009-013583-00	Wire FFC 12pin pitch 0.5mm

7.27.2 Disassembly and Assembly

Specific Steps

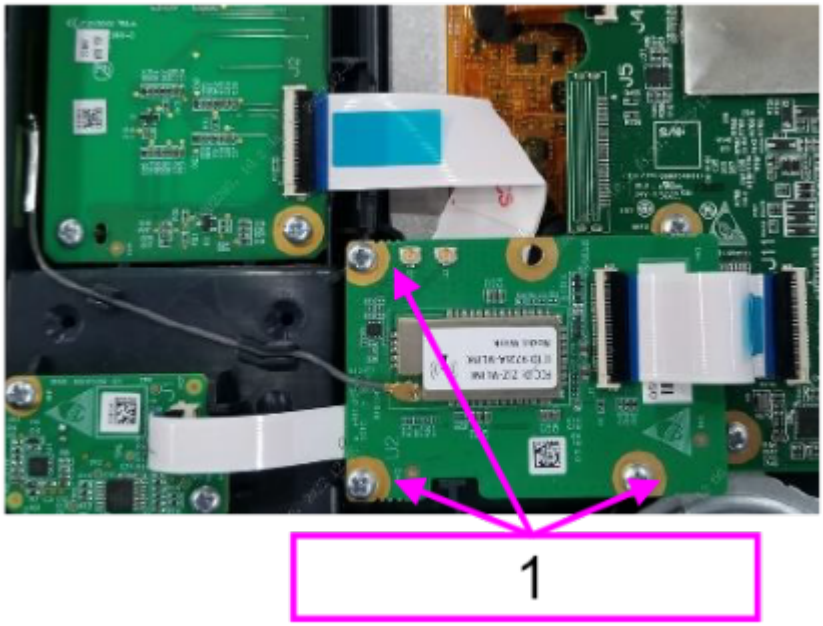
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove connecting wires from the front cover assembly: Unplug the Wi-Fi/4G/5G module connecting wire, and remove the antenna from the Wi-Fi module.



1 Wi-Fi/4G/5G module connecting wire

2 Antenna

4. Remove the Wi-Fi module: Use a Phillips screwdriver to remove the three PT3X8 cross recessed pan head self-tapping screws, and then remove the Wi-Fi PCBA (remove the 4G/5G module in the same way).



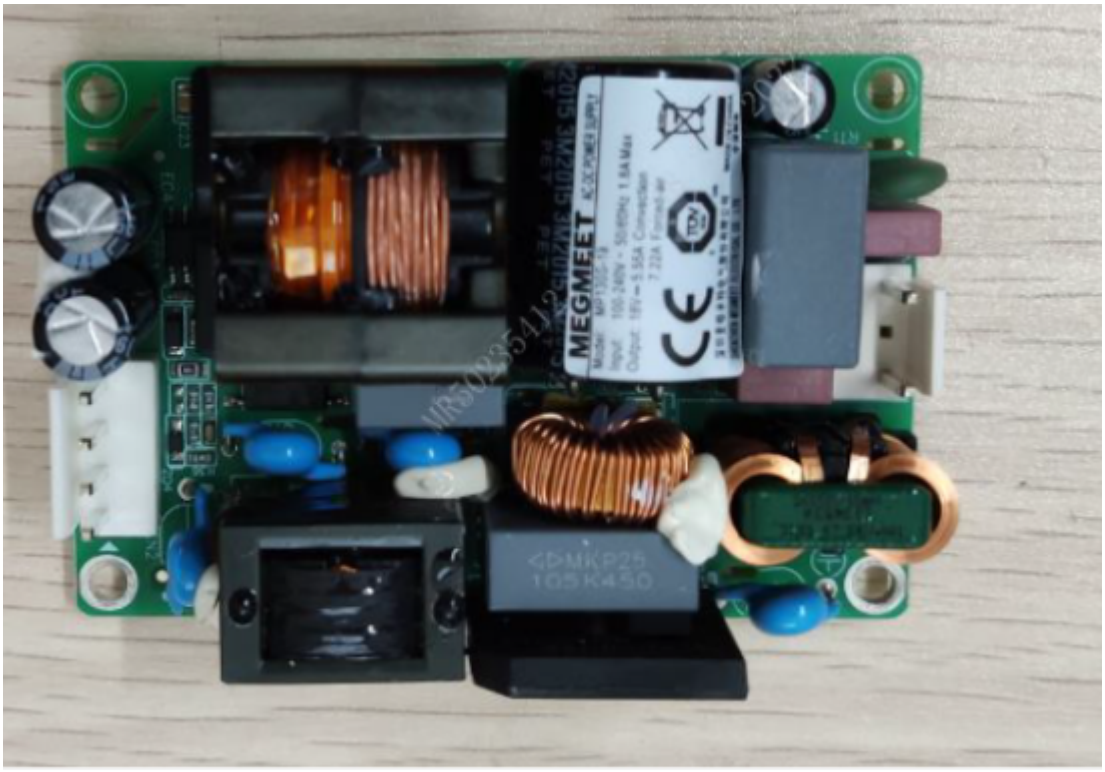
1 PT3X8 self-tapping screws

7.27.3 Commissioning and Verification

None

7.28 Power 100-240VAC 18V 100W

7.28.1 General Information

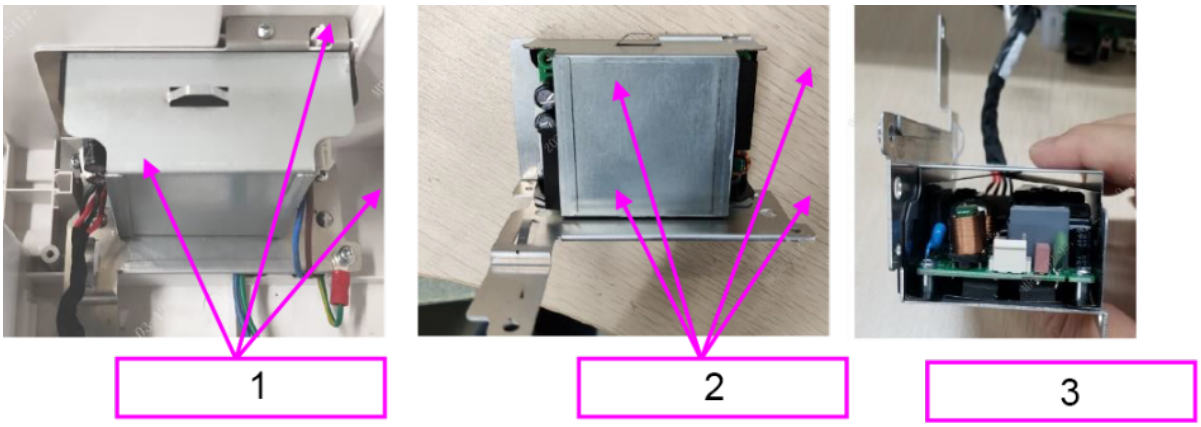


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
022-000456-00	Power 100-240VAC 18V 100W	None	None

7.28.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 D30 battery connect board PCBA according to **7.10.2** Disassembly and Assembly.
4. Use a Phillips screwdriver to remove the three PT3X8 self-tapping screws, and remove the AC/DC assembly. Then, remove the M3X6 pan head screws and replace the AC/DC module.



1 Three PT3X8 self-tapping screws

2 Four M3X6 pan head screws

3 AC/DC module

7.28.3 Commissioning and Verification

None

7.29 CO2 Interface Assy. FRU

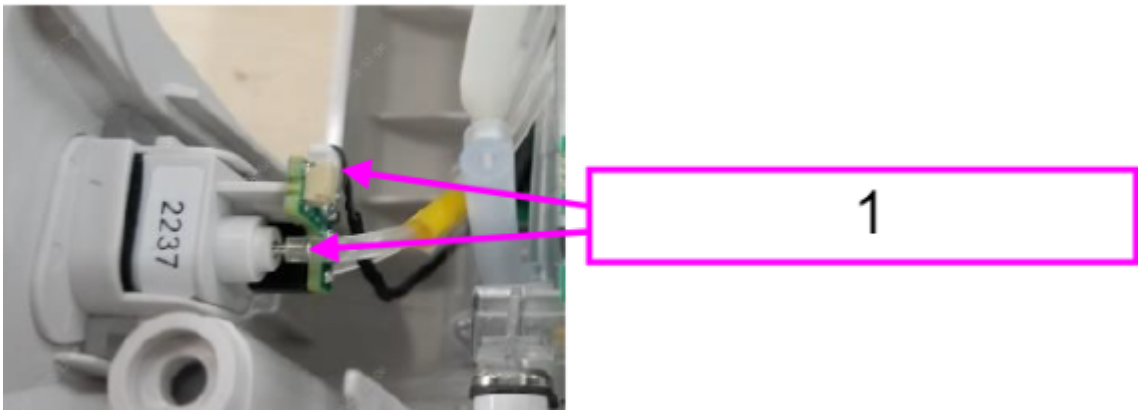
7.29.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090942-00	CO2 interface assembly FRU	None	None

7.29.2 Disassembly and Assembly

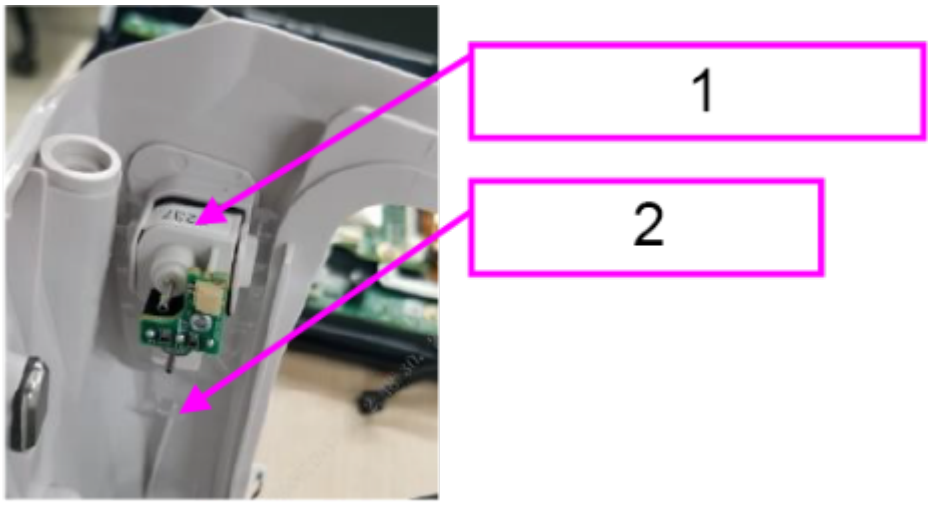
Specific Steps

1. Make preparations according to "Preparation Before Disassembly."
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the CO2 supply pipe (with a yellow tag) and the connecting wire between the CO2 exhaust pipe and CO2 module.



1 CO2 supply pipe and CO2 module connecting wire

4. Remove the CO2 interface assembly FRU: Push down the M02D pin and remove the CO2 interface assembly FRU.



1 CO2 interface assembly FRU

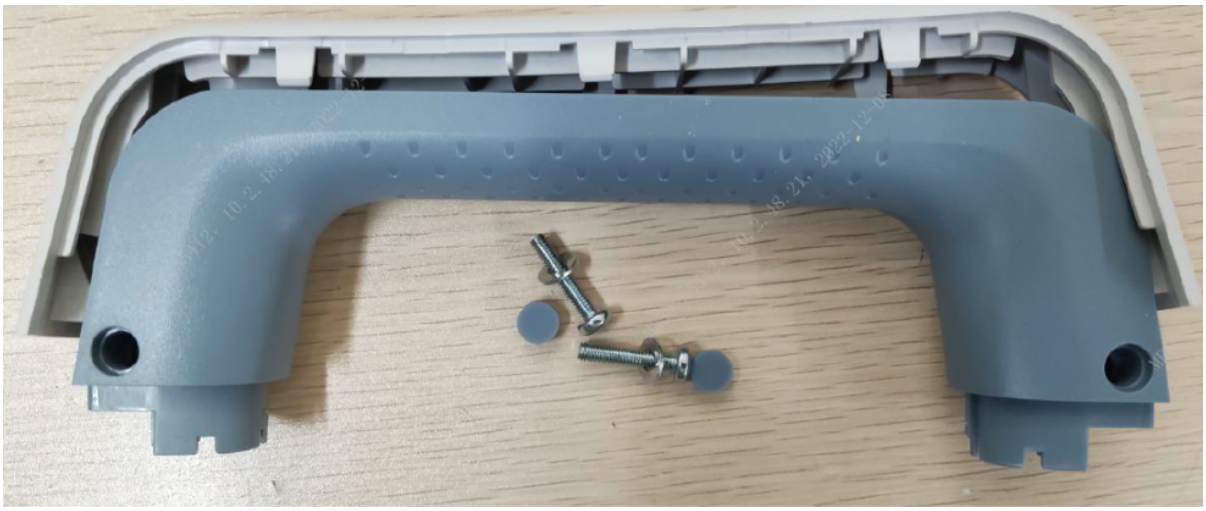
2 M02D pin

7.29.3 Commissioning and Verification

None

7.30 D20A/D20C Hand Shank Material Kit

7.30.1 General Information



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-084983-00	D20A/D20C hand shank material kit	None	None

7.30.2 Disassembly and Assembly

Specific Steps

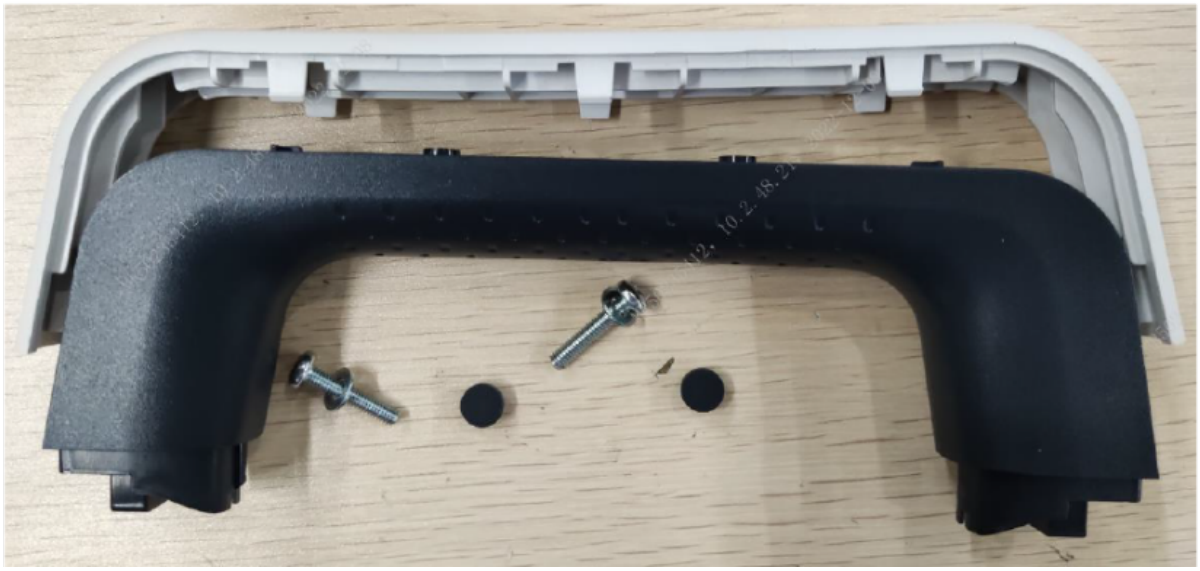
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Remove the handle assembly according to "Removing the Electrode Base Assembly and In-position Self-check Resistor Connector" in **7.4** Main Unit Disassembly.

7.30.3 Commissioning and Verification

None

7.31 D30/D20 Hand Shank Material Kit

7.31.1 General Information



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-084982-00	D30/D20 hand shank material kit	None	None

7.31.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Remove the handle assembly according to "Removing the Electrode Base Assembly and In-position Self-check Resistor Connector" in **7.4** Main Unit Disassembly.

7.31.3 Commissioning and Verification

None

7.32 D30 Panel Label Silk (ECG+SPO2)

7.32.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
047-042019-00	D30 panel label silk (ECG+SPO2)	None	None

7.32.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Tear off the panel label from the machine and attach a new one.

7.32.3 Commissioning and Verification

None

7.33 D30 Panel Label Silk

7.33.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
047-042017-00	D30 panel label silk	None	None

7.33.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Tear off the panel label from the machine and attach a new one.

7.33.3 Commissioning and Verification

None

7.34 Hook Cover of D30

7.34.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
049-002622-00	Hook cover of D30	None	None

7.34.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Remove the silicone cover from the rear cover and replace it.

7.34.3 Commissioning and Verification

None

7.35 D30 Internal Connection (Power + Recorder)

7.35.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-012794-00	D30 internal connection (power + recorder)	None	None

7.35.2 Disassembly and Assembly

Specific Steps

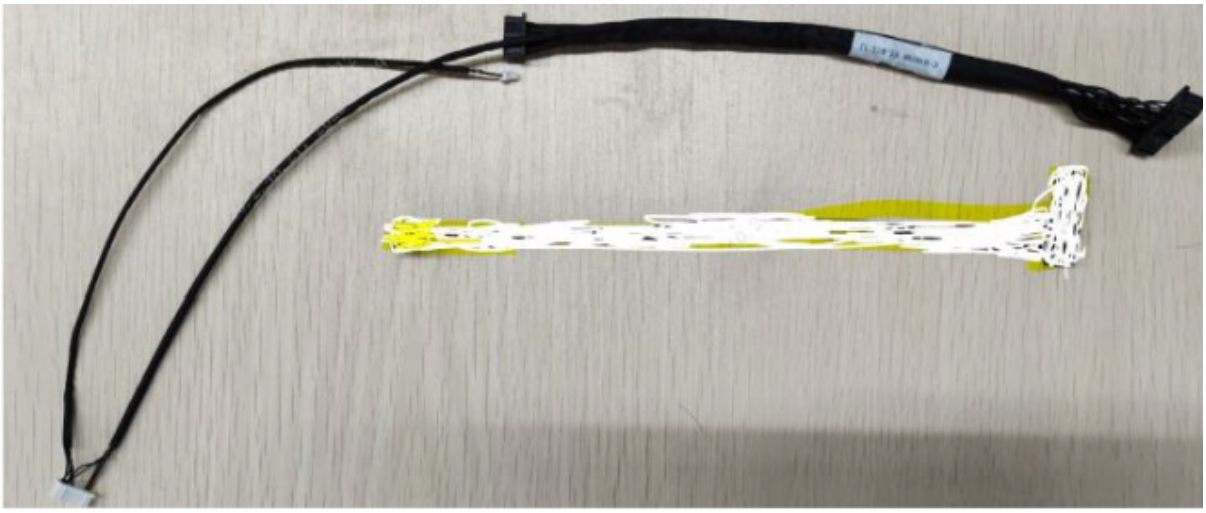
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 D30 battery connect board PCBA according to **7.10.2** Disassembly and Assembly.
4. Remove the D30 internal connecting wire from the battery connect board.

7.35.3 Commissioning and Verification

None

7.36 D30 Internal Connection (Full)

7.36.1 General Information



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-012798-00	D30 internal connection (full)	None	None

7.36.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 D30 battery connect board PCBA according to **7.10.2** Disassembly and Assembly.
4. Remove the D30 internal connecting wire from the battery connect board.

7.36.3 Commissioning and Verification

None

7.37 Cable for D30 Recorder

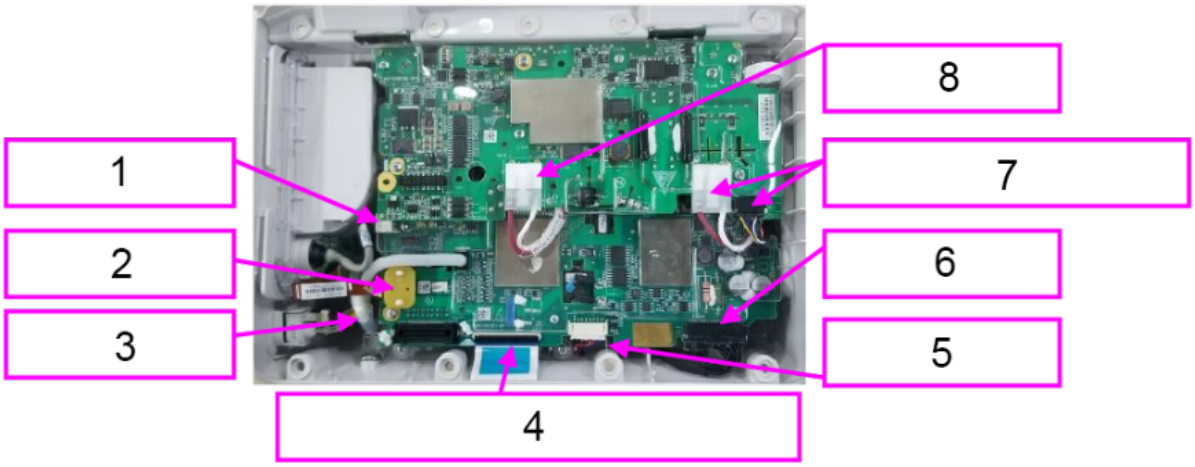
7.37.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-012799-00	Cable for D30 recorder	None	None

7.37.2 Disassembly and Assembly

Specific Steps

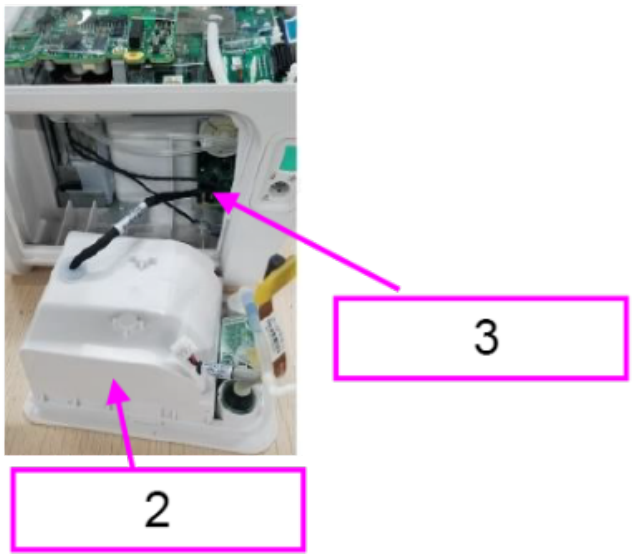
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the 50-mm recorder assembly according to **7.26.2** Disassembly and Assembly.
4. Remove the capacitor cable and internal wire to defibrillator socket from the 0656 therapy board. Remove the SpO2 cable connector, ECG FPC plate, NIBP gas supply pipe, FFC cable to battery connect board, D30 12VDC pump with connecting wire, and D30 internal connecting wire from the 0656 parameter & power board.



1	SpO2 cable connector
2	ECG FPC plate

3	NIBP intake pipe
4	FFC cable to battery connect board
5	D30 12VDC pump with connecting wire
6	D30 internal connecting wire
7	Internal wire to defibrillator socket
8	Capacitor cable

5. Pull out the recorder pin, push the MPM module out, and unplug the recorder cable.



1	Recorder pin
2	MPM module
3	Recorder cable

6. Remove the cable stopper from the MPM module, and then remove the cable.

1 Cable stopper

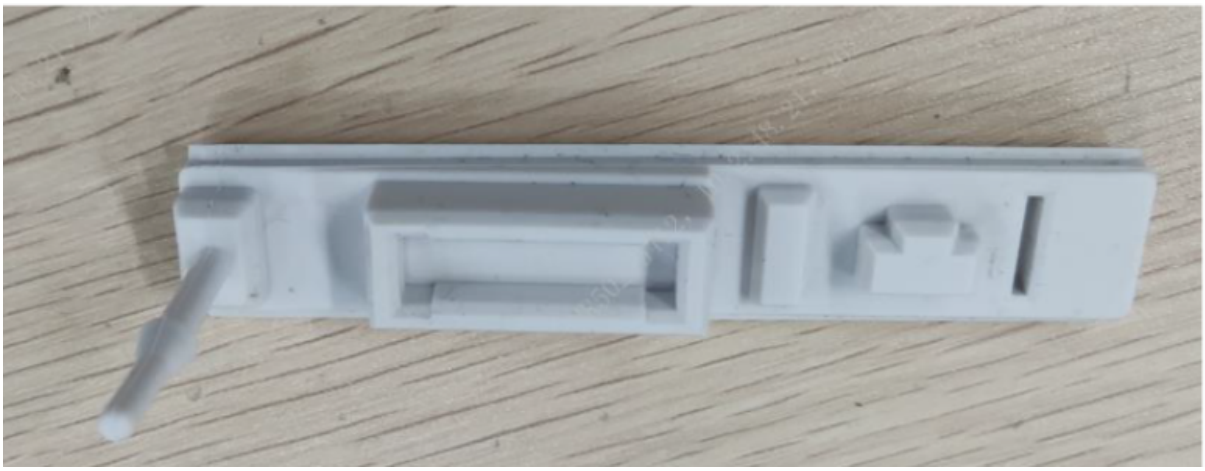
2 Gas pipe assembly

7.37.3 Commissioning and Verification

None

7.38 IO Cover

7.38.1 General Information

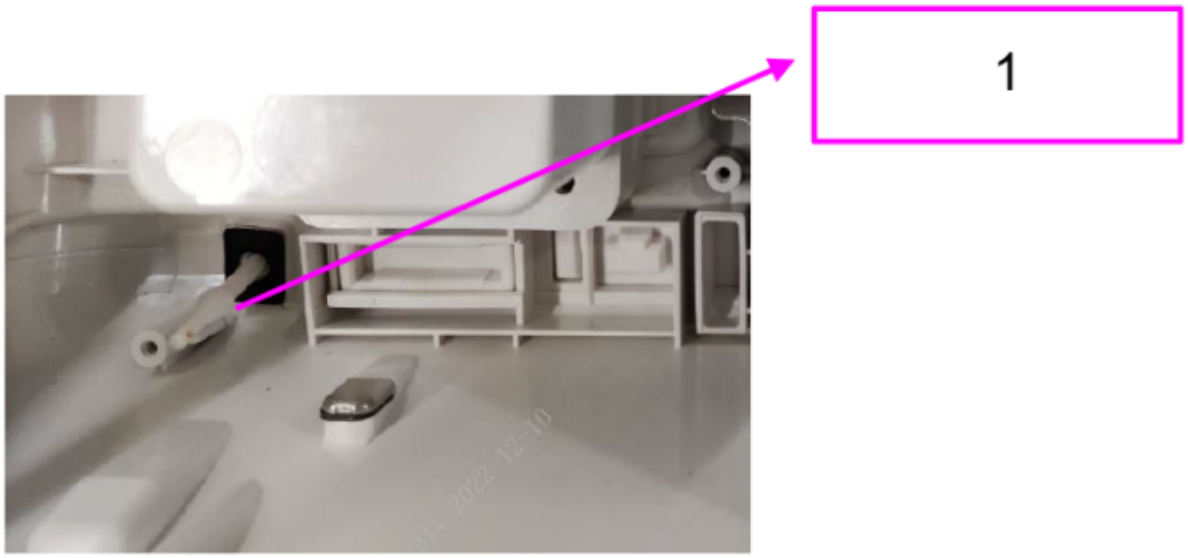


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
049-002539-00	IO cover	None	None

7.38.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the external interface board PCBA according to **7.17.2** Disassembly and Assembly.
4. Remove the IO cover from the rear cover.



7.38.3 Commissioning and Verification

None

7.39 M02D Module (0656) FRU

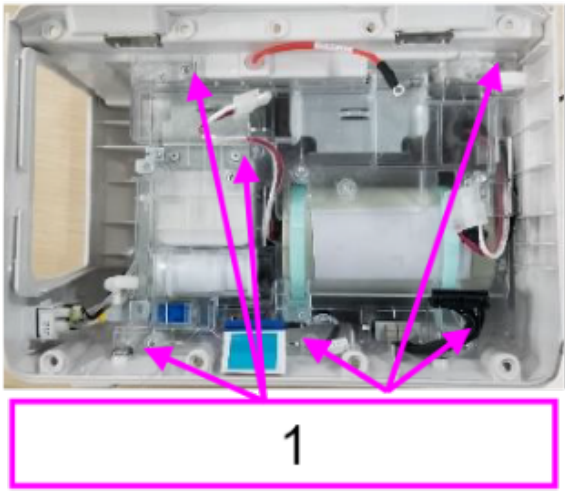
7.39.1 General Information

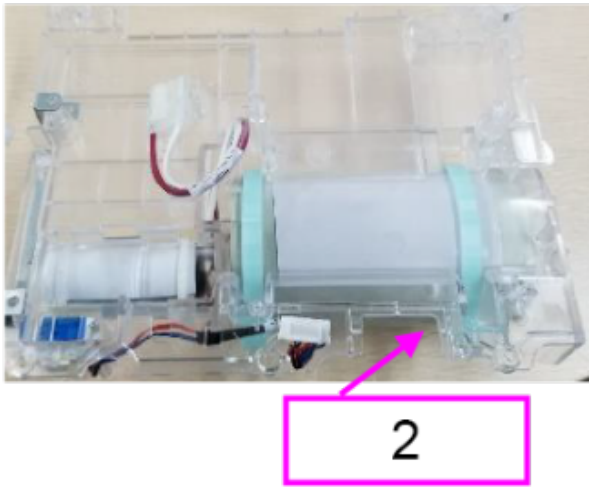
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090941-00	M02D module (0656) FRU	None	None

7.39.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 parameter & power board (5-lead, MR/NC SpO2) according to **7.19.2** Disassembly and Assembly.
4. Remove the main frame: Use a Phillips screwdriver to remove the six PT3X8 cross recessed pan head self-tapping screws, and then take out the main frame.

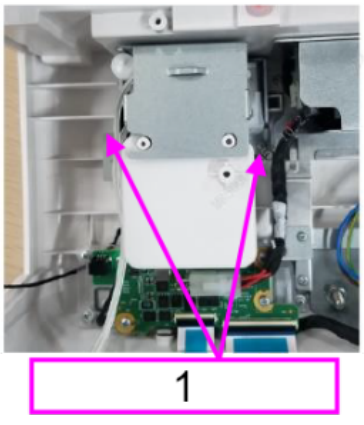


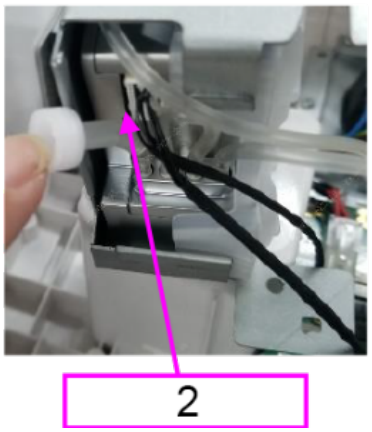


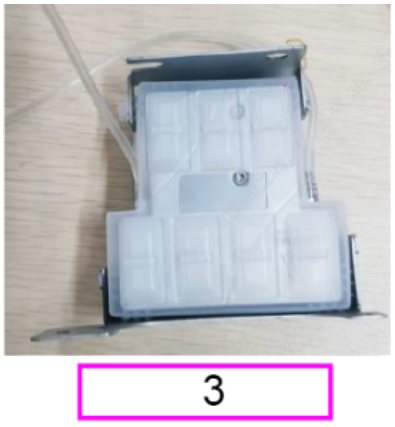
1 Six PT3X8 cross recessed pan head self-tapping screws

2 Main frame assembly

5. Remove the M02D module (0656) FRU: Use a Phillips screwdriver to remove the two PT3X8 self-tapping screws, unplug the D30 internal connecting wire (power board + recorder + M02D), and take out the CO2 module.







1 Two PT3X8 self-tapping screws

2 D30 internal connecting wire

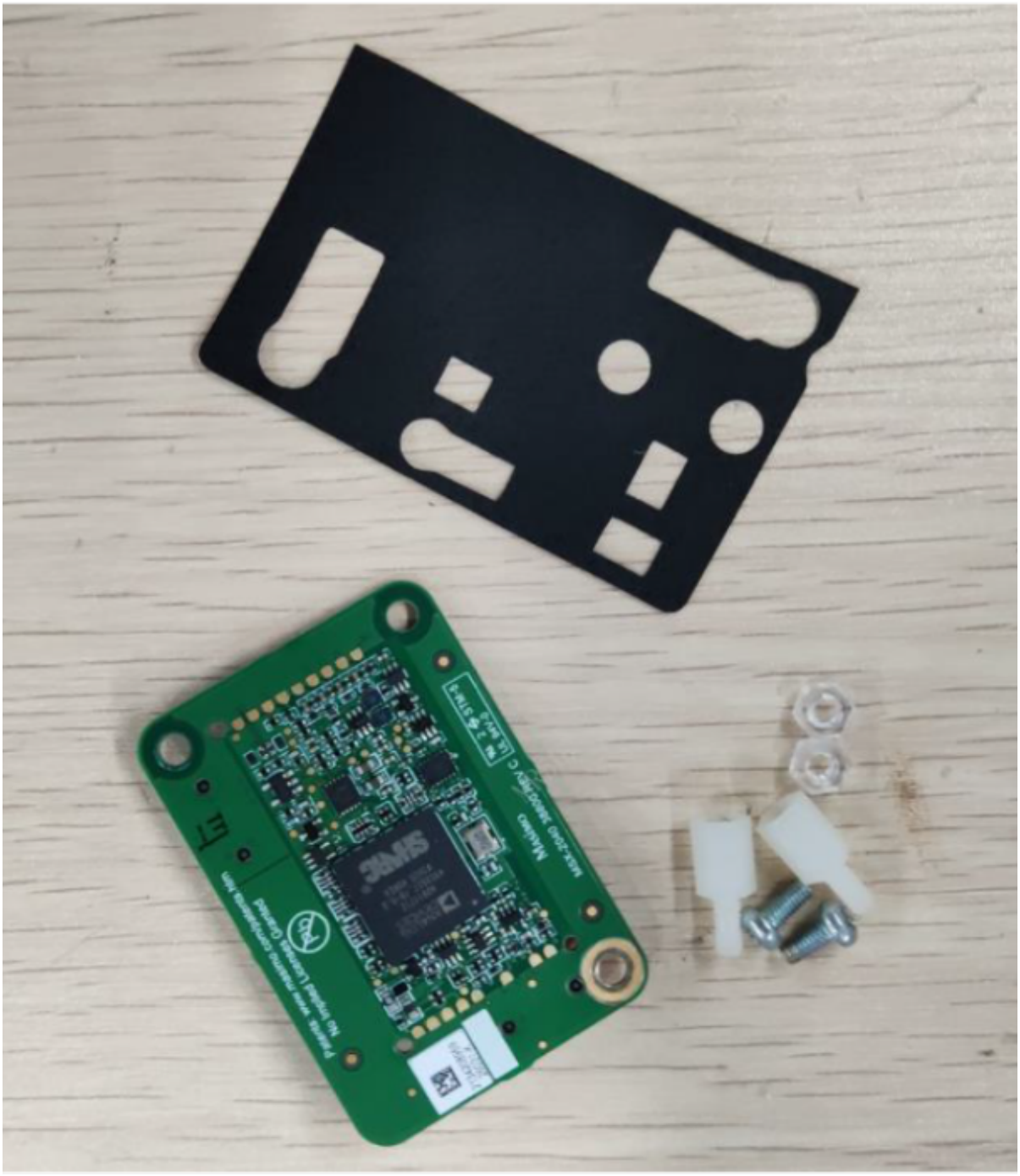
3 M02D CO2 module

7.39.3 Commissioning and Verification

None

7.40 Masimo SpO2 Material Kit

7.40.1 General Information

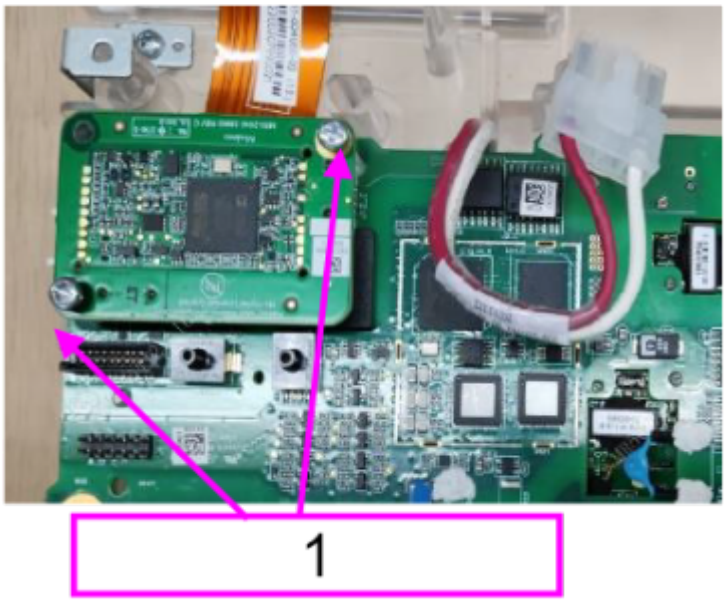


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-085547-00	Masimo SpO2 material kit	None	None

7.40.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 power & parameter-therapy FPC PCBA FRU according to **7.16.2** Disassembly and Assembly.
4. Use a Phillips screwdriver to remove the two M3X5 cross recessed pan head screws, and then remove and replace the SpO2 board.



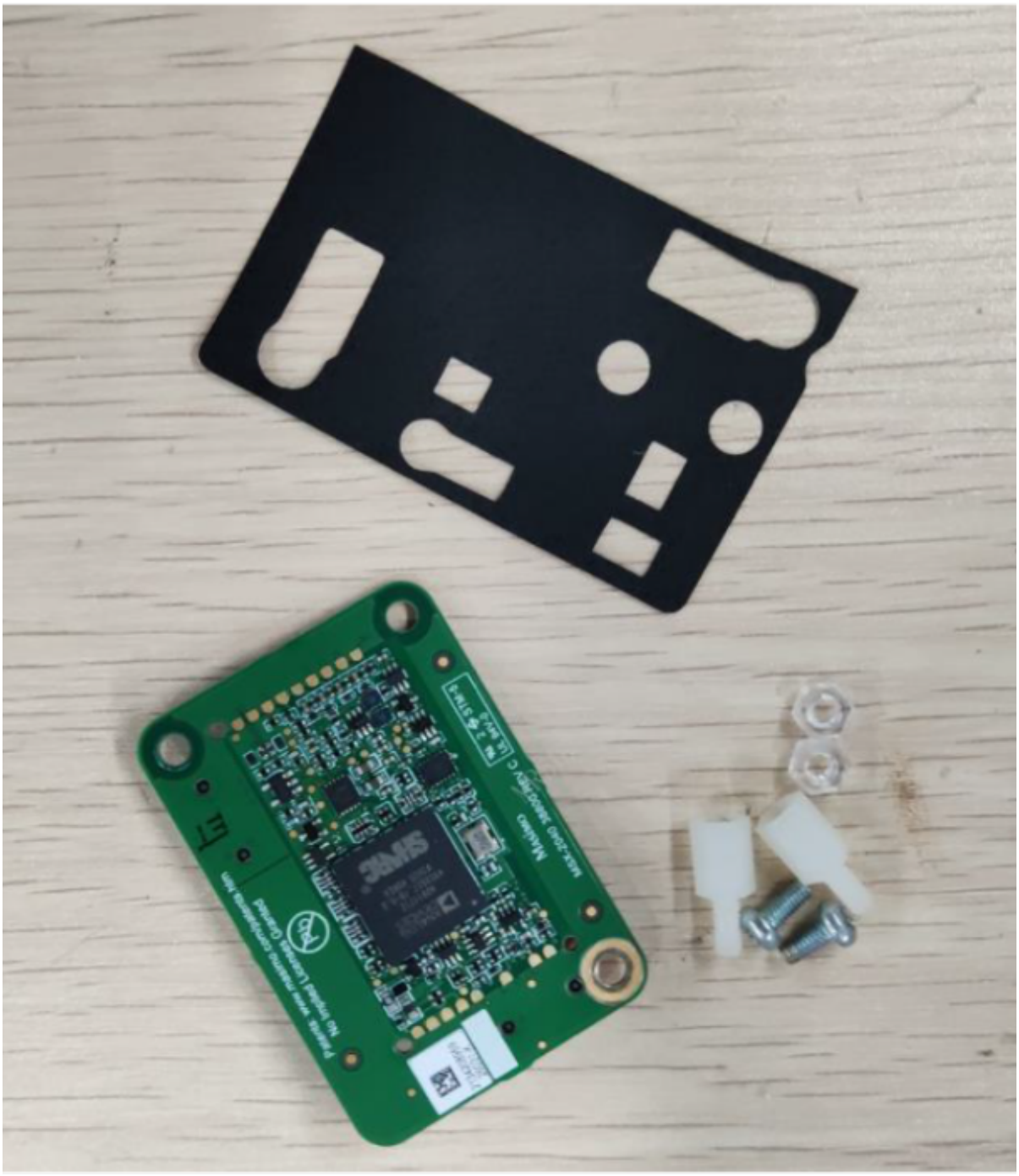
1 Two M3X5 pan head screws

7.40.3 Commissioning and Verification

None

7.41 Mindray SpO2 Material Kit

7.41.1 General Information

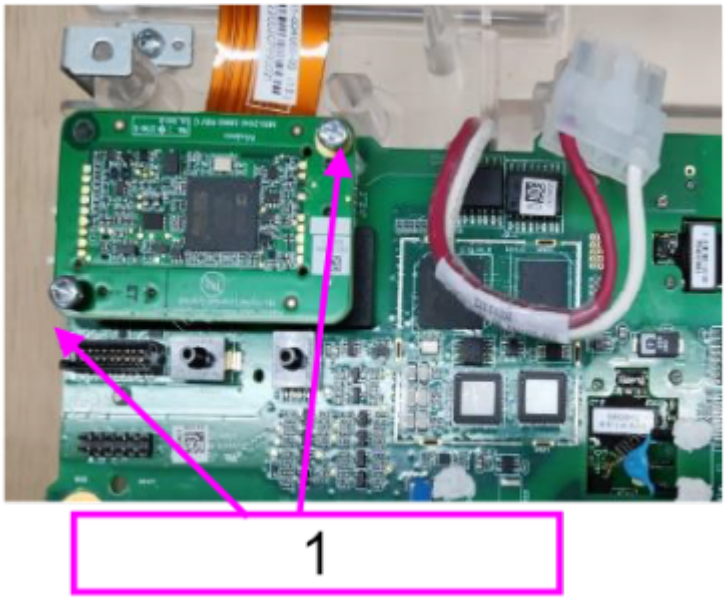


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-085547-00	Mindray SpO2 material kit	None	None

7.41.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 power & parameter-therapy FPC PCBA FRU according to **7.16.2** Disassembly and Assembly.
4. Use a Phillips screwdriver to remove the two M2X4 cross recessed pan head screws, and then remove and replace the Mindray SpO2 board.



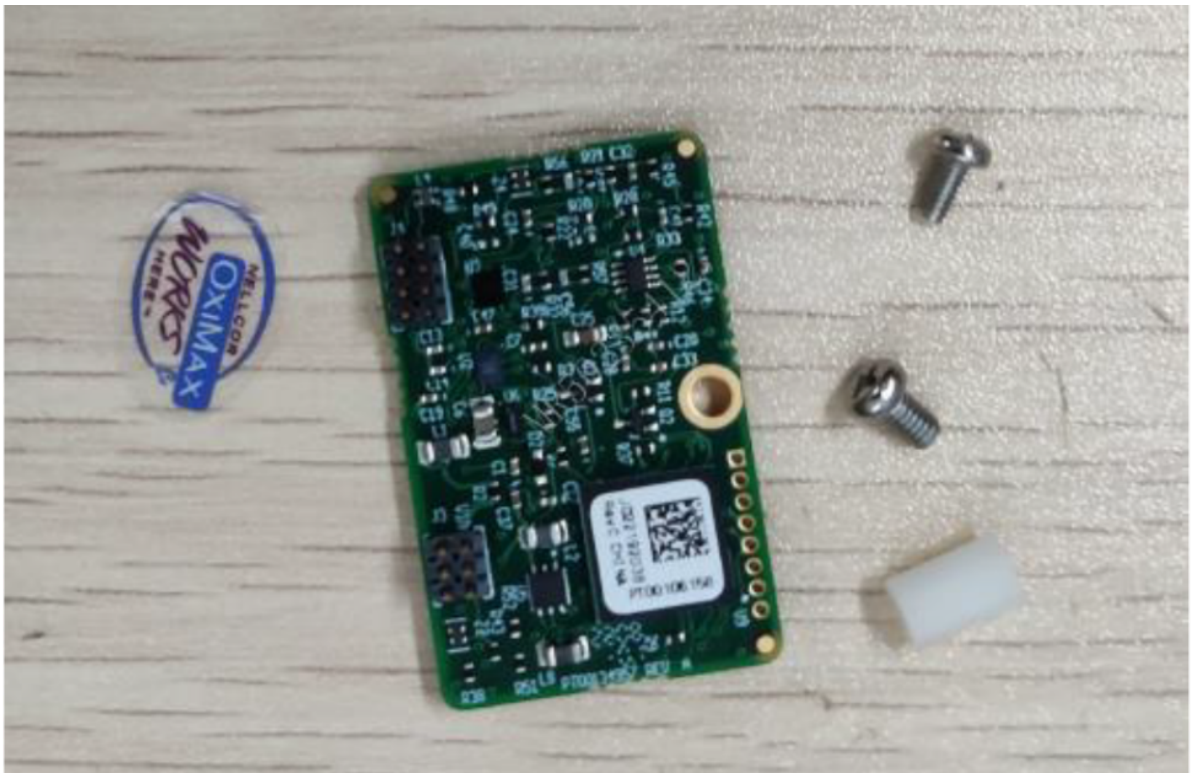
1 Two M2X4 cross recessed pan head screws

7.41.3 Commissioning and Verification

None

7.42 Nellcor SpO2 Material Kit

7.42.1 General Information

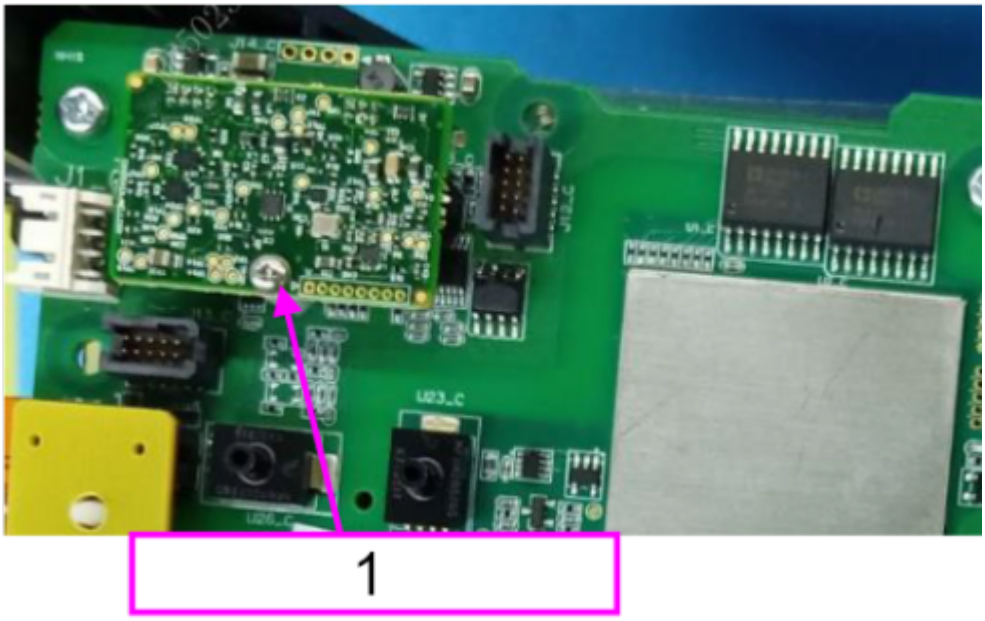


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-085545-00	Nellcor SpO2 material kit	None	None

7.42.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 power & parameter-therapy FPC PCBA FRU according to **7.16.2** Disassembly and Assembly.
4. Use a Phillips screwdriver to remove the M2X4 cross recessed pan head screw, and then remove and replace the SpO2 board.



1 One M2X4 pan head screw

7.42.3 Commissioning and Verification

None

7.43 Wire FFC 12pin Pitch 0.5mm

7.43.1 General Information

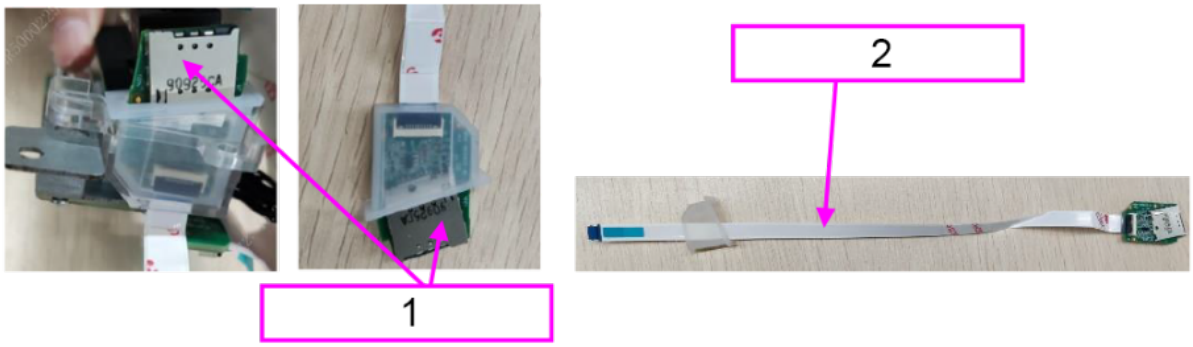
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-013583-00	Wire FFC 12pin pitch 0.5mm	None	None

7.43.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.

3. Remove the 0656 D30 battery connect board PCBA according to **7.10.2** Disassembly and Assembly.
4. Remove the SIM card board PCBA and SIM card FFC cable (009-013583-00): Take out the SIM card board PCBA and replace it. Remove the SIM card FFC cable and replace it.



1 0656 SIM card board PCBA
2 SIM card FFC cable

7.43.3 Commissioning and Verification

None

7.44 Wire FFC 12pin Pitch 0.5mm

7.44.1 General Information

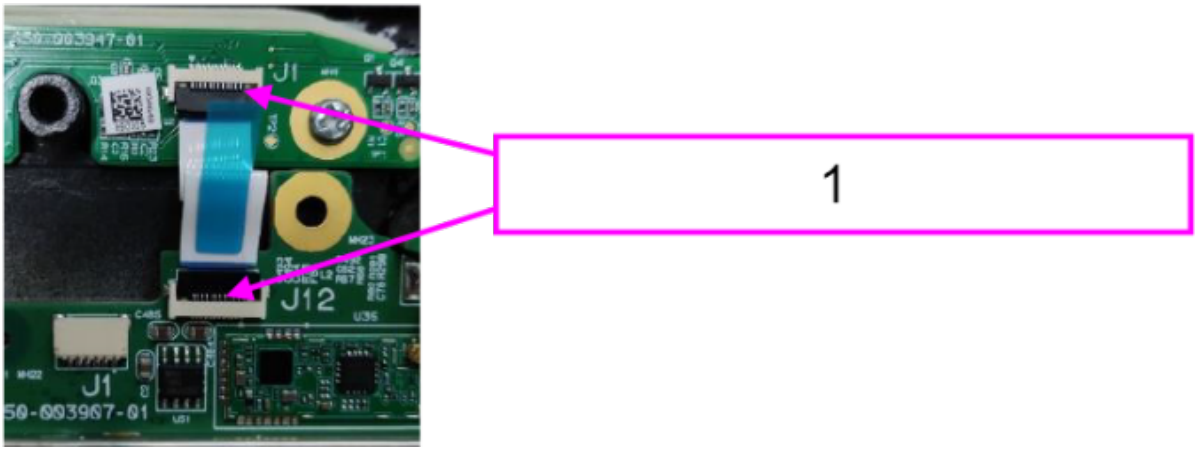
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-013582-00	Wire FFC 12pin pitch 0.5mm	None	None

7.44.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.

3. Open the FFC clips on the status indicator board and main control board, remove the wire FFC 12pin pitch 0.5mm (same aide connection), and replace the wire.



1 Open the FFC clips on the two boards

7.44.3 Commissioning and Verification

None

7.45 Wire FFC 12pin Pitch 0.5mm (Different Side Connection)

7.45.1 General Information

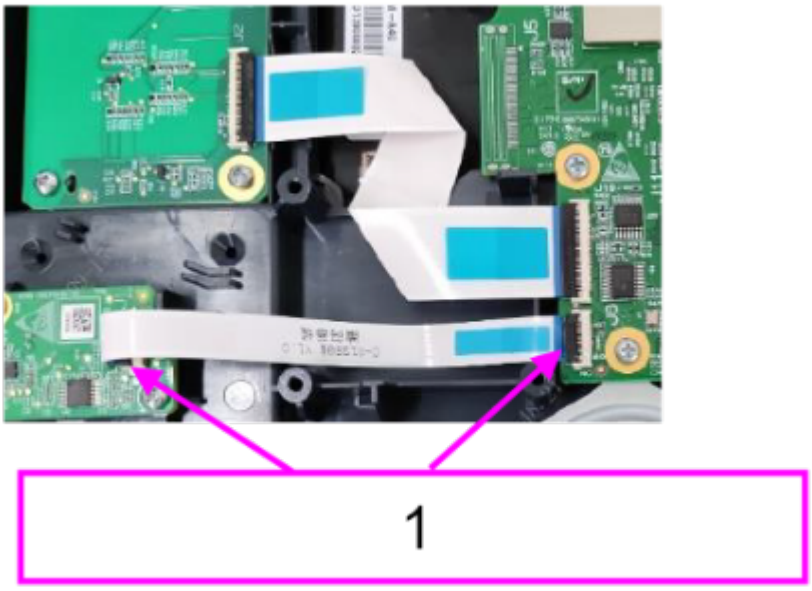
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-013584-00	Wire FFC 12pin pitch 0.5mm (different side connection)	None	None

7.45.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.

2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the 4G/5G/Wi-Fi module.
4. Open the FFC clips on the coder board and main control board, remove the wire FFC 12pin pitch 0.5mm (different aide connection), and replace the wire.



1 Open the FFC clips on the two boards

7.45.3 Commissioning and Verification

None

7.46 Wire FFC 30pin Pitch 0.5mm

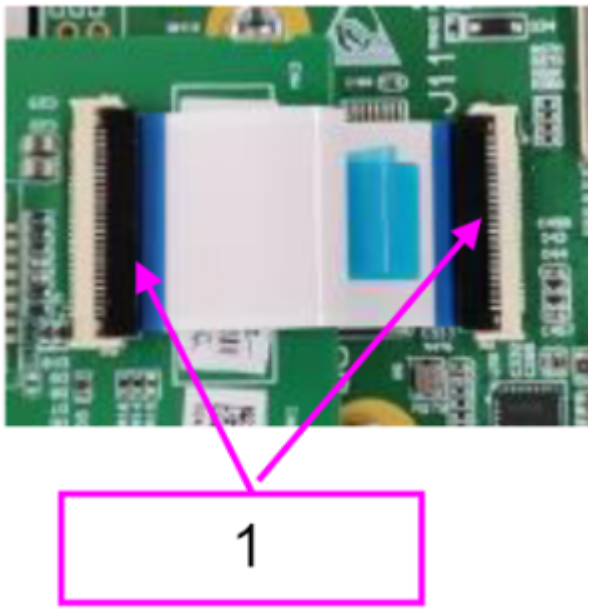
7.46.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-013591-00	Wire FFC 30pin pitch 0.5mm	None	None

7.46.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Open the FFC clips on the Wi-Fi carrier board and main control board, take out the wire FFC 30pin pitch 0.5mm (same aide connection), and replace the wire.



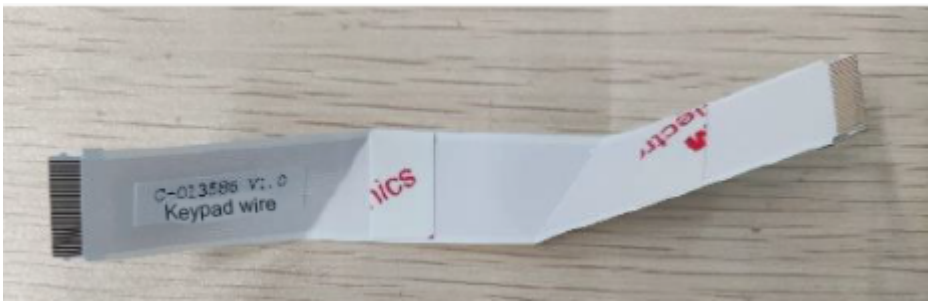
1 Open the FFC clip

7.46.3 Commissioning and Verification

None

7.47 Wire FFC 30pin Pitch 0.5mm

7.47.1 General Information

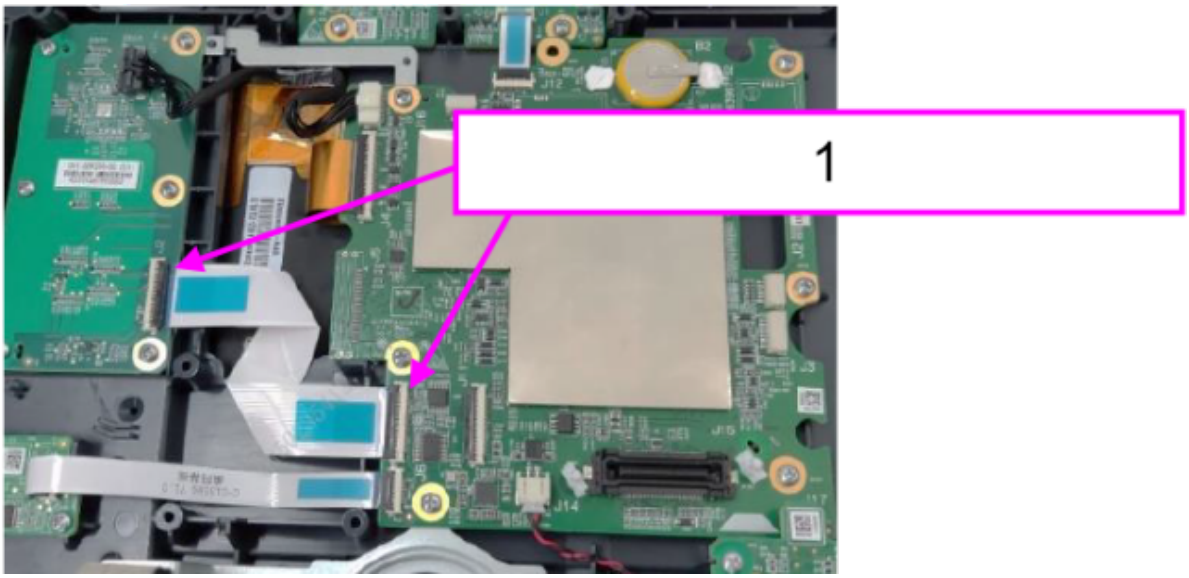


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-013586-00	Wire FFC 30pin pitch 0.5mm	None	None

7.47.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the 4G/5G/Wi-Fi module.
4. Open the FFC clips on the keypad and main control board, remove the wire FFC 30pin pitch 0.5mm (same aide connection), and replace the wire.



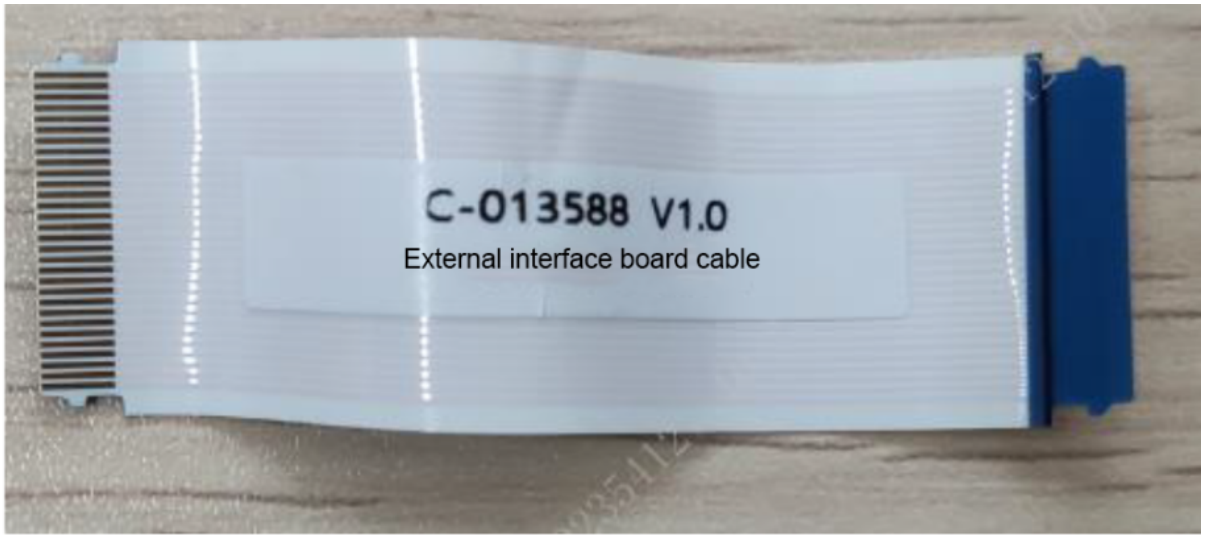
1 Open the FFC clips on the two boards

7.47.3 Commissioning and Verification

None

7.48 Wire FFC 30pin Pitch 0.5mm (Different Side Connection)

7.48.1 General Information



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-013588-00	Wire FFC 30pin pitch 0.5mm (different side connection)	None	None

7.48.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the external interface board PCBA according to **7.17.2** Disassembly and Assembly.
4. Remove the external interface board PCBA and unplug the cable.

7.48.3 Commissioning and Verification

None

7.49 Wire FFC 60pin Pitch 0.5mm (Different Side Connection)

7.49.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-013589-00	Wire FFC 60pin pitch 0.5mm (different side connection)	None	None

7.49.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 D30 battery connect board PCBA according to **7.10.2** Disassembly and Assembly.
4. Remove the battery connect board and unplug the cable.

7.49.3 Commissioning and Verification

None

7.50 Keypad Backup Connector

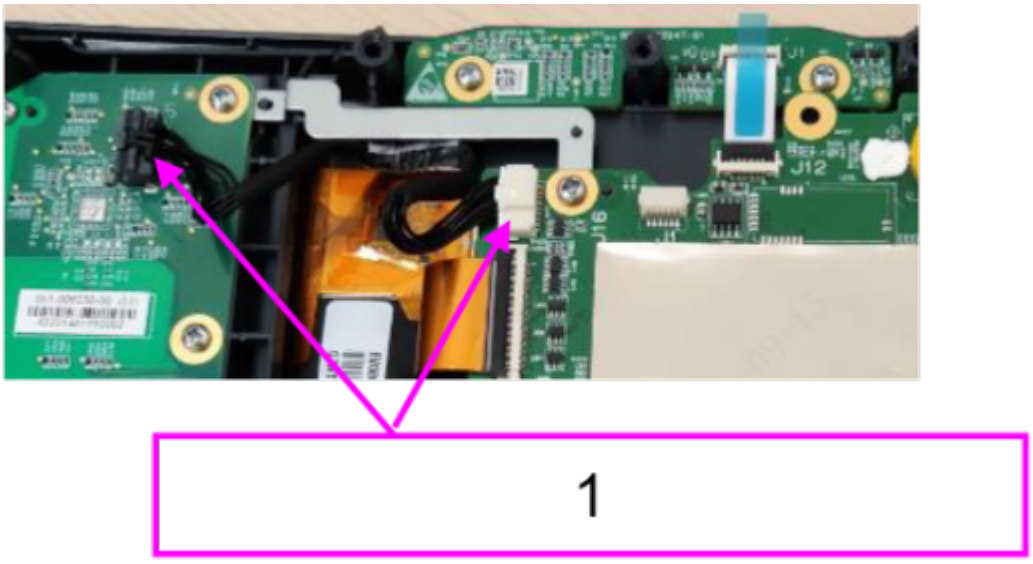
7.50.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-012790-00	Keypad backup connector	None	None

7.50.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Unplug the keypad backup connectors from the keypad and main control board socket, take out the cable and replace it. Place the new cable beneath the metal sheet.



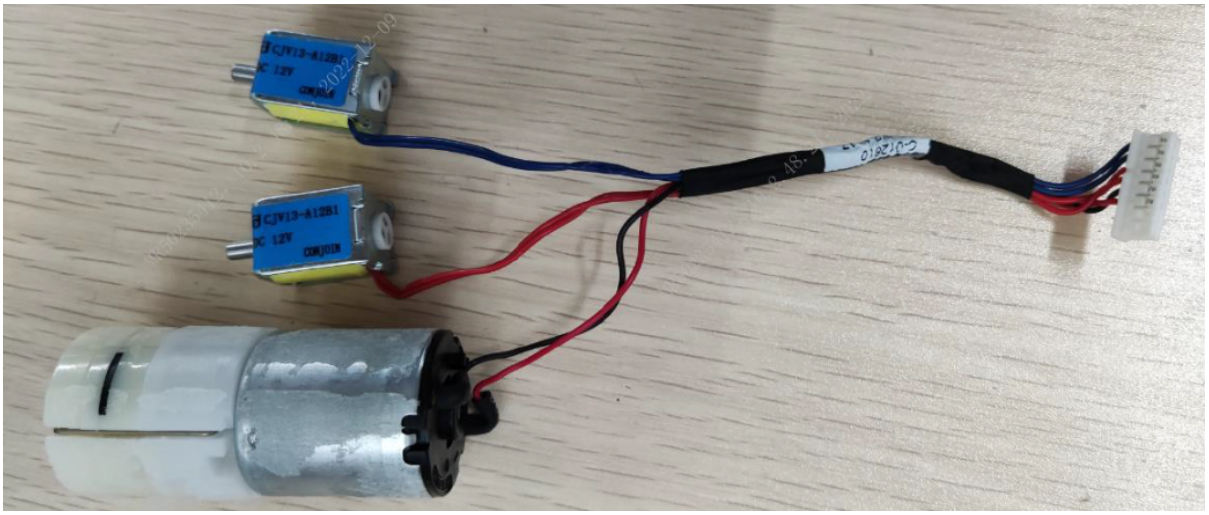
1 Unplug the keypad backup connectors from the two boards

7.50.3 Commissioning and Verification

None

7.51 D30 12VDC Pump with Connecting Wire

7.51.1 General Information

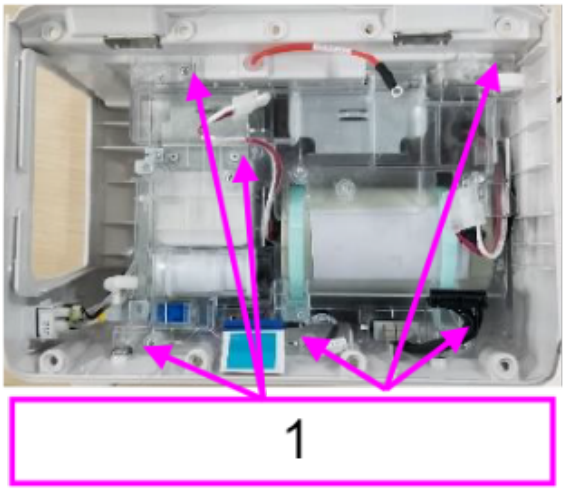


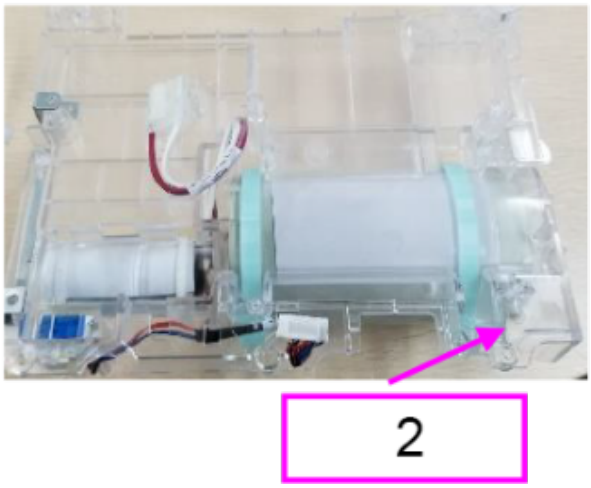
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-012810-00	D30 12VDC pump with connecting wire	None	None

7.51.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 parameter & power board (5-lead, MR/NC SpO2) according to **7.19.2** Disassembly and Assembly.
4. Remove the main frame: Use a Phillips screwdriver to remove the six PT3X8 cross recessed pan head self-tapping screws, and then take out the main frame.

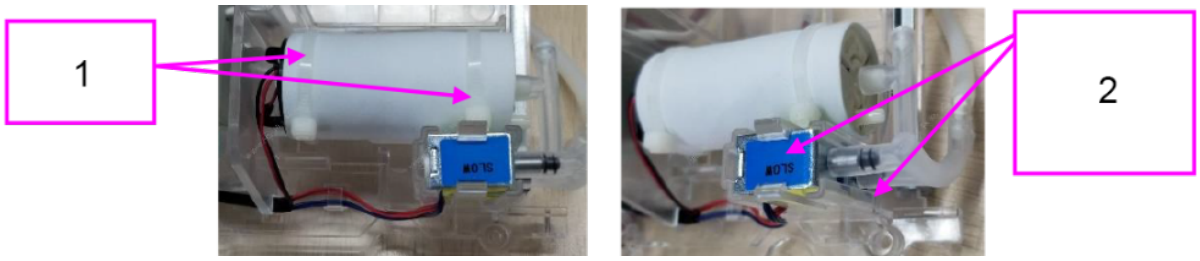




1 Six PT3X8 cross recessed pan head self-tapping screws

2 Main frame assembly

5. Remove the D30 12VDC pump with connecting wire: Cut the two cable ties on the pump with combination pliers, and then remove the pump. Pull out the integrated gas pipe assembly from the air valves, and then remove and replace the air valves.



1 Pump and cable ties

2 Air valves (blue slow release valve and red fast release valve)

7.51.3 Commissioning and Verification

None

7.52 MPM (ECG)

7.52.1 General Information

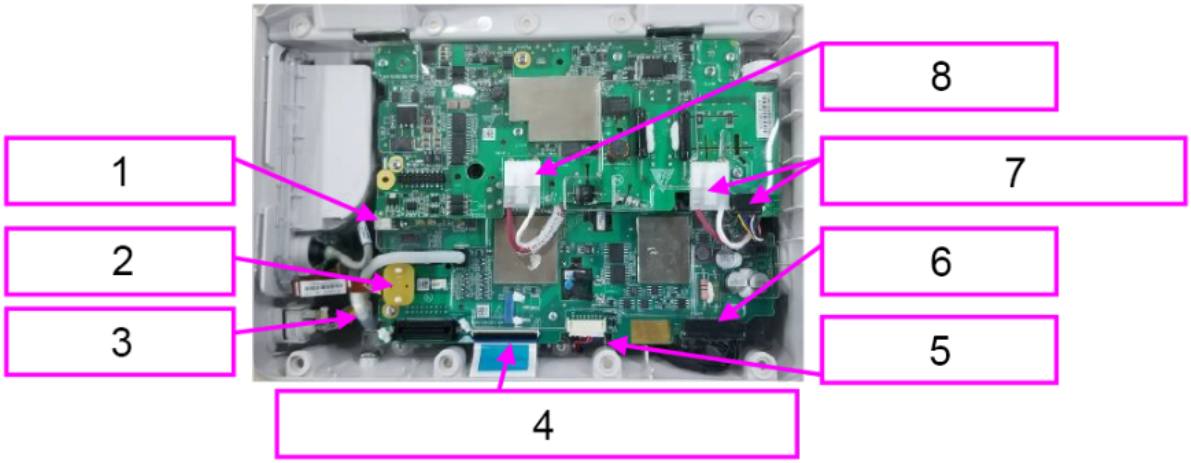
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-084975-00	MPM (ECG)	051-005191-00	0656 ECG front panel FPC board
		047-042017-00	D30 panel label silk

7.52.2 Disassembly and Assembly

Specific Steps

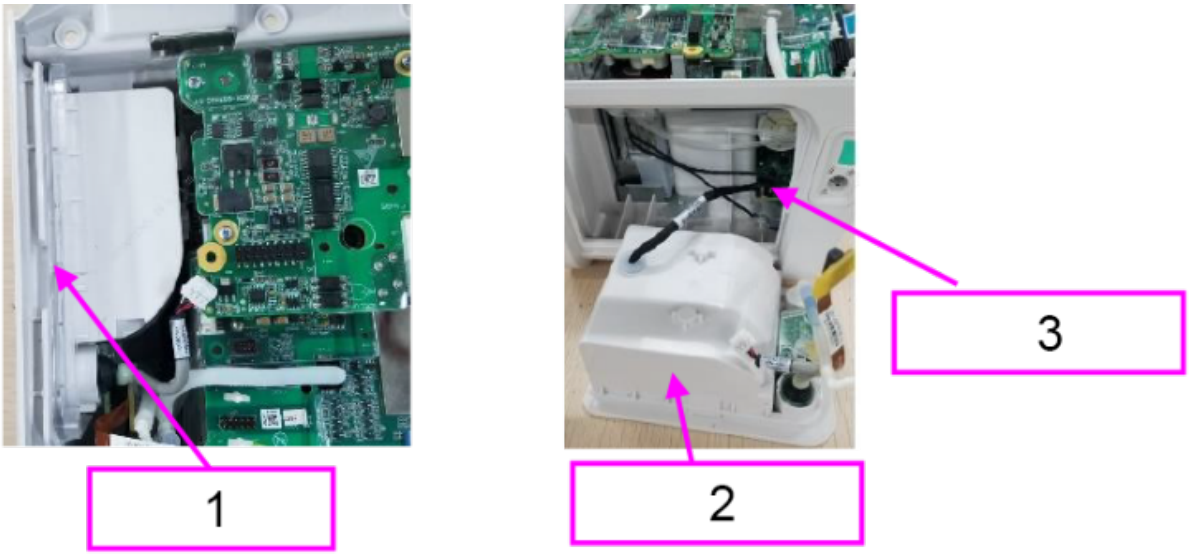
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the 50-mm recorder assembly according to **7.26.2** Disassembly and Assembly.

4. Remove the capacitor cable and internal wire to defibrillator socket from the 0656 therapy board. Remove the SpO2 cable connector, ECG FPC plate, NIBP gas supply pipe, FFC cable to battery connect board, D30 12VDC pump with connecting wire, and D30 internal connecting wire from the 0656 parameter & power board.



1	SpO2 cable connector
2	ECG FPC plate
3	NIBP intake pipe
4	FFC cable to battery connect board
5	D30 12VDC pump with connecting wire
6	D30 internal connecting wire
7	Internal wire to defibrillator socket
8	Capacitor cable

5. Pull out the recorder pin, push the MPM module out, and unplug the recorder cable.



1 Recorder pin
2 MPM module
3 Recorder cable

6. Remove the cable stopper from the MPM module, and then remove the cable. Remove the gas pipe.

1 Cable stopper
2 Gas pipe assembly

7.52.3 Commissioning and Verification

None

7.53 MPM (ECG+Masimo SPO2+NIBP) FRU

7.53.1 General Information

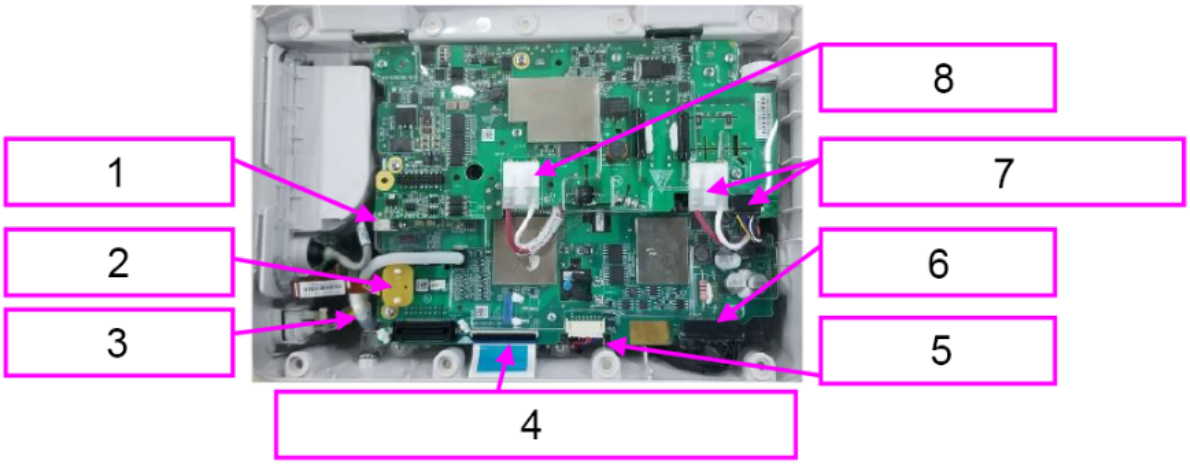
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090922-00	MPM (ECG+Masimo SPO2+NIBP) FRU	051-005191-00	0656 ECG front panel FPC board
		047-040423-00	0656 panel label (silkscreen)

7.53.2 Disassembly and Assembly

Specific Steps

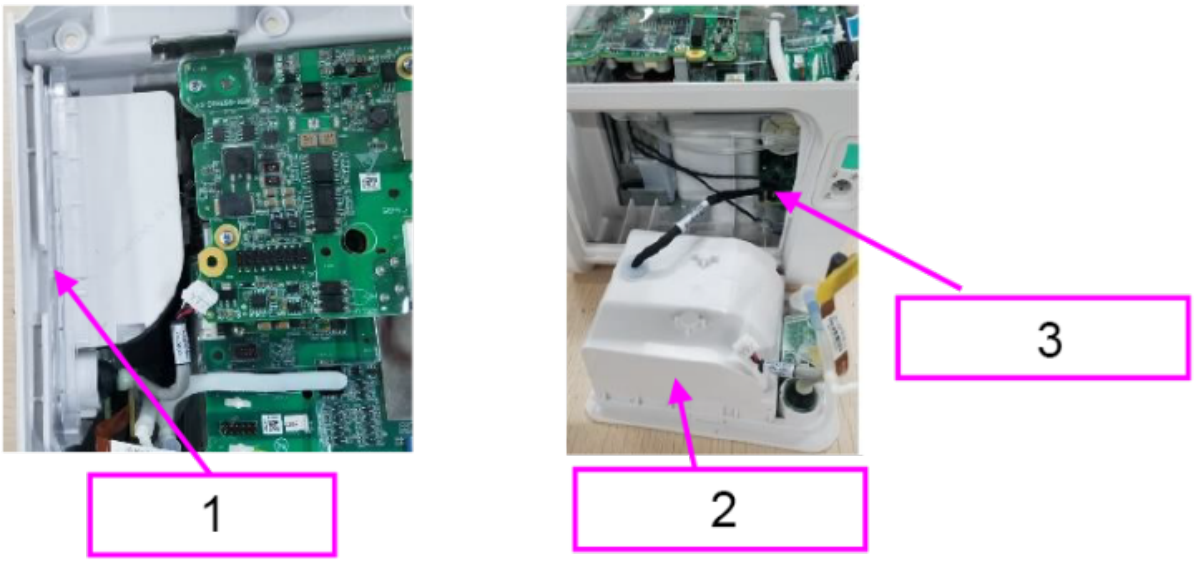
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the 50-mm recorder assembly according to **7.26.2** Disassembly and Assembly.
4. Remove the capacitor cable and internal wire to defibrillator socket from the 0656 therapy board. Remove the SpO2 cable connector, ECG FPC plate, NIBP gas supply pipe, FFC cable

to battery connect board, D30 12VDC pump with connecting wire, and D30 internal connecting wire from the 0656 parameter & power board.



1	SpO2 cable connector
2	ECG FPC plate
3	NIBP intake pipe
4	FFC cable to battery connect board
5	D30 12VDC pump with connecting wire
6	D30 internal connecting wire
7	Internal wire to defibrillator socket
8	Capacitor cable

5. Pull out the recorder pin, push the MPM module out, and unplug the recorder cable.



1	Recorder pin
2	MPM module
3	Recorder cable

6. Remove the cable stopper from the MPM module, and then remove the cable. Remove the gas pipe.

1 Cable stopper

2 Gas pipe assembly

7.53.3 Commissioning and Verification

None

7.54 MPM (ECG+Mindray SPO2) FRU

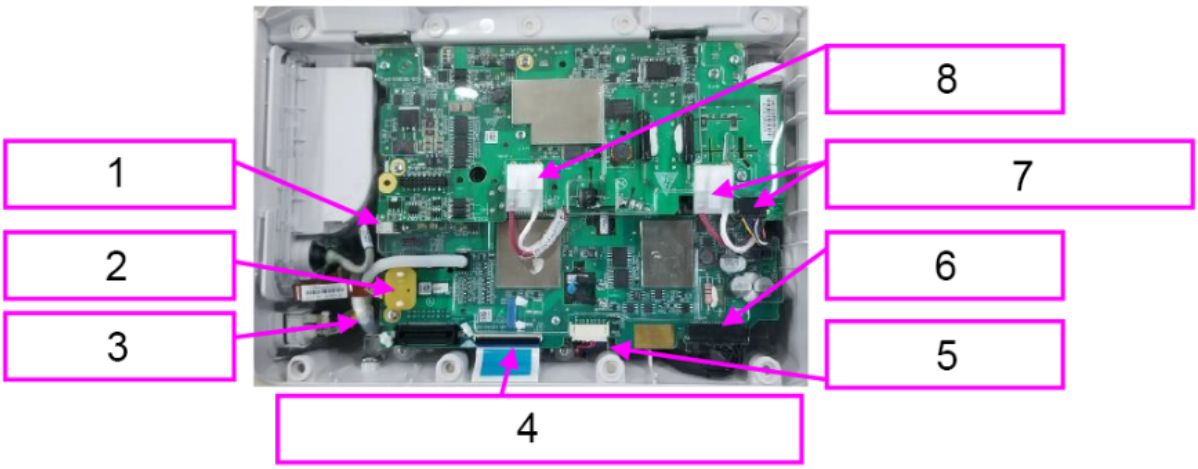
7.54.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090921-00	MPM (ECG+Mindray SPO2) FRU	051-005191-00	0656 ECG front panel FPC board
		047-042019-00	D30 Panel Label Silk (ECG+SPO2)

7.54.2 Disassembly and Assembly

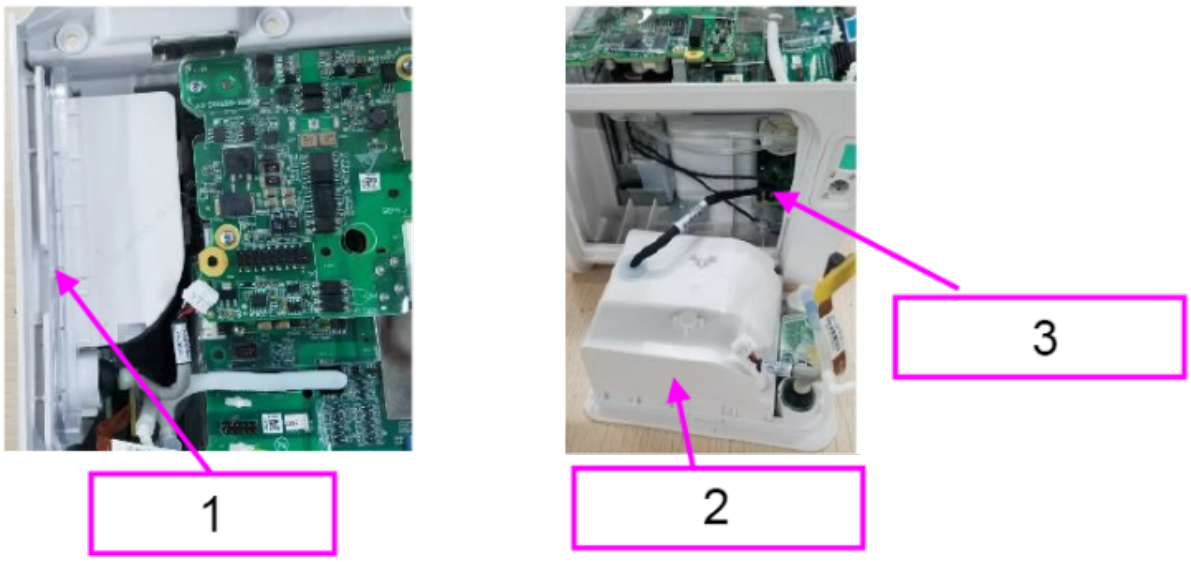
Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the 50-mm recorder assembly according to **7.26.2** Disassembly and Assembly.
4. Remove the capacitor cable and internal wire to defibrillator socket from the 0656 therapy board. Remove the SpO2 cable connector, ECG FPC plate, NIBP gas supply pipe, FFC cable to battery connect board, D30 12VDC pump with connecting wire, and D30 internal connecting wire from the 0656 parameter & power board.



1	SpO2 cable connector
2	ECG FPC plate
3	NIBP intake pipe
4	FFC cable to battery connect board
5	D30 12VDC pump with connecting wire
6	D30 internal connecting wire
7	Internal wire to defibrillator socket
8	Capacitor cable

5. Pull out the recorder pin, push the MPM module out, and unplug the recorder cable.



1	Recorder pin
2	MPM module
3	Recorder cable

6. Remove the cable stopper from the MPM module, and then remove the cable. Remove the gas pipe.

1 Cable stopper

2 Gas pipe assembly

7.54.3 Commissioning and Verification

None

7.55 MPM Module (ECG+Mindray SPO2+NIBP) FRU

7.55.1 General Information

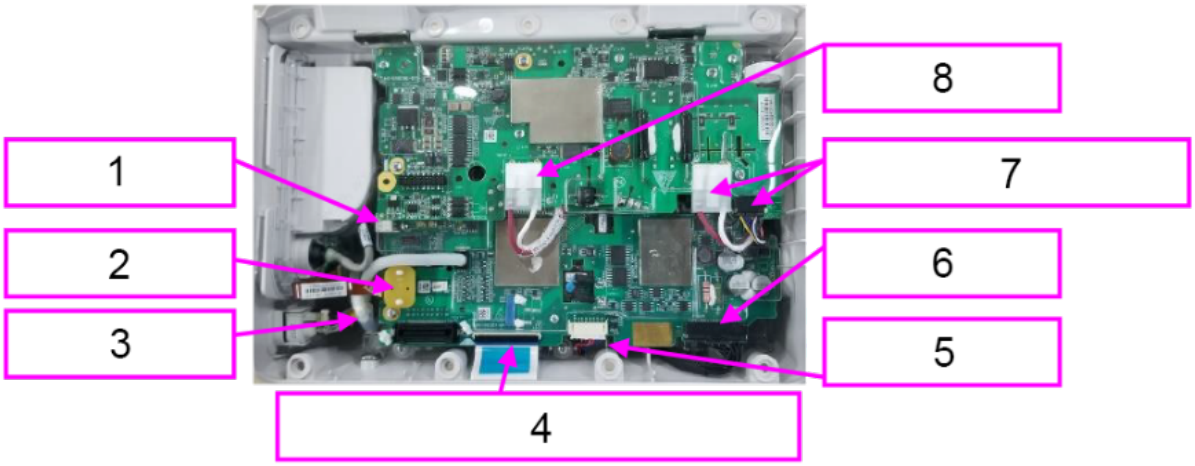
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090920-00	MPM module (ECG+Mindray SPO2+NIBP) FRU	051-005191-00	0656 ECG front panel FPC board
		047-040423-00	0656 panel label (silkscreen)

7.55.2 Disassembly and Assembly

Specific Steps

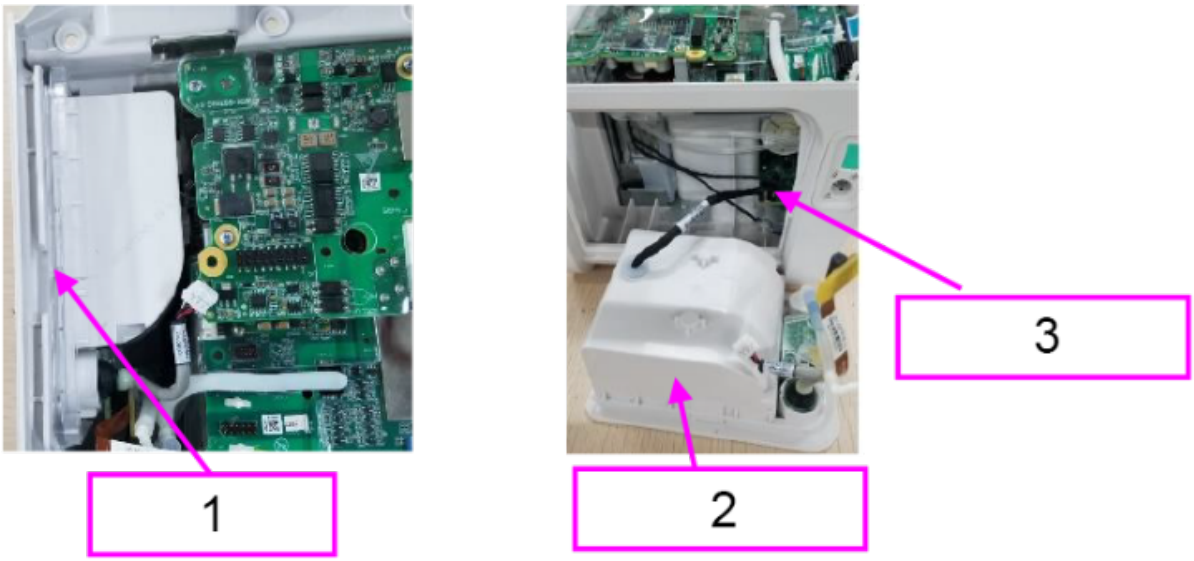
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.

3. Remove the 50-mm recorder assembly according to **7.26.2** Disassembly and Assembly.
4. Remove the capacitor cable and internal wire to defibrillator socket from the 0656 therapy board. Remove the SpO2 cable connector, ECG FPC plate, NIBP gas supply pipe, FFC cable to battery connect board, D30 12VDC pump with connecting wire, and D30 internal connecting wire from the 0656 parameter & power board.



1	SpO2 cable connector
2	ECG FPC plate
3	NIBP intake pipe
4	FFC cable to battery connect board
5	D30 12VDC pump with connecting wire
6	D30 internal connecting wire
7	Internal wire to defibrillator socket
8	Capacitor cable

5. Pull out the recorder pin, push the MPM module out, and unplug the recorder cable.



1 Recorder pin
2 MPM module
3 Recorder cable

6. Remove the cable stopper from the MPM module, and then remove the cable. Remove the gas pipe.

1 Cable stopper
2 Gas pipe assembly

7.55.3 Commissioning and Verification

None

7.56 MPM Material Kit (ECG+Nellcor SPO2 +NIBP)

7.56.1 General Information

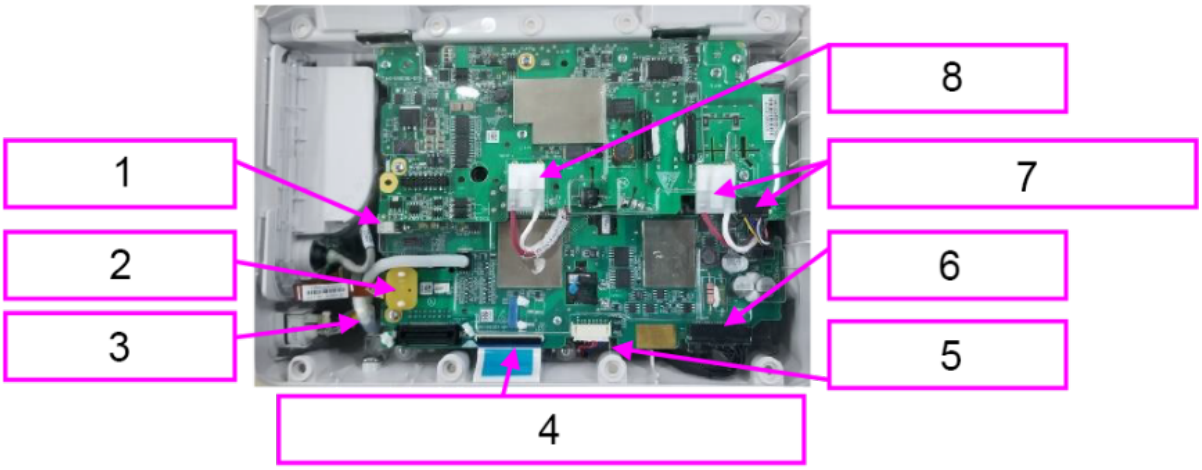
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090902-00	MPM material kit(ECG+Nellcor SPO2+NIBP)	051-005191-00	0656 ECG front panel FPC board
		047-040423-00	0656 panel label (silkscreen)

7.56.2 Disassembly and Assembly

Specific Steps

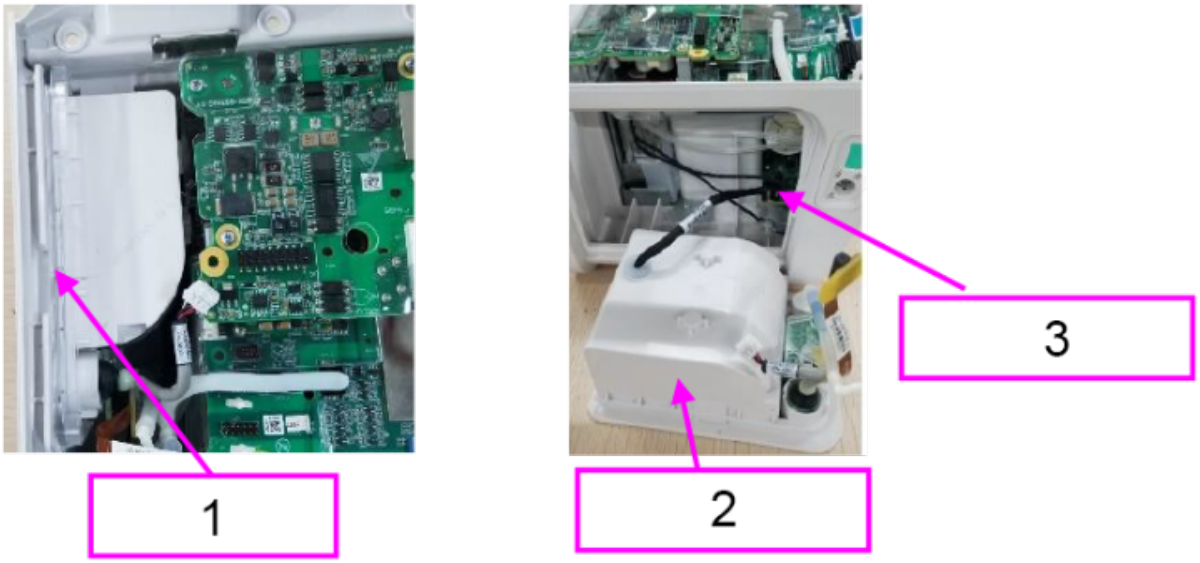
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the 50-mm recorder assembly according to **7.26.2** Disassembly and Assembly.
4. Remove the capacitor cable and internal wire to defibrillator socket from the 0656 therapy board. Remove the SpO2 cable connector, ECG FPC plate, NIBP gas supply pipe, FFC cable

to battery connect board, D30 12VDC pump with connecting wire, and D30 internal connecting wire from the 0656 parameter & power board.



1	SpO2 cable connector
2	ECG FPC plate
3	NIBP intake pipe
4	FFC cable to battery connect board
5	D30 12VDC pump with connecting wire
6	D30 internal connecting wire
7	Internal wire to defibrillator socket
8	Capacitor cable

5. Pull out the recorder pin, push the MPM module out, and unplug the recorder cable.



1	Recorder pin
2	MPM module
3	Recorder cable

6. Remove the cable stopper from the MPM module, and then remove the cable. Remove the gas pipe.

1 Cable stopper

2 Gas pipe assembly

7.56.3 Commissioning and Verification

None

7.57 Defibrillation D30 ACDC Output Wire

7.57.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-012792-00	Defibrillation D30 ACDC output wire	None	None

7.57.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 D30 battery connect board PCBA according to **7.10.2** Disassembly and Assembly.
4. Unplug the D30 internal connectors from the battery connect board and power module.

7.57.3 Commissioning and Verification

None

7.58 Defibrillation D30 ACDC Input Wire

7.58.1 General Information

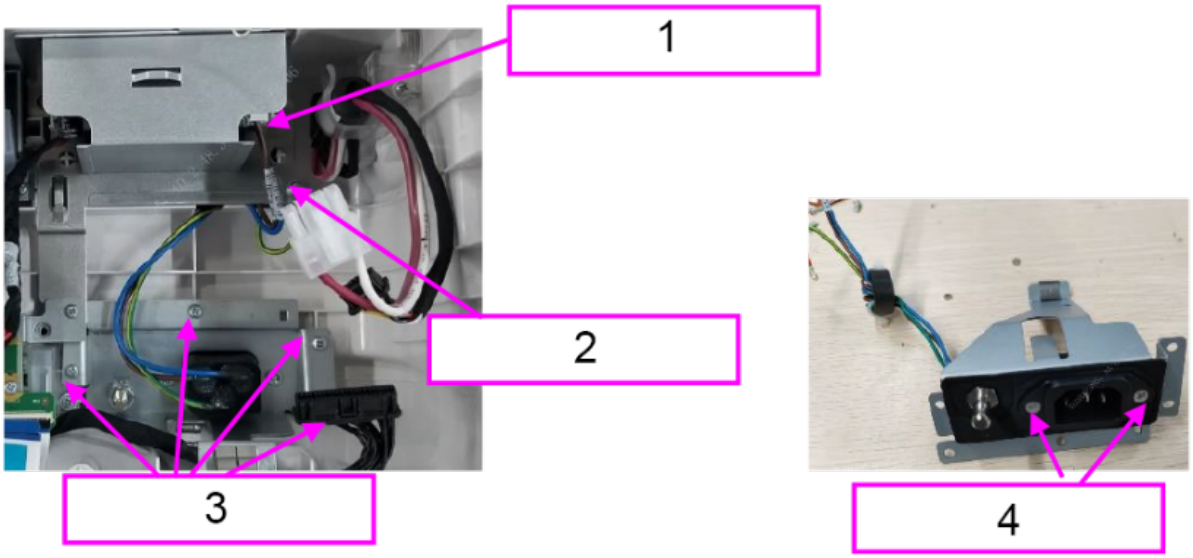
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-012791-00	Defibrillation D30 ACDC input wire	None	None

7.58.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the AC/DC module (100-240VAC 18V 100W) according to **7.28.2** Disassembly and Assembly.

4. Unplug the AC/DC power input wire from the power module. Use a Phillips screwdriver to remove the four PT3X8 self-tapping screws and one M3X6 combination screw, and remove the AC/DC input wire assembly. Then, remove the M3X6 countersunk head screws and replace the D30 AC/DC input wire.



1	ACDC power input wire
2	One M3X6 combination screw
3	Four PT3X8 self-tapping screws
4	Two M3X6 countersunk head screws

7.58.3 Commissioning and Verification

None

7.59 Defibrillation Interface Pin

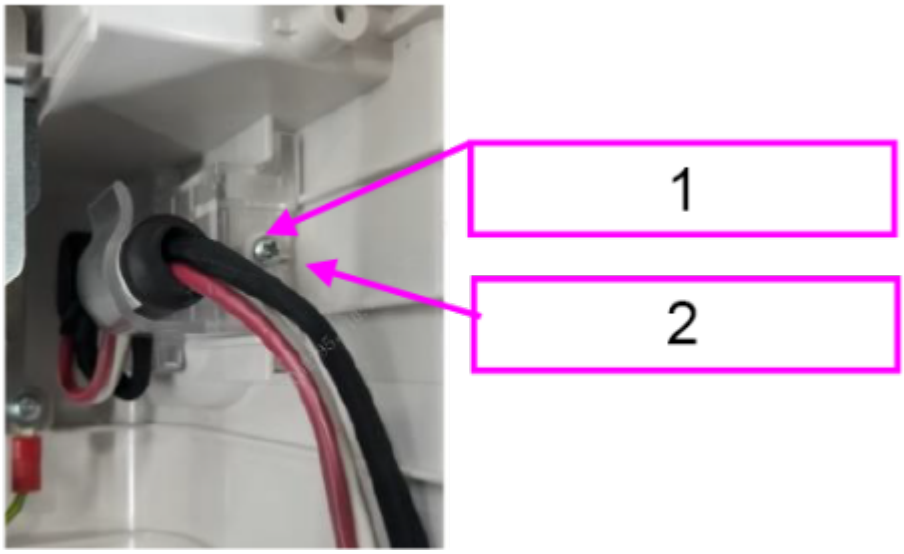
7.59.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-015584-00	Defibrillation interface pin	None	None

7.59.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the AC/DC module (100-240VAC 18V 100W) according to **7.28.2** Disassembly and Assembly.
4. Use a Phillips screwdriver to remove the PT3X8 self-tapping screw, pull out the locking pin, and remove the internal wire to defibrillator socket.



1 One PT3X8 self-tapping screw

2 Locking pin

7.59.3 Commissioning and Verification

None

7.60 Defibrillation Knob

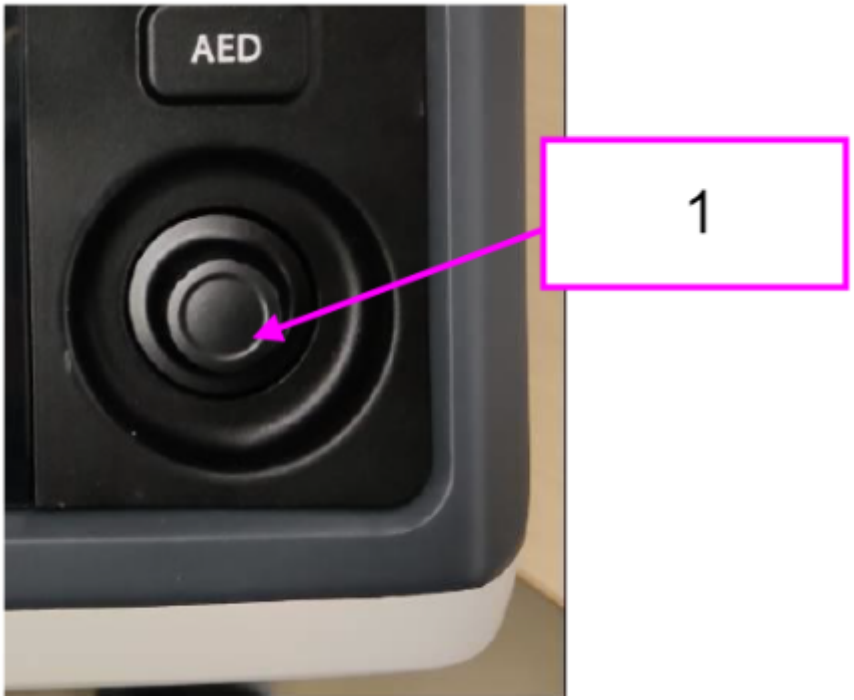
7.60.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-015581-00	Defibrillation knob	None	None

7.60.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Remove the defibrillation knob with sharp nose pliers and replace it.



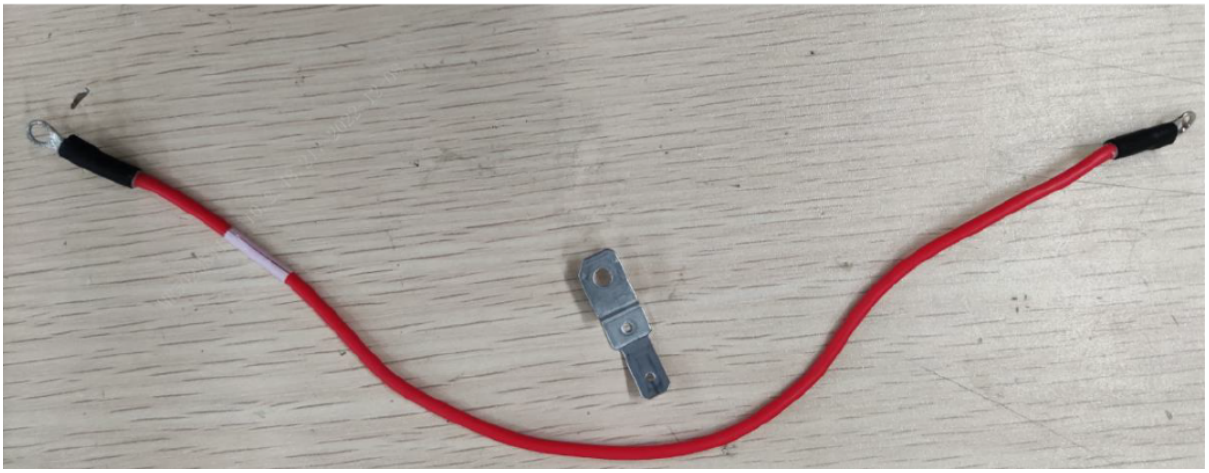
1 Defibrillation knob

7.60.3 Commissioning and Verification

None

7.61 Paddle Material Kit FRU

7.61.1 General Information

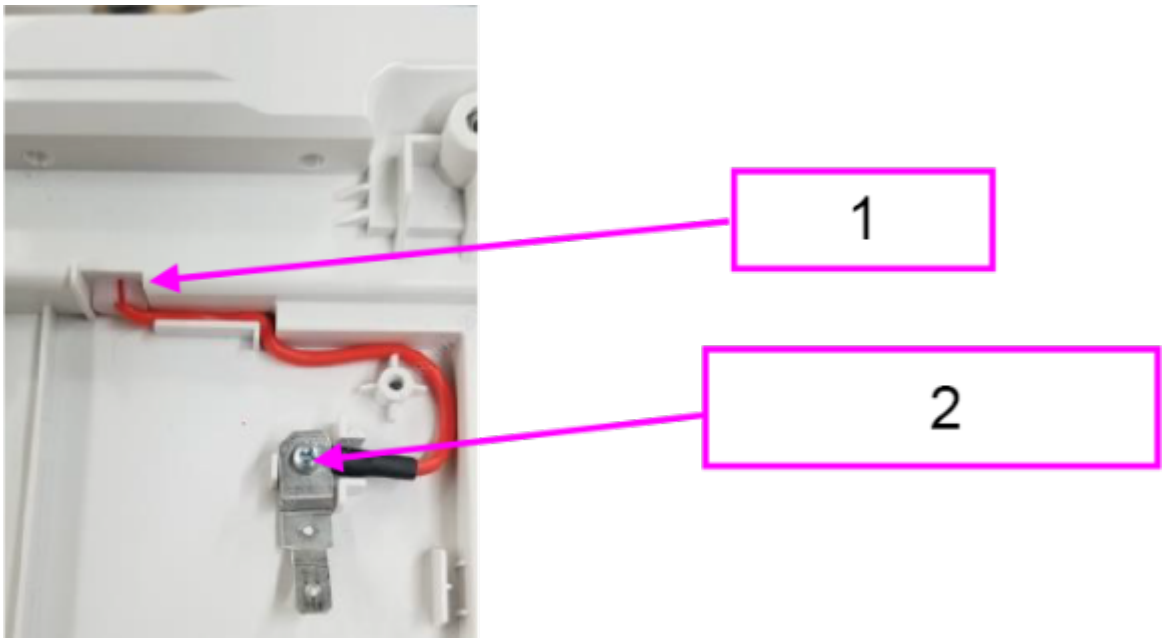


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090923-00	Paddle material kit FRU	None	None

7.61.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the therapy board according to **7.22.2** Disassembly and Assembly.
4. Use a Phillips screwdriver to remove the PT3X8 self-tapping screw, remove the in-position detection metal sheet, and push the cable stopper out. Pull the in-position detection cable out through the round hole, and replace the cable. When installing the cable stopper back, make its notch face up.



1 Cable stopper

2 One PT3X8 self-tapping screw

7.61.3 Commissioning and Verification

None

7.62 Pad Material Kit FRU

7.62.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090855-00	Pad material kit FRU	None	None

7.62.2 Disassembly and Assembly

Specific Steps

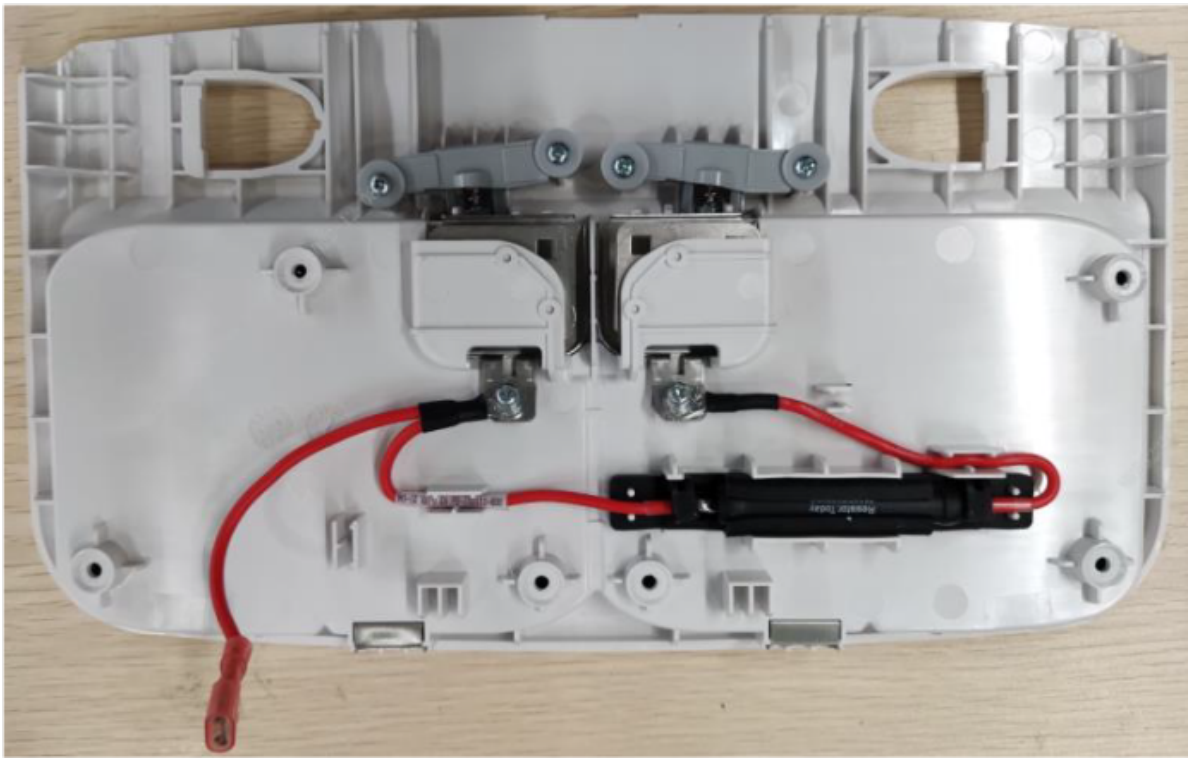
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Remove the electrode base according to "Removing the Electrode Base Assembly and In-position Self-check Resistor Connector" in **7.4** Main Unit Disassembly.

7.62.3 Commissioning and Verification

None

7.63 Electrode Base Assy (0656)

7.63.1 General Information



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-085276-00	Electrode base assy (0656)	None	None

7.63.2 Disassembly and Assembly

Specific Steps

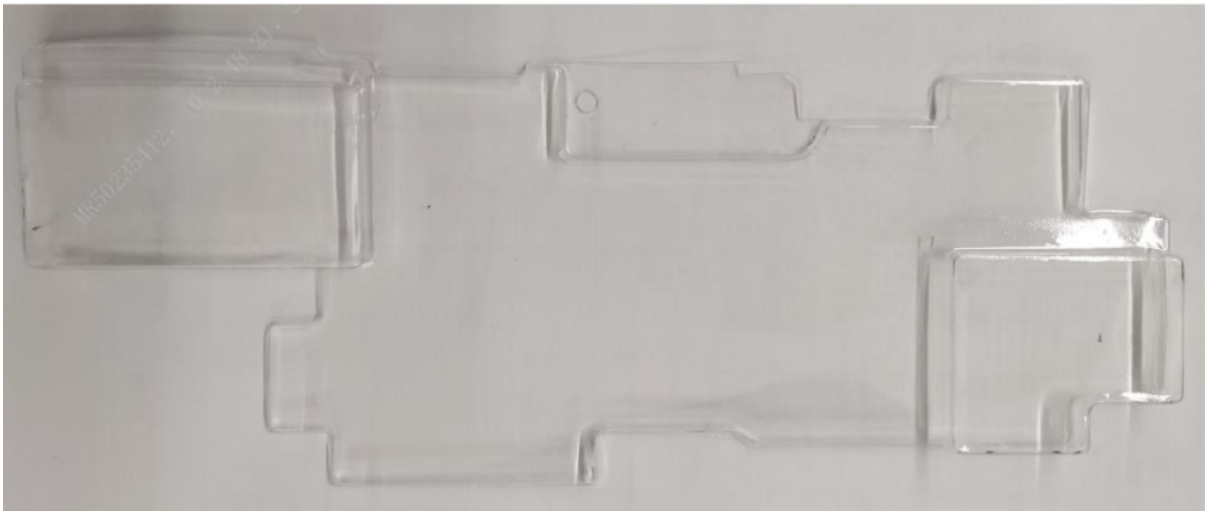
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Remove the electrode base according to "Removing the Electrode Base Assembly and In-position Self-check Resistor Connector" in **7.4** Main Unit Disassembly.

7.63.3 Commissioning and Verification

None

7.64 Power Management Board Insulation Sheet

7.64.1 General Information

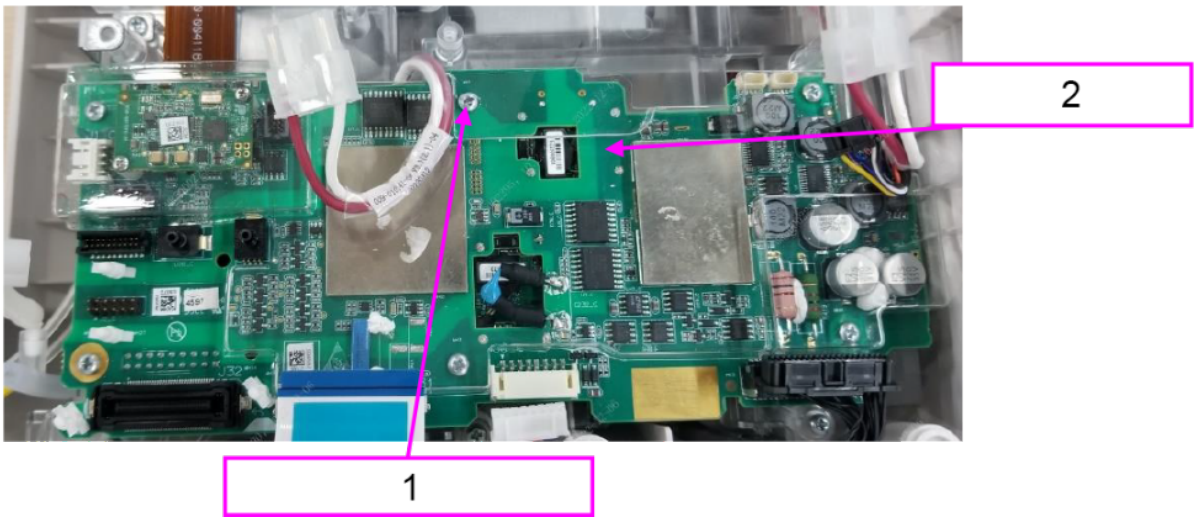


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
048-011303-00	Power management board insulation sheet	None	None

7.64.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the 0656 therapy board according to **7.22.2** Disassembly and Assembly.
4. Use a Phillips screwdriver to remove the PT3X8 cross recessed pan head self-tapping screw, and then take out the power management board insulation sheet.



1 One PT3X8 cross recessed pan head self-tapping screw

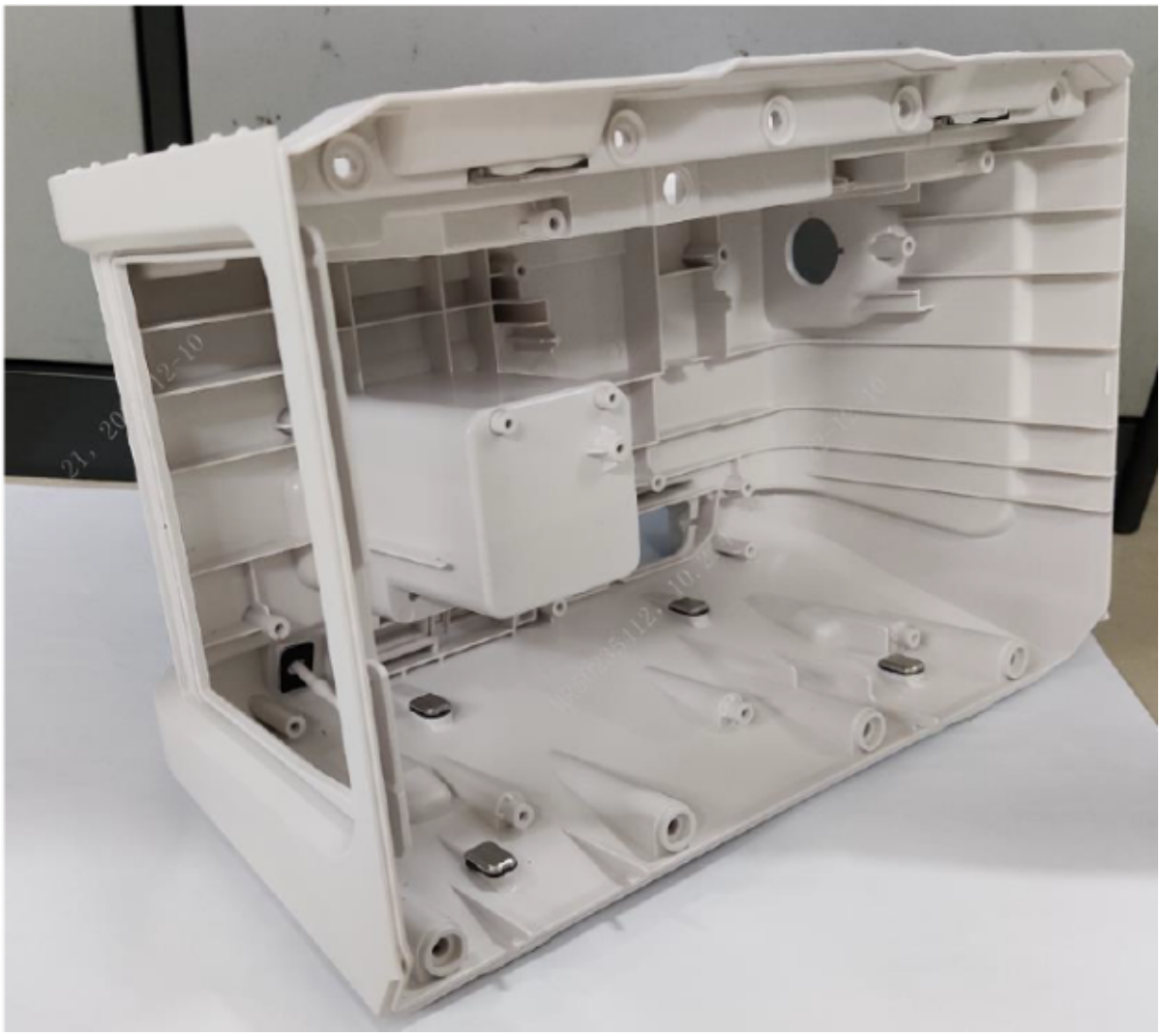
2 Power management board insulation sheet

7.64.3 Commissioning and Verification

None

7.65 Rear Cover (No CO2) FRU

7.65.1 General Information



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090904-00	Rear cover (no CO2) FRU	049-002539-00	IO cover

7.65.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the defibrillation D30 ACDC input wire according to **7.58.2** Disassembly and Assembly.

4. Remove the internal wire to defibrillator socket (D30 and D60) according to **7.68.2** Disassembly and Assembly.
5. Remove the paddle material kit FRU according to **7.61.2** Disassembly and Assembly.
6. Remove and replace the front cover.

7.65.3 Commissioning and Verification

None

7.66 Rear Cover (CO2) FRU

7.66.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090908-00	Rear cover (CO2) FRU	049-002539-00	IO Cover

7.66.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the defibrillation D30 ACDC input wire according to **7.58.2** Disassembly and Assembly.
4. Remove the internal wire to defibrillator socket (D30 and D60) according to **7.68.2** Disassembly and Assembly.
5. Remove the paddle material kit FRU according to **7.61.2** Disassembly and Assembly.
6. Remove the CO2 interface assembly FRU according to **7.29.2** Disassembly and Assembly.
7. Remove the M02D module (0656) FRU according to **7.39.2** Disassembly and Assembly.
8. Remove and replace the front cover.

7.66.3 Commissioning and Verification

None

7.67 Speaker Assy FRU

7.67.1 General Information

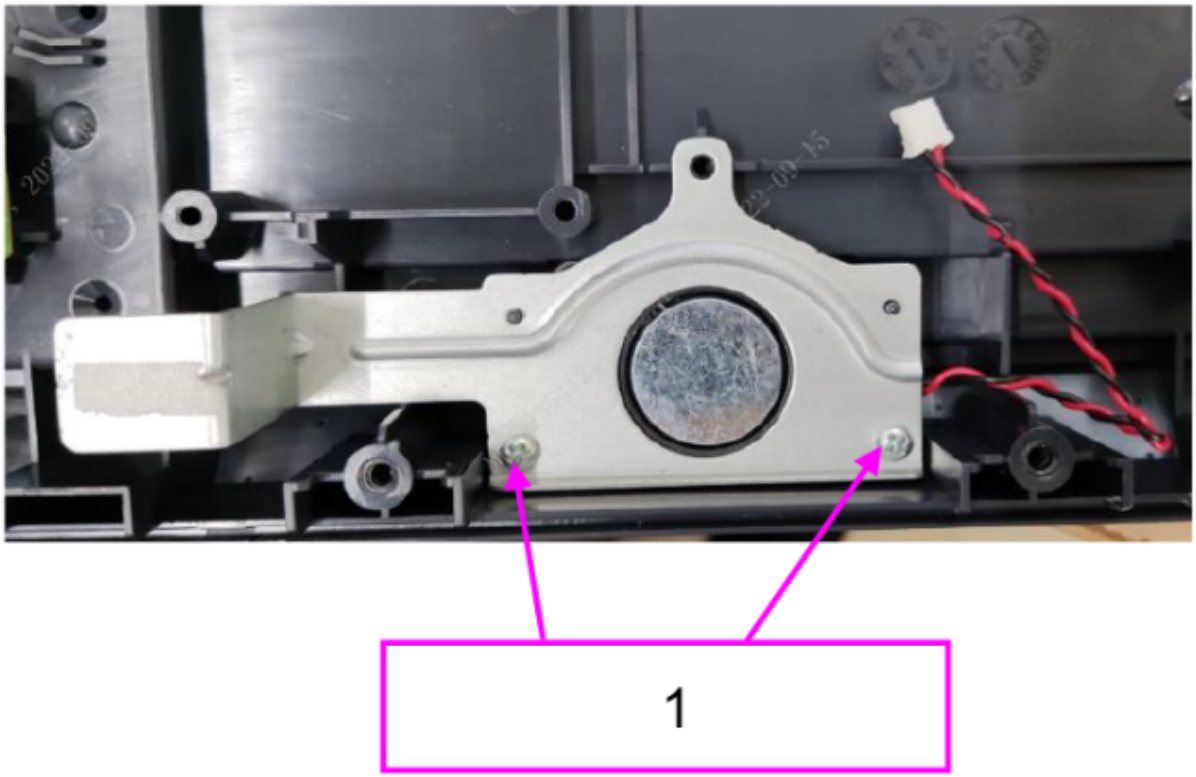
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090858-00	Speaker assy	None	None

7.67.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Disassemble the main unit according to **7.4** Main Unit Disassembly.
3. Remove the 4G/5G/Wi-Fi module.
4. Remove the 0656 D30 indicator PCBA according to **7.12.2** Disassembly and Assembly.

5. Remove the 0656 mainboard PCBA (D30) according to **7.71.2** Disassembly and Assembly.
6. Use a Phillips screwdriver to remove the two PT3X8 cross recessed pan head self-tapping screws, and then remove the speaker support and speaker for replacement.



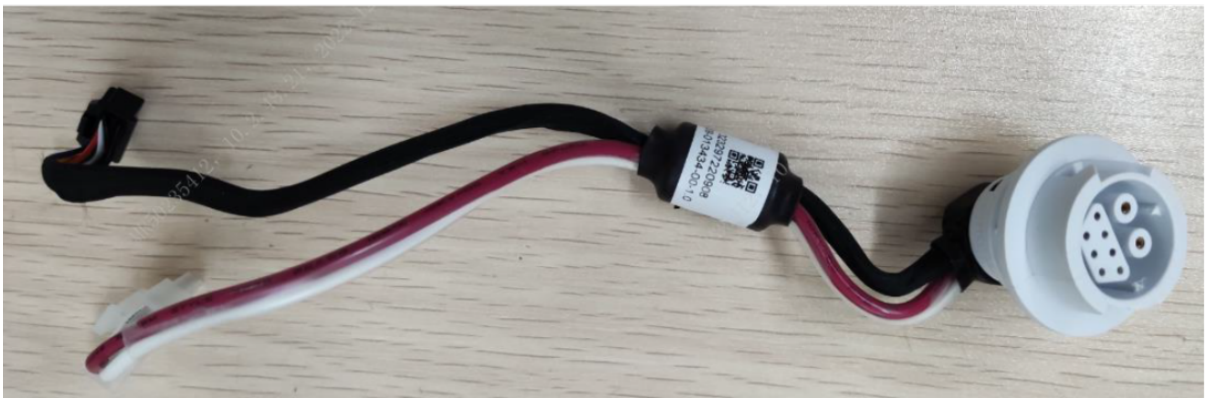
1 Two PT3X8 self-tapping screws

7.67.3 Commissioning and Verification

None

7.68 Internal Wire to Defibrillator Socket (D30 and D60)

7.68.1 General Information

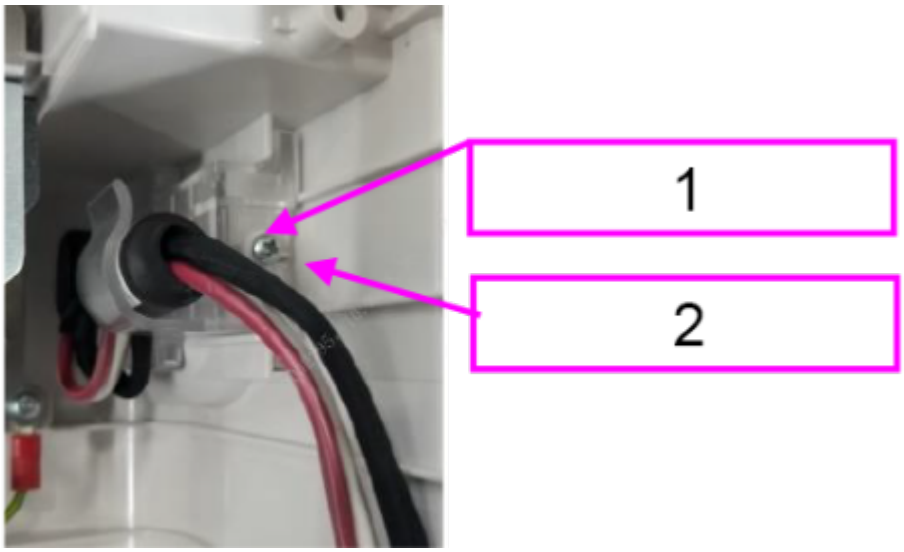


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-013434-00	Internal wire to defibrillator socket (D30 and D60)	None	None

7.68.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove the defibrillation interface pin according to **7.59.2** Disassembly and Assembly.
4. Use a Phillips screwdriver to remove the PT3X8 self-tapping screw, pull out the locking pin, and remove the internal wire to defibrillator socket.



1 One PT3X8 self-tapping screw

2 Locking pin

7.68.3 Commissioning and Verification

None

7.69 Adult sternum paddle kit (0655)

7.69.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-069139-00	Adult sternum paddle kit (0655)	None	None

7.69.2 Disassembly and Assembly

Specific Steps

1. Press the door lock button on the adult paddle.
2. Pull forward and remove the adult paddle electrodes.

7.69.3 Commissioning and Verification

None

7.70 Adult apex paddle kit (0655)

7.70.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-069140-00	Adult apex paddle kit (0655)	None	None

7.70.2 Disassembly and Assembly

Specific Steps

1. Press the door lock button on the adult paddle.
2. Pull forward and remove the adult paddle electrodes.

7.70.3 Commissioning and Verification

None

7.71 0656 MAINBOARD PCBA (D30) FRU

7.71.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-091172-00	0656 MAINBOARD PCBA (D30) FRU	None	None

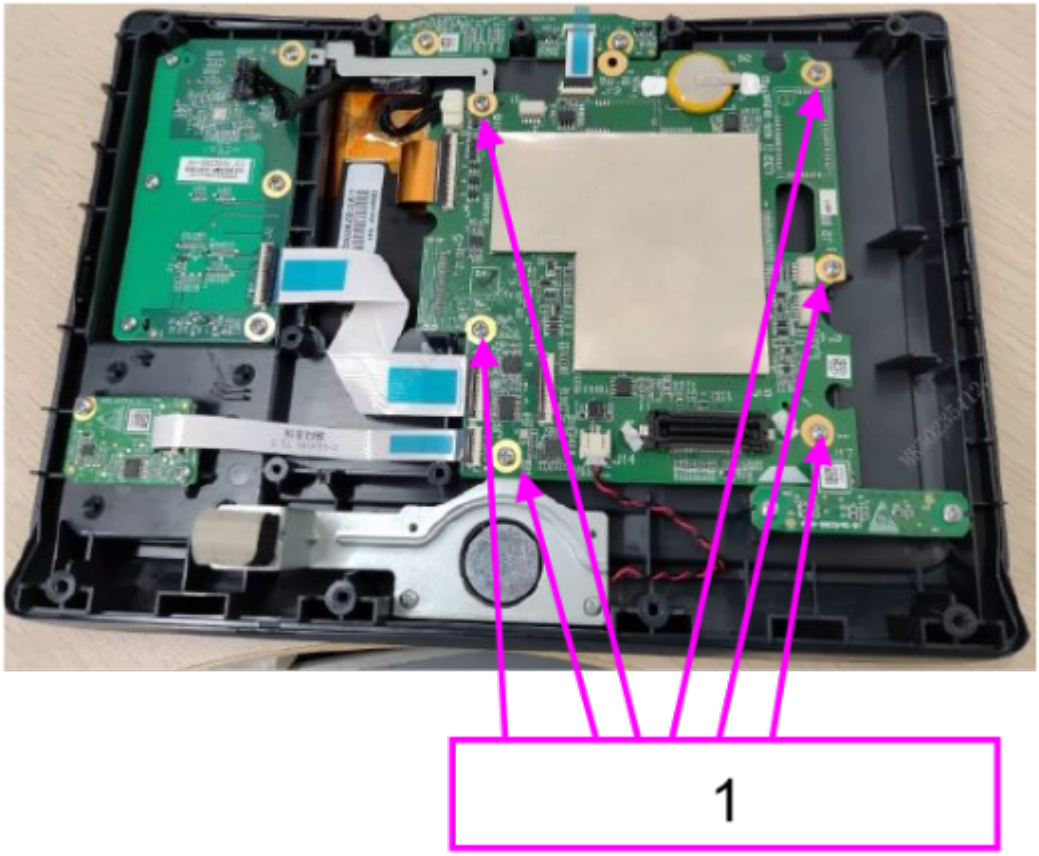
7.71.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. For the disassembly of the 4G/5G/WIFI board, see WIFI Materlal Kit FRU **7.77.2** Disassembly and Assembly, 4G Module (AU) FRU **7.24.2** Disassembly and Assembly, 4G Material Kit (EU)

FRU **7.25.2** Disassembly and Assembly and 5G Material Kit FRU **7.27.2** Disassembly and Assembly.

4. For the disassembly of the 0656 D30 indicator board, see the 0656 D30 Indicator PCBA **7.12.2** Disassembly and Assembly.
5. Unplug the keypad backup connector, and open the clips of the FFC cable connecting the alarm LED board to the main control board, speaker cable, FFC cable connecting the keypad to the main control board, FFC cable connecting the coder board to the main control board, and FPC cable connecting the display to the main control board.
6. Use a Phillips screwdriver to remove the six PT3X8 cross recessed pan head self-tapping screws, and then take out the main control board. After replacing the main control board, insert the cables back.



1 Six PT3X8 self-tapping screws

7.71.3 Commissioning and Verification

None

7.72 D30 Front Cover Assy FRU

7.72.1 General Information

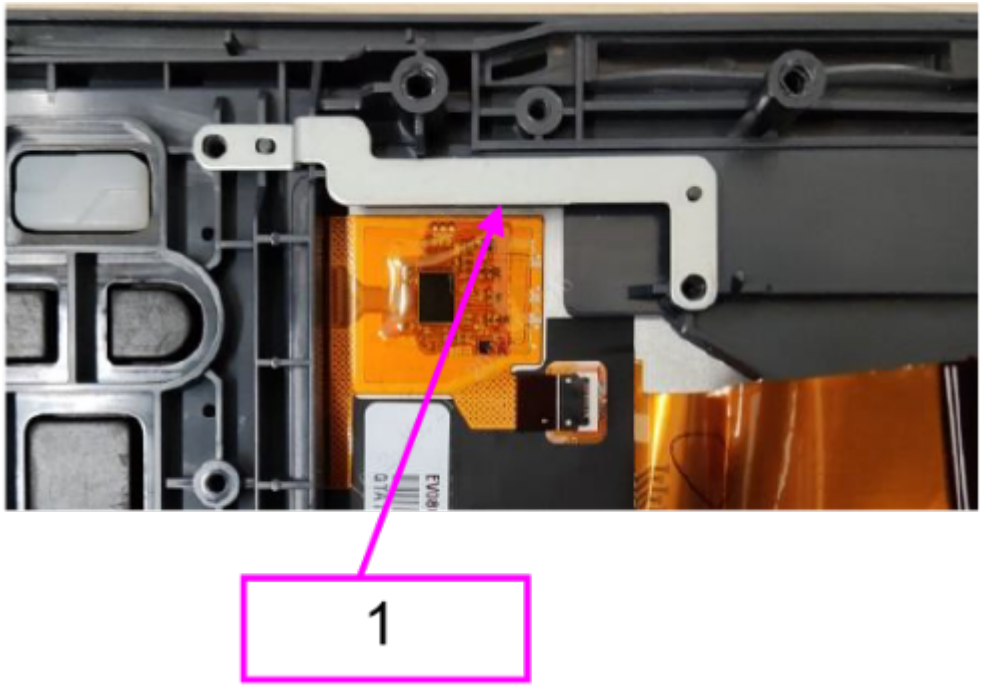
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090926-00	D30 Front Cover Assy FRU	None	None

7.72.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. For the disassembly of the 4G/5G/WIFI board, see WIFI Materlal Kit FRU **7.77.2** Disassembly and Assembly, 4G Module (AU) FRU **7.24.2** Disassembly and Assembly, 4G Material Kit (EU) FRU **7.25.2** Disassembly and Assembly and 5G Material Kit FRU **7.27.2** Disassembly and Assembly.
4. For the disassembly of the 0656 D30 indicator board, see the 0656 D30 Indicator PCBA **7.12.2** Disassembly and Assembly.

5. For the disassembly of the 0656 main control board, see the 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.
6. For the disassembly of the alarm lamp board, see the 0656 D30 Alarm PCBA **7.9.2** Disassembly and Assembly.
7. For the disassembly of the keyboard, see the 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.
8. For the disassembly of the defibrillation knob, see the Defibrillation Knob **7.60.2** Disassembly and Assembly.
9. For the disassembly of the knob encoder board, see the 0656 D30 Coder PCBA **7.11.2** Disassembly and Assembly.
10. For the disassembly of the speaker assembly, see the Speaker Assy FRU **7.67.2** Disassembly and Assembly.
11. Remove and replace the ground sheet metal.



1 Ground sheet metal

7.72.3 Commissioning and Verification

None

7.73 D20 Front Cover Assy FRU

7.73.1 General Information

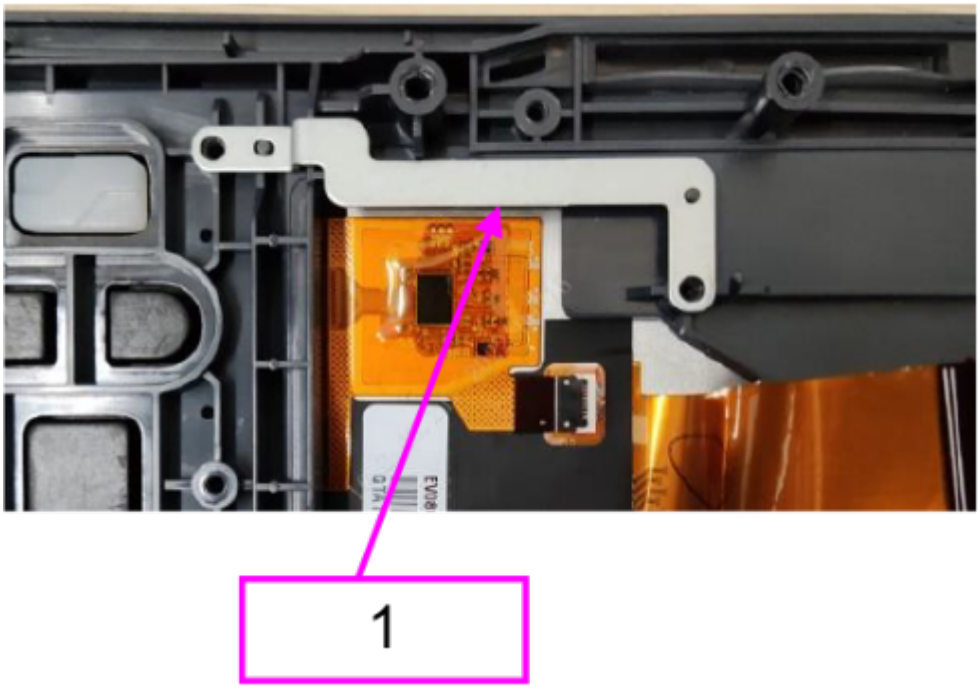
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090927-00	D20 Front Cover Assy FRU	None	None

7.73.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. For the disassembly of the 4G/5G/WIFI board, see WIFI Materlal Kit FRU **7.77.2** Disassembly and Assembly, 4G Module (AU) FRU **7.24.2** Disassembly and Assembly, 4G Material Kit (EU) FRU **7.25.2** Disassembly and Assembly and 5G Material Kit FRU **7.27.2** Disassembly and Assembly.
4. For the disassembly of the 0656 D30 indicator board, see the 0656 D30 Indicator PCBA **7.12.2** Disassembly and Assembly.

5. For the disassembly of the 0656 main control board, see the 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.
6. For the disassembly of the alarm lamp board, see the 0656 D30 Alarm PCBA **7.9.2** Disassembly and Assembly.
7. For the disassembly of the keyboard, see the 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.
8. For the disassembly of the defibrillation knob, see the Defibrillation Knob **7.60.2** Disassembly and Assembly.
9. For the disassembly of the knob encoder board, see the 0656 D30 Coder PCBA **7.11.2** Disassembly and Assembly.
10. For the disassembly of the speaker assembly, see the Speaker Assy FRU **7.67.2** Disassembly and Assembly.
11. Remove and replace the ground sheet metal.



1 Ground sheet metal

7.73.3 Commissioning and Verification

None

7.74 D20A Front Cover Assy FRU

7.74.1 General Information

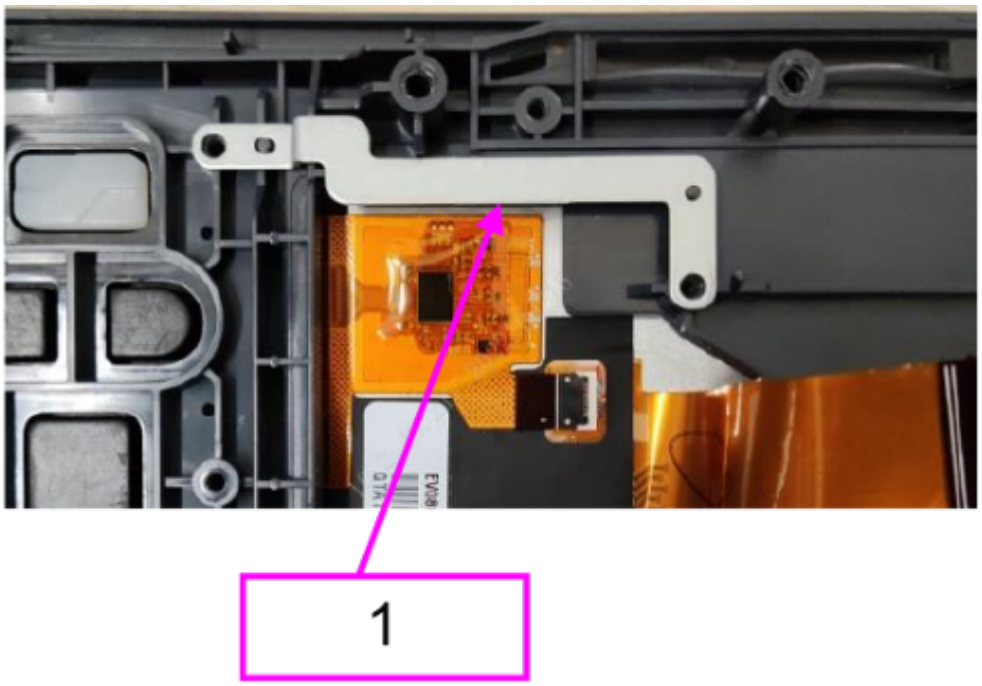
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090928-00	D20A Front Cover Assy FRU	None	None

7.74.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. For the disassembly of the 4G/5G/WIFI board, see WIFI Materlal Kit FRU **7.77.2** Disassembly and Assembly, 4G Module (AU) FRU **7.24.2** Disassembly and Assembly, 4G Material Kit (EU) FRU **7.25.2** Disassembly and Assembly and 5G Material Kit FRU **7.27.2** Disassembly and Assembly.
4. For the disassembly of the 0656 D30 indicator board, see the 0656 D30 Indicator PCBA **7.12.2** Disassembly and Assembly.

5. For the disassembly of the 0656 main control board, see the 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.
6. For the disassembly of the alarm lamp board, see the 0656 D30 Alarm PCBA **7.9.2** Disassembly and Assembly.
7. For the disassembly of the keyboard, see the 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.
8. For the disassembly of the defibrillation knob, see the Defibrillation Knob **7.60.2** Disassembly and Assembly.
9. For the disassembly of the knob encoder board, see the 0656 D30 Coder PCBA **7.11.2** Disassembly and Assembly.
10. For the disassembly of the speaker assembly, see the Speaker Assy FRU **7.67.2** Disassembly and Assembly.
11. Remove and replace the ground sheet metal.



1 Ground sheet metal

7.74.3 Commissioning and Verification

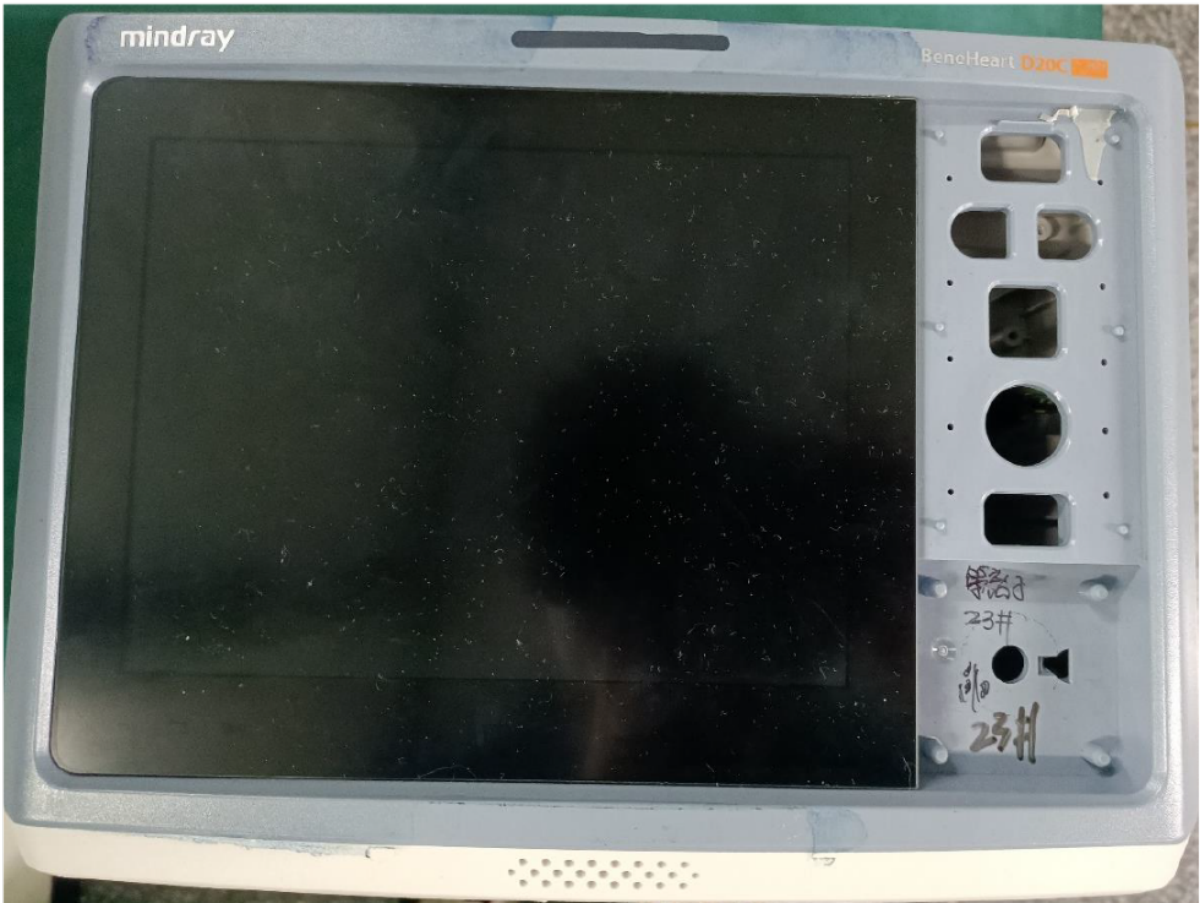
None

7.75 D20C Front Cover Assy FRU

7.75.1 Commissioning and Verification

None

7.75.2 General Information



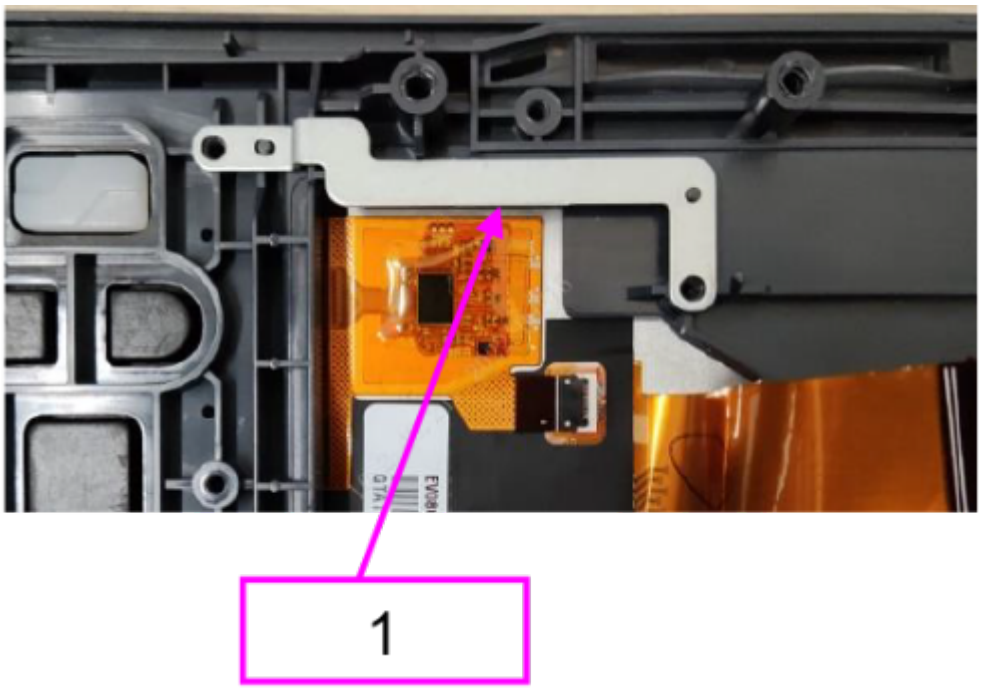
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-090929-00	D20C Front Cover Assy FRU	None	None

7.75.3 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. For the disassembly of the 4G/5G/WIFI board, see WIFI Materlal Kit FRU **7.77.2** Disassembly and Assembly, 4G Module (AU) FRU **7.24.2** Disassembly and Assembly, 4G Material Kit (EU) FRU **7.25.2** Disassembly and Assembly and 5G Material Kit FRU **7.27.2** Disassembly and Assembly.
4. For the disassembly of the 0656 D30 indicator board, see the 0656 D30 Indicator PCBA **7.12.2** Disassembly and Assembly.
5. For the disassembly of the 0656 main control board, see the 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

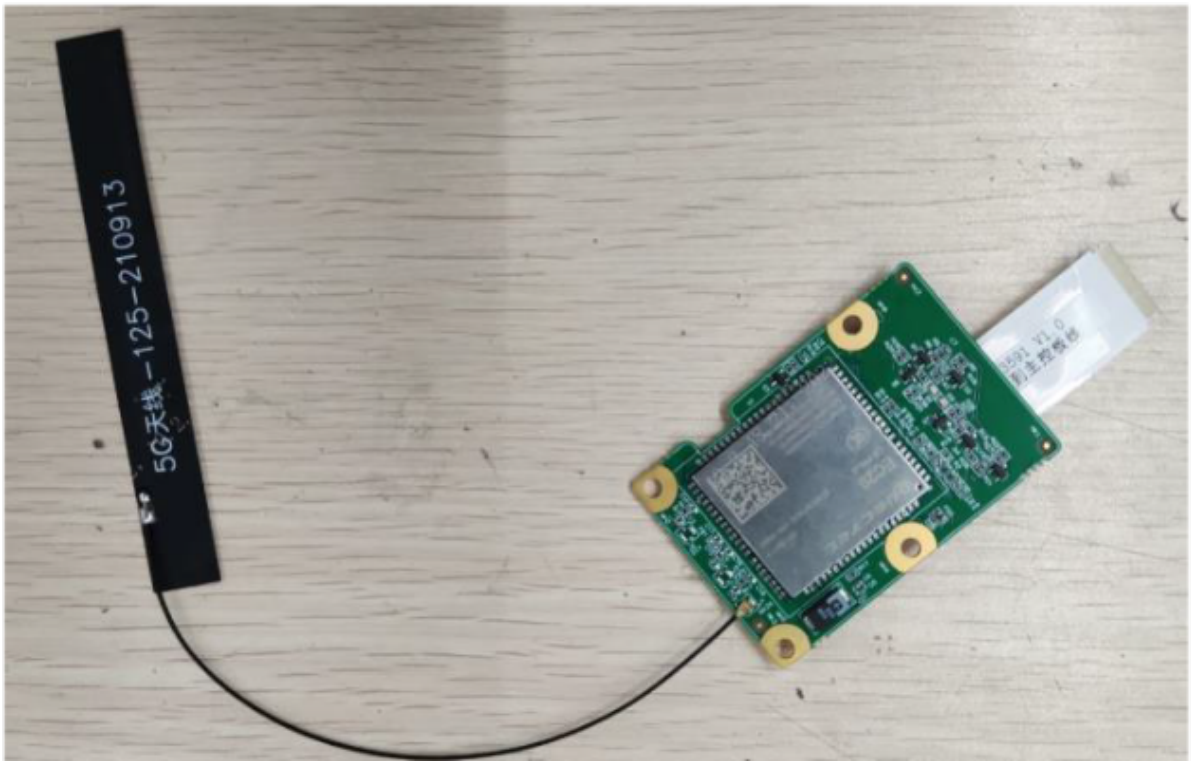
6. For the disassembly of the alarm lamp board, see the 0656 D30 Alarm PCBA **7.9.2** Disassembly and Assembly.
7. For the disassembly of the keyboard, see the 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.
8. For the disassembly of the defibrillation knob, see the Defibrillation Knob **7.60.2** Disassembly and Assembly.
9. For the disassembly of the knob encoder board, see the 0656 D30 Coder PCBA **7.11.2** Disassembly and Assembly.
10. For the disassembly of the speaker assembly, see the Speaker Assy FRU **7.67.2** Disassembly and Assembly.
11. Remove and replace the ground sheet metal.



1 Ground sheet metal

7.76 0656 4G(CN) FRU

7.76.1 General Information

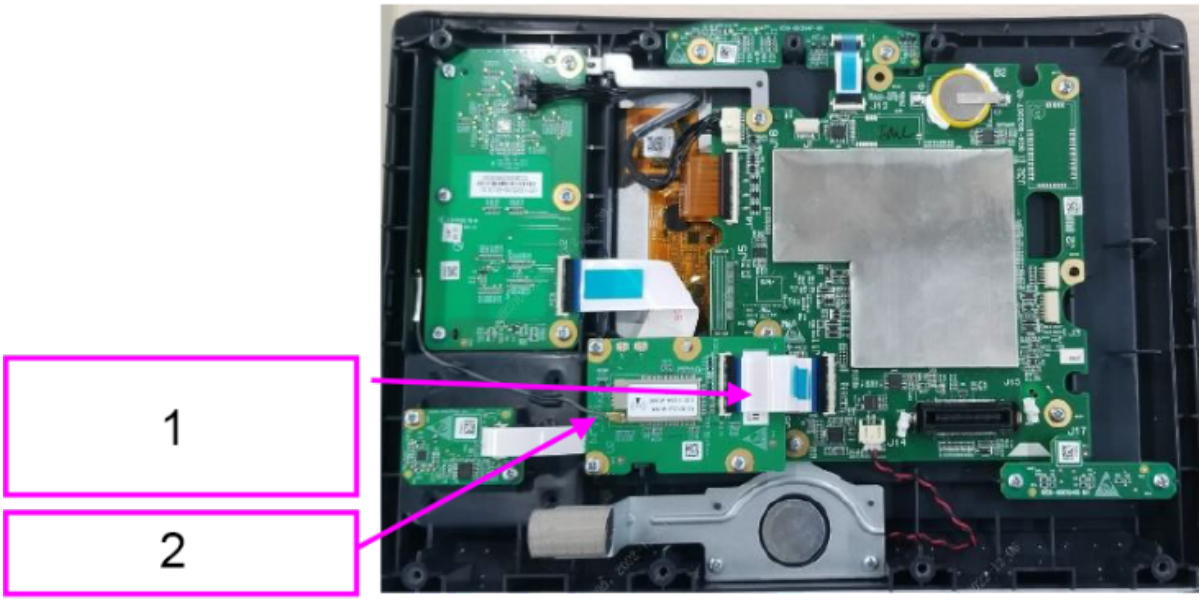


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-097033-00	0656 4G(CN) FRU	009-013591-00	Wire FFC 30pin Pitch 0.5mm
		009-013583-00	Wire FFC 12pin Pitch 0.5mm

7.76.2 Disassembly and Assembly

Specific Steps

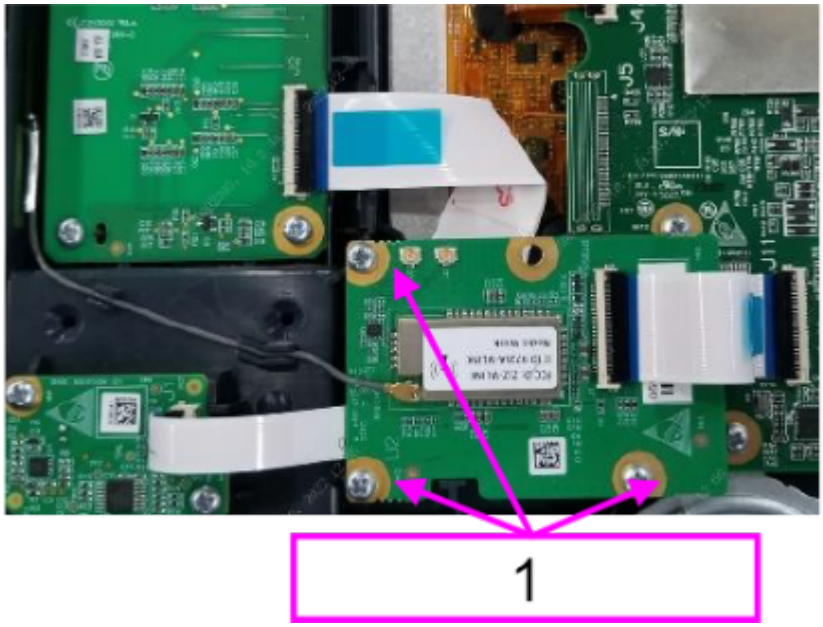
1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. Remove connecting wires from the front cover assembly: Unplug the Wi-Fi/4G/5G module connecting wire, and remove the antenna from the Wi-Fi module.



1 Wi-Fi/4G/5G module connecting wire

2 Antenna

4. Remove the Wi-Fi module: Use a Phillips screwdriver to remove the three PT3X8 cross recessed pan head self-tapping screws, and then remove the Wi-Fi PCBA (remove the 4G/5G module in the same way).



1 PT3X8 self-tapping screws

7.76.3 Commissioning and Verification

None

7.77 WIFI Materlal Kit FRU

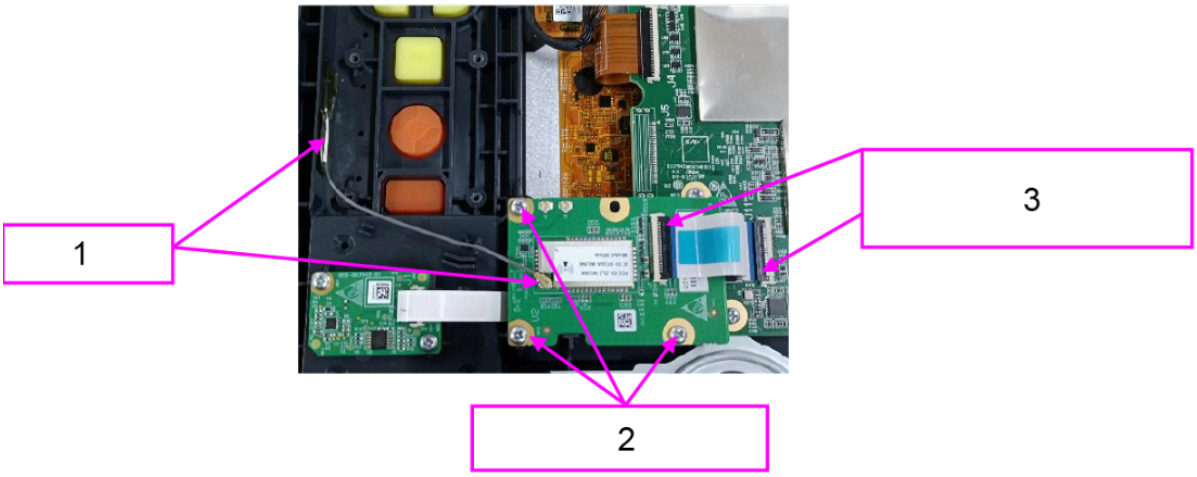
7.77.1 General Information

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-097034-00	WIFI Materlal Kit FRU	None	None

7.77.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. For the disassembly of the keyboard, see the 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.
4. Tighten the three PT3X8 cross recessed pan head self-tapping screws with a Phillips screwdriver to secure the Wi-Fi carrier board.
5. Attach the antenna as shown in the following figure, and then insert the wire FFC 30pin pitch 0.5mm (same aide connection) to the Wi-Fi carrier board and matching socket on the main control board.



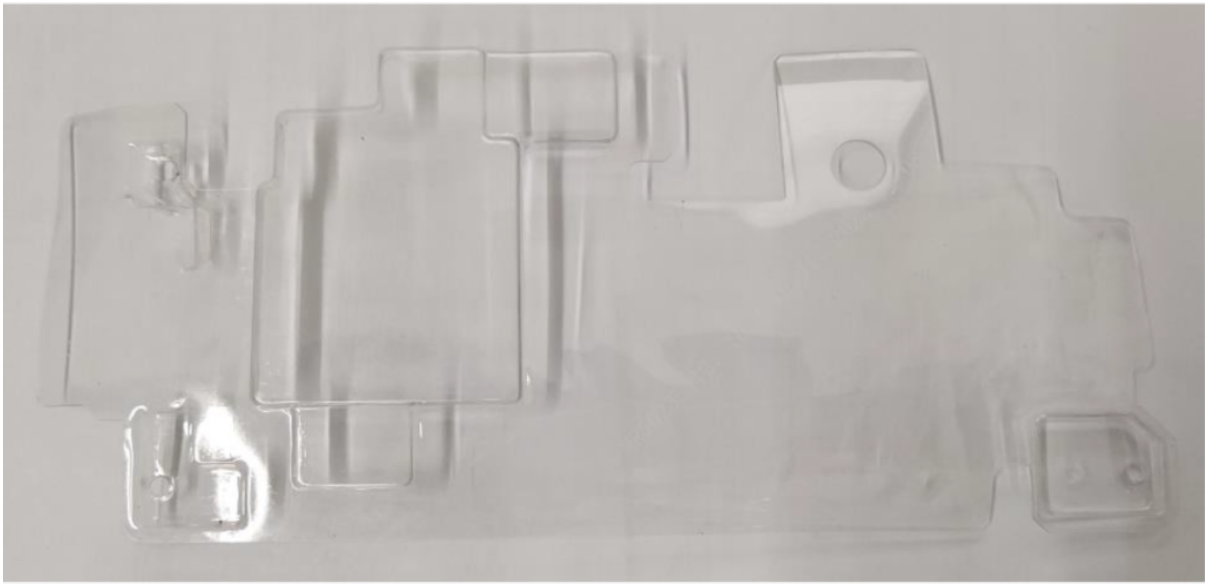
1 Wi-Fi antenna
2 Three PT3X8 self-tapping screws
3 Open the FFC clips and insert the FFC cable

7.77.3 Commissioning and Verification

None

7.78 0656 therapy board insulating sheet assembly FRU

7.78.1 General Information



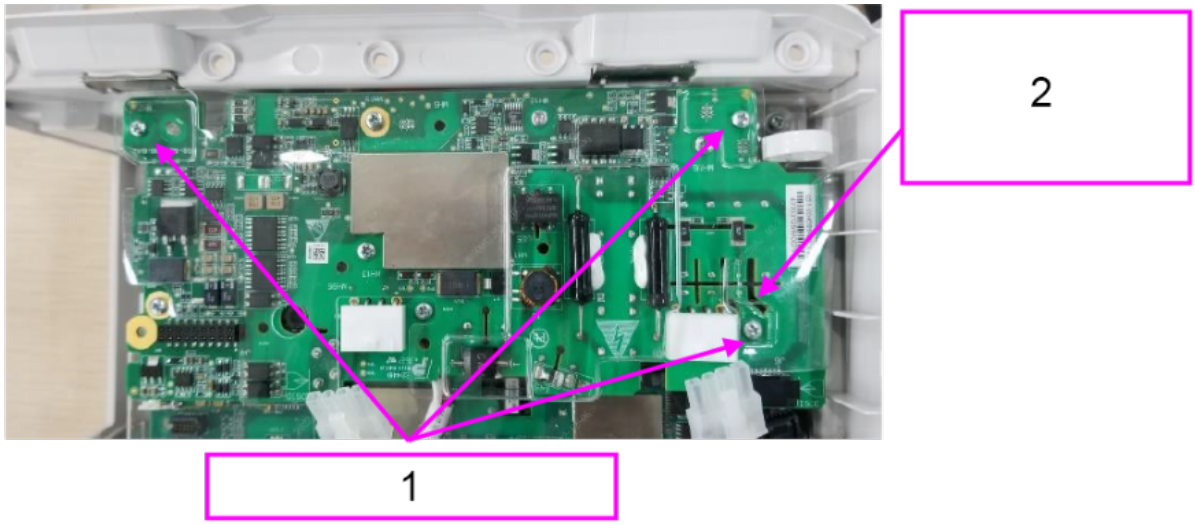
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-097036-00	0656 therapy board insulating sheet assembly FRU	None	None

7.78.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. For the disassembly of the MPM material kit (ECG+Masimo SPO2+NIBP), see the MPM (ECG +Masimo SPO2+NIBP) FRU **7.53.2** Disassembly and Assembly.

4. Use a Phillips screwdriver to remove the three PT3X8 cross recessed pan head self-tapping screws, and then take out the therapy board insulation sheet. Note: When installing the insulation sheet, fit its protruding part into the isolation slot of the therapy board.



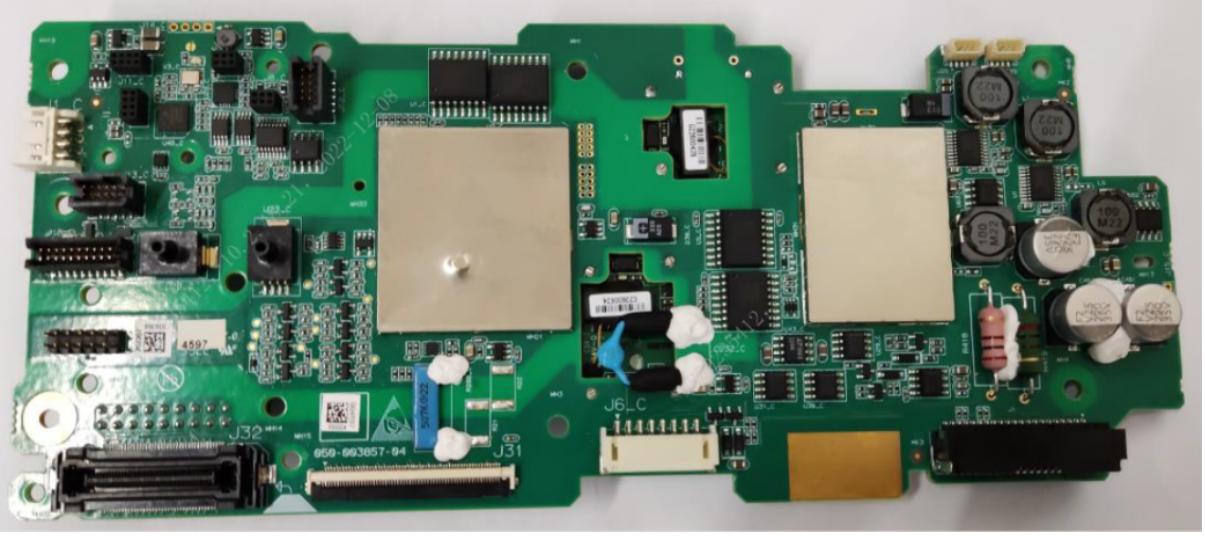
1	Three PT3X8 cross recessed pan head self-tapping screws
2	Therapy board insulation sheet (fit its protruding part into the isolation slot of the therapy board)

7.78.3 Commissioning and Verification

None

7.79 Parameter PCBA (Ext_Arr 12L_ST glasgow)

7.79.1 General Information



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-097872-00	Parameter PCBA (Ext_Arr 12L_ST glasgow)	None	None

7.79.2 Disassembly and Assembly

Specific Steps

1. Make preparations according to **7.1** Preparation Before Disassembly.
2. Separate the front and rear cover assemblies according to **7.4** Main Unit Disassembly.
3. For the disassembly of 0656 Power & Parameter-Therapy FPC PCBA, see the 0656 Power & Parameter-Therapy FPC PCBA FRU **7.16.2** Disassembly and Assembly.
4. If the SpO2 module is configured, remove the Mindray SpO2 material kit according to Mindray SpO2 Material Kit **7.41.2** Disassembly and Assembly.

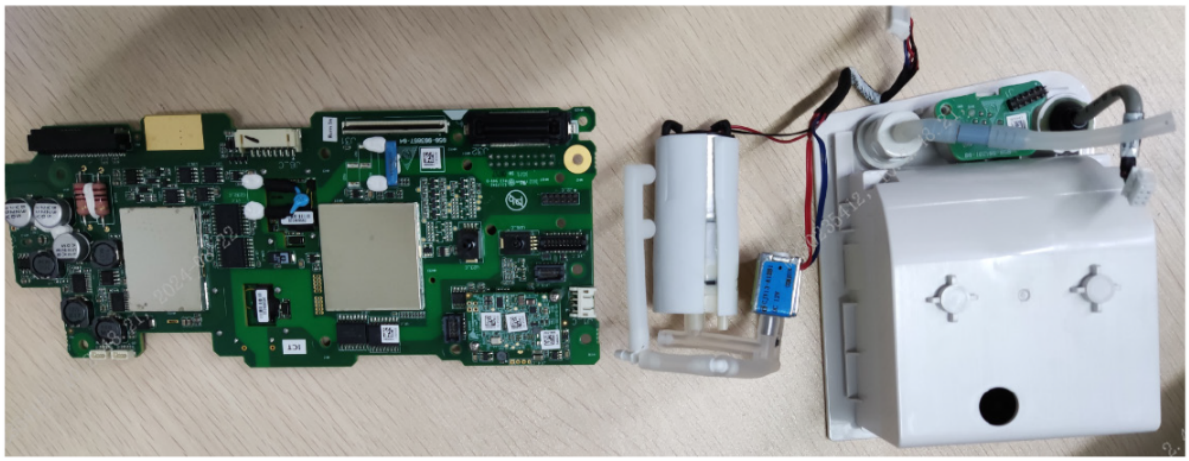
7.79.3 Commissioning and Verification

None

7.80 MRSpO2+NIBP upgrade package(0656)

7.80.1 General Information

Figure7–1

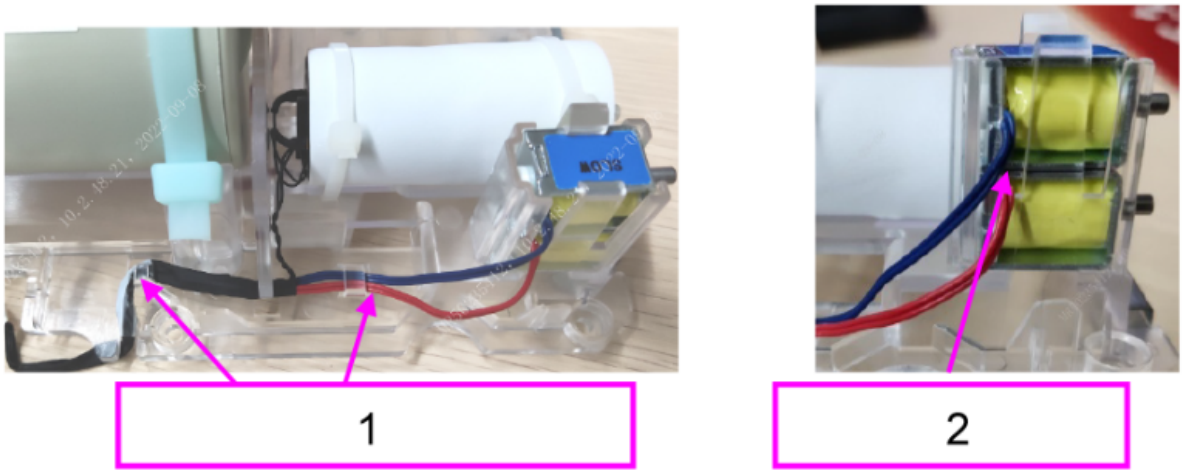


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-106164-00	MRSpO2+NIBP upgrade package(0656)	None	None

7.80.2 Disassembly and Assembly

1. Make preparations
2. Front and rear shell removal
3. 0656 Power parameters - Treatment connector FPC PCBA FRU disassembly
4. Take two cable ties to fix the pump valve to the main support, and clamp the pump valve wire to the main support according to the figure below.

Figure7–2

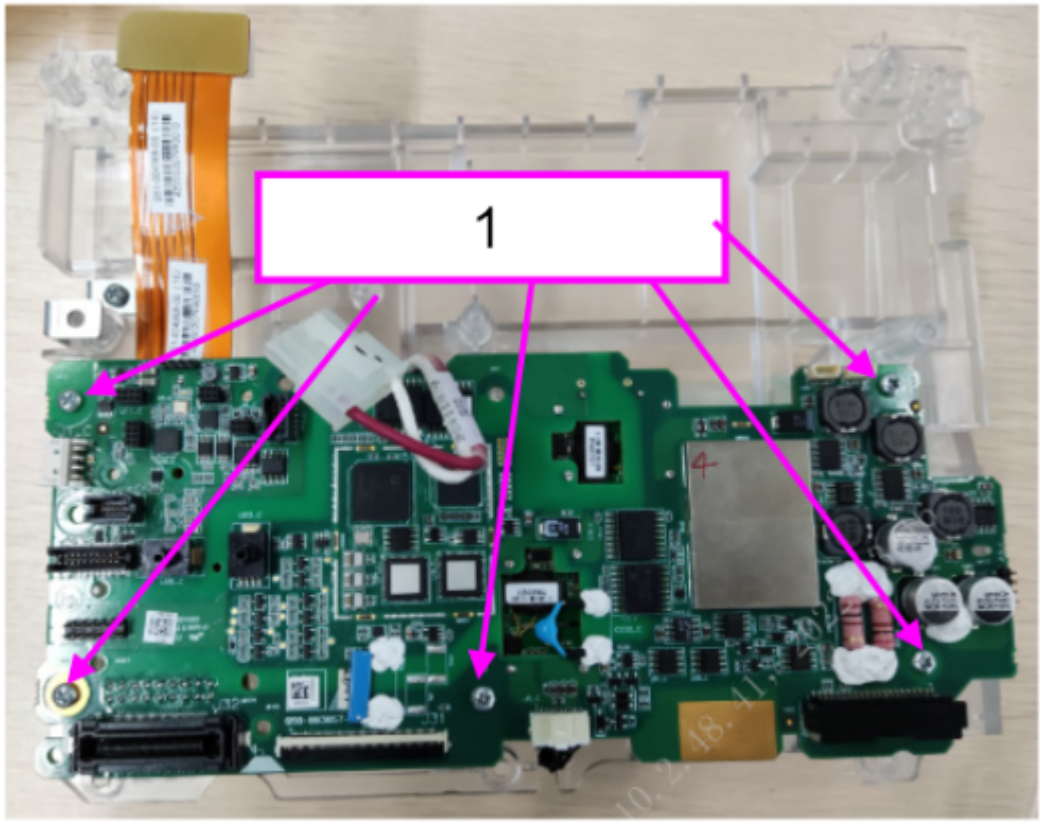


1 The pump valve cable is stuck to the buckle of the main support

2 The valve cable exits from the side

5. Secure the parameter power supply board in the upgrade package to the main support using tapping screws.

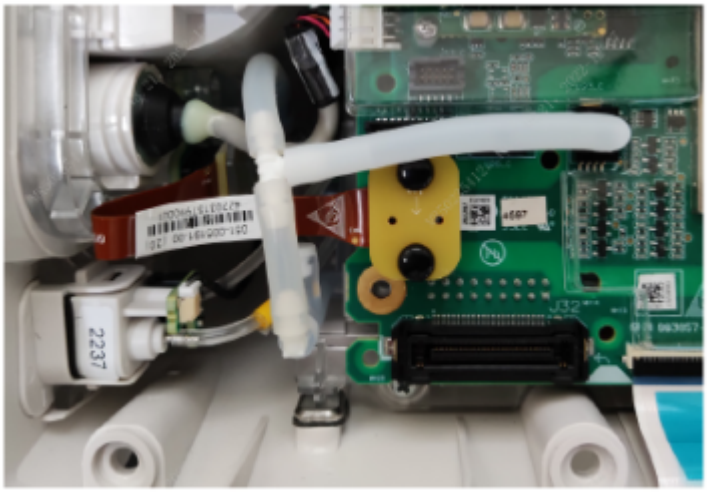
Figure7–3



1 5 PT3X8 tapping screws

6. Replace the parameter surface assembly and connect related cables.

Figure7–4



7. After replacing the spare part, reinstall the machine by referring to the procedure for removing it.

7.80.3 Commissioning and Verification

None

7.81 MRSpO2 upgrade package(0656)

7.81.1 General Information

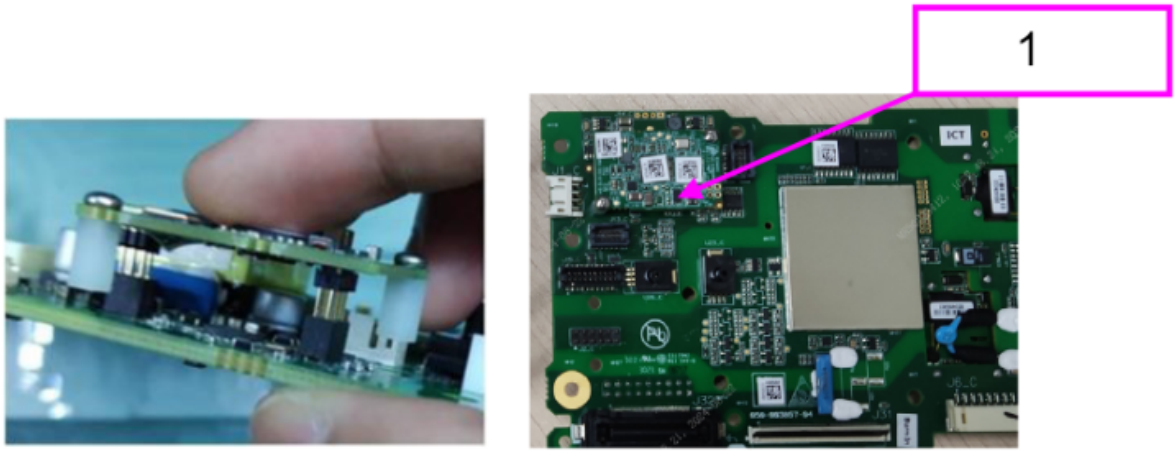
Figure7–5

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-106163-00	MRSpO2 upgrade package(0656)	None	None

7.81.2 Disassembly and Assembly

1. Make preparations .
2. Front and rear shell removal .
3. 0656 Power parameters - Treatment connector FPC PCBA FRU disassembly.
4. Install the SPO2 board to the parametric power board.

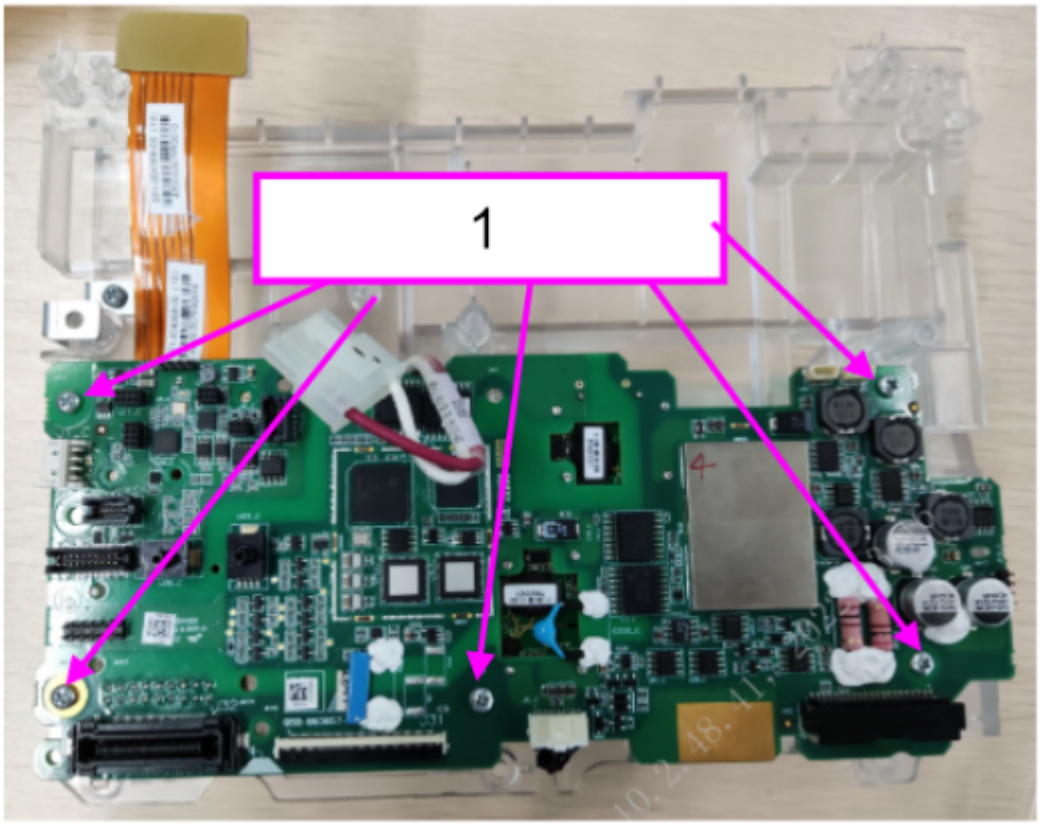
Figure7–6



1 SPO2n board card

5. Secure the parametric power supply board to the main support using self-tapping screws.

Figure7–7



1 5 PT3X8 tapping screws

6. After replacing the spare part, reinstall the machine by referring to the procedure for removing it.

7.81.3 Commissioning and Verification

None

7.82 BT Upgrade Kit(0656)

7.82.1 General Information

Figure7–8

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-105926-00	BT Upgrade Kit(0656)	None	None

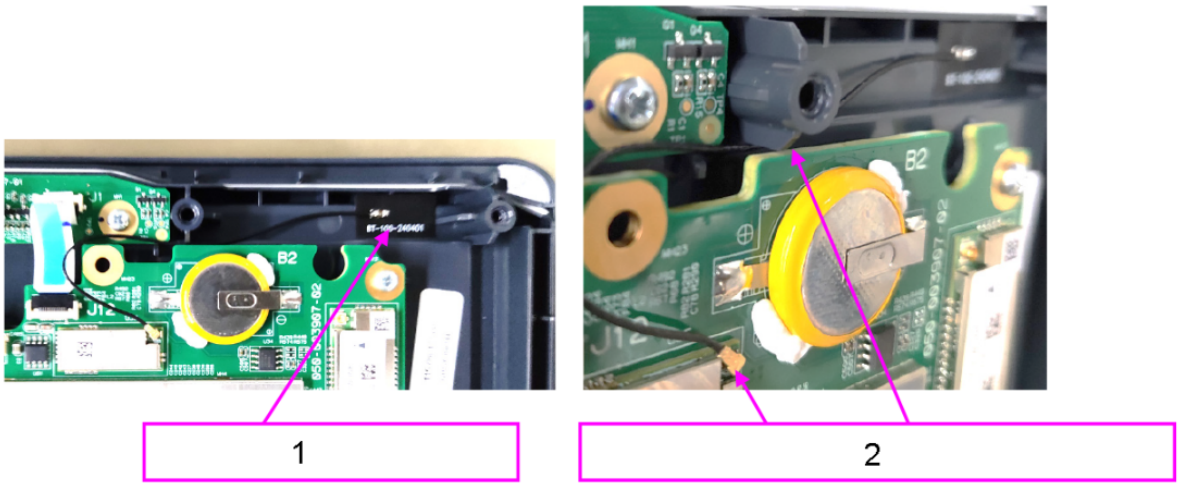
7.82.2 Disassembly and Assembly

1. Make preparations
2. Front and rear shell removal
3. Specific steps:

1) Remove the adhesive from the antenna and attach it to the position shown on the front shell.

2) Insert the antenna seat into the seat of the main control board card by following the following figure.

Figure7–9



1 Align the antenna with the plastic column on the front shell

2 Route the antenna from the bottom of the main control board and insert it into the seat of the main control board

4. After replacing the spare part, reinstall the machine by referring to the procedure for removing it.

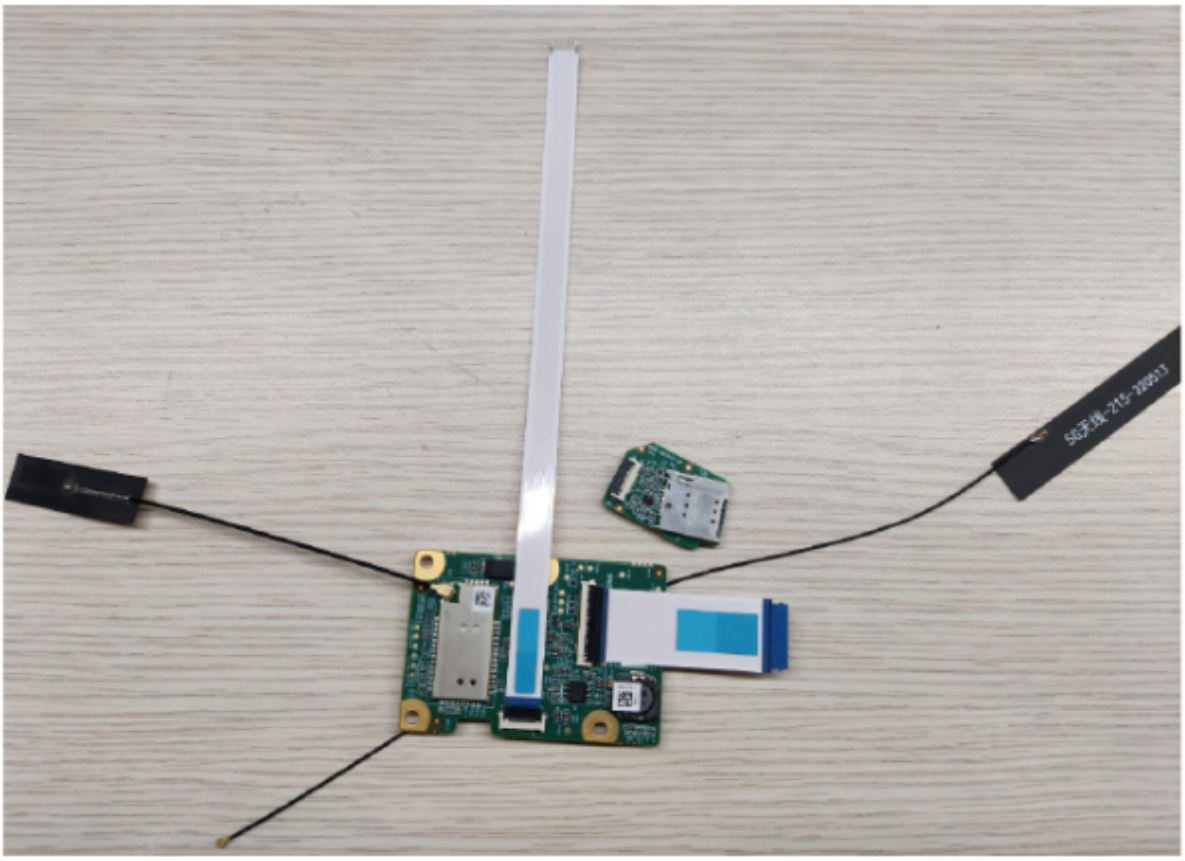
7.82.3 Commissioning and Verification

None

7.83 WiFi+4G module package(0656/EU) FRU

7.83.1 General Information

Figure7–10



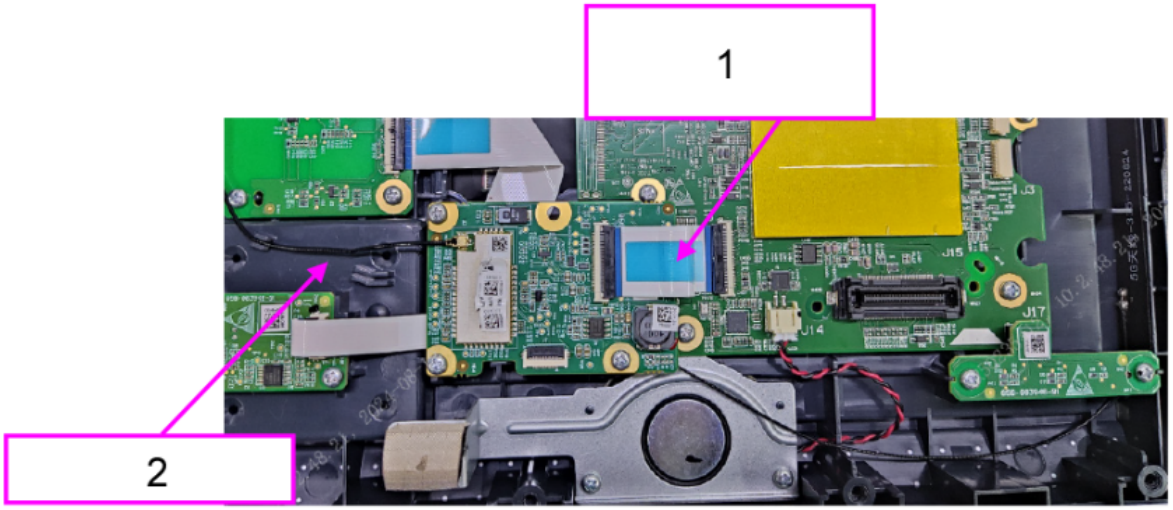
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-105986-00	iFi+4G module package(0656/EU) FRU	None	None

7.83.2 Disassembly and Assembly

1. Make preparations
2. .Disassemble the main unit
3. Remove the SIM card according to 0656 SIM card PCBA
4. Specific steps:

1) Remove the connection cable from the front shell assembly: connect the Wifi or 4G or 5G connection cable and unplug the WIFI antenna from the wireless module.

Figure7–11

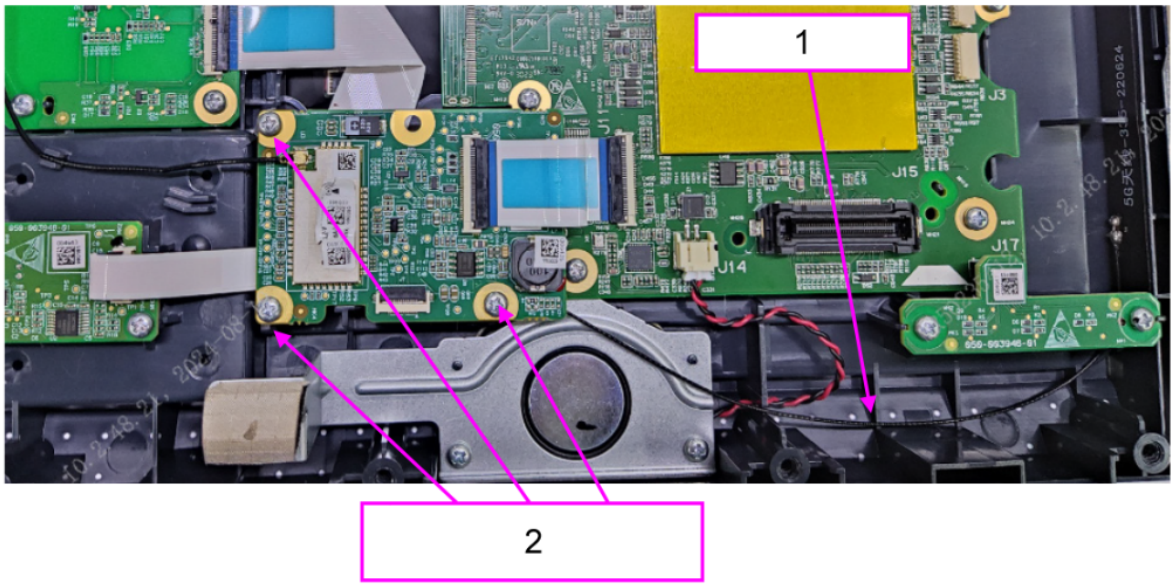


1 Wifi or 4G or 5G cable connection

2 WIFI antenna

2) Remove the WiFi+4G module: Use a Phillips screwdriver to remove the three PT3X8 cross pan head tapping screws, remove the WiFi+4G board PCBA, and remove the 4G antenna.

Figure7–12



1 4G antenna

2 3 PT3X8 tapping screws

5. After replacing the spare part, reinstall the machine by referring to the procedure for removing it.

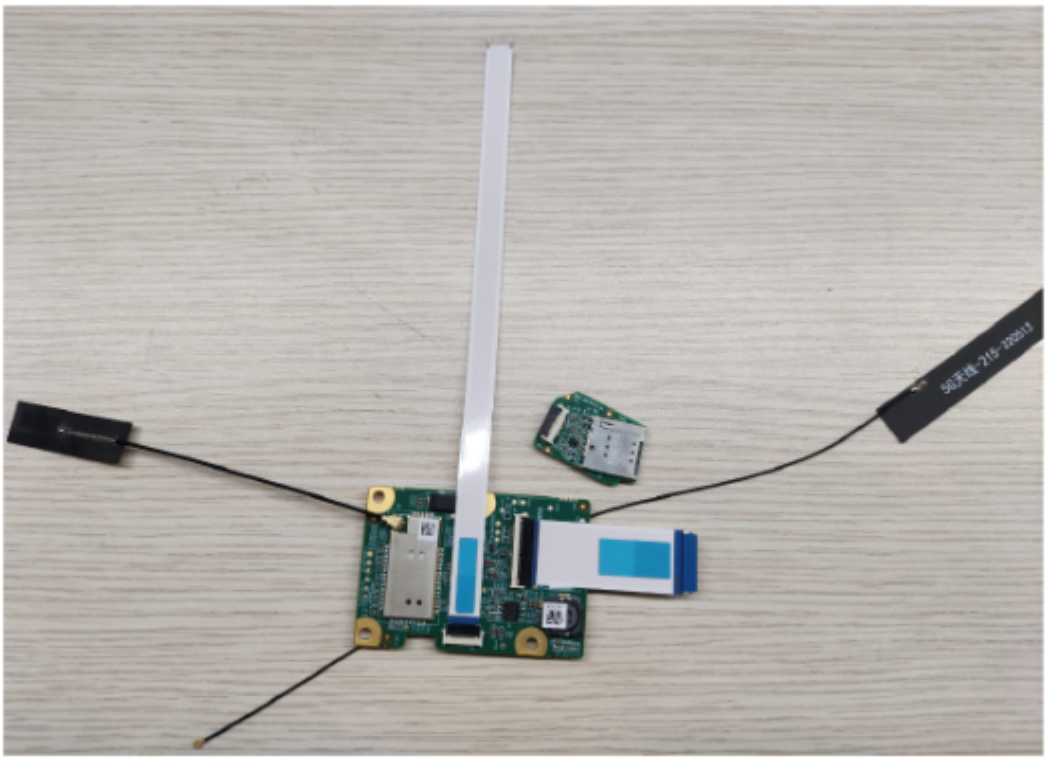
7.83.3 Commissioning and Verification

None

7.84 WiFi+4G module package(0656/AU) FRU

7.84.1 General Information

Figure7–13



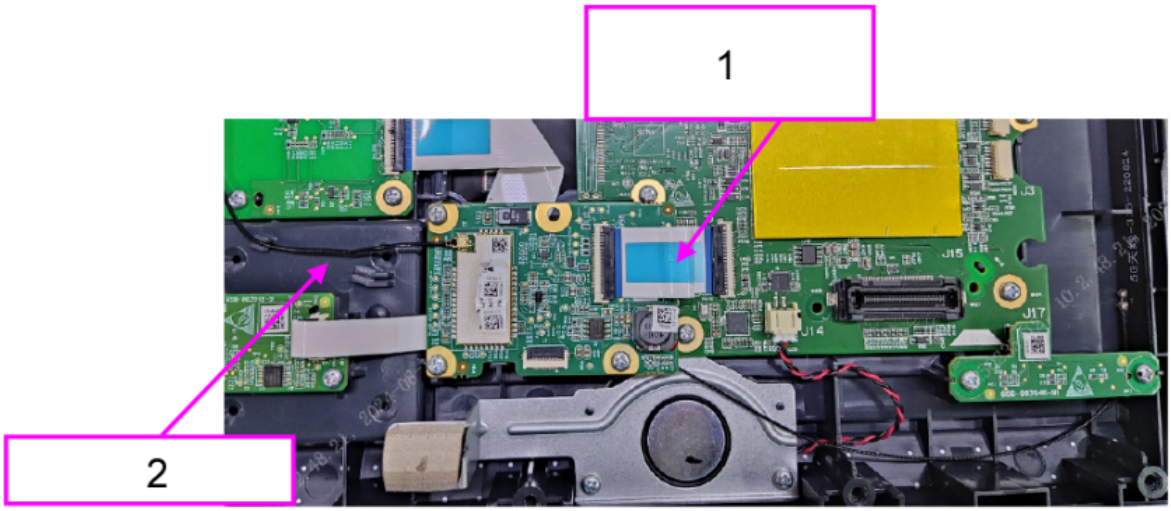
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-105985-00	WiFi+4G module package(0656/AU) FRU	None	None

7.84.2 Disassembly and Assembly

1. Make preparations .
2. .Disassemble the main unit .
3. Remove the SIM card according to 0656 SIM card PCBA.
4. Specific steps:

1) Remove the connection cable from the front shell assembly: connect the Wifi or 4G or 5G connection cable and unplug the WIFI antenna from the wireless module.

Figure7–14

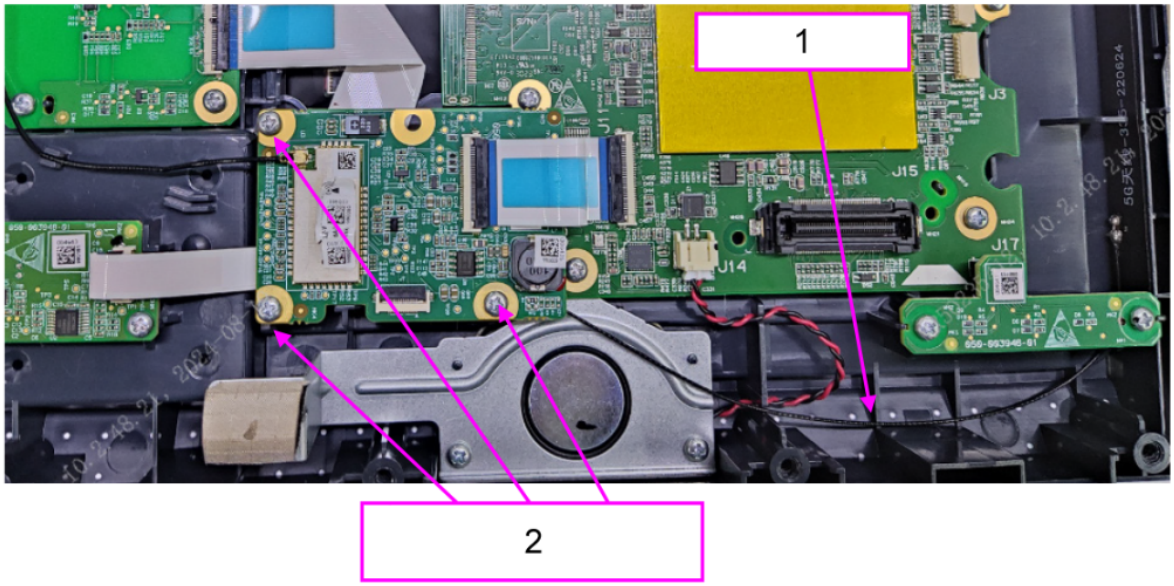


1 Wifi or 4G or 5G cable connection

2 WIFI antenna

2) Remove the WiFi+4G module: Use a Phillips screwdriver to remove the three PT3X8 cross pan head tapping screws, remove the WiFi+4G board PCBA, and remove the 4G antenna.

Figure7–15



1 4G antenna

2 3 PT3X8 tapping screws

5. After replacing the spare part, reinstall the machine by referring to the procedure for removing it.

7.84.3 Commissioning and Verification

None

7.85 Main control board PCBA (D30/with BT) FRU

7.85.1 General Information

Figure7–16

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-091480-00	Main control board PCBA (D30/with BT)FRU	None	None

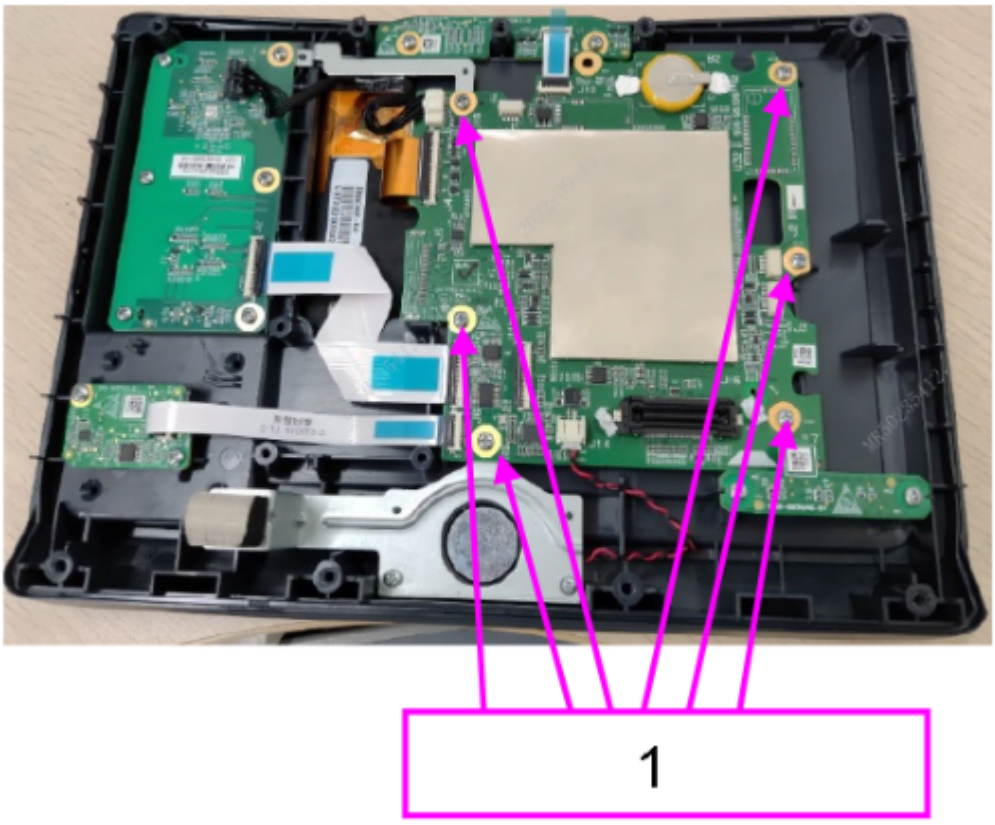
7.85.2 Disassembly and Assembly

1. Disassembly and Assembly.
2. .Disassemble the main unit .
3. Remove the 4G/5G/WIFI board components. For details, see the 4G/5G/WIFI board components.
4. 0656 D30 Indicator Board PCBA Removal Refer to 0656 D30 Indicator Board PCBA removal.
5. Specific steps:

1) Pull out the backup switch cable of the key board by hand, and unplug the screen cable buckle corresponding to the FFC line from the alarm light board to the main control board, the speaker line, the FPC line from the key board to the main control board, the FPC line from the encoder board to the main control board, and the FPC line from the display screen to the main control board.

2) Remove the six PT3X8 cross-pan head tapping screws using a Phillips screwdriver, take out the main control board card for replacement, and insert the corresponding cable in place.

Figure7–17



1 6 PT3X8 tapping screws

6. After replacing the spare part, reinstall the machine by referring to the procedure for removing it.

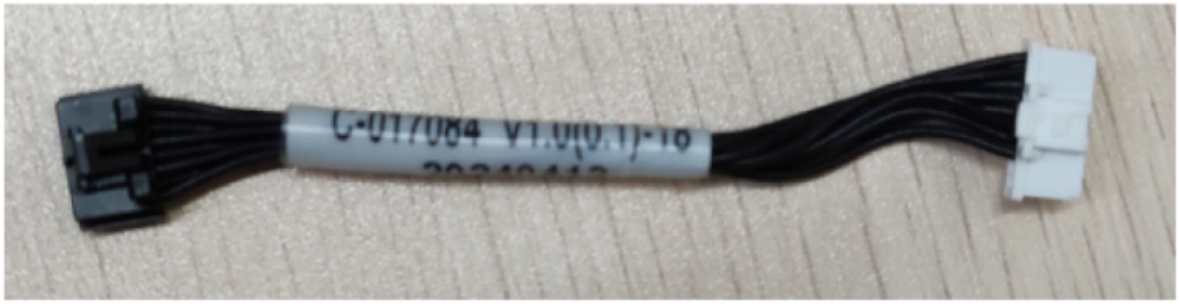
7.85.3 Commissioning and Verification

None

7.86 D30 Keypad backup connector

7.86.1 General Information

Figure7–18



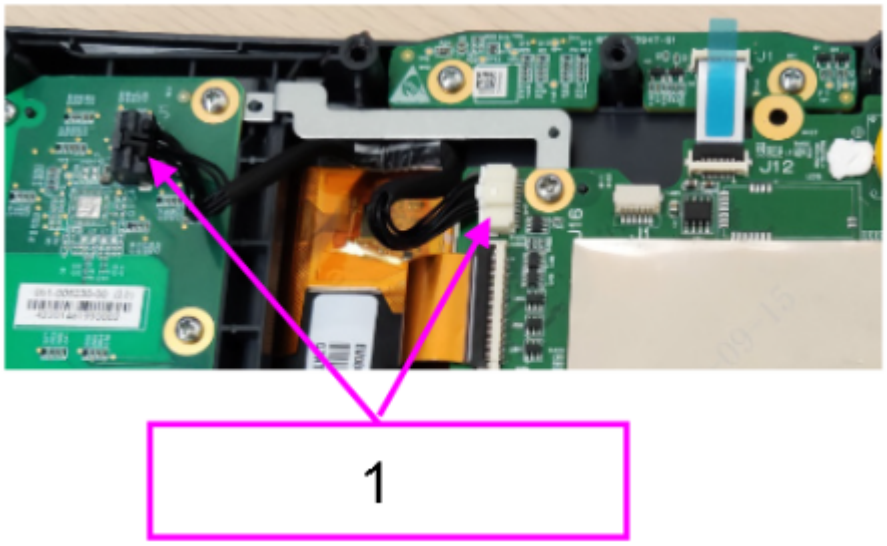
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-017084-00	D30 Keypad backup connector	None	None

7.86.2 Disassembly and Assembly

1. Make preparations .
2. .Disassemble the main unit .
3. Specific steps:

1) Remove the backup cable from the key plate and the socket of the main control board, and replace the cable. Press the backup cable under the sheet metal when replacing the cable.

Figure7–19



1 Unplug the backup cable from both board sockets

4. After replacing the spare part, reinstall the machine by referring to the procedure for removing it.

7.86.3 Commissioning and Verification

None

7.87 BT Antenna-100

7.87.1 General Information

Figure7–20

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
024-001475-00	BT Antenna-100	None	None

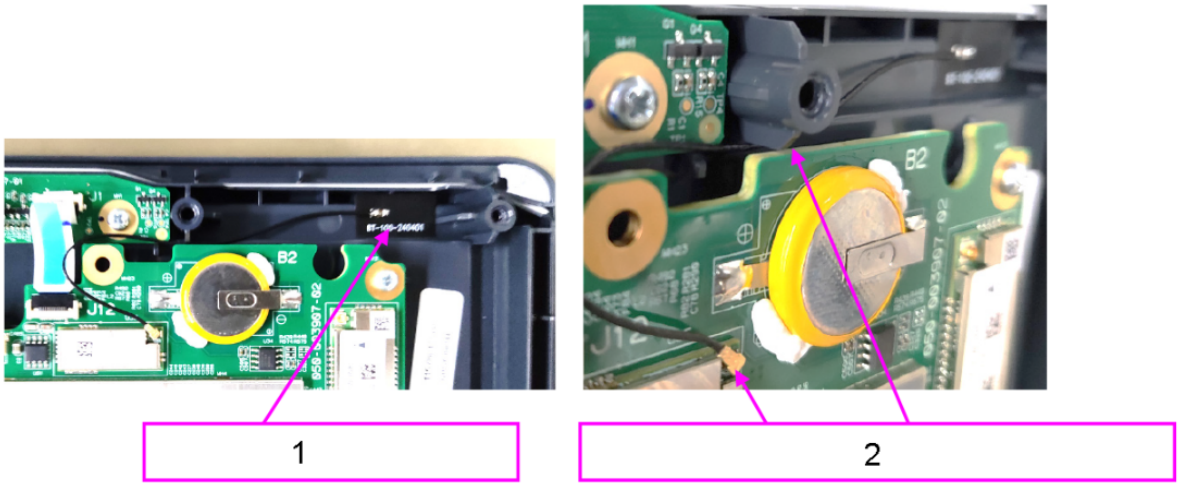
7.87.2 Disassembly and Assembly

1. Make preparations
2. .Disassemble the main unit
3. Specific steps:

1) Remove the adhesive from the antenna and attach it to the position shown on the front shell.

2) Insert the antenna seat into the seat of the main control board card by following the following figure.

Figure7–21



1	Align the antenna with the plastic column on the front shell
2	Route the antenna from the bottom of the main control board and insert it into the seat of the main control board

4. After replacing the spare part, reinstall the machine by referring to the procedure for removing it.

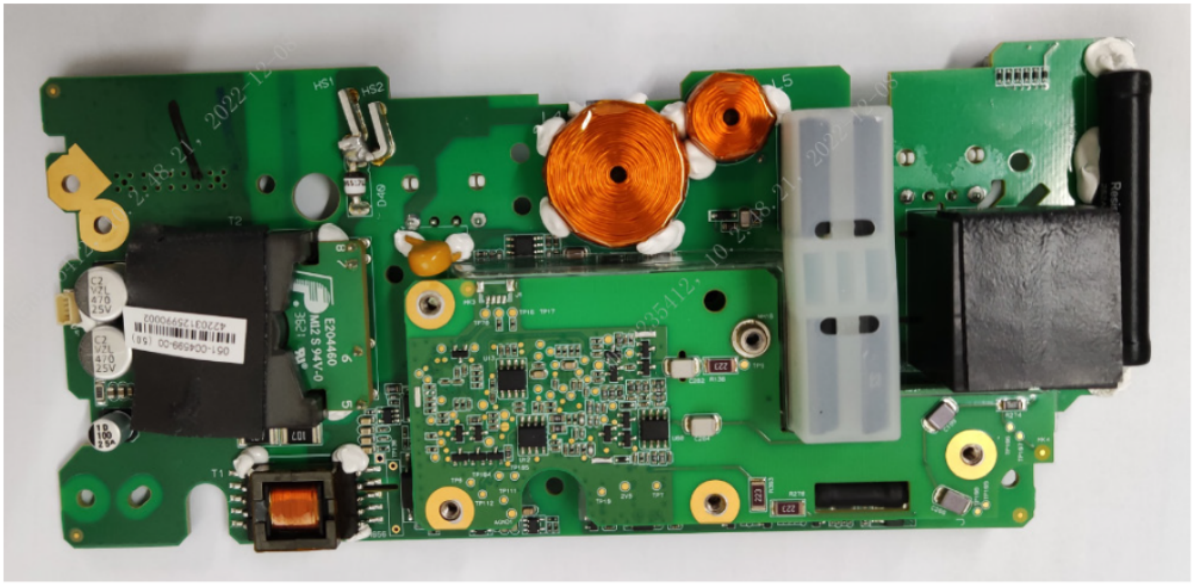
7.87.3 Commissioning and Verification

None

7.88 0656 Therapy Board(CPR) PCBA

7.88.1 General Information

Figure7–22



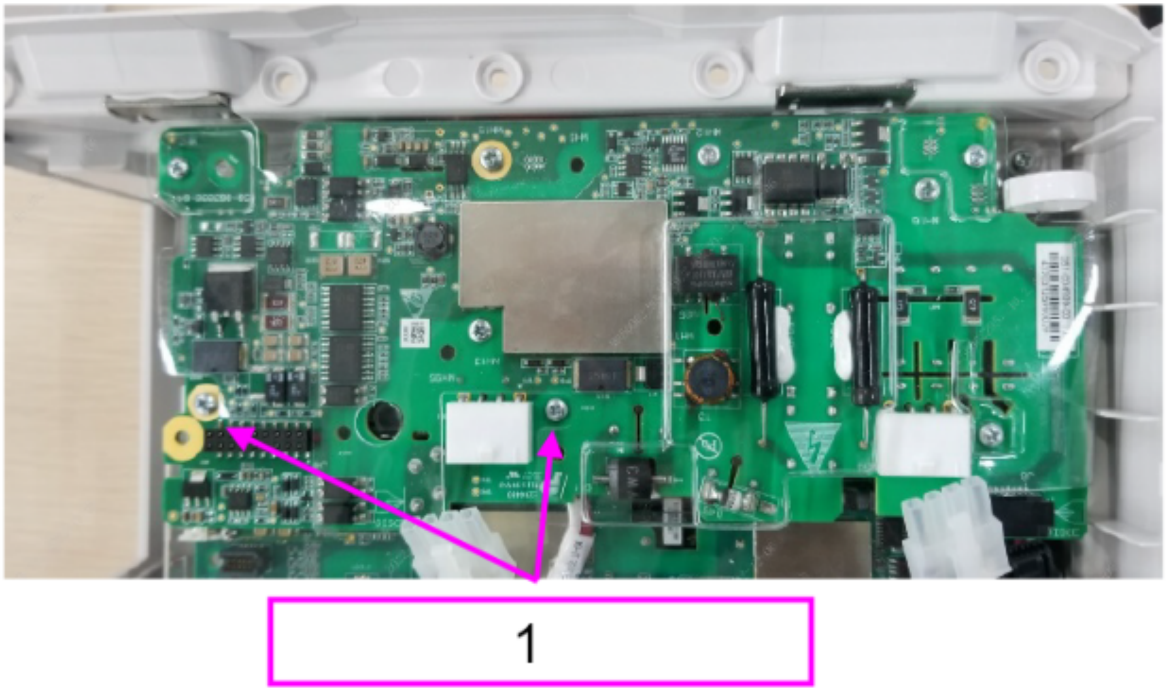
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-006528-00	0656 Therapy Board(CPR) PCBA	None	None

7.88.2 Disassembly and Assembly

1. Make preparations
2. .Disassemble the main unit
3. Remove the insulating sheet of the treatment board.
4. Specific steps:

1) Use a screwdriver to remove two PT3X8 cross pan head tapping screws and take out the defibrillation treatment board.

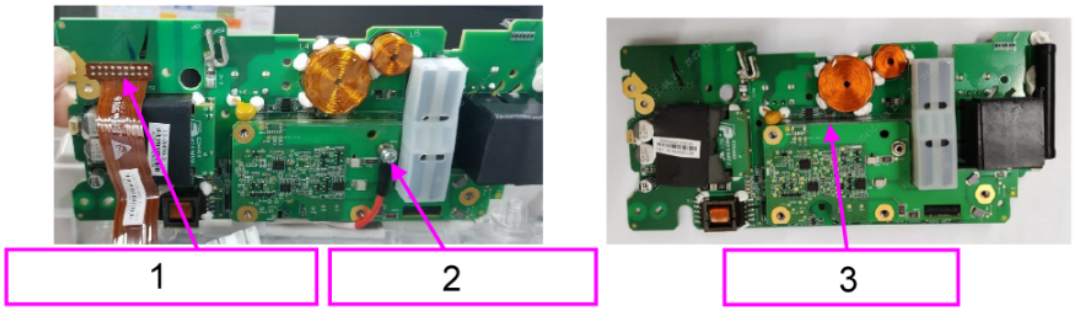
Figure7–23



1 2 PT3X8 cross pan head tapping screws

2) Unplug 0656 power parameter - Treatment connection board FPC PCBA FRU from 0656 defibrillator board; Use a Phillips screwdriver to remove one M3X6 cross pan head combination screw, remove the red online detection cable, and take out the defibrillation treatment board.

Figure7–24



1 0656 Power parameters - Treatment board FPC FRU

2 One M3X6 pan head assembly screw

3 0656 Defibrillation therapyt board insulation

7.88.3 Commissioning and Verification

None

7.89 0656 therapy PCBA (with MR66)

7.89.1 General Information

None

7.89.2 Disassembly and Assembly

None

7.89.3 Commissioning and Verification

None

8 Troubleshooting

8.1 Overview

8.1.1 Overview

This chapter classifies faults according to the faulty components and fault phenomena in the defibrillation monitor for troubleshooting. The faults shall be checked, located, and troubleshooted in sequence according to the corresponding fault table.

The recommended solutions in this chapter can help you solve most device faults but not all possible faults. In the case of any fault that is not described in this chapter, contact our after-sales service department.

8.1.2 Part Replacement

The circuit board and other major parts and components in the defibrillation monitor are replaceable. After the faulty part or component of the circuit board is located, it can be replaced with a new one following the steps in ***Chapter 6 FRU Replacement***. Then check if the fault is eliminated or the defibrillation monitor can pass the relevant test. If the fault is eliminated, it demonstrates that the original circuit board part is damaged. In this case, please return the original part to us for repair. If the fault persists, reinstall the original part and continue troubleshooting for other possible reasons.

8.1.3 Device Status Checking

Some troubleshooting tasks may involve the hardware version and device status of the defibrillation monitor. Check the device status according to the following steps:

1. Choose **Main Menu>Review>Events**. In the pop-up menu, you can view the system boot time and technical alarm information.
2. Choose **Main Menu>System>Maintenance>Enter Manufacturer Maintenance Password>Device Information**. On the Device Information screen, you can view the current device status.

8.1.4 Device Information Checking

Some troubleshooting tasks may involve software version compatibility. At this point, you need to know the configuration and software version information of your defibrillation monitor. For information on software version compatibility, contact our After-sales Service. Check the software version according to the following steps:

- Choose **Main Menu> System >>>Maintenance>>>Enter Manufacturer Maintenance Password> Version Information >>**. In the **Version Information** screen, you can view the version information of the system software and software of all the modules.

8.1.5 Technical Alarms and Diagnosis

Check whether the defibrillation monitor displays a technical alarm before troubleshooting. If so, please release the alarm first. For information and reasons of and solutions to the technical alarm, please refer to the product manual.

8.2 Intuitive Performance Class Troubleshooting

8.2.1 Display Fault

8.2.1.1 Poor Screen Display

Fault Description

Poor Screen Display

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

White screen, broken screen, black screen.

Involved FRU

1. D30 Front Cover Assembly (Tianma) FRU
2. D20 Front Cover Assembly (Tianma) FRU
3. D20A Front Cover Assembly (Tianma) FRU
4. D20C Front Cover Assembly (Tianma) FRU

Solution

Check the screen connection and display screen. Reconnect or replace the front shell assembly in the case of errors. For details, see D30 Front Cover Assy FRU **7.72.2** Disassembly and

Assembly, D20 Front Cover Assy FRU **7.73.2** Disassembly and Assembly, D20A Front Cover Assy FRU **7.74.2** Disassembly and Assembly and D20C Front Cover Assy FRU **7.75.3** Disassembly and Assembly.

8.2.1.2 No Response on Touch Screen

Fault Description

No Response on Touch Screen

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The touch screen fails.

Involved FRU

1. D30 Front Cover Assembly (Tianma) FRU
2. D20 Front Cover Assembly (Tianma) FRU
3. D20A Front Cover Assembly (Tianma) FRU
4. D20C Front Cover Assembly (Tianma) FRU

Solution

Check the screen connection and display screen. Reconnect or replace the front shell assembly in the case of errors.

8.2.1.3 Touch Screen Mistrigger

Fault Description

Touch Screen Mistrigger

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

ESD or electrotome interference, leading to touch screen mistrigger

Involved FRU

1. D30 Front Cover Assembly (Tianma) FRU
2. D20 Front Cover Assembly (Tianma) FRU
3. D20A Front Cover Assembly (Tianma) FRU
4. D20C Front Cover Assembly (Tianma) FRU

Solution

1. Adjust to the low sensitivity mode to confirm if the problem is present.
2. Check the screen connection and display screen. Reconnect or replace the front shell assembly in the case of errors.

8.2.2 Network Malfunction

8.2.2.1 Failure to Establish Wireless Connection

Fault Description

Failure to Establish Wireless Connection

Severity

Maintenance as soon as possible

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Wireless connection function failure.

Involved FRU

1. 0656 Main Board PCBA (D30) FRU
2. WIFI Material Kit FRU

Solution

1. Check the network settings and reset the network in the case of abnormal settings.
2. Check the software version.
3. Replace the main control board/Wi-Fi module. For details, see 0656 MAIN BOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly and WIFI Materlal Kit FRU **7.77.2** Disassembly and Assembly.

8.2.2.2 Unstable Wireless Connection

Fault Description

Unstable Wireless Connection

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Weak signal.

Involved FRU

None

Solution

Check the network environment.

8.2.3 Appearance Fault

8.2.3.1 Physical Damage and Corrosion

Fault Description

Physical Damage and Corrosion

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Physical damage, cleaning disinfectants, moisture and other reasons lead to corrosion of the pump body and electronic components.

Involved FRU

None

Solution

Replace the damaged FRU.

8.2.3.2 Abnormal Appearance

Fault Description

Abnormal Appearance

Severity

Maintenance as soon as possible

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Silk faded, not clear, damaged, etc.

Involved FRU

None

Solution

1. Investigate the use of disinfectants (brand/model, frequency of disinfection).
2. Replace the shell.

8.2.3.3 Equipment Smoking/Smelling Burnt/On Fire

Fault Description

Equipment Smoking/Smelling Burnt/On Fire

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Equipment smoking/burning smell/on fire caused by overly high temperature, short circuit, etc.

Involved FRU

None

Solution

1. Investigate the use environment to find out whether there is liquid inlet.
2. Replace damaged parts.

8.2.4 Pace-making Fault

8.2.4.1 Abnormal Pacing Function

Fault Description

Abnormal Pacing Function

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Therapy board malfunction.

Involved FRU

0656 Therapy Board

Solution

Replace the defibrillation therapy board. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.2.5 Recorder Fault

8.2.5.1 Poor Printing Effect of Recorder

Fault Description

Poor Printing Effect of Recorder

Severity

Maintenance as soon as possible

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Paper not in place or door not closed or recorder module malfunction.

Involved FRU

50mm Recorder

Solution

1. Check that the printing paper for the recorder is in place.
2. Check that the door is closed.
3. Replace the recorder. For details, see 50mm Recorder **7.26.2** Disassembly and Assembly.

8.2.5.2 Recorder Printing Failure

Fault Description

Recorder Printing Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Paper not in place or door not closed or recorder module malfunction.

Involved FRU

50mm Recorder

Solution

1. Check that the printing paper for the recorder is in place.
2. Check that the door is closed.
3. Replace the recorder. For details, see 50mm Recorder **7.26.2** Disassembly and Assembly.

8.2.6 Accessory Fault

8.2.6.1 Test Load Damage

Fault Description

Test Load Damage

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Fail in self checking.

Involved FRU

None

Solution

Replace the test load.

8.2.6.2 Paddle Fault

Fault Description

Paddle Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Unable to discharge.

Involved FRU

None

Solution

Replace the extracorporal board.

8.2.6.3 Paddle Rusting

Fault Description

Paddle Rusting

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Discharge energy accuracy affected.

Involved FRU

None

Solution

Replace the extracorporal board.

8.2.6.4 Poor Contact of Paddle

Fault Description

Poor Contact of Paddle

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Not in place.

Involved FRU

None

Solution

Replace the paddle and carry out user test.

8.2.7 Power Error

8.2.7.1 Power-on Failure

Fault Description

Power-on Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Failure of the keypad, main board, or power board.

Involved FRU

1. 0656 D30 Keyboard (No NFC)
2. 0656 Parameter (5lead, 3SpO2, NIBP)
3. 0656 Parameter Power Integrated Board
4. 0656 Parameter (5lead)
5. 0656 Main Board PCBA (D30) FRU

Solution

1. Replace the keyboard. For details, see 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.
2. Replace the parameter power board according to the configuration. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.
3. Replace the main control board. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.2.7.2 Power-off Failure

Fault Description

Power-off Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Failure of the keypad or power board.

Involved FRU

1. 0656 D30 Keyboard (No NFC)
2. 0656 Parameter (5lead, 3SpO2, NIBP)

3. 0656 Parameter Power Integrated Board
4. 0656 Parameter (5lead)

Solution

1. Replace the keyboard. For details, see 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.
2. Replace the parameter power board according to the configuration. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.2.7.3 Overlong Battery Charging Duration

Fault Description

Overlong Battery Charging Duration

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery aging or charging circuit error.

Involved FRU

None

Solution

1. Check the battery and replace it if it is abnormal.
2. Check the power module. If it is abnormal, replace it. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.2.7.4 Battery charging failed

Fault Description

Battery charging failed

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery, charging circuit or software fault, resulting in failure in battery charging.

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

1. Check the software version.
2. Check the battery and replace it if it is abnormal.
3. Check the power module. If it is abnormal, replace it. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.2.7.5 Battery Fault

Fault Description

Battery Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Failure of the battery or power board.

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

1. Check the battery and replace it if it is abnormal.
2. Check the power module. If it Module abnormal, replace it. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.2.7.6 Battery Aging

Fault Description

Battery Aging

Severity

Maintenance as soon as possible

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery aging.

Involved FRU

None

Solution

Replace the battery.

8.2.7.7 Short Battery Life

Fault Description

Short Battery Life

Severity

Maintenance as soon as possible

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery aging.

Involved FRU

None

Solution

Replace the battery.

8.2.8 Defibrillation Error

8.2.8.1 High Undischarged Impedance

Fault Description

High Undischarged Impedance

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The discharge circuit resistance exceeds the designated scope (therapy board, internal wire, extracorporal board, etc.), leading to failure in releasing defibrillation energy.

Involved FRU

None

Solution

1. Run user test and record the fault code if it fails. Select FRU according to the fault code.
2. If it passes the user test, it indicates the possibility of connection failure between the extracorporal board/pad and the human body.

8.2.8.2 Low Undischarged Impedance

Fault Description

Low Undischarged Impedance

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The discharge circuit resistance exceeds the designated scope (therapy board, internal wire, extracorporal board, etc.), leading to failure in releasing defibrillation energy.

Involved FRU

None

Solution

1. Run user test and record the fault code if it fails. Select FRU according to the fault code.
2. If it passes the user test, it indicates the possibility of connection failure between the extracorporal board/pad and the human body.

8.2.8.3 Low Discharge Energy Accuracy

Fault Description

Low Discharge Energy Accuracy

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The energy storage capacitor is aging and decaying, resulting in low discharge energy.

Involved FRU

0655 Large Capacitance

Solution

Run user test to confirm whether the discharge energy accuracy meets the specification. If it exceeds the specification, replace the 0655 large capacitance. For details, see 0655 Large Capacitance **7.5.2** Disassembly and Assembly.

8.2.8.4 Charging Failure

Fault Description

Charging Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Failure of the energy storage capacitor or therapy board, leading to failure to start charging.

Involved FRU

None

Solution

Run user test. Select FRU according to the fault code hint.

8.2.8.5 Slow Charging Speed

Fault Description

Slow Charging Speed

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Storage capacitor or battery failure, resulting in slow charging or timeout.

Involved FRU

None

Solution

Run user test. Select FRU according to the fault code hint.

8.2.8.6 Energy Regulation Failure

Fault Description

Energy Regulation Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Poor connection or fault of the extracorporal board

Involved FRU

None

Solution

Replug the extracorporal board. Run user test. Select FRU according to the fault code hint.

8.2.9 Parameter Measurement Error

8.2.9.1 Failure to Connect CPR Sensor to Main Unit

Fault Description

Failure to Connect CPR Sensor to Main Unit

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Failure in hard connection or no response after connection.

Involved FRU

None

Solution

Replace the relevant connection cable.

8.2.9.2 ECG Communication Error/No Waveform

Fault Description

ECG Communication Error/No Waveform

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Failure in parameter measurement and no waveform.

Involved FRU

None

Solution

Check ECG leads.

8.2.9.3 SpO2 Probe Fault

Fault Description

SpO2 Probe Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

No waveform measured.

Involved FRU

None

Solution

Replace the probe.

8.2.9.4 No SpO2 Value Measured

Fault Description

No SpO2 Value Measured

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

No value measured.

Involved FRU

1. Mindray SpO2 Material Kit
2. Nellcor SpO2 Material Kit
3. Masimo SpO2 Material Kit

Solution

Replace the probe, main cable or blood oxygen plate. For details, see Mindray SpO2 Material Kit **7.41.2** Disassembly and Assembly, Nellcor SpO2 Material Kit **7.42.2** Disassembly and Assembly and Masimo SpO2 Material Kit **7.40.2** Disassembly and Assembly.

8.2.9.5 No NIBP Value Measured

Fault Description

No NIBP Value Measured

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

No value measured.

Involved FRU

None

Solution

1. Check if the oversleeve is well connected.
2. Check if the air channel is free from leakage: air channel connection.
3. Replace the parameter module.

8.2.9.6 Inflation Failure for NIBP Measurement

Fault Description

Inflation Failure for NIBP Measurement

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

No value measured.

Involved FRU

None

Solution

1. Check if the oversleeve is well connected.
2. Check if the air channel is free from leakage: air channel connection.
3. Replace the parameter module.

8.2.9.7 No Waveform in ECG Measurement

Fault Description

No Waveform in ECG Measurement

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

No value measured.

Involved FRU

None

Solution

1. Check if the lead and pad are well connected.
2. Replace the lead or parameter module.

8.2.9.8 Excessive Noise in ECG Measurement

Fault Description

Excessive Noise in ECG Measurement

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Excessive noise in measurement.

Involved FRU

None

Solution

1. Check if the lead and pad are well connected.
2. Check whether there is a source of disturbance in the surrounding environment.
3. Replace the lead or parameter module.

8.2.9.9 ECG Lead Damaged

Fault Description

ECG Lead Damaged

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

None

Involved FRU

None

Solution

Replace the lead wire.

8.2.10 Alarm Fault

8.2.10.1 Low Alarm Volume

Fault Description

Low Alarm Volume

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Abnormal horn or driver circuit.

Involved FRU

1. Speaker Assy FRU
2. 0656 Main Board PCBA (D30) FRU

Solution

1. Adjust the alarm volume. Check the horn cable and the horn and reconnect or replace the FRU in the case of error. For details, see Speaker Assy FRU **7.67.2** Disassembly and Assembly.

2. Replace the 0656 MAINBOARD PCBA (D30) FRU. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.2.10.2 No Alarm Sound

Fault Description

No Alarm Sound

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Fault of horn cable or horn.

Involved FRU

1. Speaker Assy FRU
2. 0656 Main Board PCBA (D30) FRU

Solution

1. Check the horn cable and the horn and reconnect or replace the FRU in the case of error. For details, see Speaker Assy FRU **7.67.2** Disassembly and Assembly.
2. Replace the 0656 MAINBOARD PCBA (D30) FRU. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.2.10.3 Abnormal Alarm Sound

Fault Description

Abnormal Alarm Sound

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Abnormal tone.

Involved FRU

1. Speaker Assy FRU
2. 0656 Main Board PCBA (D30) FRU

Solution

1. Check the software version.
2. Check the horn cable and the horn and reconnect or replace the FRU in the case of error. For details, see Speaker Assy FRU **7.67.2** Disassembly and Assembly.
3. Replace the 0656 MAINBOARD PCBA (D30) FRU. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.2.10.4 Non-working Alarm Light

Fault Description

Non-working Alarm Light

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Fault of alarm light cable or LED.

Involved FRU

1. 0656 D30 Alarm PCBA
2. 0656 Main Board PCBA (D30) FRU

Solution

1. Check the cable of the alarm light board or the alarm light board. Reconnect or replace it in the case of error. For details, see 0656 D30 Alarm PCBA **7.9.2** Disassembly and Assembly.
2. Replace the keyboard. For details, see 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.

8.2.11 Button Fault

8.2.11.1 Non-responsive Button

Fault Description

Non-responsive Button

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The button doesn’t respond after it is pressed.

Involved FRU

0656 D30 Keyboard (No NFC)

Solution

1. Check if the connection cable is loose.
2. Replace the keyboard. For details, see 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.

8.2.11.2 Non-responsive Coder

Fault Description

Non-responsive Coder

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The coder doesn’t respond after it is operated.

Involved FRU

0656 D30 Coder PCBA

Solution

Replace the coder PCBA. For details, see 0656 D30 Coder PCBA **7.11.2** Disassembly and Assembly.

8.3 Code Fault Handling

8.3.1 Therapy Module Fault

8.3.1.1 1: M0+ Power-on CPU Self Checking Failure

Fault Code

1

Fault Description

M0+ Power-on CPU Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.2 2: M0+ Power-on RAM Self Checking Failure

Fault Code

2

Fault Description

M0+ Power-on RAM Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.3 3: M0+ Power-on ROM Self Checking Failure

Fault Code

3

Fault Description

M0+ Power-on ROM Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.4 4: M0+ Power-on Watchdog Self Checking Failure

Fault Code

4

Fault Description

M0+ Power-on Watchdog Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.5 5: M0+ Power-on ADC Self Checking Failure

Fault Code

5

Fault Description

M0+ Power-on ADC Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.6 6: M3 Power-on Register Self Checking Failure

Fault Code

6

Fault Description

M3 Power-on Register Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.7 7: M3 Power-on RAM Self Checking Failure

Fault Code

7

Fault Description

M3 Power-on RAM Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.8 8: M3 Power-on ROM Self Checking Failure

Fault Code

8

Fault Description

M3 Power-on ROM Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.9 9: M3 Power-on Watchdog Self Checking Failure

Fault Code

9

Fault Description

M3 Power-on Watchdog Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.10 10: M0+ Power-on ASIC Self Checking Failure

Fault Code

10

Fault Description

M0+ Power-on ASIC Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.11 11: M3 Power-on CPU Self Checking Failure

Fault Code

11

Fault Description

M3 Power-on CPU Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.12 12: M3 Power-on Hardware Version Number Error

Fault Code

12

Fault Description

M3 Power-on Hardware Version Number Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.13 13: M0 Power-on Hardware Version Number Error

Fault Code

13

Fault Description

M0 Power-on Hardware Version Number Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.14 31: 1s Following Pacing Charging Starting: V1/2<=20V

Fault Code

31

Fault Description

1s Following Pacing Charging Starting: V1/2<=20V

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.15 32: After Pacing Charging: V1>240V

Fault Code

32

Fault Description

After Pacing Charging: V1>240V

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.16 33: During Pacing Charging: V1/2>240V

Fault Code

33

Fault Description

During Pacing Charging: V1/2>240V

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.17 45: M0+ Abnormal Reduction

Fault Code

45

Fault Description

M0+ Abnormal Reduction

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.18 46: ASIC Error

Fault Code

46

Fault Description

ASIC Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.19 47: M3 Abnormal Reduction

Fault Code

47

Fault Description

M3 Abnormal Reduction

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.20 48: M3 and M0+ Communication Error

Fault Code

48

Fault Description

M3 and M0+ Communication Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.21 49: M3 Real-Time ADC Self Checking Error

Fault Code

49

Fault Description

M3 Real-Time ADC Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.22 50: M3 Chip Calculation Function Error

Fault Code

50

Fault Description

M3 Chip Calculation Function Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.23 51: Upon Charging Starting: |V1-V2| > 500V

Fault Code

51

Fault Description

Upon Charging Starting: |V1-V2| > 500V

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.24 52: 1s Following Charging Starting: V1<= 65V or V2 <= 65V

Fault Code

52

Fault Description

1s Following Charging Starting: V1<= 65V or V2 <= 65V

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.25 53: V1/V2 Drop Exceeding 10% of V1/V2tgt During Charging

Fault Code

53

Fault Description

V1/V2 Drop Exceeding 10% of V1/V2tgt During Charging

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.26 54: |V1-V2| > 128V During Charging and Usage and |V1-V2| > 108V During Self Checking

Fault Code

54

Fault Description

|V1-V2| > 128V During Charging and Usage and |V1-V2| > 108V During Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.27 55: V1>=2400V or V2>=2400V During Charging

Fault Code

55

Fault Description

V1>=2400V or V2>=2400V During Charging

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.28 56: Charging Not Completed Within 25s After Charging Starting

Fault Code

56

Fault Description

Charging Not Completed Within 25s After Charging Starting

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.29 57: After Charging Completion: V1>(V1Tgt*1.2)

Fault Code

57

Fault Description

After Charging Completion: V1>(V1Tgt*1.2)

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.30 58: V1<=50V or V2<=50V During Charging

Fault Code

58

Fault Description

V1<=50V or V2<=50V During Charging

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.31 59: V1>(V1Tgt*1.2) or V2>(V1Tgt*1.2) During Charging

Fault Code

59

Fault Description

V1>(V1Tgt*1.2) or V2>(V1Tgt*1.2) During Charging

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.32 60: Overcurrent During Self-discharge

Fault Code

60

Fault Description

Overcurrent During Self-discharge

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.33 61: V1>=40V or V2>=40V post Self-discharge

Fault Code

61

Fault Description

V1>=40V or V2>=40V post Self-discharge

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.34 62: Overvoltage Protection Occurring

Fault Code

62

Fault Description

Overvoltage Protection Occurring

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.35 63: Error in Zeroing Sample Value

Fault Code

63

Fault Description

Error in Zeroing Sample Value

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.36 64: Error in Gain Calibration Sample Value

Fault Code

64

Fault Description

Error in Gain Calibration Sample Value

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.37 65: Error in Calculation Slope in Gain Calibration

Fault Code

65

Fault Description

Error in Calculation Slope in Gain Calibration

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.38 66: Zeroing Failure prior to Gain Calibration

Fault Code

66

Fault Description

Zeroing Failure prior to Gain Calibration

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.39 67: FLASH Error in Calibration Information Write

Fault Code

67

Fault Description

FLASH Error in Calibration Information Write

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.40 68: FLASH Error in Calibration Information Read

Fault Code

68

Fault Description

FLASH Error in Calibration Information Read

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.41 71: Abnormal Pacing Power Supply

Fault Code

71

Fault Description

Abnormal Pacing Power Supply

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.42 72: Abnormal Pacing Relay

Fault Code

72

Fault Description

Abnormal Pacing Relay

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.43 73: Wrong Pacing Frequency

Fault Code

73

Fault Description

Wrong Pacing Frequency

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.44 74: Abnormal Pacing Current

Fault Code

74

Fault Description

Abnormal Pacing Current

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.45 75: Abnormal Pacing DA

Fault Code

75

Fault Description

Abnormal Pacing DA

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.46 76: Abnormal Human Body Voltage During Pacing

Fault Code

76

Fault Description

Abnormal Human Body Voltage During Pacing

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.47 77: Overcurrent Protection Point of Pacing Too High

Fault Code

77

Fault Description

Overcurrent Protection Point of Pacing Too High

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.48 78: Pacing Overcurrent Protection Fault

Fault Code

78

Fault Description

Pacing Overcurrent Protection Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.49 201: Self Checking Failure of Function Self Checking AD

Fault Code

201

Fault Description

Self Checking Failure of Function Self Checking AD

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.50 202: Timeout and Incompletion of Clock Self Checking in Function Self Checking

Fault Code

202

Fault Description

Timeout and Incompletion of Clock Self Checking in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.51 203: Clock Frequency Error in Clock Self Checking in Function Self Checking

Fault Code

203

Fault Description

Clock Frequency Error in Clock Self Checking in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.52 210: Defibrillation Charging Failure in Function Self Checking

Fault Code

210

Fault Description

Defibrillation Charging Failure in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.53 211: Charging Timeout in Function Self Checking

Fault Code

211

Fault Description

Charging Timeout in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.54 212: Charge Maintenance Failure in Function Self Checking

Fault Code

212

Fault Description

Charge Maintenance Failure in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.55 216: Self Checking Failure of Discharge Circuit in Function Self Checking

Fault Code

216

Fault Description

Self Checking Failure of Discharge Circuit in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.56 217: Self Checking Failure of Discharge Circuit in Function Self Checking

Fault Code

217

Fault Description

Self Checking Failure of Discharge Circuit in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.57 218: Self Checking Failure of Discharge Circuit in Function Self Checking

Fault Code

218

Fault Description

Self Checking Failure of Discharge Circuit in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.58 219: Self Checking Failure of Discharge Circuit in Function Self Checking

Fault Code

219

Fault Description

Self Checking Failure of Discharge Circuit in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.59 220: Self Checking Failure of Discharge Circuit in Function Self Checking

Fault Code

220

Fault Description

Self Checking Failure of Discharge Circuit in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.60 221: Self Checking Failure of Discharge Circuit in Function Self Checking

Fault Code

221

Fault Description

Self Checking Failure of Discharge Circuit in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.61 222: Self Checking Failure of Discharge Circuit in Function Self Checking

Fault Code

222

Fault Description

Self Checking Failure of Discharge Circuit in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.62 223: Self Checking Failure of Discharge Circuit in Function Self Checking

Fault Code

223

Fault Description

Self Checking Failure of Discharge Circuit in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.63 224: Self Checking Failure of Discharge Circuit in Function Self Checking

Fault Code

224

Fault Description

Self Checking Failure of Discharge Circuit in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.64 225: Function Self Checking Failure: Discharge Circuit: Closed Bridge Arm, Abnormal Internal Discharge Resistance

Fault Code

225

Fault Description

Function Self Checking Failure: Discharge Circuit: Closed Bridge Arm, Abnormal Internal Discharge Resistance

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.65 226: Self Checking Failure in Function Self Checking upon the Completion of Discharge

Fault Code

226

Fault Description

Self Checking Failure in Function Self Checking upon the Completion of Discharge

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.66 230: Self Checking Failure in Small Signal Impedance Detection in Function Self Checking

Fault Code

230

Fault Description

Self Checking Failure in Small Signal Impedance Detection in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.67 231: Defibrillation Relay Short Circuit in Small Signal Impedance Detection in Function Self Checking

Fault Code

231

Fault Description

Defibrillation Relay Short Circuit in Small Signal Impedance Detection in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.68 232: Test Load Relay Short Circuit in Small Signal Impedance Detection in Function Self Checking

Fault Code

232

Fault Description

Test Load Relay Short Circuit in Small Signal Impedance Detection in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.69 233: V1-V2 Exceeding [2.4, 25]V During Pacing MOS Self Checking

Fault Code

233

Fault Description

V1-V2 Exceeding [2.4, 25]V During Pacing MOS Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.70 234: V2-V3 Exceeding [2.4, 20]V During Pacing MOS Self Checking

Fault Code

234

Fault Description

V2-V3 Exceeding [2.4, 20]V During Pacing MOS Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.71 235: V3-V4 Exceeding [2.4, 17]V During Pacing MOS Self Checking

Fault Code

235

Fault Description

V3-V4 Exceeding [2.4, 17]V During Pacing MOS Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.72 257: Self Checking Failure in N1 RFLAG in Function Self Checking

Fault Code

257

Fault Description

Self Checking Failure in N1 RFLAG in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.73 258: Self Checking Failure in P-guide ECG in Function Self Checking

Fault Code

258

Fault Description

Self Checking Failure in P-guide ECG in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.74 259: Self Checking Failure in PFlag&RFlag in Function Self Checking

Fault Code

259

Fault Description

Self Checking Failure in PFlag&RFlag in Function Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.75 260: M3 5V7 Power Fault

Fault Code

260

Fault Description

M3 5V7 Power Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.76 261: M3 +-5V Power Fault

Fault Code

261

Fault Description

M3 +-5V Power Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.77 262: M3 +18V Power Fault

Fault Code

262

Fault Description

M3 +18V Power Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.78 263: M3 3V3 Power Fault

Fault Code

263

Fault Description

M3 3V3 Power Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.79 264: M0 AVCC Power Fault

Fault Code

264

Fault Description

M0 AVCC Power Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.80 265: M0 AVSS Power Fault

Fault Code

265

Fault Description

M0 AVSS Power Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.81 266: M0 +2V5 Power Fault

Fault Code

266

Fault Description

M0 +2V5 Power Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.82 267: M0 -2V5 Power Fault

Fault Code

267

Fault Description

M0 -2V5 Power Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.83 268: M0 ASIC_VREF Power Fault

Fault Code

268

Fault Description

M0 ASIC_VREF Power Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.84 269: M0 DVDD Power Fault

Fault Code

269

Fault Description

M0 DVDD Power Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.85 270: Forbidden to Charge When the Internal Cable Is Connected to the Human Body

Fault Code

270

Fault Description

Forbidden to Charge When the Internal Cable Is Connected to the Human Body

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.86 271: Discharge Upper Tube Failing to Discharge due to Short Circuit Fault

Fault Code

271

Fault Description

Discharge Upper Tube Failing to Discharge due to Short Circuit Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.87 272: Large Capacitance Drop Exceeding 5% Within 3s During 360J Charging for Automatic Self Checking

Fault Code

272

Fault Description

Large Capacitance Drop Exceeding 5% Within 3s During 360J Charging for Automatic Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction or large capacitance malfunction

Involved FRU

1. 0656 Therapy Board
2. 0655 Large Capacitance (D30)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly and 0655 Large Capacitance **7.5.2** Disassembly and Assembly.

8.3.1.88 273: Large Capacitance Exceeding Threshold [195+/-30%]μF During 360J External Discharge for User Self Checking

Fault Code

273

Fault Description

Large Capacitance Exceeding Threshold [195+/-30%]μF During 360J External Discharge for User Self Checking

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction or large capacitance malfunction

Involved FRU

1. 0656 Therapy Board
2. 0655 Large Capacitance (D30)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly and 0655 Large Capacitance **7.5.2** Disassembly and Assembly.

8.3.1.89 274: Defibrillation Energy Double Backup Check Error

Fault Code

274

Fault Description

Defibrillation Energy Double Backup Check Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0655 Large Capacitance (D30)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0655 Large Capacitance **7.5.2** Disassembly and Assembly.

8.3.1.90 277: Significant Error in Defibrillation Discharge Resistance

Fault Code

277

Fault Description

Significant Error in Defibrillation Discharge Resistance

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.1.91 291: Identification of New and Old Extracorporal Paddle Exceeding 3s

Fault Code

291

Fault Description

Identification of New and Old Extracorporal Paddle Exceeding 3s

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction or extracorporal board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.2 Power Module Fault

8.3.2.1 143: Battery Communication Error

Fault Code

143

Fault Description

Battery Communication Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Check if the battery is properly installed and replace it with a new one if it is not.

8.3.2.2 144: Abnormal Power Voltage

Fault Code

144

Fault Description

Abnormal Power Voltage

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)

2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.3 145: Battery Charging Fault

Fault Code

145

Fault Description

Battery Charging Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Check if the battery is properly installed and replace it with a new one if it is not.

8.3.2.4 146: Power-on Self Checking Error

Fault Code

146

Fault Description

Power-on Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.5 147: Main Board Fault

Fault Code

147

Fault Description

Main Board Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Contact the relevant person to replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.2.6 151: Low Charge of Battery 1

Fault Code

151

Fault Description

Low Charge of Battery 1

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The current battery charge is below the low charge threshold.

Involved FRU

None

Solution

Connect an AC power supply to charge the battery.

8.3.2.7 152: Extremely Low Charge of Battery 1

Fault Code

152

Fault Description

Extremely Low Charge of Battery 1

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The current battery charge is below the extremely low charge threshold.

Involved FRU

None

Solution

Connect an AC power supply to charge the battery.

8.3.2.8 153: Battery 1 Fault

Fault Code

153

Fault Description

Battery 1 Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery with a new one.

8.3.2.9 154: Battery 1 Aging

Fault Code

154

Fault Description

Battery 1 Aging

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Aging

Involved FRU

None

Solution

Replace the battery with a new one.

8.3.2.10 155: RTC Self Checking Failure

Fault Code

155

Fault Description

RTC Self Checking Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.11 156: Low Charge and Low Voltage

Fault Code

156

Fault Description

Low Charge and Low Voltage

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The current battery charge is below the low charge and low voltage thresholds.

Involved FRU

None

Solution

Connect an AC power supply to charge the battery.

8.3.2.12 157: Battery 1 Charging Fault

Fault Code

157

Fault Description

Battery 1 Charging Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery with a new one.

8.3.2.13 160: Failure to Identify Battery Model

Fault Code

160

Fault Description

Failure to Identify Battery Model

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery with a new one.

8.3.2.14 161: Abnormal Battery EEPROM Data

Fault Code

161

Fault Description

Abnormal Battery EEPROM Data

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery with a new one.

8.3.2.15 162: Charging Current Greater than 10A

Fault Code

162

Fault Description

Charging Current Greater than 10A

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.16 163: Charging (Current Greater than 0.7A Discharge) Overrunning by 45s

Fault Code

163

Fault Description

Charging (Current Greater than 0.7A Discharge) Overrunning by 45s

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.17 164: Charging/Discharging IO Flipping Overrunning by 45s

Fault Code

164

Fault Description

Charging/Discharging IO Flipping Overrunning by 45s

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.18 165: Battery Voltage Detection Error (Inconsistency Between VUSB1 and VBUS2)

Fault Code

165

Fault Description

Battery Voltage Detection Error (Inconsistency Between VUSB1 and VBUS2)

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery with a new one.

8.3.2.19 170: Low Charge of Battery 2

Fault Code

170

Fault Description

Low Charge of Battery 2

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The current battery charge is below the low charge threshold.

Involved FRU

None

Solution

Connect an AC power supply to charge the battery.

8.3.2.20 171: Extremely Low Charge of Battery 2

Fault Code

171

Fault Description

Extremely Low Charge of Battery 2

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The current battery charge is below the extremely low charge threshold.

Involved FRU

None

Solution

Connect an AC power supply to charge the battery.

8.3.2.21 172: Battery 2 Fault

Fault Code

172

Fault Description

Battery 2 Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery with a new one.

8.3.2.22 173: Battery 2 Aging

Fault Code

173

Fault Description

Battery 2 Aging

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Aging

Involved FRU

None

Solution

Replace the battery with a new one.

8.3.2.23 174: Battery 2 Charging Fault

Fault Code

174

Fault Description

Battery 2 Charging Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery with a new one.

8.3.2.24 175: VBUS Fault

Fault Code

175

Fault Description

VBUS Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.25 176: 18V Fault

Fault Code

176

Fault Description

18V Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.26 177: 5V Fault

Fault Code

177

Fault Description

5V Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.27 178: 3.3V Fault

Fault Code

178

Fault Description

3.3V Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.28 179: 12V Fault

Fault Code

179

Fault Description

12V Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.29 180: VCC Fault

Fault Code

180

Fault Description

VCC Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.30 181: VBB Fault

Fault Code

181

Fault Description

VBB Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.31 182: ADSYSV Fault

Fault Code

182

Fault Description

ADSYSV Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.32 183: AD5VD Fault

Fault Code

183

Fault Description

AD5VD Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.33 184: 25703 Register Setting Error

Fault Code

184

Fault Description

25703 Register Setting Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.34 185: AD5VDD Fault

Fault Code

185

Fault Description

AD5VDD Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.35 186: 12VPP Fault

Fault Code

186

Fault Description

12VPP Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.36 187: 5VDD Fault

Fault Code

187

Fault Description

5VDD Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.37 188: 5VBB Fault

Fault Code

188

Fault Description

5VBB Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.2.38 189: N1 Charging 12V Fault

Fault Code

189

Fault Description

N1 Charging 12V Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.3 Main Control Module Fault

8.3.3.1 491: Touch Screen Fault

Fault Code

491

Fault Description

The touchscreen is faulty.

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

LCD failure

Involved FRU

1. D30 Front Cover Assembly (Tianma) FRU

2. D20 Front Cover Assembly (Tianma) FRU
3. D20A Front Cover Assembly (Tianma) FRU
4. D20C Front Cover Assembly (Tianma) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see D30 Front Cover Assy FRU **7.72.2** Disassembly and Assembly, D20 Front Cover Assy FRU **7.73.2** Disassembly and Assembly, D20A Front Cover Assy FRU **7.74.2** Disassembly and Assembly and D20C Front Cover Assy FRU **7.75.3** Disassembly and Assembly.

8.3.3.2 403: Communication Error in Power Board

Fault Code

403

Fault Description

Communication Error in Power Board

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.3.3 404: Communication Error in Therapy Board

Fault Code

404

Fault Description

Communication Error in Therapy Board

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.3.4 405: Self Checking Error in Main Control Module

Fault Code

405

Fault Description

Self Checking Error in Main Control Module

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.5 406: Real-Time Clock Error

Fault Code

406

Fault Description

Real-Time Clock Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.6 407: Memory Card Read and Write Error

Fault Code

407

Fault Description

Memory Card Read and Write Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.7 409: Machine Type Identification Error

Fault Code

409

Fault Description

Machine Type Identification Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.8 410: Recorder Communication Error

Fault Code

410

Fault Description

Recorder Communication Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.9 411: Key User Self Checking Error

Fault Code

411

Fault Description

Key User Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Keypad fault

Involved FRU

0656 D30 Keyboard (No NFC)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.

8.3.3.10 412: Speaker User Self Checking Error

Fault Code

412

Fault Description

Speaker User Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The speaker is faulty.

Involved FRU

Speaker Assy FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see Speaker Assy FRU **7.67.2** Disassembly and Assembly.

8.3.3.11 413: Real-Time Clock Inaccuracy

Fault Code

413

Fault Description

Real-Time Clock Inaccuracy

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.12 414: Key Adhesion

Fault Code

414

Fault Description

Key Adhesion

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Keypad fault

Involved FRU

0656 D30 Keyboard (No NFC)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 D30 Keyboard (No NFC) **7.8.2** Disassembly and Assembly.

8.3.3.13 415: Program CRC Check Error

Fault Code

415

Fault Description

Program CRC Check Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.14 417: AT Battery 1 Discharge Error

Fault Code

417

Fault Description

AT Battery 1 Discharge Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery.

8.3.3.15 418: AT Battery 2 Discharge Error

Fault Code

418

Fault Description

AT Battery 2 Discharge Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery.

8.3.3.16 419: UT Battery 1 Discharge Error

Fault Code

419

Fault Description

UT Battery 1 Discharge Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery.

8.3.3.17 420: UT Battery 2 Discharge Error

Fault Code

420

Fault Description

UT Battery 2 Discharge Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Battery Fault

Involved FRU

None

Solution

Replace the battery.

8.3.3.18 423: Failure in Loading User Configuration

Fault Code

423

Fault Description

Failure in Loading User Configuration

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.19 424: Maintenance Lamp User Self Checking Error

Fault Code

424

Fault Description

Maintenance Lamp User Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.20 426: Power Integrated Board Self Checking Error

Fault Code

426

Fault Description

Power Integrated Board Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.3.21 427: CO2 Self Checking Error

Fault Code

427

Fault Description

CO2 Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The CO2 module fails.

Involved FRU

M02D Module (0656) FRU

Solution

Re-run user test and confirmation. Contact the relevant person to replace the relevant FRU if the problem remains. For details, see M02D Module (0656) FRU **7.39.2** Disassembly and Assembly.

8.3.3.22 429: NIBP Self Checking Error

Fault Code

429

Fault Description

NIBP Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.3.23 430: M51C Self Checking Error

Fault Code

430

Fault Description

M51C Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.3.24 431: Power-on IO Self Checking Error on 3.3V Power

Fault Code

431

Fault Description

Power-on IO Self Checking Error on 3.3V Power

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.3.25 432: Overcurrent on Recorder

Fault Code

432

Fault Description

Overcurrent on Recorder

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Recorder module fault

Involved FRU

50mm Recorder

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 50mm Recorder **7.26.2** Disassembly and Assembly.

8.3.3.26 434: Dormant IO Self Checking Error

Fault Code

434

Fault Description

Dormant IO Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.3.27 435: RTC Arousing IO Self Checking Error

Fault Code

435

Fault Description

RTC Arousing IO Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board
3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.3.28 436: Wrong Order from Therapy Board

Fault Code

436

Fault Description

Wrong Order from Therapy Board

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.3.29 437: Therapeutic Handshake Packet Error Report

Fault Code

437

Fault Description

Therapeutic Handshake Packet Error Report

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.3.30 438: Therapeutic Discharge Failure

Fault Code

438

Fault Description

Therapeutic Discharge Failure

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

0656 defibrillation therapy board malfunction

Involved FRU

0656 Therapy Board

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Therapy Board **7.22.2** Disassembly and Assembly.

8.3.3.31 455: Turning on Device after Abnormal Shutdown

Fault Code

455

Fault Description

Turning on Device after Abnormal Shutdown

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.32 456: Wrong Impedance Indicator on Paddle

Fault Code

456

Fault Description

Wrong Impedance Indicator on Paddle

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Extracorporal board fault

Involved FRU

None

Solution

Replace the extracorporal board.

8.3.3.33 457: Automatic Self Checking IO Self Checking Error

Fault Code

457

Fault Description

Automatic Self Checking IO Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Parameter power board fault

Involved FRU

1. 0656 Parameter (5lead, 3SpO2, NIBP)
2. 0656 Parameter Power Integrated Board

3. 0656 Parameter (5lead)

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 Parameter (5lead, 3SpO2, NIBP) **7.20.2** Disassembly and Assembly, 0656 Parameter Power Integrated Board **7.18.2** Disassembly and Assembly, 0656 Parameter Power Board (5lead, MR/NC SpO2), and 0656 Parameter (5lead) **7.19.2** Disassembly and Assembly.

8.3.3.34 458: Self Checking Error of Paddle Button

Fault Code

458

Fault Description

Self Checking Error of Paddle Button

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Extracorporal board fault

Involved FRU

None

Solution

Replace the extracorporal board.

8.3.3.35 459: Display User Self Checking Error

Fault Code

459

Fault Description

Display User Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

LCD failure

Involved FRU

1. D30 Front Cover Assembly (Tianma) FRU
2. D20 Front Cover Assembly (Tianma) FRU
3. D20A Front Cover Assembly (Tianma) FRU
4. D20C Front Cover Assembly (Tianma) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see D30 Front Cover Assy FRU **7.72.2** Disassembly and Assembly, D20 Front Cover Assy FRU **7.73.2** Disassembly and Assembly, D20A Front Cover Assy FRU **7.74.2** Disassembly and Assembly and D20C Front Cover Assy FRU **7.75.3** Disassembly and Assembly.

8.3.3.36 460: SPI FPGA Version Getting Error

Fault Code

460

Fault Description

SPI FPGA Version Getting Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.37 461: Screen Connection IO Self Checking Error

Fault Code

461

Fault Description

Screen Connection IO Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.38 462: Keypad Connection IO Self Checking Error

Fault Code

462

Fault Description

Keypad Connection IO Self Checking Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Keypad cable is not properly connected or is loose.

Involved FRU

None

Solution

Re-run user test and confirmation. Contact the relevant person to confirm if the cable is properly connected if the problem remains.

8.3.3.39 463: IO Self Checking Error in Front-Rear-Shell Connection

Fault Code

463

Fault Description

IO Self Checking Error in Front-Rear-Shell Connection

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

Front and rear shells are not properly connected or the connection is loose.

Involved FRU

None

Solution

Re-run user test and confirmation. Contact the relevant person to confirm if the cable is properly connected if the problem remains.

8.3.3.40 464: Getting Display FPGA Version Error

Fault Code

464

Fault Description

Getting Display FPGA Version Error

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.

8.3.3.41 489: Wi-Fi Module (Station) Fault

Fault Code

489

Fault Description

Wi-Fi Module (Station) Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The Wi-Fi module fails.

Involved FRU

WIFI Material Kit FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see WIFI MaterIal Kit FRU **7.77.2** Disassembly and Assembly.

8.3.3.42 490: Wi-Fi Module (AP) Fault

Fault Code

490

Fault Description

Wi-Fi Module (AP) Fault

Severity

Suspension

Response

Contact the device provider for onsite troubleshooting.

Possible Causes

The main control board is faulty.

Involved FRU

0656 Main Board PCBA (D30) FRU

Solution

Re-run user test and confirmation. Replace the relevant FRU if the problem remains. For details, see 0656 MAINBOARD PCBA (D30) FRU **7.71.2** Disassembly and Assembly.