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R300 Series Full-digital Multi-channel ECG Machines.

Service Manual

Version 1.0

P/N: M506B-IS001

1 Preface

1.1 Revision History

Version	Revision Date	Revision Description	Effective Date
1.0	12/9/2024	Initial version released.	

1.2 Applicable For

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

1.3 Intellectual Property Statement

SHENZHEN MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD. (hereinafter called Mindray) owns the intellectual property rights to this product and this maintenance manual.

Mindray reserves the right of final interpretation to this maintenance manual. Copy, modification, and translation of this manual in any manner whatsoever without the written permission of Mindray is strictly forbidden.

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1.4 Statement

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.

1.5 Password

A password is required to access different modes within the ECG machine.

- User maintenance: 888888
- Factory maintenance: 332888
- Demo mode: 2088

1.6 Safety Information

WARNING

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

CAUTION

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

NOTICE

Highlights important precautions and provides descriptions or explanations for better use of this product.

⚠WARNING

- This equipment is not intended for direct cardiac contact.
- This equipment can be used in adults, children and neonates.
- 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.
- This equipment is used in professional medical institutions and must be operated by qualified medical personnel who have received equipment operation training. Any unauthorized or untrained personnel are not allowed to perform any operation.
- To avoid fire or explosion hazards, do not use the equipment in the oxygen-rich environment, or with the presence of flammable anesthetics, vapor or liquids.
- The equipment, cables and accessories must be inspected before use to guarantee their proper and safe operation.
- 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.
- Do not use mobile multi-position sockets (MPSO) or AC power extension cords. Ensure that the sum of the individual ground leakage currents does not exceed the allowable limit.
- 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.
- When connecting external devices through the external device interface, they must not touch the patient at the same time to avoid causing the patient leakage current to exceed the standard requirements.
- This equipment is not intended for use with the high-frequency electrosurgical generator.
- When connected to a patient for use, the equipment and its accessories must not be maintained or serviced.
- During defibrillation, do not touch the patient or conductive parts connected to it, as serious injury or death may result.
- In patients with implanted pacemakers, this equipment may interpret and record pacemaker pulses as QRS complexes. The ECG waveforms recorded by this equipment should be carefully examined.

- The physiological waveforms and physiological parameters displayed by this equipment are for doctors' reference only and cannot be directly used as the basis for clinical treatment.
- Do not allow liquid to enter this equipment to prevent electric shock and equipment damage. Once liquid enters the equipment, stop using it immediately and send it to a maintenance engineer for inspection.
- 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.
- The software copyright of this equipment is owned by Mindray. Without permission, any organization or individual shall not tamper with, copy or exchange in any form or other infringing acts.
- Observe local applicable laws and regulations or hospital regulations on waste treatment to dispose of packaging materials. keep it out of children's reach.
- Do not touch the patient and live parts simultaneously.

⚠CAUTION

- **Please use the accessories specified in this manual and follow the instructions for use, observing all warnings and precautions.**
- **Dispose of the equipment and its accessories that approach the end of service life in compliance with applicable local laws and regulations or hospital regulations.**
- **Electromagnetic field may affect the equipment performance. Therefore, other devices used in the vicinity of the equipment must meet corresponding EMC requirements. Mobile phone, X-ray or MRI devices are possible sources of interference as they may emit high levels of electromagnetic radiation.**
- **Ensure that the voltage and frequency of the power supply fall into the specified ranges on the equipment's label or in this manual before connecting the equipment to a power supply.**
- **Always install or carry the equipment properly to avoid damage caused by drop, impact, strong vibration or other mechanical force.**

NOTICE

- This equipment is suitable for use on adult, pediatric and neonatal patients.
- Put the equipment in a location where you can easily view, operate, and maintain the equipment.
- During normal use, the operator shall stand in front of the equipment.
- Keep this manual close to the equipment so that it can be obtained conveniently when needed.
- The software of the equipment was developed in compliance with the GB 9706.1−2020, with potential risks from program errors minimized.
- This manual describes the product for the purpose of fully covering its functions and configuration options, and the product you have purchased may not support part of these functions or configuration options.

1.7 Symbols on the Equipment

The following symbols may appear on your device.

	Refer to the instruction manual.		Universal warning symbol
	Standby		Switch-on (only for one part of the device)
	Manufacturer		Manufacture date
	Alternating current (AC)		Battery
	CF-type defibrillation prevention application		Serial Number
	Equipotentiality		Protected against solid foreign objects with a diameter no less than 12.5 mm
	USB port		Computer network
	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

	Environmental protection service life of electronic products (20 years)		Unique identification of medical devices
	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.

The following table describes the geometry, meaning, and color of safety labels.

Geometry	Meaning	Safe Color	Contrast Color	Color of Graphical Symbol
	Forced action	Blue	White	White
	WARNING	Yellow	Black	Black

2 Product Knowledge

2.1 Design Principles

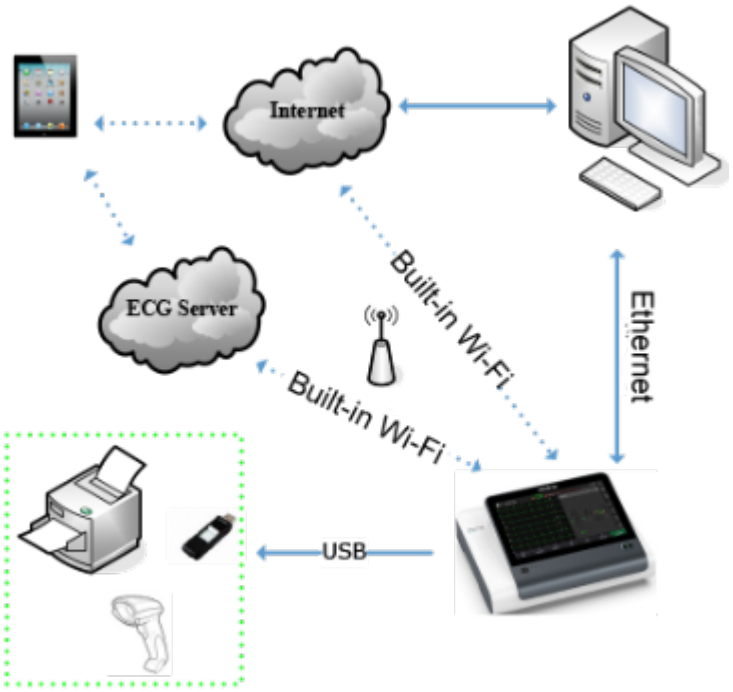
2.1.1 Overview

The electrocardiograph (ECG) device is intended for use in medical departments to extract human ECG waveforms for morphological and rhythm analysis, supporting clinical diagnosis and research. The device mainly provides the following functions:

- Conduct resting ECG examinations for patients in medical institutions.
- Provide 12-lead ECG waveform collection, recording, storage, measurement/diagnostic analysis, export, and transmission functions.
- Provide ECG algorithms for automated analysis of the collected ECG waveforms, and deliver measurement values and diagnostic result information.
- Support automatic, manual, and rhythm measurement modes.
- Enable report output through the thermal recorder and external printer, capable of synchronously outputting 12-lead ECG waveforms.
- Allow previewing, storing, and retrieving ECG reports.
- Support wired or wireless Wi-Fi network connections for transmitting ECG examination data.
- Facilitate input of patient information through a touch screen and barcode scanner.
- Provide prompts for lead detachment, interference, low battery, and other device anomalies.

The ECG device can connect with other peripheral devices through wired or Wi-Fi networks to form a data interaction system, as illustrated in the following block diagram:

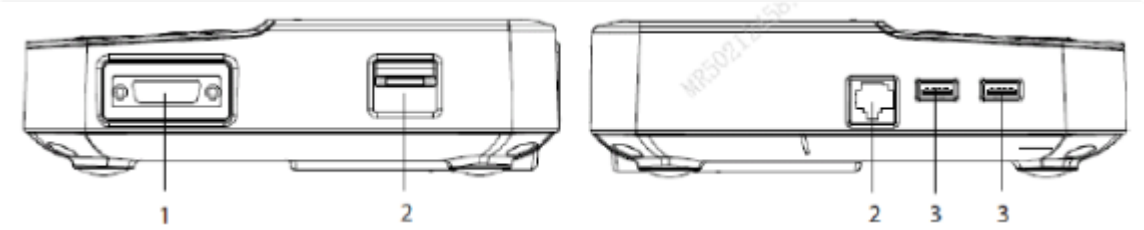
Figure2–1



2.1.2 Peripheral Ports

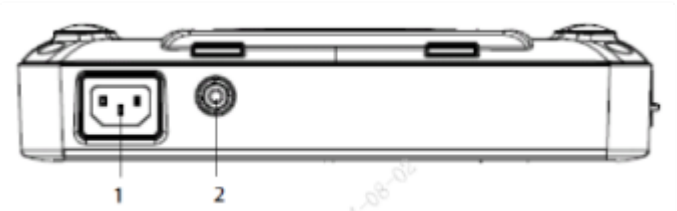
R300 Input and Output Ports

Figure2–2 Side View



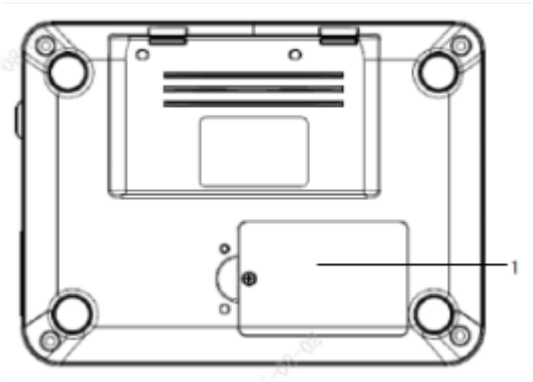
1	ECG cable port: Connects the ECG cable for ECG data collection.
2	Recorder paper compartment switch: Opens the paper compartment of the recorder after being pressed.
2	Network port: Connects to a network for software updates.
3	USB port: Connects to a USB Flash drive for data transfer.

Figure2–3 Rear View



1	AC power port: Connects the power cord to supply AC power to the ECG device.
2	Equipotential ground terminal: When other devices are used alongside the ECG device, a wire should be used to connect the equipotential terminals of all devices. This eliminates potential differences between devices, ensuring safety.

Figure2–4 Bottom View



1	Battery compartment: Houses the battery for powering the device.

NOTICE

USB and network ports are located on the side panel of the monitor.

2.1.3 Architecture Diagram of Hardware System

- Screen:
  - The R300 features a 5-inch display with an 800×480 resolution. It supports operation through physical buttons instead of touch screen.
- Battery:
  - The R300 is equipped with a rechargeable, non-smart soft-pack battery, which requires tools for installation and removal.
- Wireless:

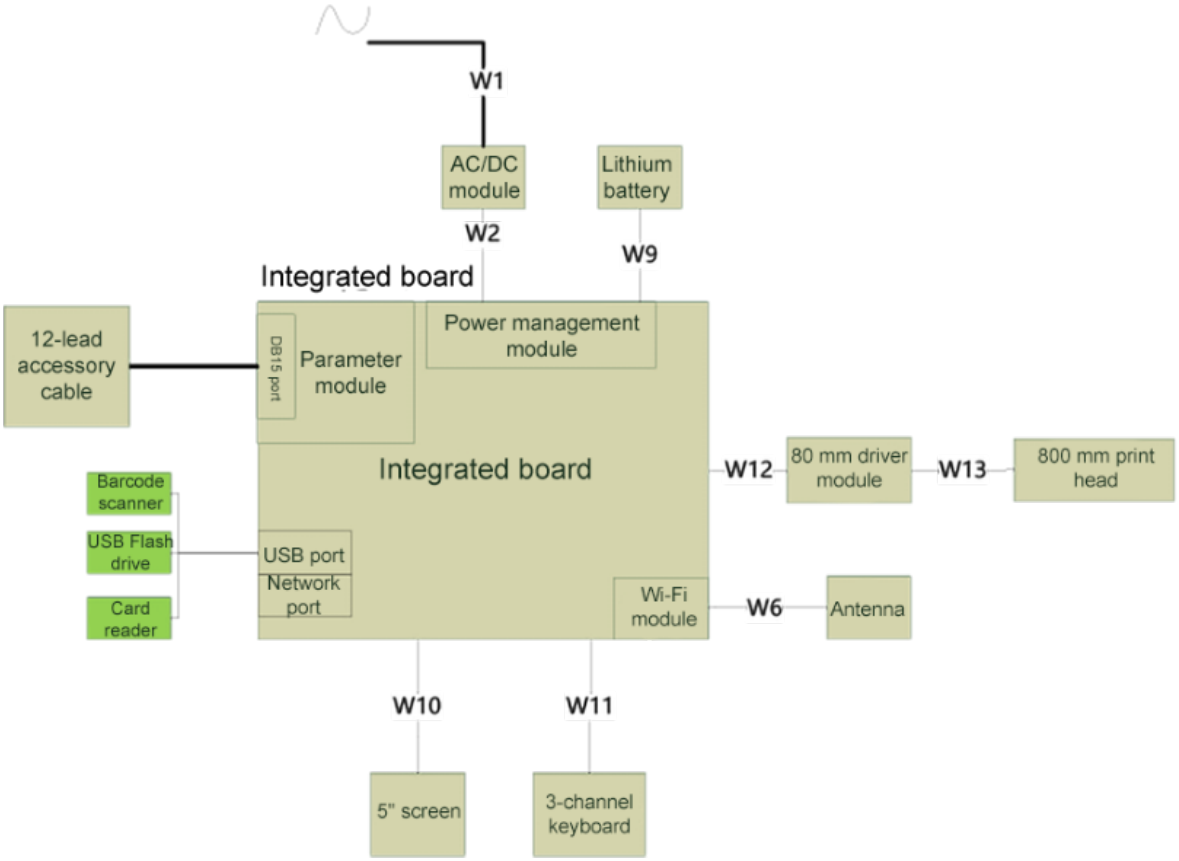
— The Wi-Fi module is available as an optional feature of the R300.

- Thermal recording:

— The R300 comes standard with an 80 mm thermal module that supports printing on 80 mm thermal paper.

The following figure shows the architecture diagram of R300 hardware system.

Figure2–5 Architecture diagram of R300 hardware system



Integrated Main Control and Parameter Board (Referred to as Integrated Board or Main Control Board)

The integrated board is the core of the ECG device, consisting of the following modules:

- Main control module: Includes the CPU processor, program memory, data memory (permanent data memory, random data memory and configuration data memory) and system control circuits (watchdog, power supply circuit, and RTC).
- Parameter module: Includes the ECG and pacing signal collection and preprocessing circuits.
- Interface module: Includes the DB15 lead wire interface, USB interface, network interface, and Wi-Fi interface.
- The main functions of the power management module are as follows:

1. Power management: An MCU is used to implement powering on/off and internal power supply monitoring, and the main voltage needs to be monitored. It provides overcurrent and overvoltage protection functions.
2. Power conversion: It converts AC-DC input (about 15 V) into 12 V/5 V/3.3 V and other voltage rails to power other boards and functional modules on this board.
3. Battery management: including battery charging, in-place detection, and battery voltage detection.

Wi-Fi

The Wi-Fi module enables the monitor to support Wi-Fi network.

AC/DC power module

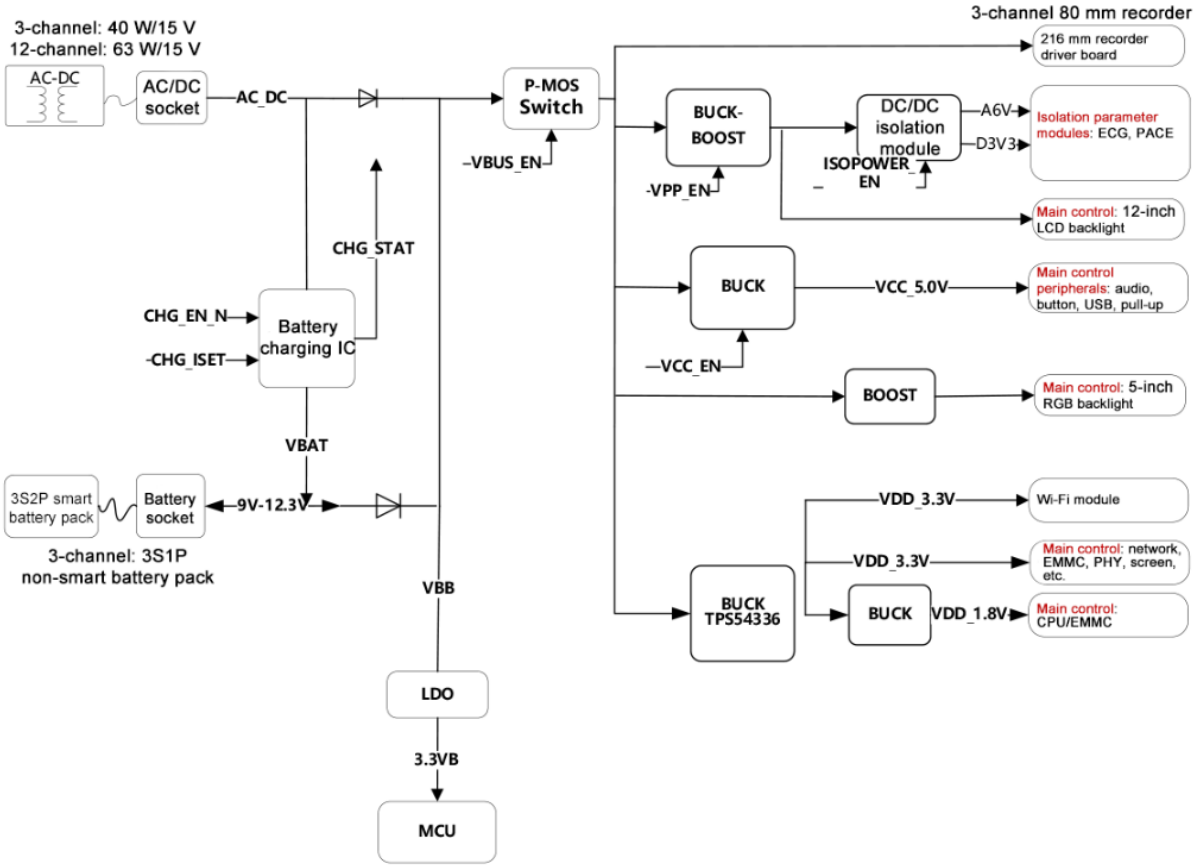
It converts AC power to DC power for output.

Recorder module

It receives data sent by the main control board and outputs it.

2.1.4 Power Architecture Diagram

Figure2–6 Power Architecture Diagram



Battery of the host: R300 uses a non-intelligent battery with an output voltage of 9 V to 12.3 V.
The AC-DC output voltage is 15 V, and R300 is a 40 W module.
The VBUS voltage ranges from 10 V to 15 V, which powers the recorder power part and the 5-inch display backlight.
The 12 V power supply energizes the 12.1-inch screen backlight and parameter isolation power supply.
In addition to 5 V and 3.3 V power supplies that power USB peripherals, Wi-Fi module, internal lower-voltage power rails are also provided to energize the minimal system of the main control board.

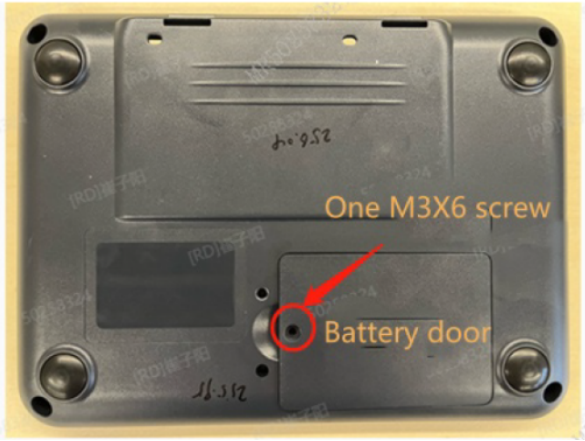
2.2 Installing the Accessories

2.2.1 Installing the Battery

Installing the BnenHeart R300/R30 battery:

Use a handheld screwdriver to loosen and remove the M3X6 screw at the bottom of the machine. Open the battery compartment door and install the battery, as shown in the figure on the right

below. Plug in and organize the wires. Then, close the battery compartment door and tighten the M3X6 screw.



2.2.2 Installing the Parameter Accessories

Refer to online instructions or manual.

2.2.3 Peripheral Installation (If Applicable)

Peripherals refer to USB, Bluetooth, and network-connected devices, such as printers, scanners, and temperature modules.

Connect the peripheral devices to the corresponding interfaces on the ECG machine as instructed in the manual.

2.3 System Installation

2.3.1 System Installation

After the accessories are installed, connect the AC power and press the power button to turn on the ECG machine.

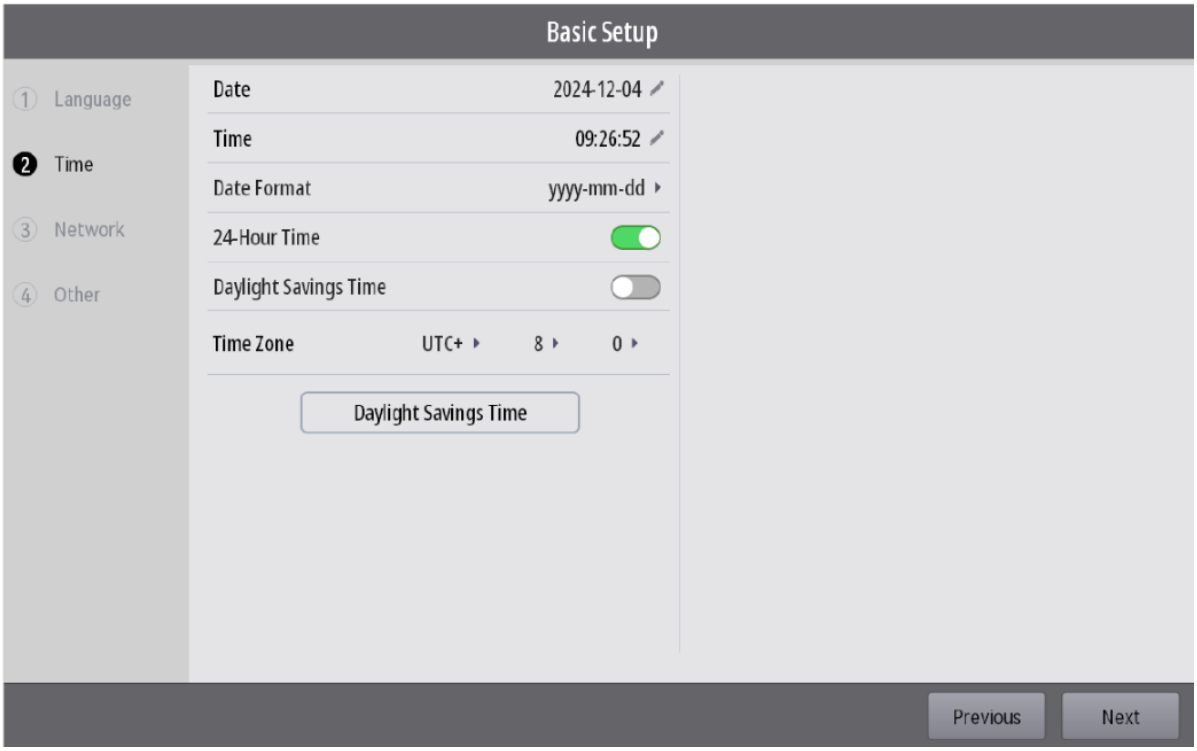
This ECG machine provides a setup wizard. When you turn it on for the first time, you can complete the monitor settings according to the prompts from the wizard:

1. Choose your preferred language, such as English/English. After selection, click Next to proceed.

Figure2–7

2. Configure the required time, time zone, and date format.

Figure2–8

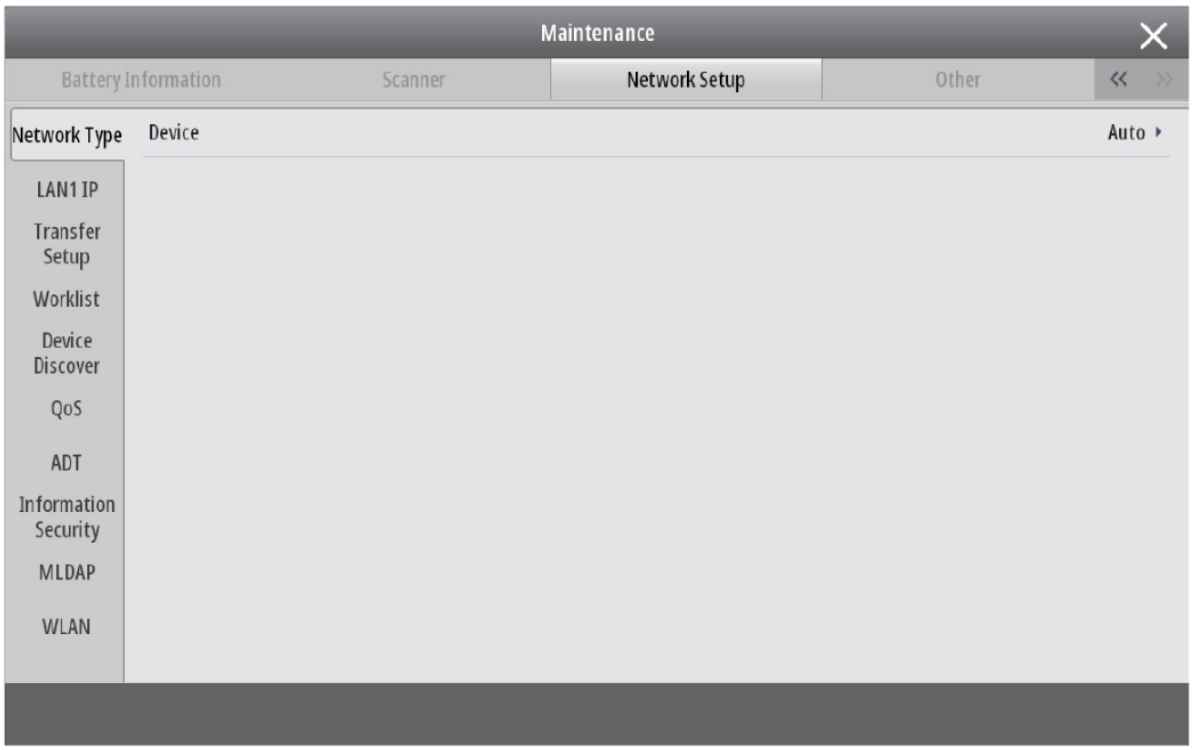


3. Select Network and click Network Setup.

Figure2–9

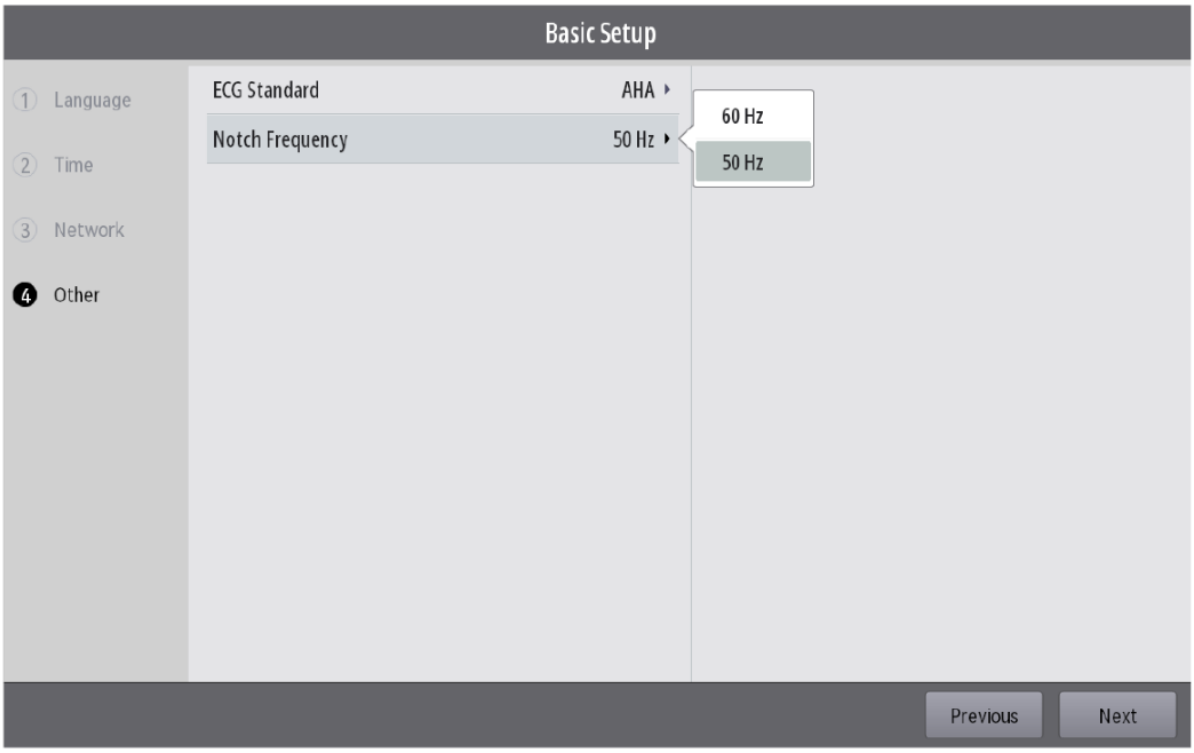
Choose the network type according to actual conditions (defaulted to automatic).

Figure2–10



4. Basic setup: Select and set ECG standard according to regional requirements: AHA/IEC; power frequency notch: 50 Hz/60 Hz

Figure2–11



After completing the setup wizard, restart the ECG machine to finalize the settings and apply the changes.

2.3.2 Component and Cart Installation

The ECG machine has optional components and a compatible rolling stand. For detailed installation instructions, see the ECG Machine Cart Installation Manual (PN: H-046-029364-00).

3 Maintenance and Test

3.1 Introduction

3.1.1 Introduction

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

The procedures are intended to verify that the ECG machine meets the performance specifications. If a module of the ECG machine or the ECG machine fails to perform as specified in any test, it must be maintained or replaced in a timely manner. 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 User Maintenance/ Factory Maintenance 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.**

3.1.2 Device Test

See the test sections below.

3.1.3 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.

3.1.4 Preventative Maintenance

Below is the list of tasks that need to be performed for the preventive maintenance of the ECG machine. Please conduct maintenance according to the specified tasks and frequencies provided in the table.

3.1.5 Maintenance Period

Inspection/Maintenance Item		Frequency
Visual Check		When the machine is installed for the first time or every time it is reinstalled
Power-on Self-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
ECG test	Performance Test	1. When you suspect that the measured values are inaccurate 2. When the functional module is repaired or replaced 3. At least once every year
	Module calibration	
Electrical Safety Test	Shell leakage current test	1. When the power module is repaired or replaced 2. After the ECG machine drops 3. At least once every two years or based on requirements
	Earth leakage current	
	Patient leakage current	
	Patient auxiliary current	
Recorder Test		When the recorder is repaired or replaced
Battery Test	Function Check	1. Upon first installation 2. When battery is replaced
	Performance Checks	Every 3 months or when the battery's operating time is significantly reduced

3.1.6 Maintenance Kit Content

The ECG machine does not have any consumable maintenance material kit that require regular replacement.

3.2 Preparation Before Maintenance

3.2.1 Preparation Before Maintenance

Before performing maintenance, ensure that the equipment is not in operation and is not connected to any patients.
Prior to maintenance, properly clean and disinfect the equipment to prevent contamination of the maintenance workspace.

3.2.2 Visual Check

The visual check involves a thorough inspection of the ECG machine's external appearance. The inspection is considered passed if no obvious physical damage is found.

Preparation before Testing

None

Test Procedure

Visually check the appearance of the ECG machine and its accessories. Inspect the following:

- Inspect the ECG machine enclosure, LCD, and buttons for any physical damage.
- Inspect all external connections for loose connectors, bent pins, or frayed cables.
- Inspect all connectors on the ECG machine for loose connectors or bent pins.
- Make sure that safety labels and nameplates on the equipment are clearly legible.

3.2.3 Power-on Self-test

This test is to verify that the ECG machine can start and function properly.

Preparation before Testing

None

Test Procedure

If the ECG machine completes the startup process as follows, the power-on self-test is passed:

1. Insert the battery into the ECG machine and connect the machine to the AC power supply. The AC power indicator and battery indicator light up.
2. Press the power button to turn on the ECG machine. The power indicator lights up.
3. The system emits a **beep** (indicating that the self-test has passed).
4. The startup screen disappears, the main interface is displayed, and normal startup is completed.

3.3 Module Performance Test

3.3.1 ECG test

This test is used to verify the ECG function state.

Preparation before Testing

None

Test Procedure

1. Connect the ECG machine and the patient simulator using the ECG machine cable.
2. Set the simulator as follows: ECG: Sinus rhythm; Amplitude: 1 mV (default setting upon startup); HR: 80 bpm.
3. Check the ECG waveform displayed on the screen of the ECG machine. It should be clear, complete, and without noticeable noise.
4. Start the automatic collection and analysis process. Record the ECG waveform and diagnostic results.
5. The recorded waveform should be clear and complete, with the amplitude of the II lead waveform around 10 mm (set the gain to 10 mm/mV). The diagnostic result should show sinus rhythm and a HR of 80 bpm.
6. Sequentially disconnect each lead and observe the screen for the corresponding lead-off prompt message.

3.3.2 Barcode Scanner Test

This test is used to verify the functionality of the barcode scanner.

Preparation before Testing

None

Test Procedure

1. Aim the barcode scanner at the pre-scanned barcode. The aiming point should be centered on the barcode, and adjust the scanning area size to match the target barcode.
2. Pull the trigger. The barcode scanner will decode the target barcode. If the decoding is successful, the scanner will emit a short intermediate beep, the indicator will turn green, and the ECG machine will display the scanned characters.

3.4 Electrical Safety Test

3.4.1 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 tests shall comply with the following standards: GB9706.1 or YY/T0841.**
- **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 ECG machine.**

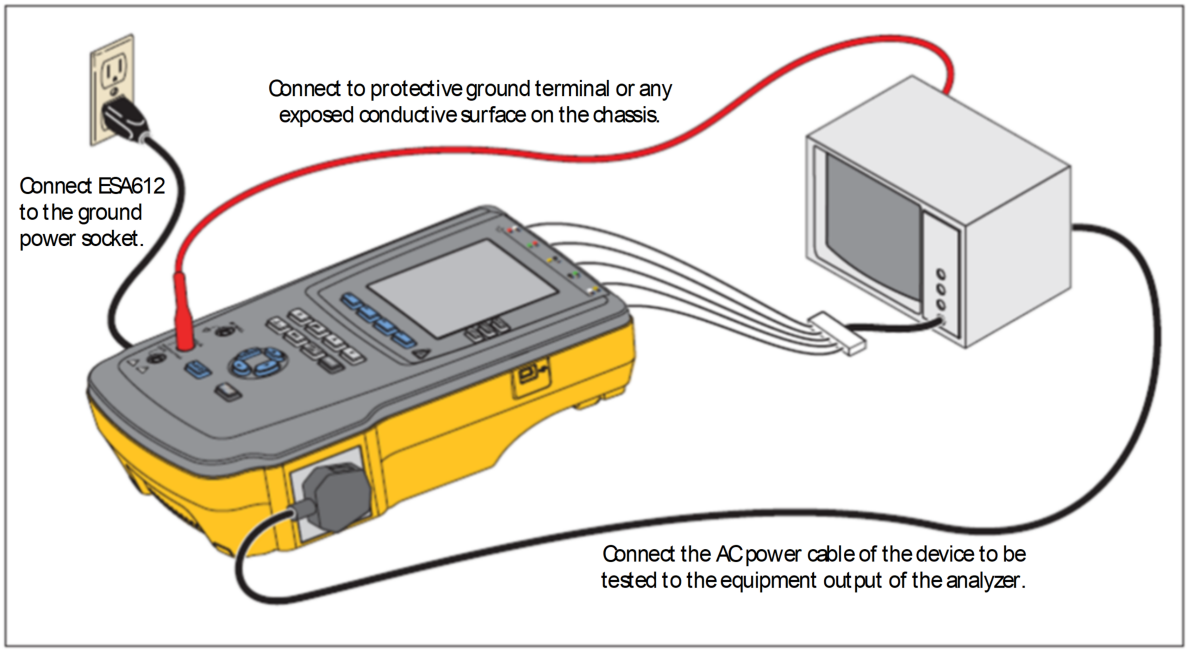
3.4.2 Ground Resistance Test

Preparation before Testing

Electrical safety tests in this manual are performed in accordance with the IEC62353 (equivalent to YY/T0841) standard.
Test equipment: Fluke ESA612 or ESA615 or equivalent equipment.

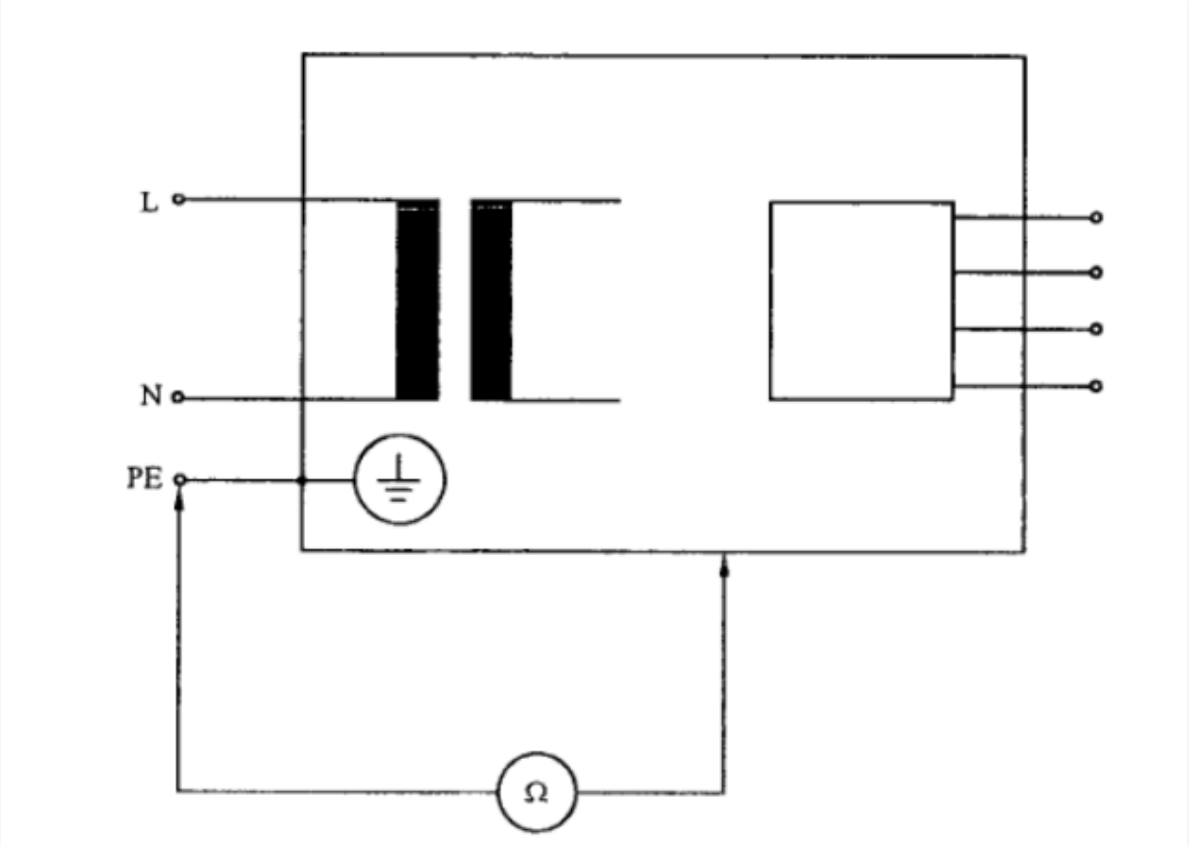
Connection Diagram of the Device Under Test and the Test Equipment

Figure3–1 Connection Diagram of the Device Under Test and the Analyzer



1. Plug the analyzer power cord plug into the socket and turn on the power button to enter the startup screen.
2. Press the **SETUP** soft key and press the More function key to display other menu options. Press the Instrument function key to display the instrument setup options. Press the **Standard** function key to scroll between the standard options to select the test standard (62353).

Figure3–2 Schematic Diagram of Ground Resistance Test



Test Procedure

Steps to perform a ground resistance test:

1. Connect the device under test to the analyzer according to the connection diagram.
2. Press the **Ω** soft key on the panel.
3. Connect one end of the test lead wire to the V/Ω/A jack and the other end of the test lead wire to the Ø/Null (zero) jack.
4. Press the Zero Leads function key. The analyzer zeroes the measurement to offset the resistance of the test lead.
5. Remove the test lead wire from the Ø/Null terminal and connect it to the ground point of the protective ground post of the device under test or the metal enclosure of the device under test to read the ground resistance.
6. After completing the connection of the device under test, the measured resistance will be displayed.
7. Record the maximum value.

The ground resistance is not greater than 300 mOhms.

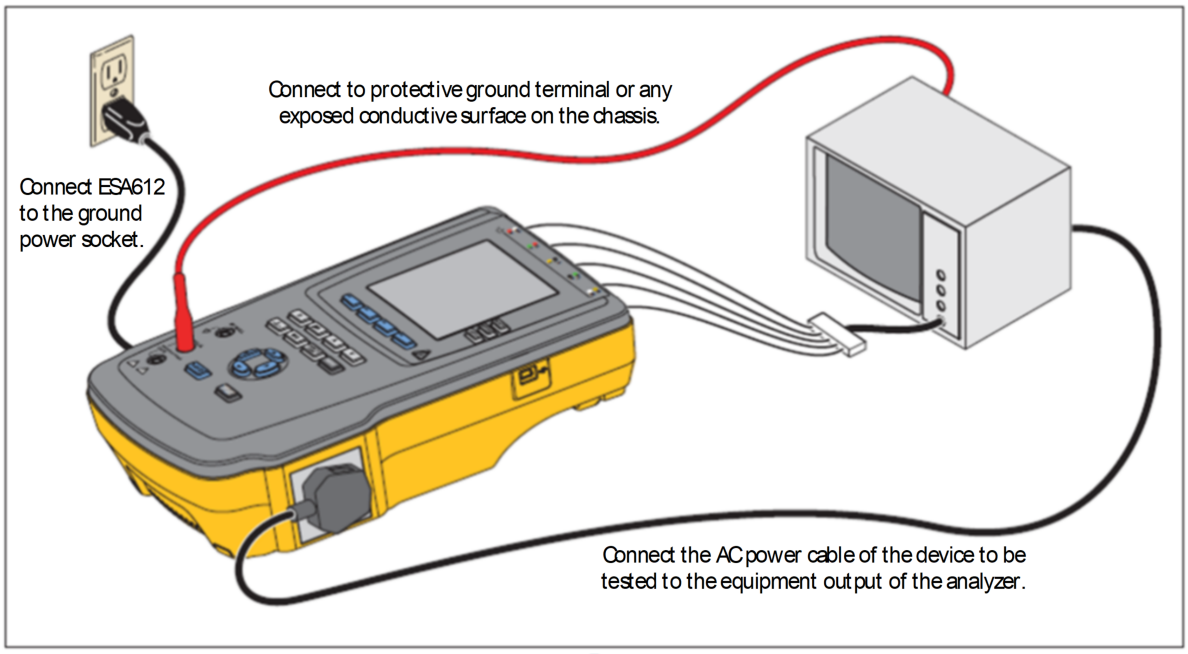
3.4.3 Device Leakage Current Test (Normal State)

Preparation before Testing

Electrical safety tests in this manual are performed in accordance with the IEC62353 (equivalent to YY/T0841) standard.
Test equipment: Fluke ESA612 or ESA615 or equivalent equipment.

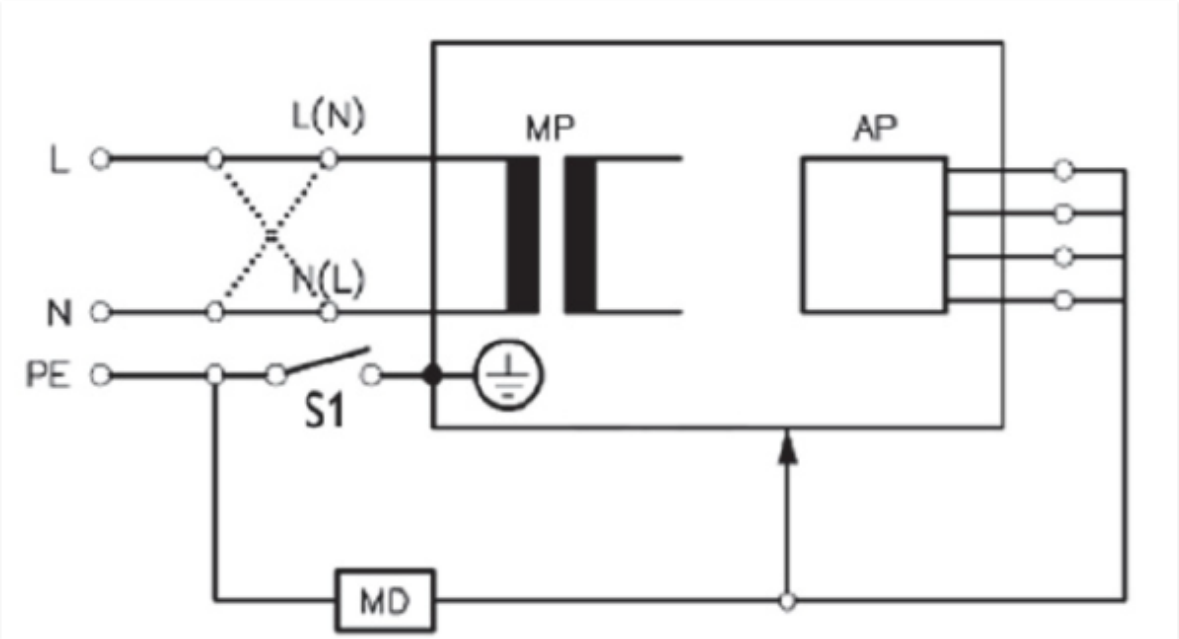
Connection Diagram of the Device Under Test and the Test Equipment

Figure3–3 Connection Diagram of the Device Under Test and the Analyzer



1. Plug the analyzer power cord plug into the socket and turn on the power button to enter the startup screen.
2. Press the **SETUP** soft key and press the More function key to display other menu options. Press the Instrument function key to display the instrument setup options. Press the **Standard** function key to scroll between the standard options to select the test standard (62353).

Figure3–4 Schematic Diagram of Device Leakage Current Test



Test Procedure

Steps to perform a device leakage current test:

1. Connect the device under test to the analyzer according to the connection diagram. Connect the test accessory to the metal enclosure of the device under test or the metal foil on the surface of the device under test.
2. Press μA.
3. The direct device test is the default mode and should already be selected.
4. Press TEST to apply voltage and read the leakage current on the screen.
5. Use the **Polarity** setting on the right to select Normal Polarity.
6. Use the **Earth** setting to select Ground Closed.
7. Record the maximum value and the corresponding status.

The leakage current should not exceed 100 μA in normal state.

3.4.4 Device Leakage Current Test (Single Fault)

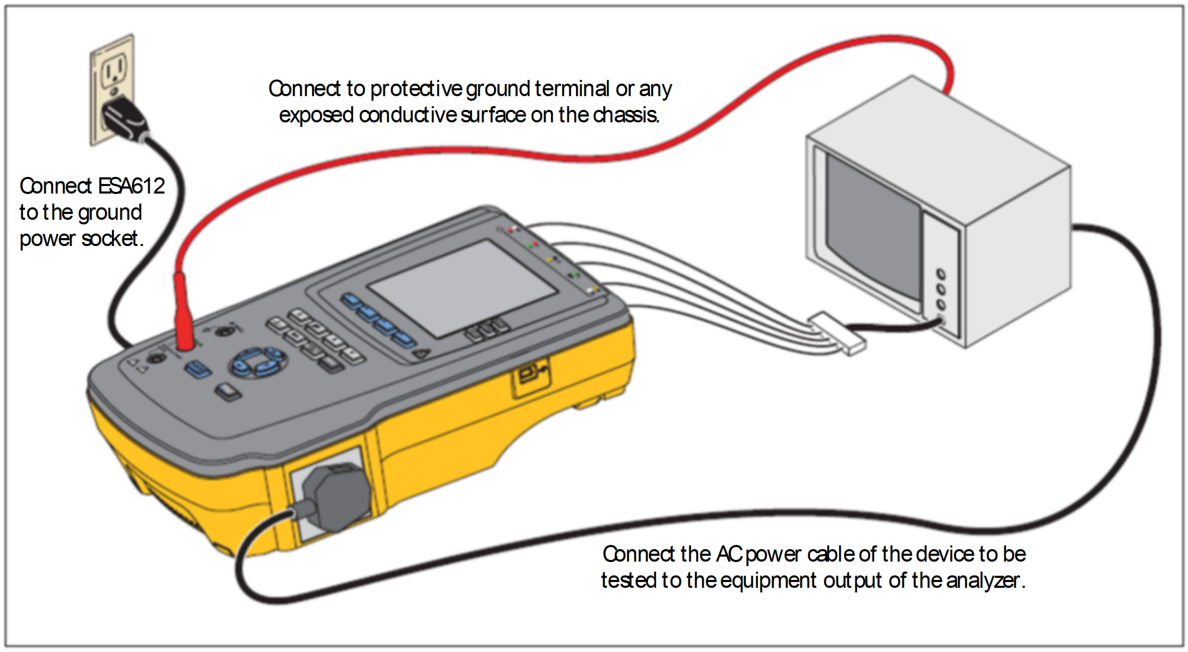
Preparation before Testing

Electrical safety tests in this manual are performed in accordance with the IEC62353 (equivalent to YY/T0841) standard.

Test equipment: Fluke ESA612 or ESA615 or equivalent equipment.

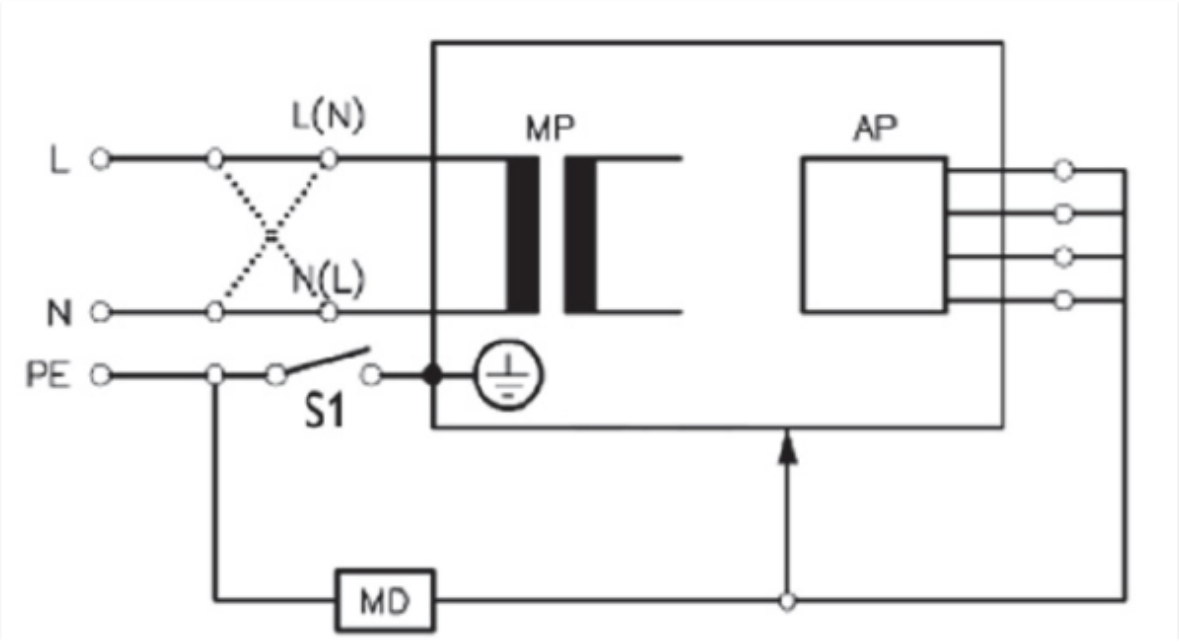
Connection Diagram of the Device Under Test and the Test Equipment

Figure3–5 Connection Diagram of the Device Under Test and the Analyzer



1. Plug the analyzer power cord plug into the socket and turn on the power button to enter the startup screen.
2. Press the **SETUP** soft key and press the More function key to display other menu options. Press the Instrument function key to display the instrument setup options. Press the **Standard** function key to scroll between the standard options to select the test standard (62353).

Figure3–6 Schematic Diagram of Device Leakage Current Test



Test Procedure

Steps to perform a device leakage current test:

1. Connect the device under test to the analyzer according to the connection diagram. Connect the test accessory to the metal enclosure of the device under test or the metal foil on the surface of the device under test.
2. Press μA.
3. The direct device test is the default mode and should already be selected.
4. Press TEST to apply voltage and read the leakage current on the screen.
5. Use the **Polarity** setting on the right to select Normal or Reverse Polarity.
6. Use the **Earth** setting to select Ground Open.
7. Record the maximum value and the corresponding status.

The leakage current should not exceed 300 μA in single fault state.

3.4.5 Leakage Current on the Applied Part

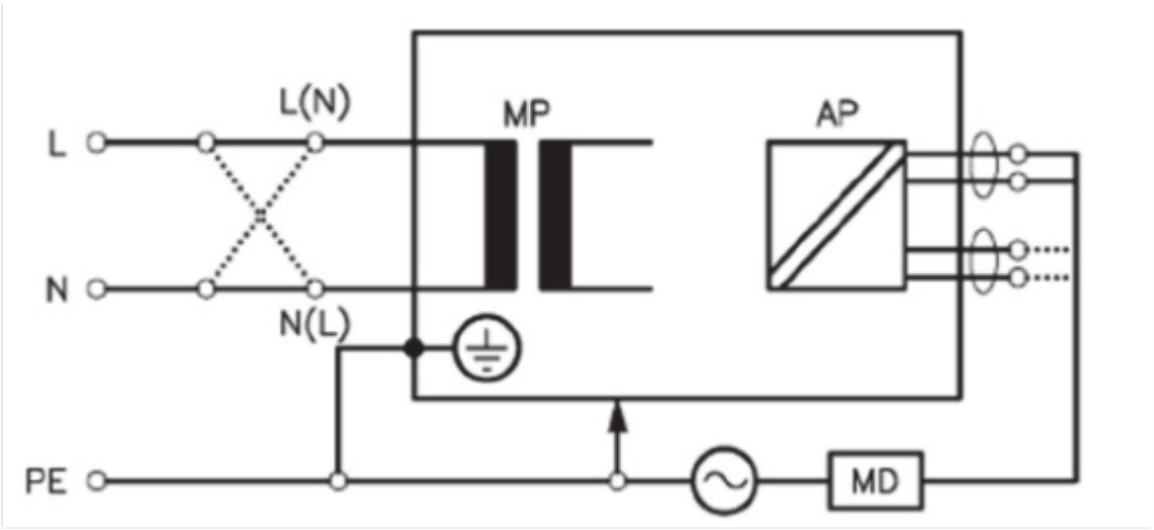
Preparation before Testing

Electrical safety tests in this manual are performed in accordance with the IEC62353 (equivalent to YY/T0841) standard.

Test equipment: Fluke ESA612 or ESA615 or equivalent equipment.

1. Connect the device under test to the test equipment.
2. Plug the analyzer power cord plug into the socket and turn on the power button to enter the startup screen.
3. Press the **SETUP** soft key and press the More function key to display other menu options. Press the Instrument function key to display the instrument setup options. Press the **Standard** function key to scroll between the standard options to select the test standard (62353).

Figure3–7 Schematic Diagram of Leakage Current on the Applied Part



Test Procedure

Steps to perform an applied part leakage test:

1. Connect the parameter accessory to be tested (for example, SpO2) of the device under test to the applied part connector of the electrical safety analyzer.
   - For ECG accessories, insert the banana plug-to-ECG adapter into the jack of the applied part of the analyzer. Connect the ECG lead wire to the banana plug-to-ECG adapter.
   - For SpO2 and other accessories, wrap the SpO2 accessory in copper foil. Clamp the copper foil with the clip end of the test lead, and plug the other end of the test lead into the jack of the applied part of the analyzer.
2. Press μA.
3. Press the More function key.
4. Use and to select the desired applied part.
5. Press the Select function key. The **Direct leakage current test for the applied part** should already be selected.
6. Press or to select the appropriate test configuration for the applied part.
7. Press TEST to apply the test voltage and read the current on the screen.
8. Press or to move to the next set of applied part tests (if applicable).
9. Use the **Polarity** setting on the right to select Normal or Reverse Polarity.
10. Record the maximum value and the corresponding status.

For CF-type equipment, the leakage current should not exceed 50 μA. For BF-type equipment, the leakage current should not exceed 5000 μA.

3.5 Recorder Test

3.5.1 Recorder Test

This test is used to verify the functionality of the recorder.

3.5.2 Preparation before Testing

None

3.5.3 Test Procedure

1. Power on the ECG machine and set the ECG collection mode to manual. Press the ECG button to start the ECG test. The recorder should print the data normally, with clear and consistent print quality.
2. Simulate faults such as "out of paper" or "recorder compartment door open". The screen should display corresponding error messages. After the faults are eliminated, the machine should resume normal operation.

3.6 Battery Test

3.6.1 Battery Test

This test is main used to measure the battery status.

3.6.2 Preparation before Testing

None

3.6.3 Test Procedure

Function Check

1. If the ECG machine has a battery installed, remove the battery.
2. Verify that the ECG machine operates normally when powered by AC power supply.
3. Follow the correct steps described in the user manual to insert the battery.
4. Remove the AC power cord and check that the ECG machine continues to function normally.

Performance Checks

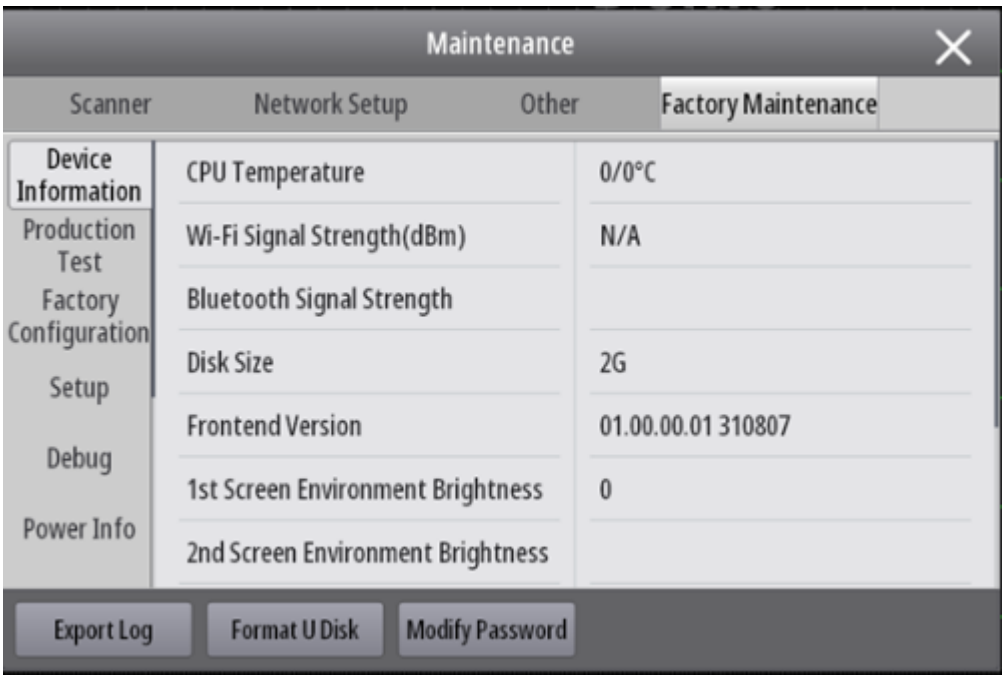
Check that the battery power supply time meets the specifications by referring to the relevant content in the battery chapter of the user manual.

3.7 Factory Maintenance

3.7.1 Entering Factory Maintenance Mode

Choose **Main Menu** > **System**. In the **System** column, select **Maintenance**. Enter the required password. Select **OK**. Select Factory Maintenance.

Figure3–8



3.7.2 Device 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.

Access the **Device Information** menu, in which you can view information of the main unit, such as the CPU temperature, Wi-Fi signal strength and hard disk capacity.

In the lower left corner of the window, click **Export Log** to export all logs of the device.

3.7.3 Production Test

Access the **Production Test** menu, in which you can test basic functions related to hardware interfaces of the ECG machine.

Production test includes automated test and single-test.

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

3.7.4 Setup

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

3.7.5 Commissioning

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

3.7.6 Power Information

Access the **Power Information** menu, in which you can view the power status of the ECG machine.

3.7.7 Clinical Data

Access the **Clinical Data Collection** menu, in which you can set the collection of clinical data.
When Clinical Data Location is set to **Local**, the clinical data is saved on the ECG machine 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.

3.7.8 Clinical Data Sending

Access the **Clinical Data Transfer** menu, in which you can select the clinical data to send.

4 Upgrade

4.1 Software version

Access the **Version Information** menu, in which you can view all software versions in the system.
Maintenance Test Report
See the above sections for detailed test procedures and contents.

Customer name		
Customer address		
Servicing person		
Servicing company		
Equipment under test (EUT)		
Model of EUT		
SN of EUT		
Hardware version		
Software version		
Test equipment	**Model/No.**	**Effective date of calibration**
Test Items	**Test Records**	**Test Result (Pass/Fail)**
Visual Check		
ECG machine shell, screen, keys, power cord, wall-mounted bracket, and accessories for physical damage.		
The external connectors are not frayed and the connector pins are not loose or bent.		
All connectors on the equipment for loose connectors or bent pins.		
The safety labels and nameplates are clearly legible.		
Power−on Self−test		

The power-on test passes, the power indicator and alarm system work properly, and the monitor starts properly.		
Electrical Safety Test		
The shell leakage current is not more than 100 μA in the normal state or not more than 500 μA in the single fault state.		
The earth leakage current is not more than 500 μA in the normal state or no 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.		
Touch Screen Calibration		
The touch screen calibration is successful.		
Recorder Test		
The data can be printed normally, with clear and correct printing effect.		
If there are faults such as paper shortage and buckle tilting, there should be corresponding prompts on the screen, and the machine should be able to work normally after recovery		
The alarm recording function of each parameter is normal.		
Battery Test		
When the AC power supply is accidentally disconnected, the battery enables the monitor to continue to work normally.		
The battery power time meets the product specifications.		

Test conclusion:
Result: (Yes/No)
Tested by: Date:

4.2 Software Upgrade

4.2.1 Network Upgrade

Functions of this ECG machine and its peripheral firmware can be upgraded through a PC network or a USB Flash disk.

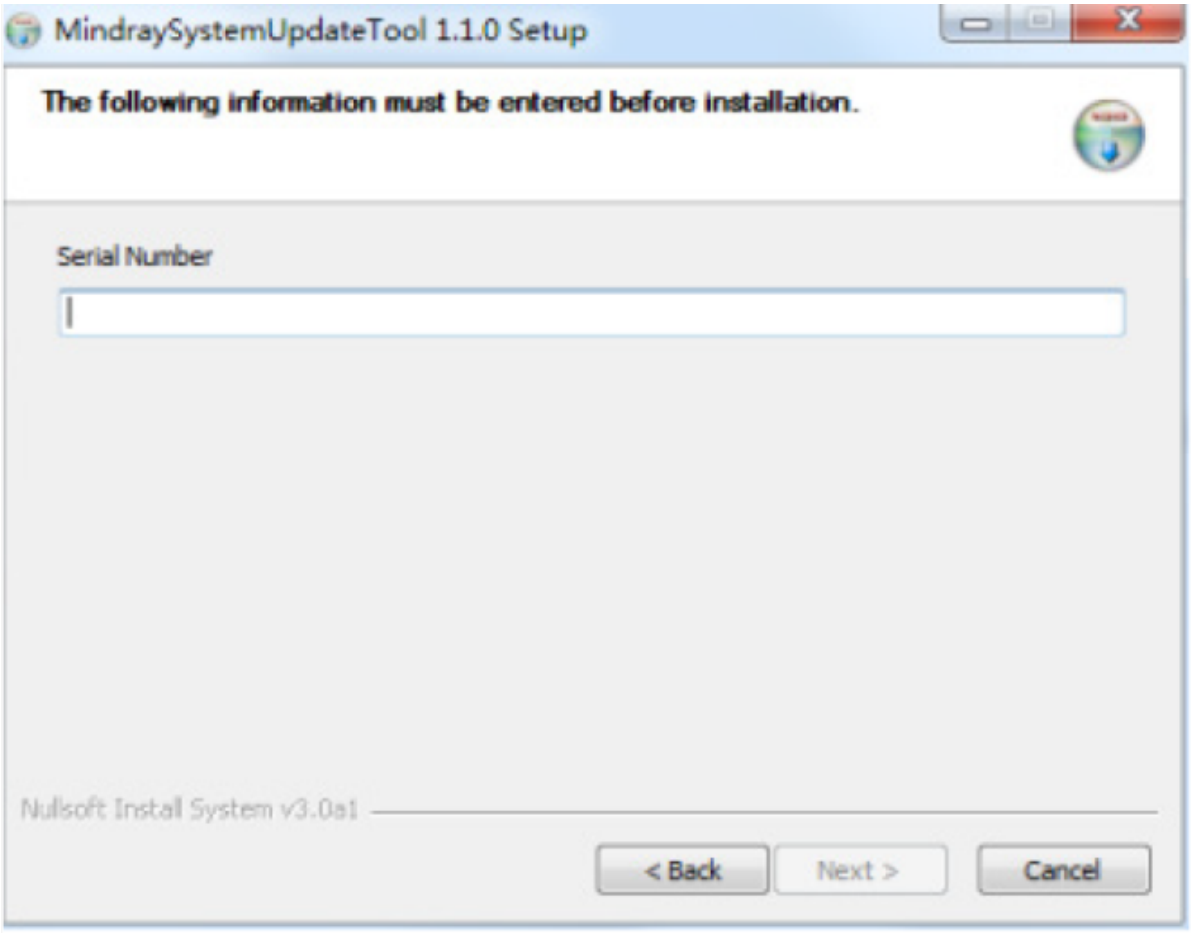
This ECG machine can be upgraded by using the Mindray ECG Network Upgrade Software (PN: 110-008081-00 PC Upgrade Tool)., which can directly run on a laptop or a desktop PC. It is recommended to a switch or router to connect the PC and ECG machine for network upgrades.

This ECG machine can also be upgraded using a specifically authorized USB Flash drive (which includes the USB upgrade boot program PN: 110-008082-00) to upgrade the following programs of the ECG machine.

How to Install the Tool Software

1. Click SystemUpdateTool.exe. On the wizard displayed, click "Next >" to enter the **Serial Number** page.

Figure4–1



2. Enter the serial number, and click "Next >" to enter the program installation path page. Select the installation folder, click "Next >", and perform following steps as instructed.
   Appendix: Multi-language Reference Table

Language (English Reference)	Language (Chinese Reference)	Remarks
ENGLISH	English	None
SIM.CHINESE	Simplified Chinese	None
FRENCH	French	None
GERMAN	German	None
ITALIAN	Italian	None
POLISH	Polish	None
SPANISH	Spanish	None
PORTUGUESE	Portuguese	None
RUSSIAN	Russian	None
CZECH	Czech	None
TURKISH	Turkish	None
HUNGARIAN	Hungarian	None
Danish	Danish	None
Dutch	Dutch	None
Finnish	Finnish	None
Norwegian	Norwegian	None
Swedish	Swedish	None
Romanian	Romanian	None
Serbian	Serbian	None
GREEK	Greek	None
TRA.CHINESE	Traditional Chinese	None
Japanese	Japanese	None

PC and ECG Machine Connection Method

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

1. Connect the PC to the ECG machine 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 ECG machine through a network cable in the same way. One hub has multiple slots and thus can be connected to at least 5 ECG machines a time for upgrade.
2. Modify the IP address of the PC NIC.

NOTICE

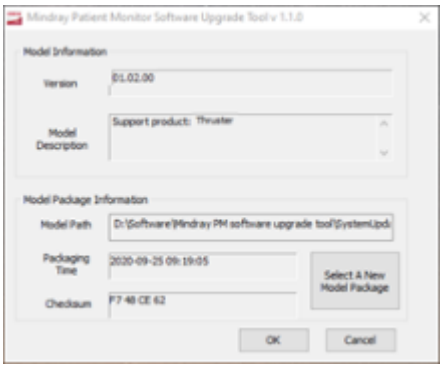
To ensure successful upgrade, before running the upgrade program, set the IP address to 77.77.1.xx. There is no restriction on the gateway and DNS addresses. For example, you can set the IP address to 77.77.1.13 and the subnet mask to 255.255.255.0.

Software Tool Upgrade

Set the system software upgrade package as follows:

1. Download the ECG machine 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 **Thruster.Tool** model package, **open it**, and then click **OK**.

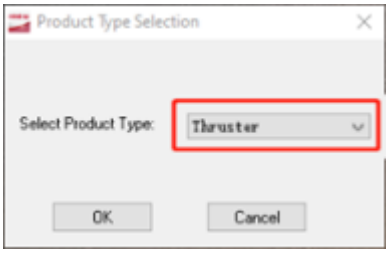
Figure4–2



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

The PC displays the following page:

Figure4–3



Upgrade Success Confirmation

After the upgrade is complete, the device list screen shows Success to indicate that the upgrade has been completed successfully. Go to the Maintenance menu on the ECG machine and check the version information to ensure that the version is correctly updated.

4.2.2 Upgrade Through a USB Flash Drive

Preparation of Directory Structure for Upgrade Through a USB Flash Drive

Tools:
USB Flash drive: A standard USB Flash drive formatted as FAT32 (such as, Kingston, Netac, or similar models with a capacity of 2 GB or more).
Directory preparation steps:

1. Create the following directory structure in the root of the USB Flash drive: UPGRADE_AMP \Thruster.
2. Copy the upgrade boot program Thruster_Installer.pkg (do not modify this file name) into the UPGRADE_AMP\Thruster directory.
3. Copy the upgrade file in the format of PKG or MPKG to the directory UPGRADE_AMP \Thruster.
4. Insert the prepared USB Flash drive into any USB port on the ECG machine.

Enter Upgrade Mode on the ECG Machine

- R300: Turn off the ECG machine. Connect a USB keyboard. Press the power button to turn on the ECG machine. During startup, continuously press **F4+F1** together to enter upgrade mode.
- R700/900: Turn off the ECG machine. Press the power button to turn on the ECG machine. During startup, use two or more fingers to continuously swipe on the touch screen to enter upgrade mode.

Selection of USB Flash Drive Upgrade File

Figure4–4

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 keyboard 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 keyboard 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 keyboard to select the upgrade program.
- Click the 

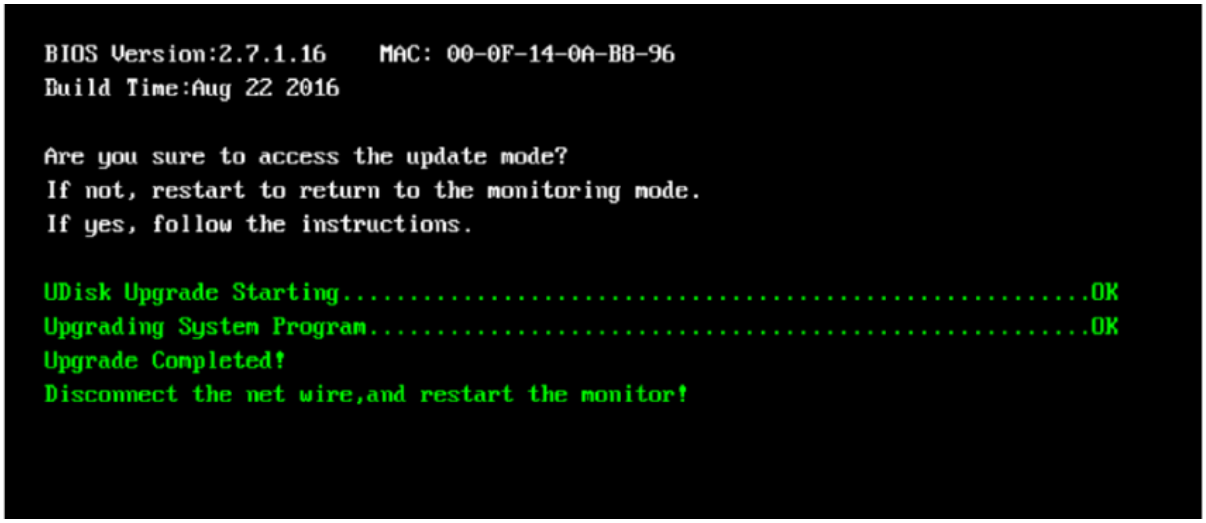
area on the touchscreen. The cursor moves to the right, and you can select the upgrade program. You can also press → on the keyboard to select the upgrade program.
- Click the 

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

Completion of USB Flash Drive Upgrade Process

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

Figure4–5



CAUTION

- **Disconnect the ECG machine 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.**
- **When upgrading directly through a PC connection, it is recommended to use a crossover network cable.**

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.

5 FRU Replacement

5.1 Disassembly

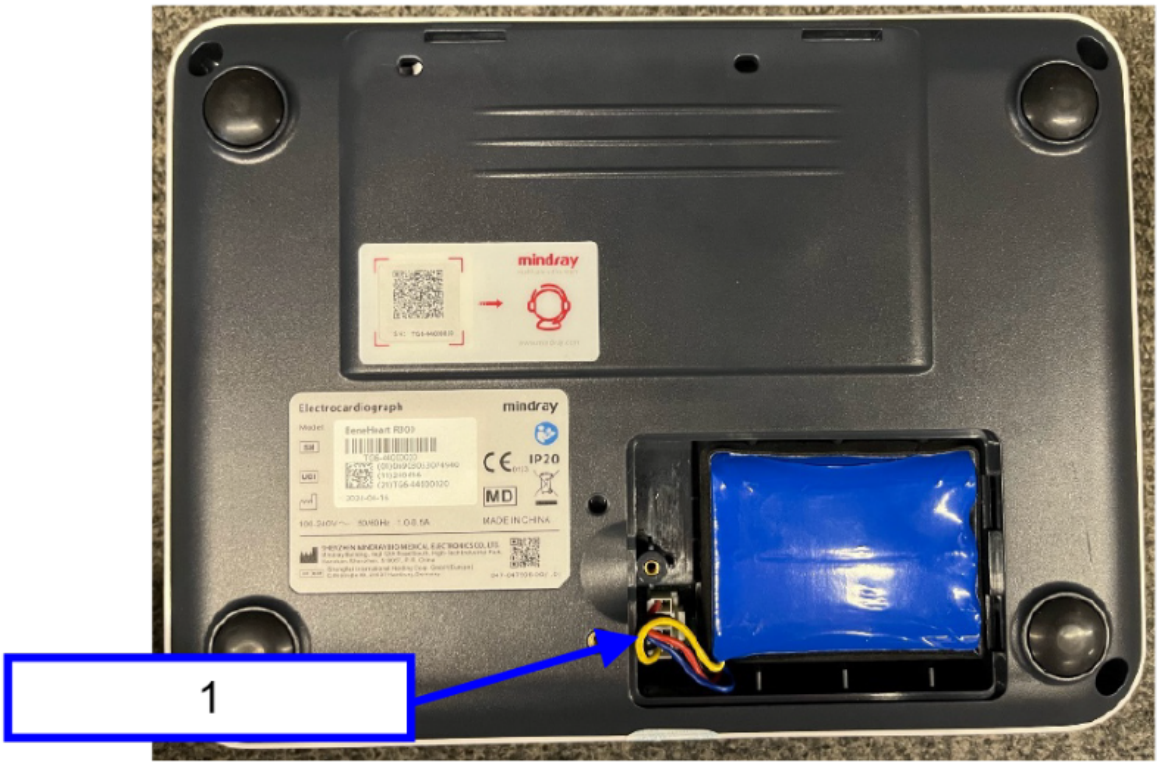
5.1.1 Disassembly of Upper and Lower Cover Assemblies

1. As shown in the figure below, use a screwdriver to unscrew one M3×6 pan head cross recessed screw. Take out the battery cover plate.

Figure5–1

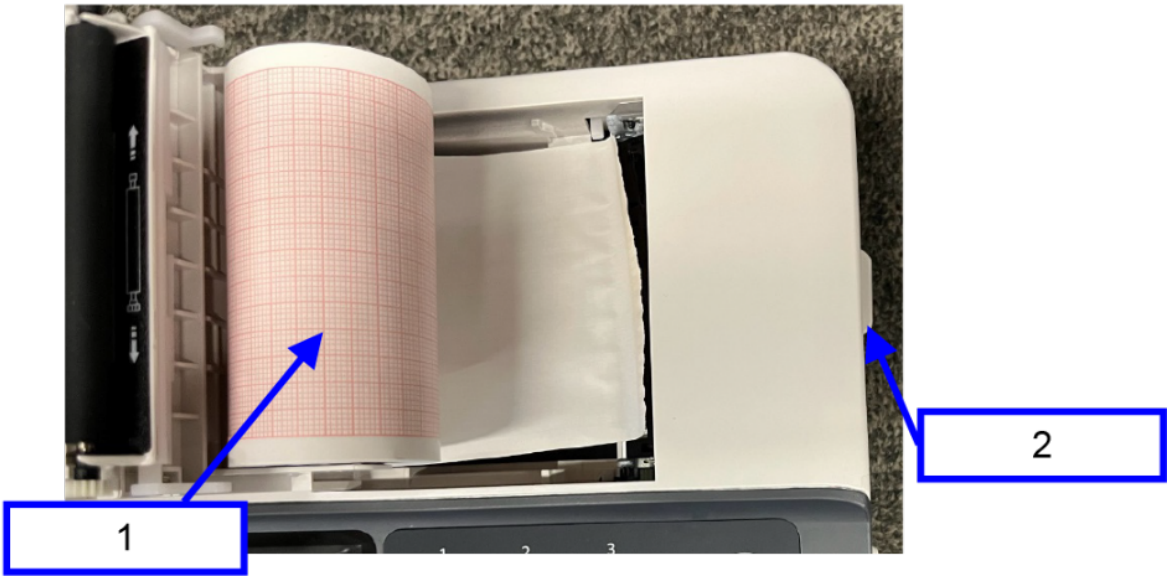
2. Loosen the battery cable buckle and remove the lithium battery. Press the recorder door button to open the recorder door, and then take out the printing paper. Use a screwdriver to unscrew the four M4×10 pan head cross recessed screws.

Figure5–2



1 Loosen the battery cable buckle

Figure5–3



1 Take out the printing paper

2 Recorder door button

Figure5–4

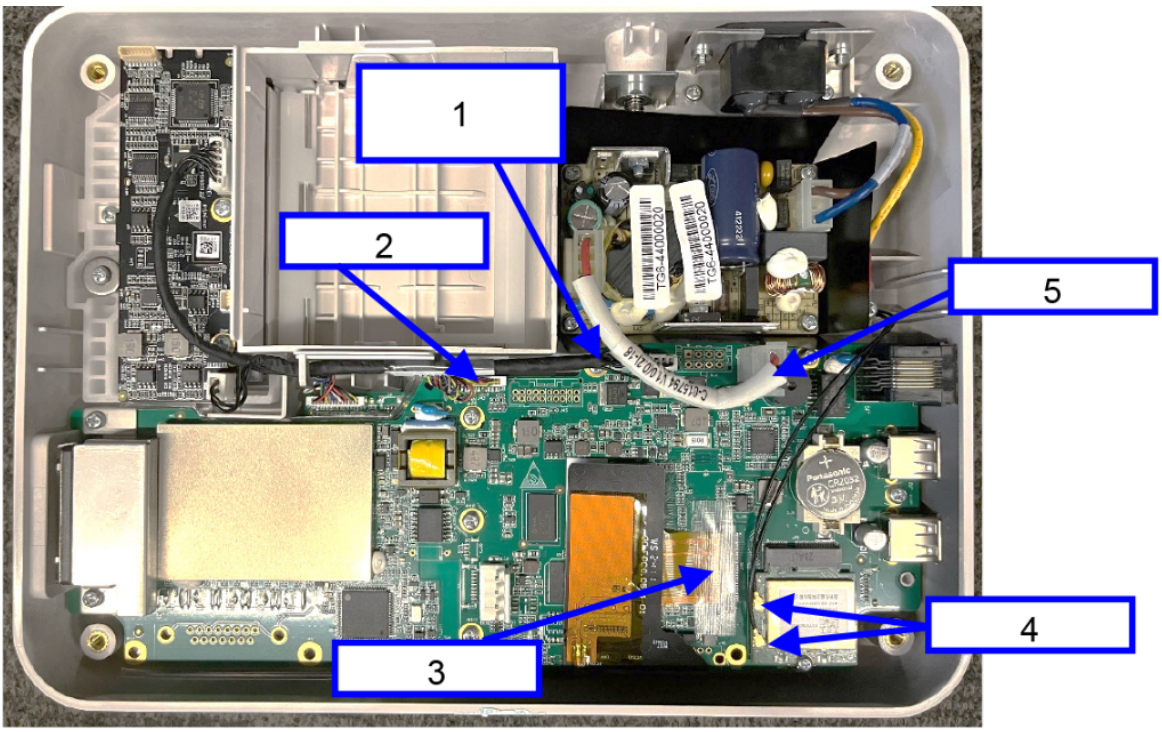
1 Four M4×10 pan head cross recessed screws

3. Separate the upper and lower covers.

5.1.2 Disassembly of Main Control Board

1. As shown in the figure below, unplug the power board connecting cable, Wi-Fi antenna (optional for some models), recorder driver board connecting cable, and keyboard connecting cable. Tear off the fiber tape on the screen FPC, loosen the socket on the main control board and unplug the screen FPC.

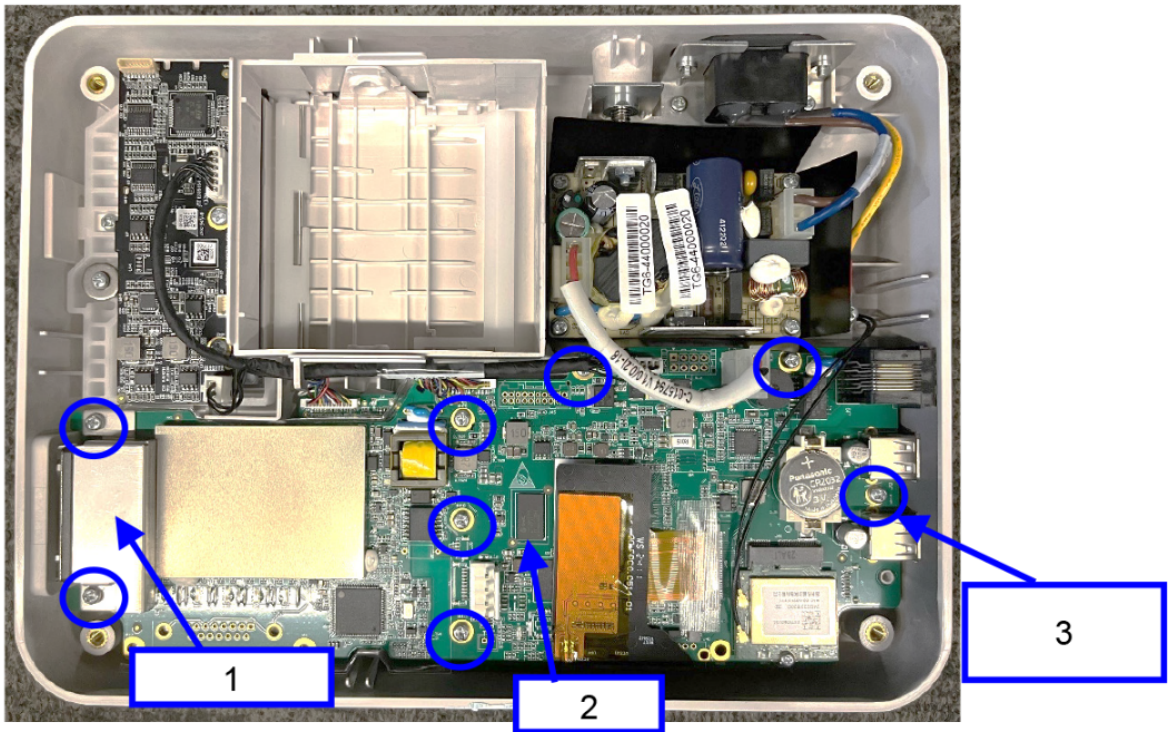
Figure5–5



1 Recorder driver board connecting cable
2 Keyboard connecting cable
3 Screen FPC
4 Wi-Fi antenna
5 Power board connecting cable

2. Use a screwdriver to unscrew eight M3×6 pan head cross recessed screws. Remove the ECG connect shell. Lift the right side of the main control board to remove it. Be careful not to damage the screen FPC during operation.

Figure5–6

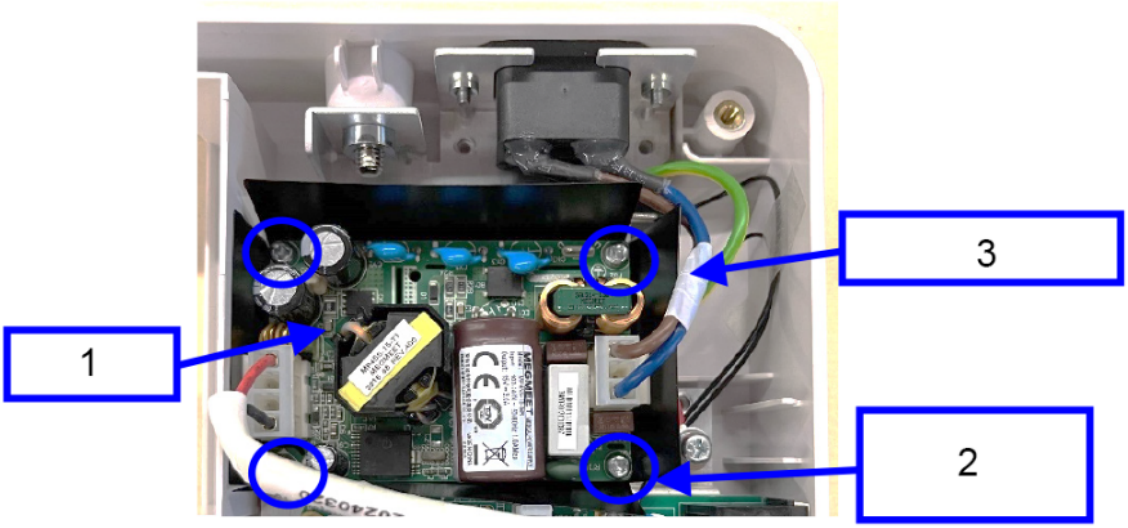


1 ECG connect shell
2 CPU board
3 Eight M3×6 pan head cross recessed screws

5.1.3 Disassembly of the Power Board

1. As shown in the figure, disconnect the AC socket cable from the power board. Use a screwdriver to unscrew 4 M3×6 pan head cross recessed screws from the power board. Then, take off the power board along with the insulating sheet.

Figure5–7

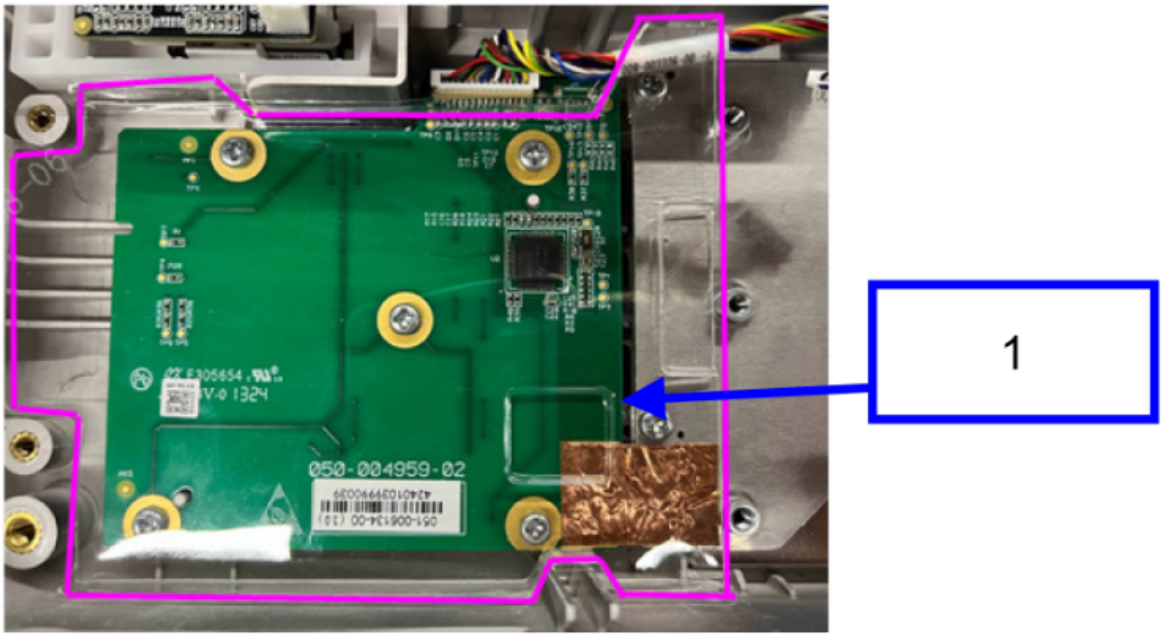


1 Power board
2 Four M3X6 cross pan head screws
3 AC socket cable

5.1.4 Disassembly of Keyboard

1. As shown in the figure below, remove the keyboard insulation sheet.

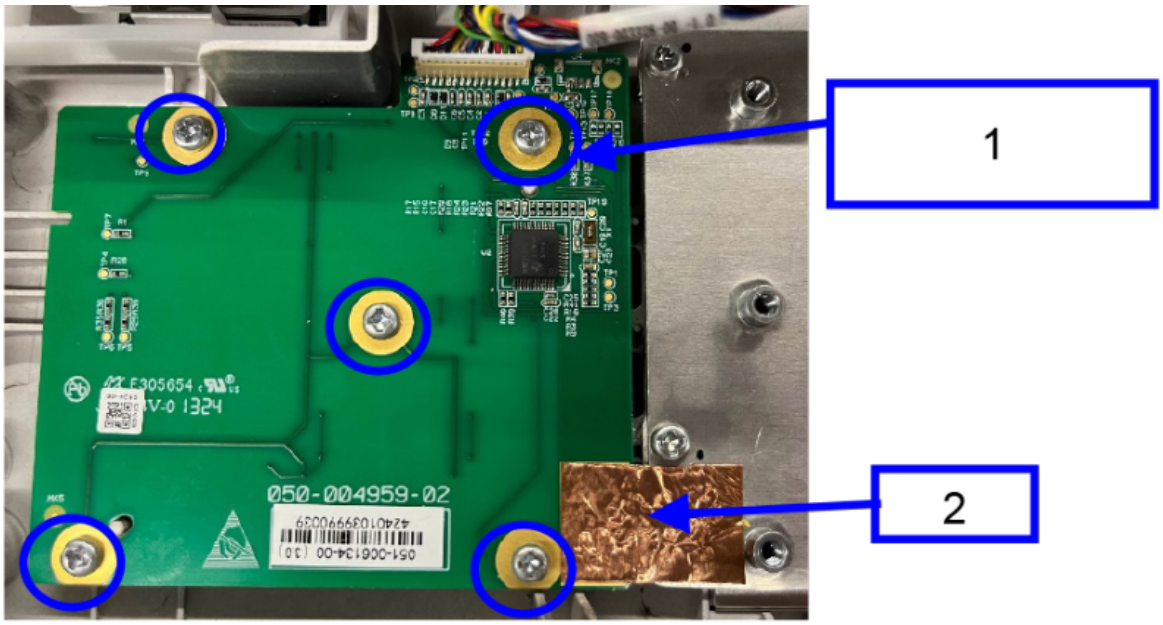
Figure5–8



1 Transparent keyboard insulation sheet

2. Tear off the copper foil on the keyboard. Use a screwdriver to unscrew the five PT3×6 cross-head flat tail self-tapping screws on the keyboard and remove the keyboard.

Figure5–9



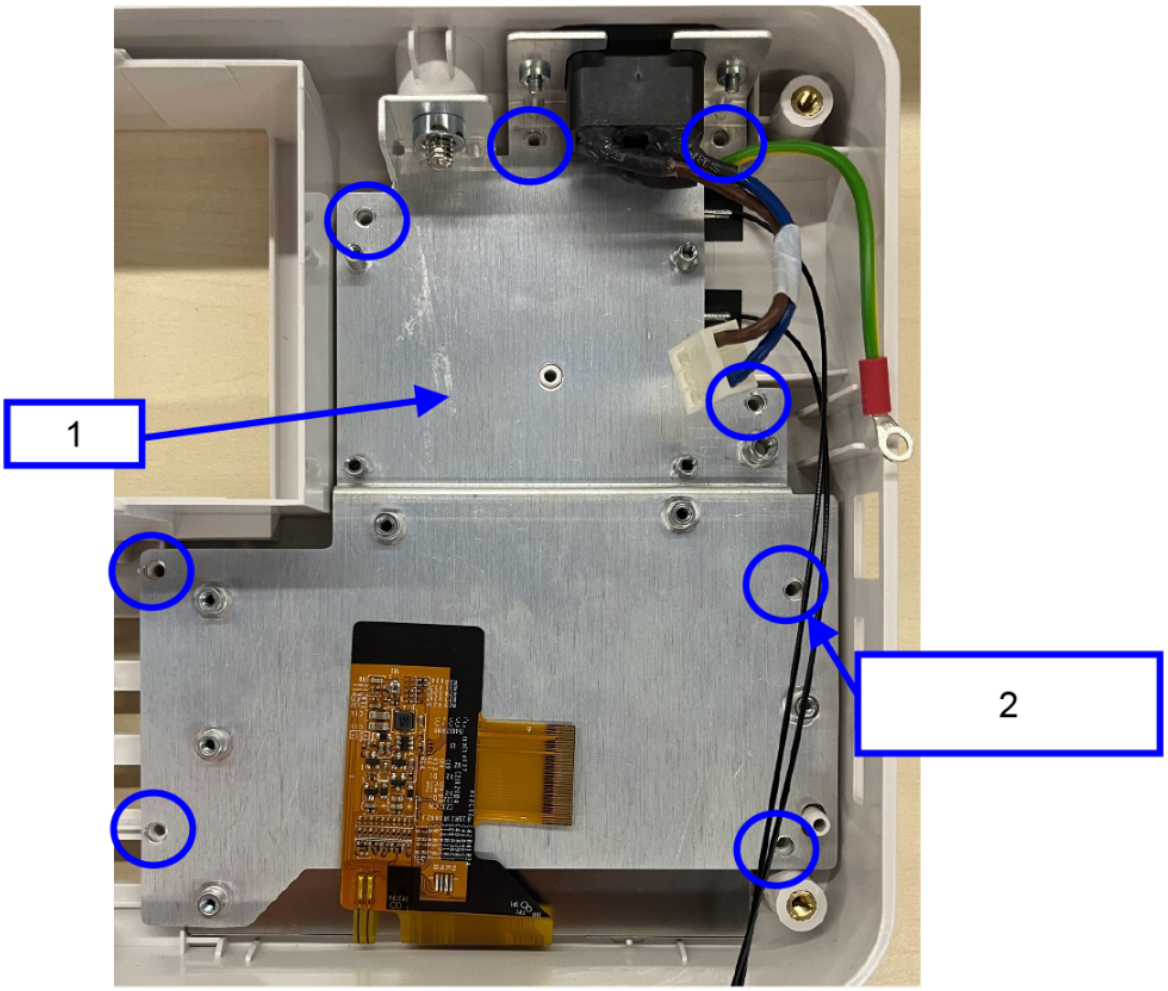
1 Five M3×6 cross-head flat tail self-tapping screws

2 Copper foil

5.1.5 Disassembly of Main Sheet Metal

1. As shown in the figure, use a screwdriver to unscrew the eight PT3×6 cross-head flat tail self-tapping screws on the main sheet metal. Lift the bottom side of the main sheet metal to remove it. Be careful not to damage the screen FPC during operation.

Figure5–10



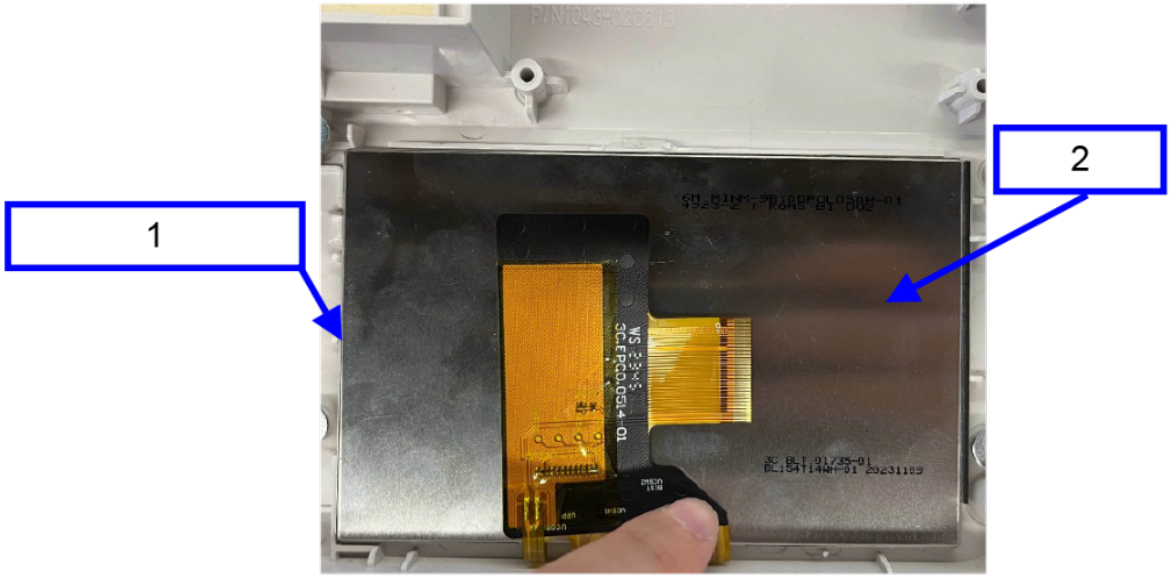
1 Main sheet metal

2 Eight PT3×6 cross-head flat tail self-tapping screws

5.1.6 Disassembly of Screen

1. As shown in the figure below, use a screwdriver or other tool to remove the screen from the upper cover of the machine. Be careful not to damage the screen and its FPC during operation.

Figure5–11



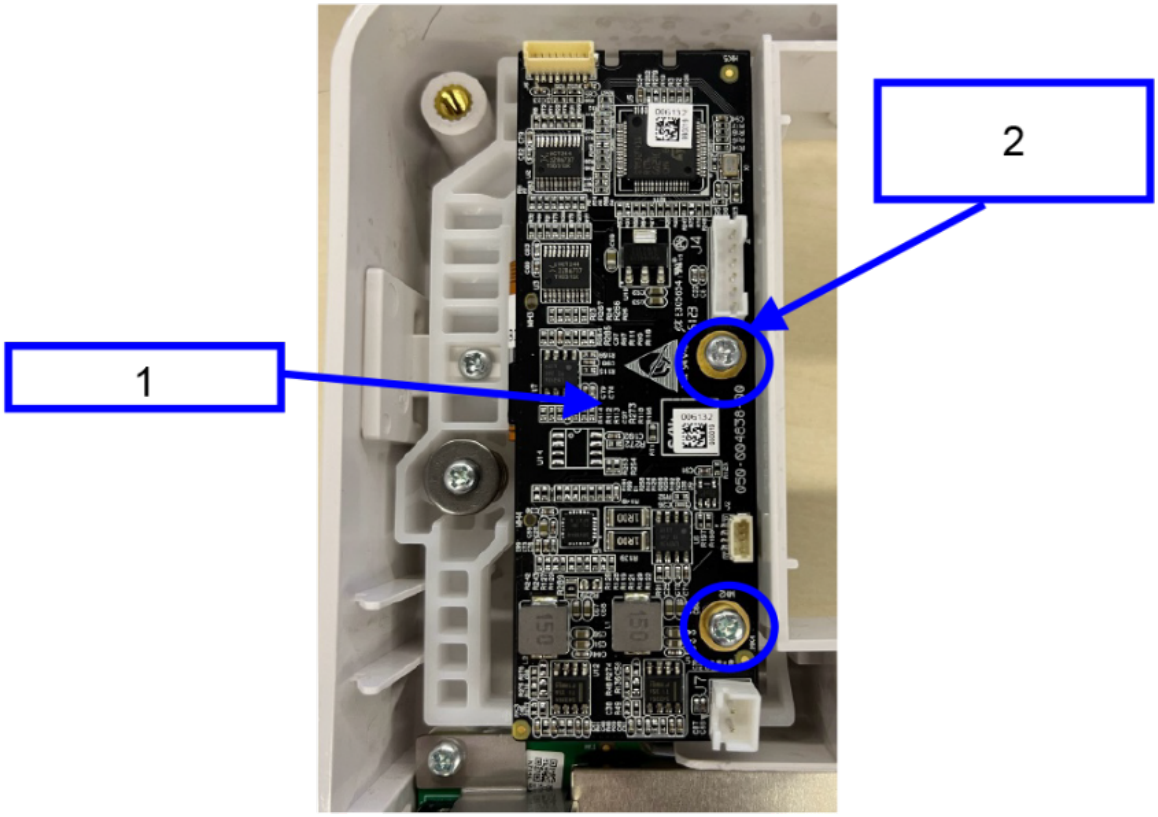
1 Lift the screen from here.

2 Screen

5.1.7 Disassembly of Recorder Board

1. As shown in the figure below, use a screwdriver to unscrew the two M3×6 pan head cross recessed screws on the recorder driver board. Flip the recorder driver board, loosen the socket on the back of the recorder driver board, and gently pull the print head FPC out of the recorder driver board. Then, remove the recorder driver board.

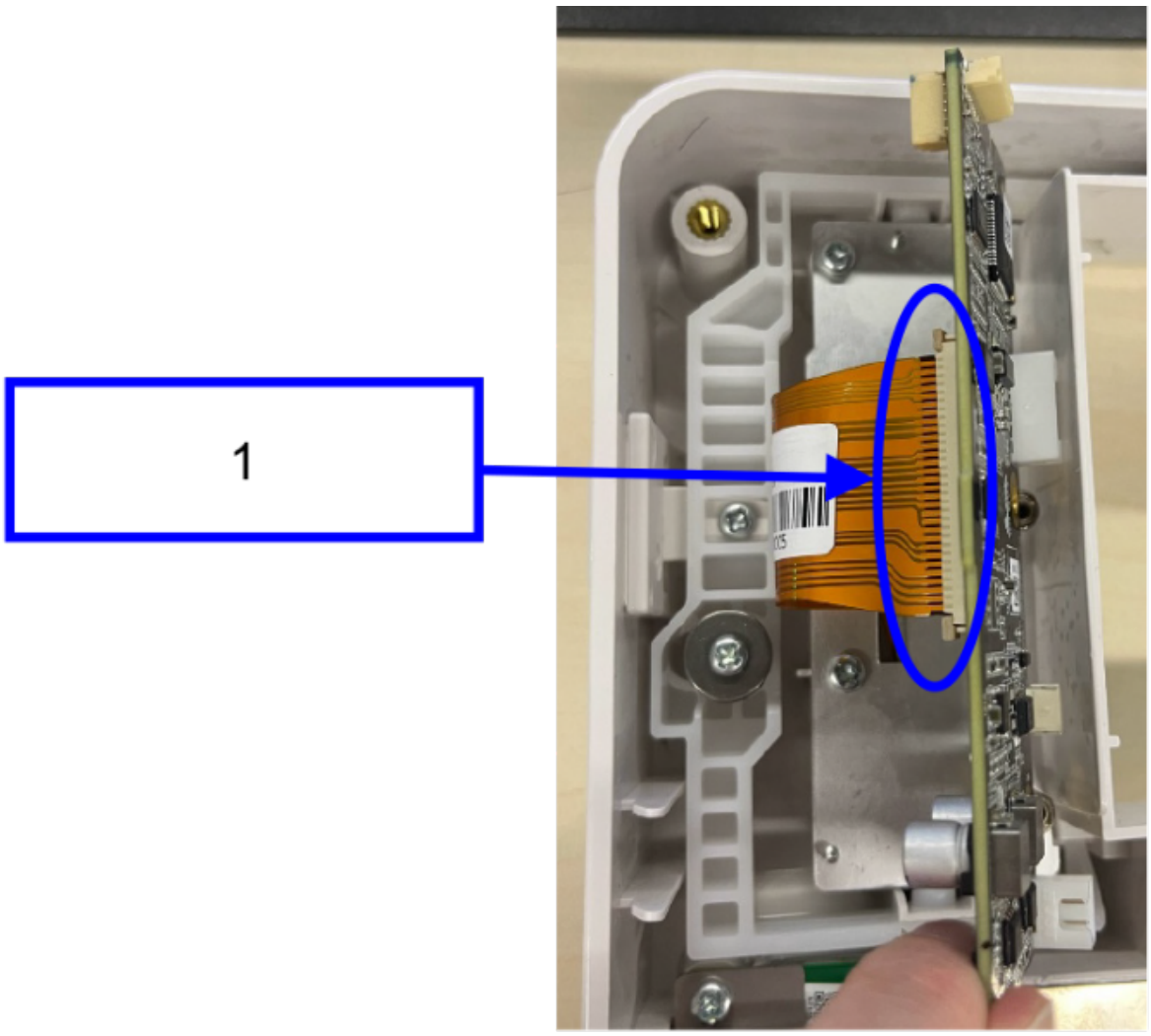
Figure5–12



1 Recorder board

2 Two M3×6 pan head cross recessed screws

Figure5–13

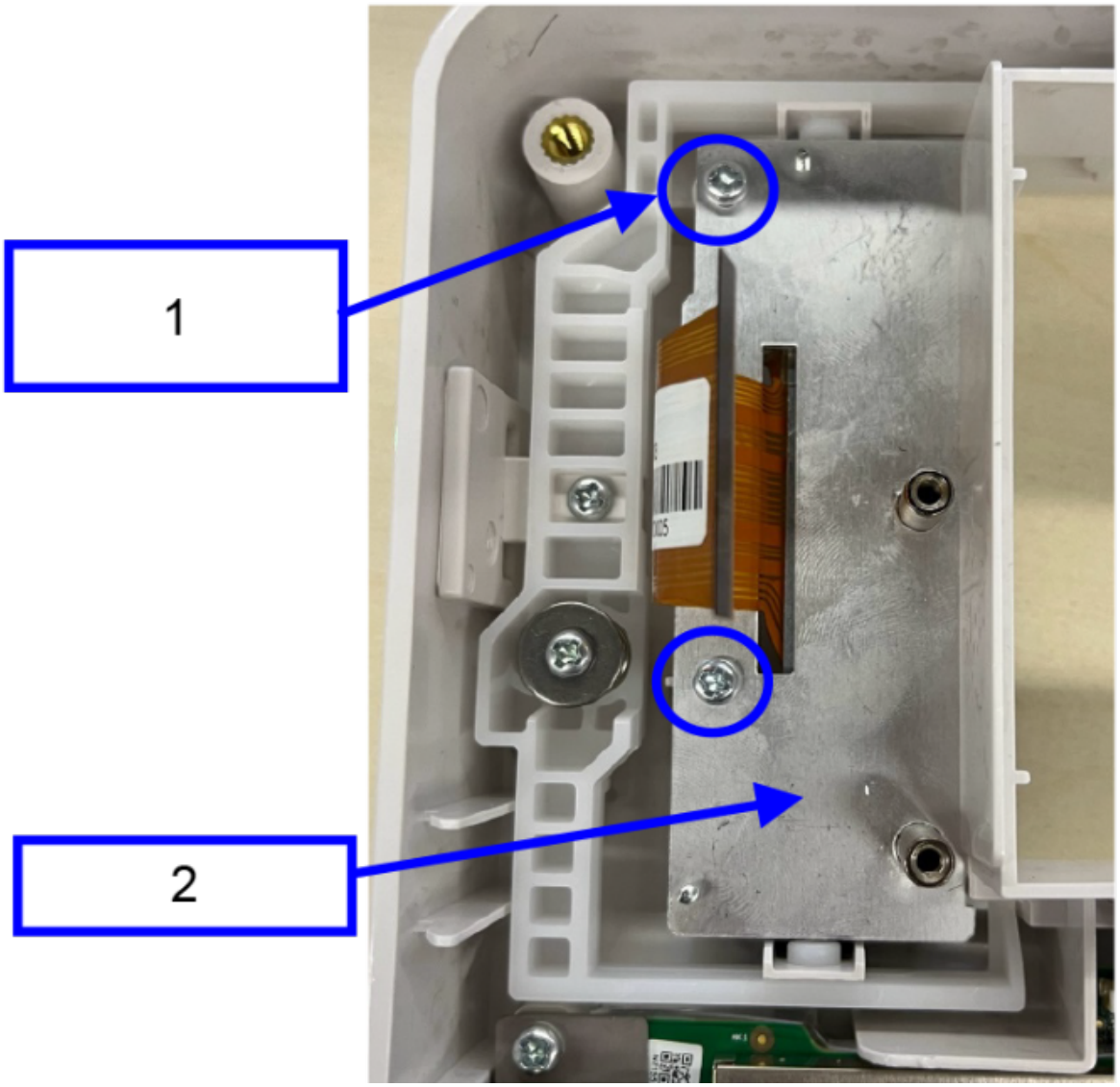


1 Loosen the socket and pull out the print head FPC cable.

5.1.8 Disassembly of Print Head

1. As shown in the figure below, use a screwdriver to unscrew the two M3×6 pan head cross recessed screws on the print head mounting plate. Remove the print head along with the mounting plate.

Figure5–14

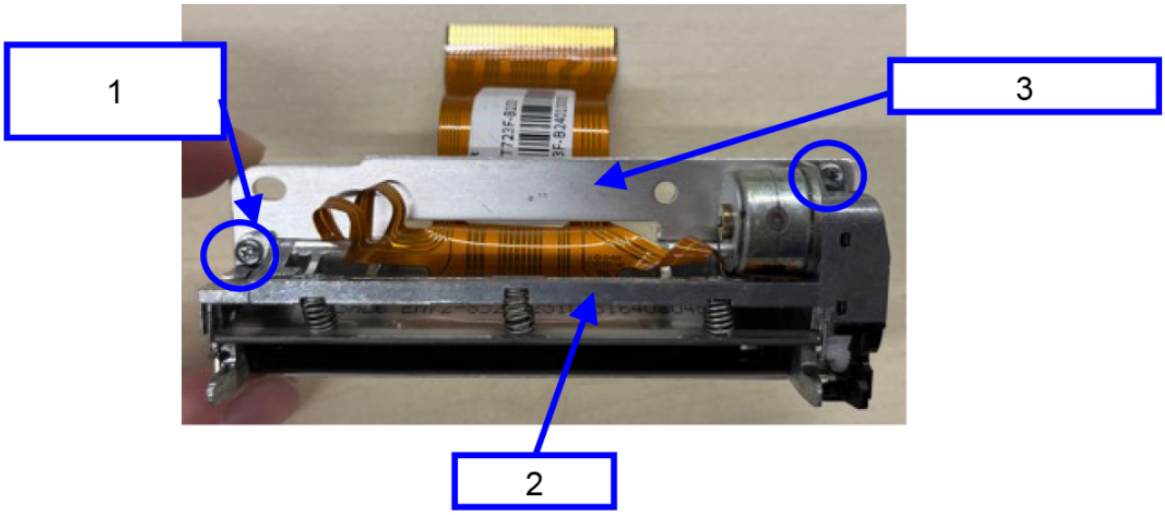


1 Two M3×6 pan head cross recessed screws

2 Print head mounting plate

2. As shown in the figure below, use a screwdriver to unscrew the two M2×6 pan head cross recessed screws on the print head mounting plate. Remove the print head.

Figure5–15

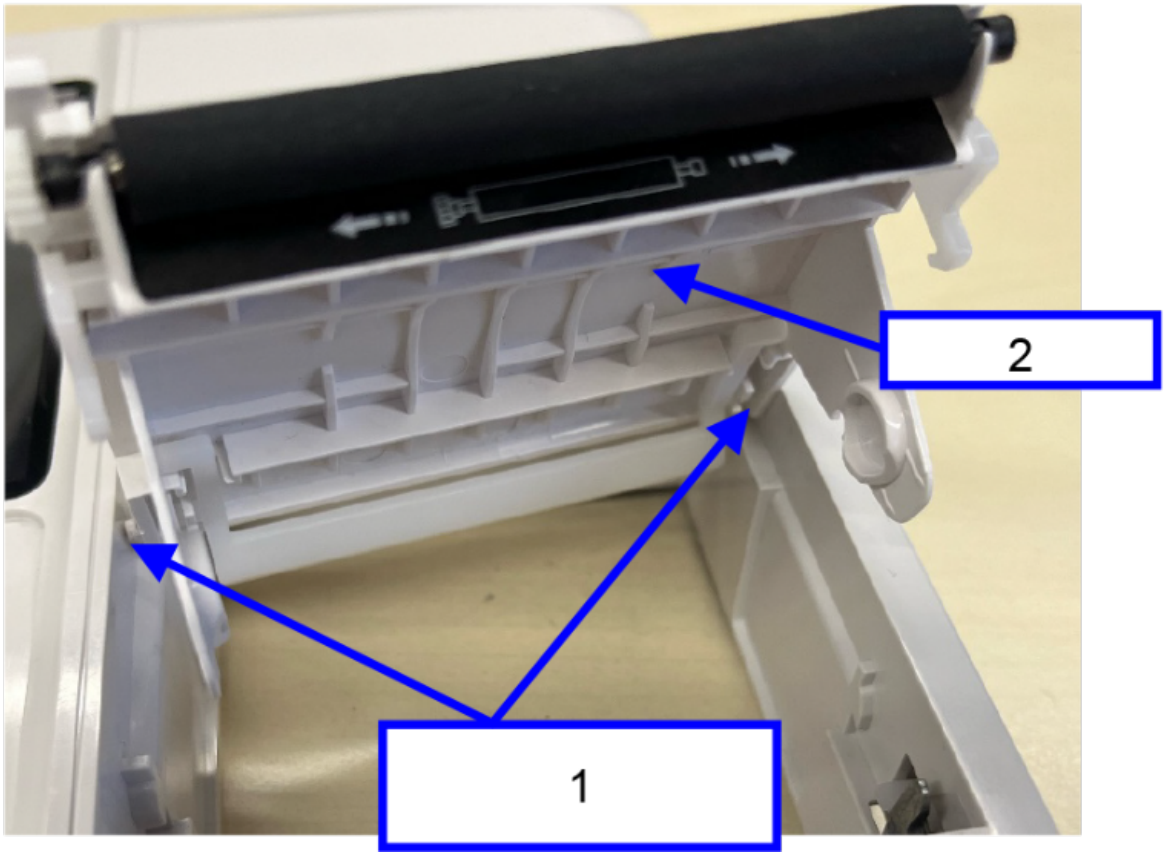


1	Two M2×6 pan head cross recessed screws
2	Print head
3	Print head mounting plate

5.1.9 Disassembly of Recorder Door

1. As shown in the figure below, use a screwdriver or other tool to remove the recorder door assembly from the upper cover of the machine.

Figure5–16



1 Push the small shafts on both sides of the recorder door out of the upper cover of the machine.

2 Recorder door assembly

5.1.10 Tool

During parts disassembly and replacement, the following tools may be required:

- Screwdriver

5.1.11 Preparing for Disassembly

Before disassembling the ECG machine, do the following:

- Stop measuring, turn off the ECG machine, and disconnect all accessories and external devices.
- Disconnect the AC power supply and remove the battery.
- Ensure that the work surface is clean and tidy.

WARNING

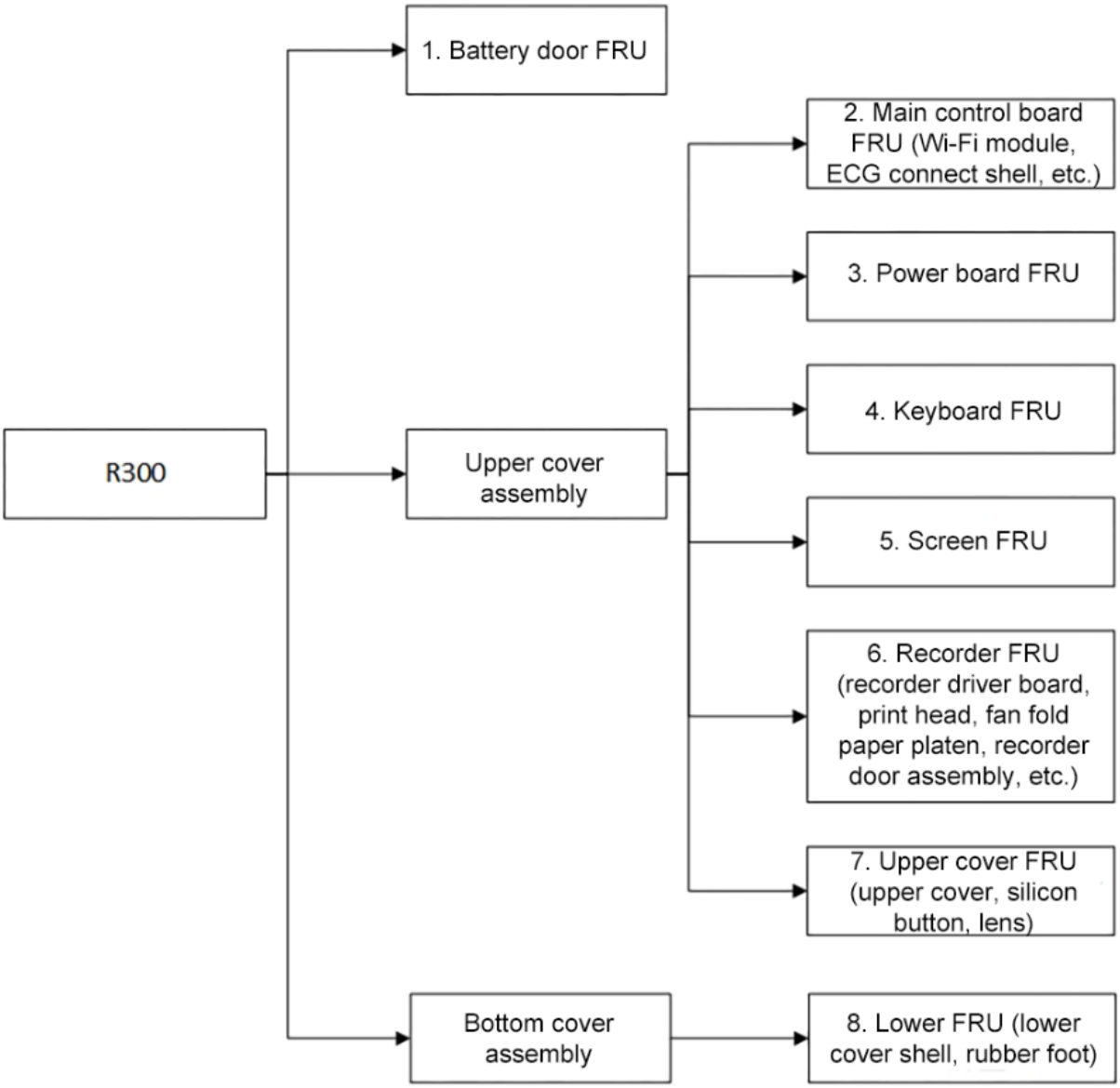
- Disassembly operations must be performed by professionals.
- Take ESD precautionary measures before starting the disassembly. Be sure to wear the ESD bracelet or ESD gloves before touching the parts identified with the ESD warning symbol to avoid parts damage.
- Disassemble the equipment in the correct 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.
- Place removed parts by module to avoid mixing or missing during re-assembly.
- 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.
- During re-assembly, assemble components before assembling the main unit.
- 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.

5.1.12 Whole Machine Disassembly Flowchart

Disassembly Flowchart for R300 Series

For the R300 series products, follow the flowchart below to perform maintenance and disassembly for the corresponding FRUs.

Figure5–17



5.1.13 Main Unit Disassembly

WARNING

- **When disassembling, make sure the placement area is smooth and free of debris to avoid scratching the screen lens or display.**
- **All operations must be performed by professionals. Wear insulating gloves during the operations.**

5.2 FRU Replacement

5.2.1 ECG connect shell (R300)

5.2.1.1 General Information

Figure5–18

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
042-054415-00	ECG connect shell (R300)	None	None

5.2.1.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the ECG connect shell, refer to **5.1.2** Disassembly of Main Control Board.

Specific Steps

1. Take a new ECG connect shell and place it in the corresponding position on the main control board.
2. Secure the ECG connect shell using two M3×6 pan head cross recessed screws.
3. Re-install the machine according to the disassembly steps.

5.2.1.3 Commissioning and Verification

None

5.2.2 POWER SUPPLY BOARD 15V 40W

5.2.2.1 General Information

Figure5–19

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
022-000125-00	POWER SUPPLY BOARD 15V 40W	None	None

5.2.2.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the power board, see **5.1.3** Disassembly of the Power Board.

Specific Steps

1. Take a new power board and secure it on the main sheet metal using four M3×6 pan head cross recessed screws.
2. Re-install the equipment according to the disassembly steps.

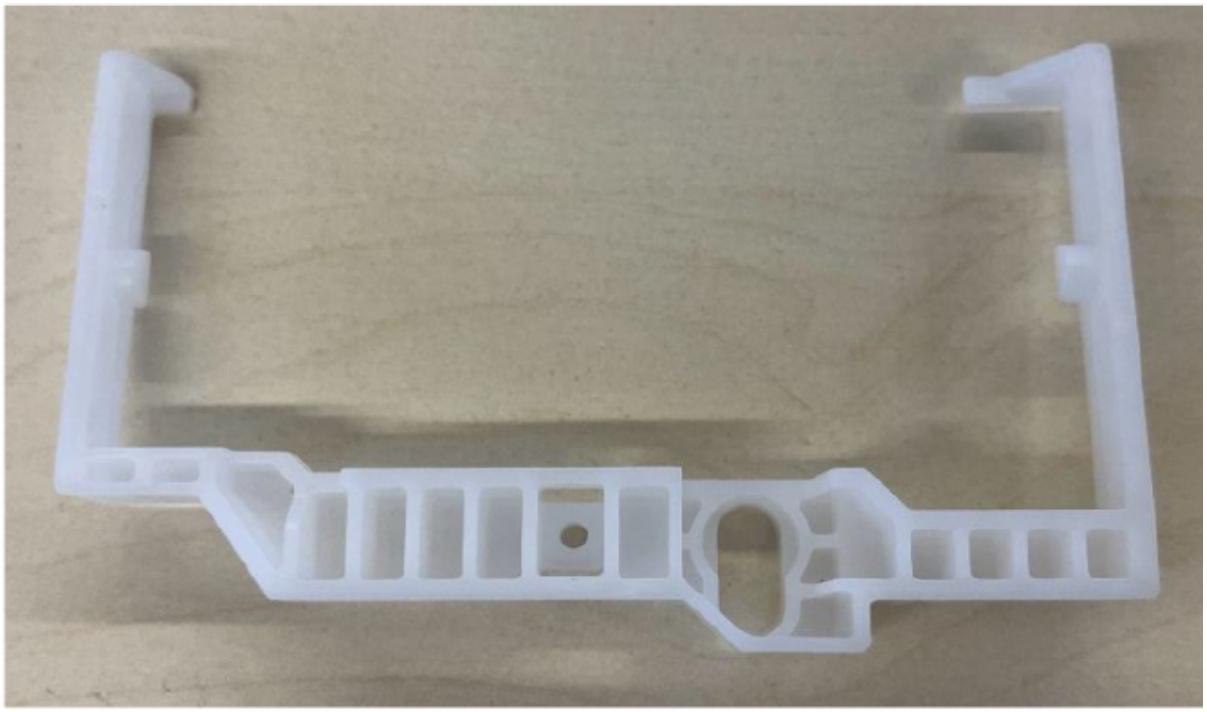
5.2.2.3 Commissioning and Verification

None

5.2.3 recorder link

5.2.3.1 General Information

Figure5–20

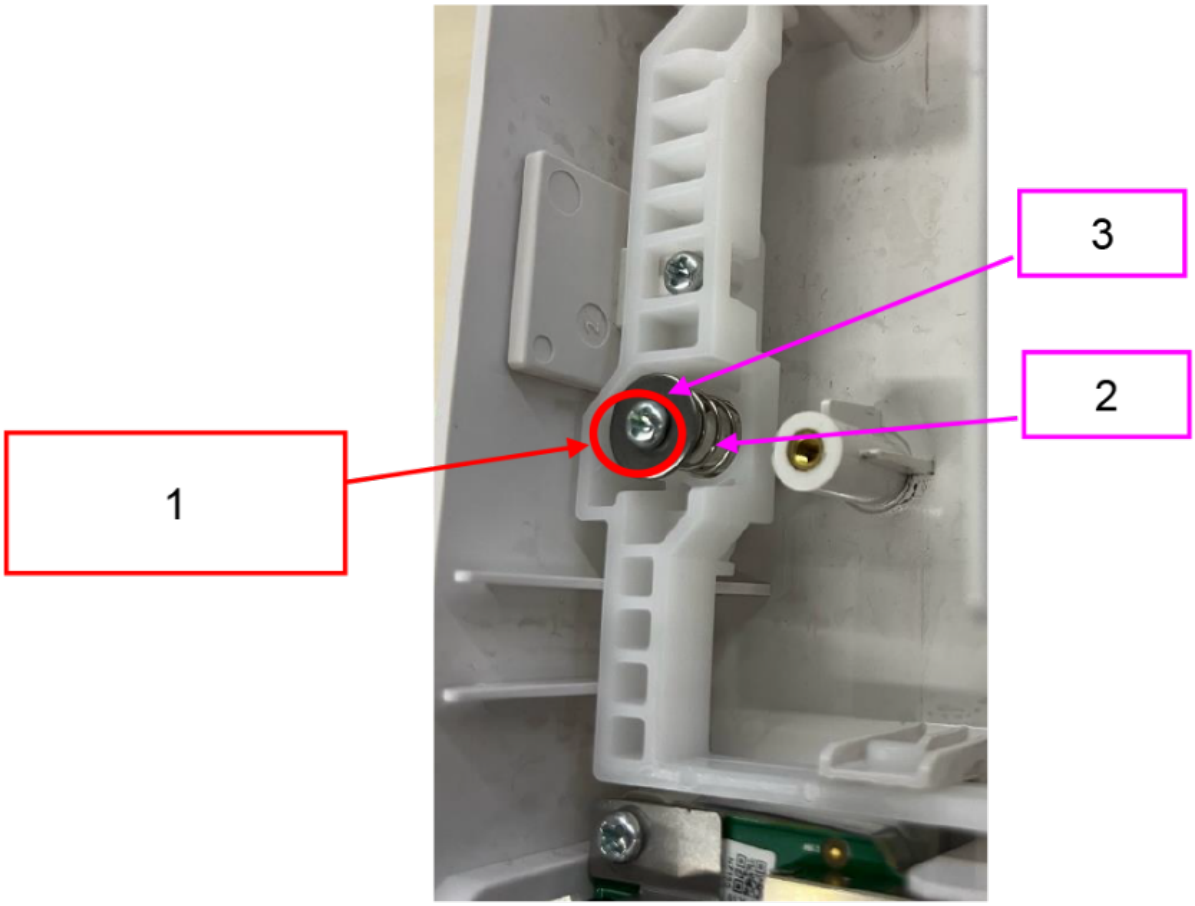


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-003112-00	Recorder link	None	None

5.2.3.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the recorder driver board, refer to **5.1.7** Disassembly of Recorder Board.
3. As shown in the figure, use a screwdriver to unscrew one PT3×6 self-tapping screw and remove the washer and compression spring.

Figure5–21



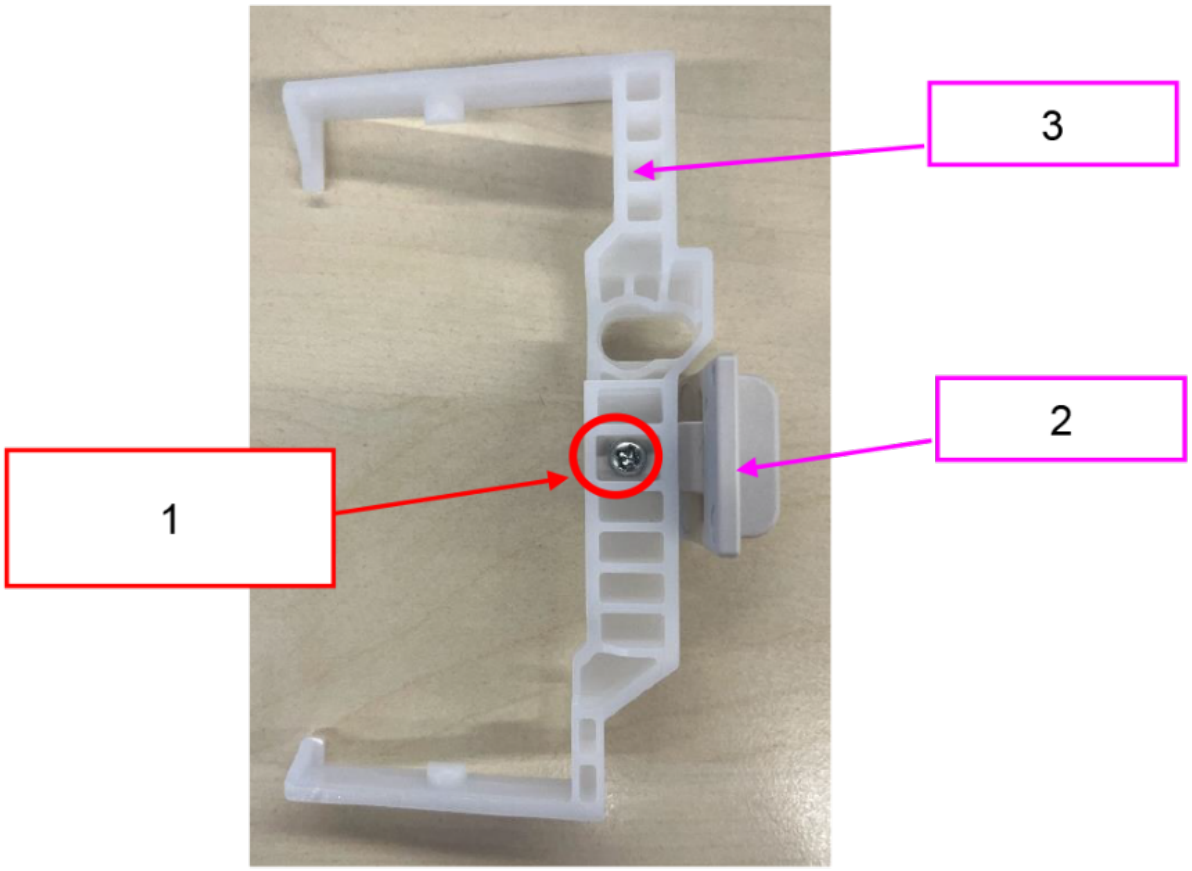
1 One PT3×6 pan head cross recessed self-tapping screw

2 Compression spring

3 Washer

4. Remove the recorder link from the upper cover, unscrew a PT3×6 pan head cross recessed self-tapping screw with a screwdriver, and remove the recorder button.

Figure5–22



1	One PT3×6 pan head cross recessed self-tapping screw
2	Recorder button
3	Recorder link

Specific Steps

1. Take a new recorder link and install the recorder button.
2. Re-install the equipment according to the disassembly steps.

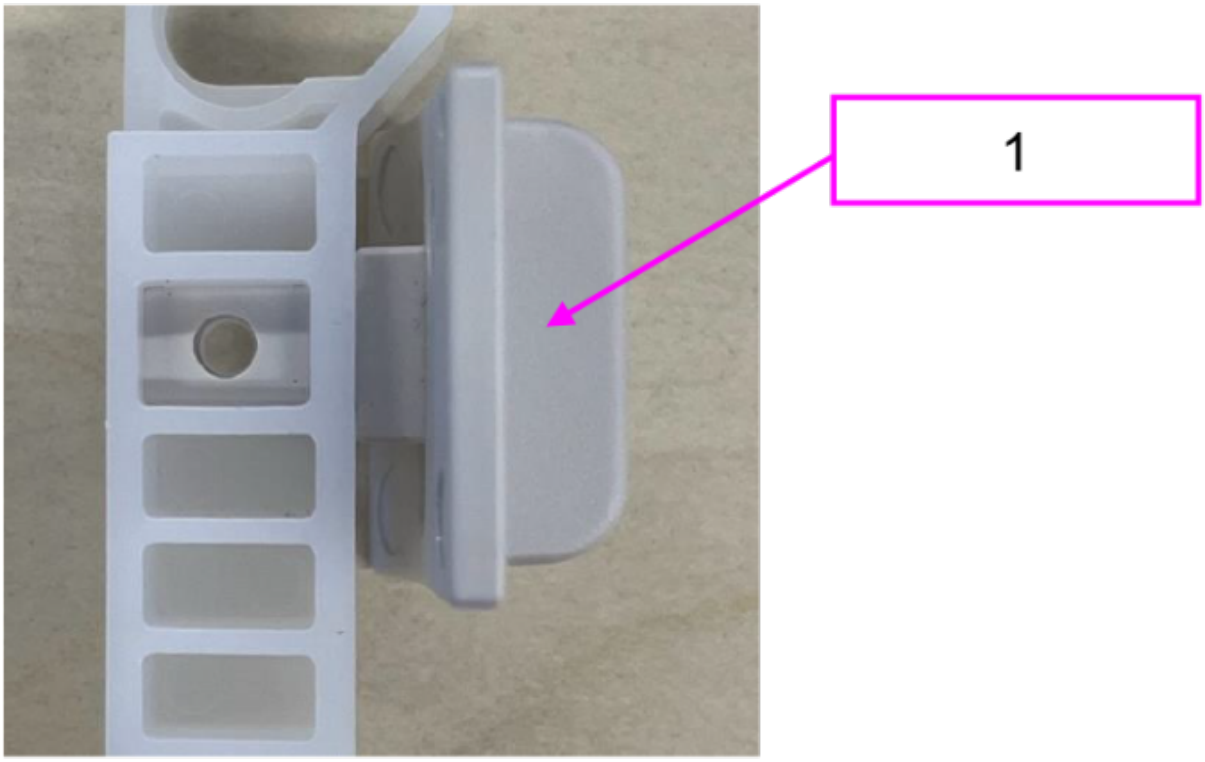
5.2.3.3 Commissioning and Verification

None

5.2.4 R300 recorder button

5.2.4.1 General Information

Figure5–23



1 Recorder button

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-021755-00	R300 recorder button	None	None

5.2.4.2 Disassembly and Assembly

For the disassembly of the recorder button, refer to **recorder link** **5.2.3.2** Disassembly and Assembly.

5.2.4.3 Commissioning and Verification

None

5.2.5 R300 screen lens screen printing (M508)

5.2.5.1 General Information

Figure5–24

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
047-047994-00	R300 screen lens screen printing (M508)	None	None

5.2.5.2 Disassembly and Assembly

Use a screwdriver or other tool to remove the screen lens from the upper cover of the machine (it is unnecessary to disassemble the upper and lower covers of the machine).

Specific Steps

1. Clean off the glue remaining on the old screen lens.
2. Take a new screen lens, tear off the adhesive on the screen lens, and then attach the screen lens flatly into the limit frame of the upper cover of the machine. Finally, press around the lens.

5.2.5.3 Commissioning and Verification

None

5.2.6 battery block pole spring

5.2.6.1 General Information

Figure5–25

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
DA6H-20-22947	Battery block pole spring	None	None

5.2.6.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the recorder driver board, refer to **5.1.7** Disassembly of Recorder Board.

Specific Steps

For the disassembly steps, refer to **recorder link** **5.2.3.2** Disassembly and Assembly.

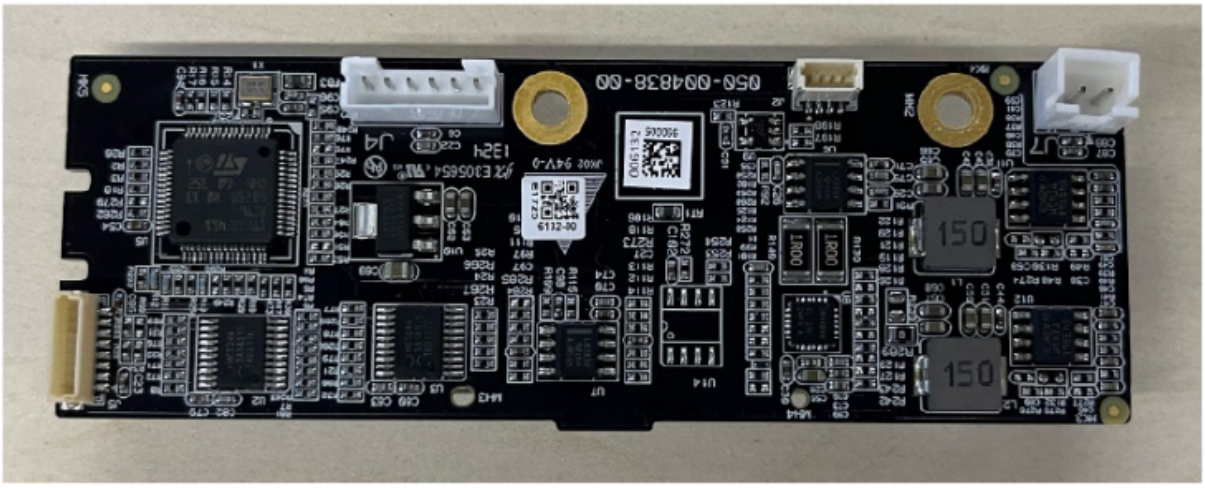
5.2.6.3 Commissioning and Verification

Press the recorder button to ensure the recorder door opens and closes smoothly.

5.2.7 80mm Recoder Board PCBA

5.2.7.1 General Information

Figure5–26



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
051-006132-00	80mm Recorder Board PCBA	None	None

5.2.7.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the recorder driver board, refer to **5.1.7** Disassembly of Recorder Board.

Specific Steps

Take a new recorder driver board. Re-install the machine according to the disassembly steps.

5.2.7.3 Commissioning and Verification

After turning on the machine, put the printing paper in the machine and perform a test print.

5.2.8 WXT5CM2803 WiFi6E module

5.2.8.1 General Information

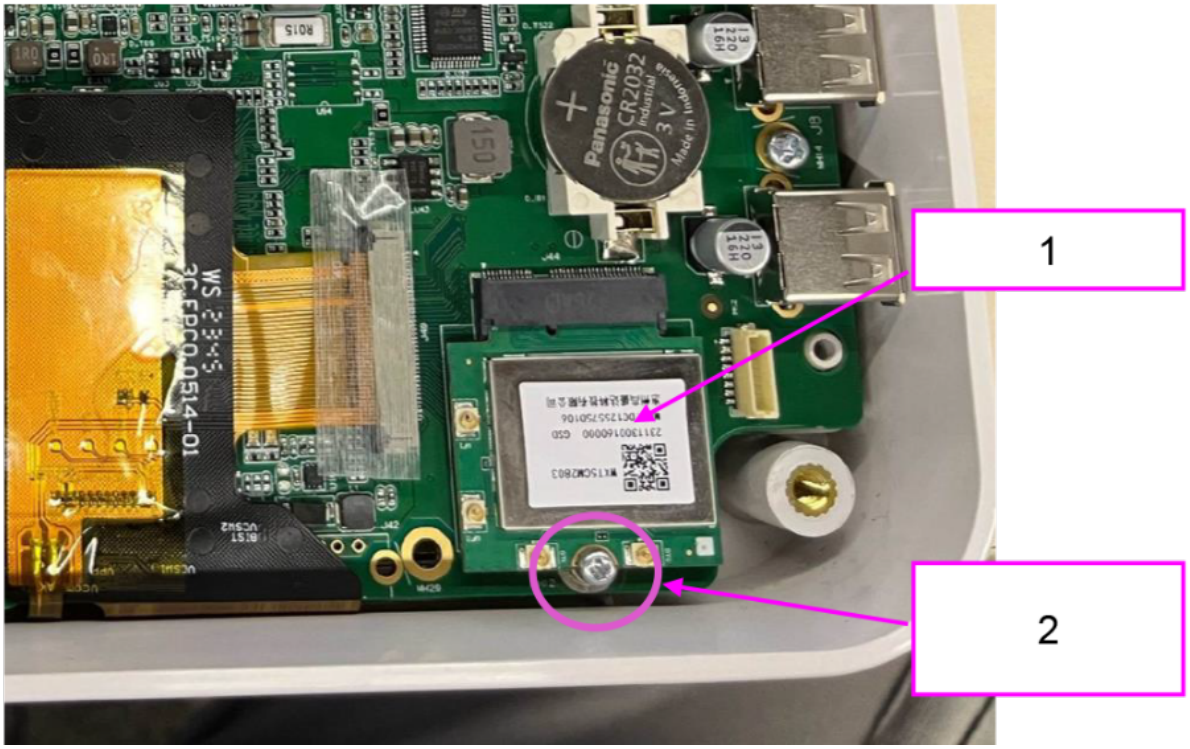
Figure5–27

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
025-000052-00	WXT5CM2803 WiFi6E module	None	None

5.2.8.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. Disconnect the Wi-Fi antenna from the Wi-Fi module connection socket.
3. As shown in the figure, use a screwdriver to unscrew the one M2.5×6 small pan head screw on the Wi-Fi module, and then remove the Wi-Fi module from the main control board.

Figure5–28

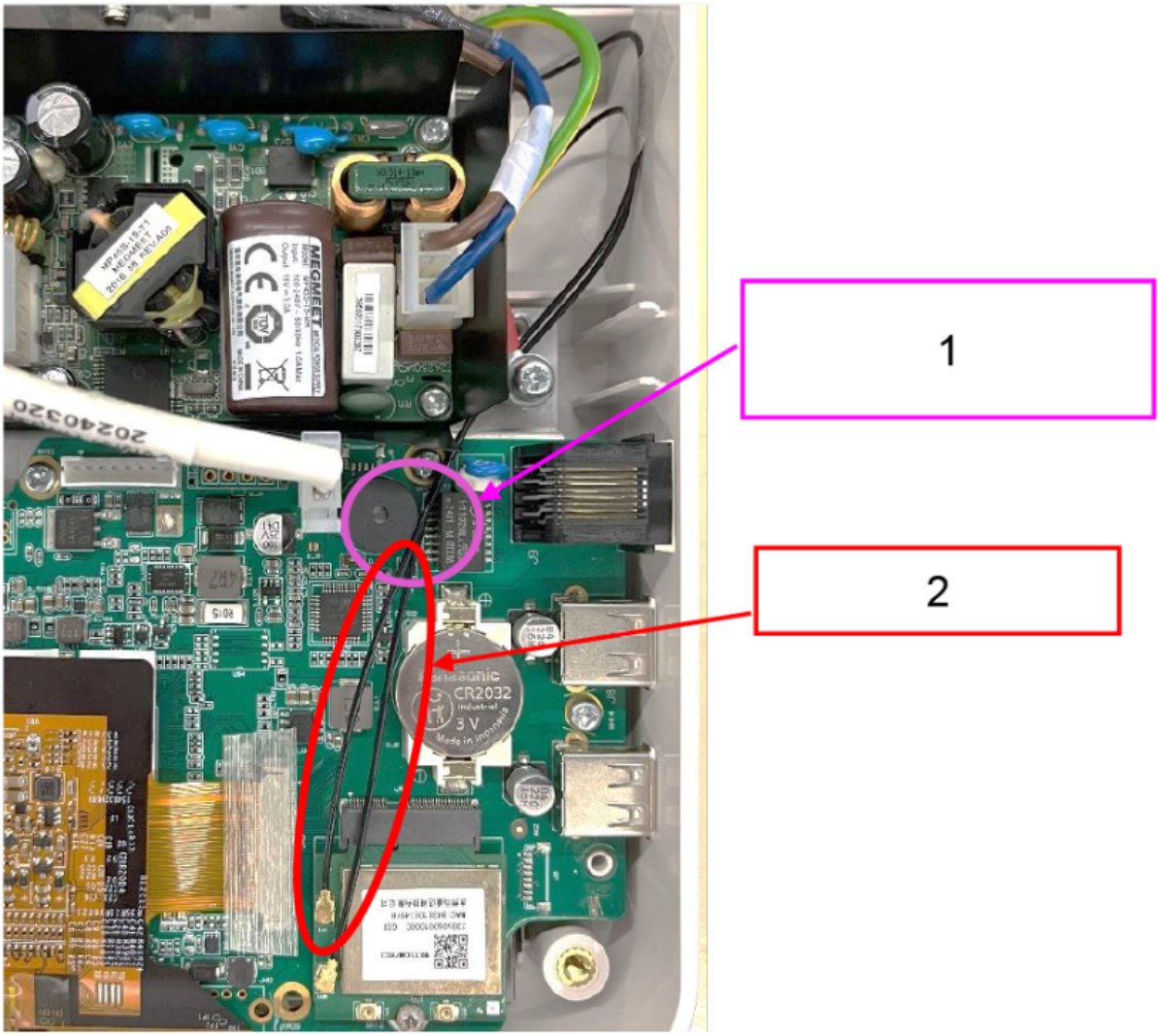


1	Wi-Fi Module
2	One M2.5×6 small pan head screw

Specific Steps

1. Take a new Wi-Fi module. Insert the Wi-Fi module into the connection socket and place it in the corresponding position on the main control board. Then, use an M2.5×6 small pan head screw to secure the Wi-Fi module to the main control board.
2. Attach the Wi-Fi antenna to the connection socket of the Wi-Fi module. Follow the Wi-Fi antenna routing method shown in the figure.

Figure5–29



1 The antenna is routed from the gap on the right side of the buzzer.

2 Straighten the antenna on the board.

3. Re-install the machine according to the disassembly steps.

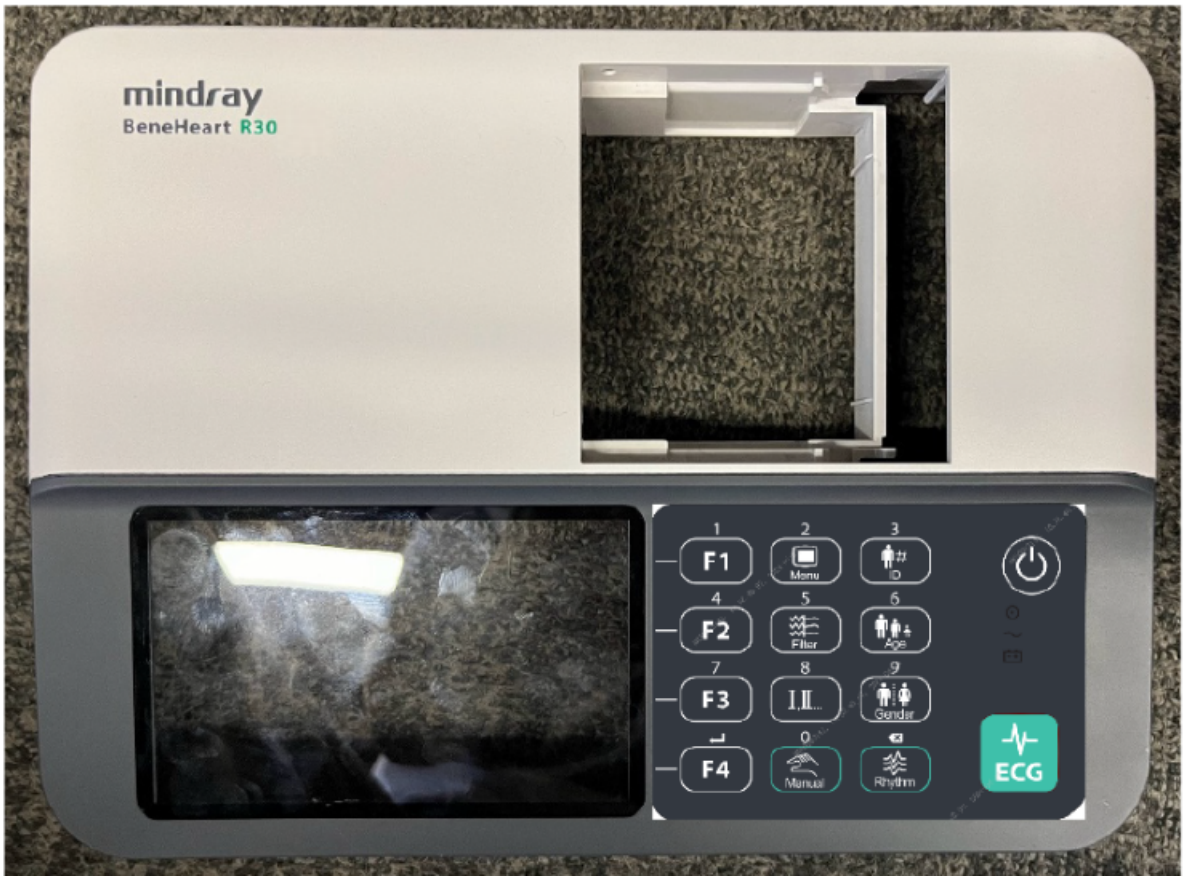
5.2.8.3 Commissioning and Verification

After powering on the machine, verify the Wi-Fi connection functionality to ensure it is working correctly.

5.2.9 R30 upper cover FRU(CE)

5.2.9.1 General Information

Figure5–30



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108240-00	R30 upper cover FRU (CE)	047-047994-00	R300 screen lens screen printing (M508)

5.2.9.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the main control board, refer to **5.1.2** Disassembly of Main Control Board.
3. For the disassembly of the keyboard, refer to **5.1.4** Disassembly of Keyboard.
4. For the disassembly of the main sheet metal, refer to **5.1.5** Disassembly of Main Sheet Metal.
5. For the disassembly of the screen, refer to **5.1.6** Disassembly of Screen .
6. For the disassembly of the recorder driver board, refer to **5.1.7** Disassembly of Recorder Board.
7. For the disassembly of the print head, refer to **5.1.8** Disassembly of Print Head.
8. For the disassembly of the recorder door, refer to **5.1.9** Disassembly of Recorder Door.

9. For the disassembly of the recorder button, refer to **recorder link** **5.2.3.2** Disassembly and Assembly.

Specific Steps

Take a new R300 upper cover. Re-install the machine according to the disassembly steps.

5.2.9.3 Commissioning and Verification

None

5.2.10 R300 upper cover FRU(CE)

5.2.10.1 General Information

Figure5–31

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108239-00	R30 upper cover FRU (CE)	047-047994-00	R300 screen lens screen printing (M508)

5.2.10.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the main control board, refer to **5.1.2** Disassembly of Main Control Board.
3. For the disassembly of the keyboard, refer to **5.1.4** Disassembly of Keyboard.
4. For the disassembly of the main sheet metal, refer to **5.1.5** Disassembly of Main Sheet Metal.
5. For the disassembly of the screen, refer to **5.1.6** Disassembly of Screen .
6. For the disassembly of the recorder driver board, refer to **5.1.7** Disassembly of Recorder Board.
7. For the disassembly of the print head, refer to **5.1.8** Disassembly of Print Head.
8. For the disassembly of the recorder door, refer to **5.1.9** Disassembly of Recorder Door.
9. For the disassembly of the recorder button, refer to **recorder link** **5.2.3.2** Disassembly and Assembly.

Specific Steps

Take a new R300 upper cover. Re-install the machine according to the disassembly steps.

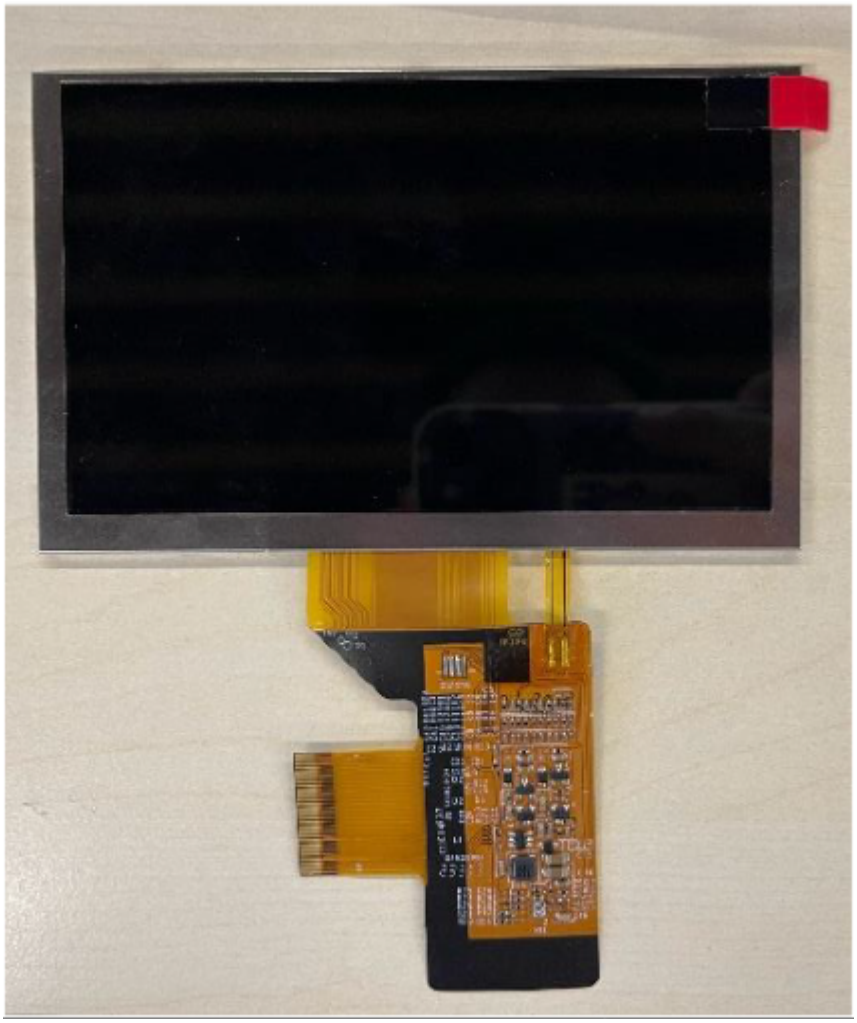
5.2.10.3 Commissioning and Verification

None

5.2.11 5-inch screen FRU

5.2.11.1 General Information

Figure5–32



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108241-00	5-inch screen FRU	None	None

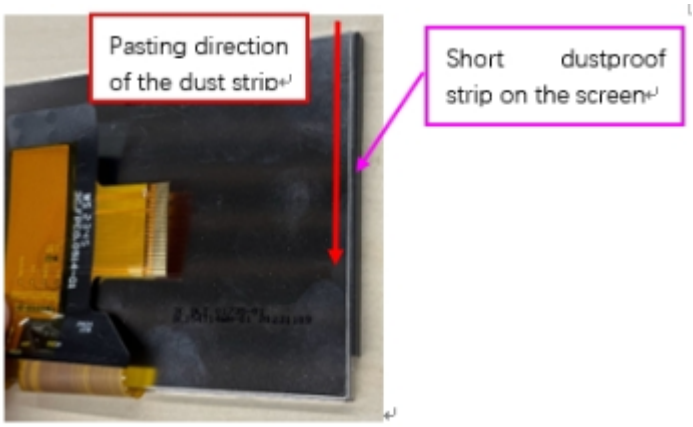
5.2.11.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the main control board, refer to **5.1.2** Disassembly of Main Control Board.
3. After removing the insulating sheet on the keyboard, remove the main sheet metal. For the disassembly of the main sheet metal, refer to **5.1.5** Disassembly of Main Sheet Metal.
4. For the disassembly of the screen, refer to **5.1.6** Disassembly of Screen .

Specific Steps

1. Take a new screen and paste a short dust strip on the right side of the screen. The effect is as shown in the figure.

Figure5–33

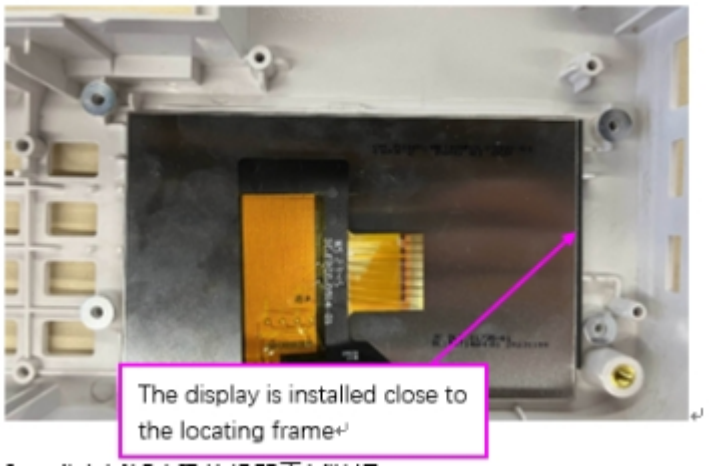


1 Dust strip paste direction

2 Short dust strip on the screen

2. **Tear off the protective film on the screen.** Put the screen into the screen limit frame of the upper cover. When installing the screen, approach the positioning frame on the right side, and then install the other side of the screen into the screen frame, as shown in the figure. **Pay attention to the direction of the screen FPC.**

Figure5–34



1 When installing the screen, approach to this positioning frame first.

3. Re-install the equipment according to the disassembly steps.

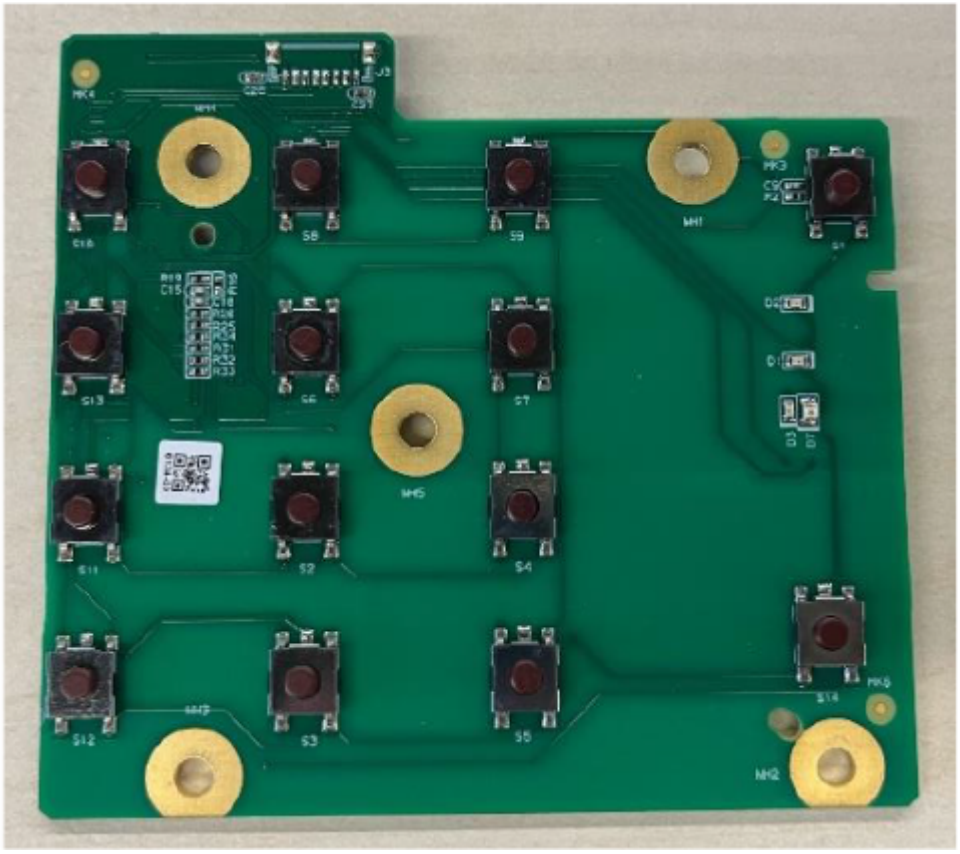
5.2.11.3 Commissioning and Verification

After turning on the machine, observe the display on the screen for any issues.

5.2.12 5-inch KeyBoard PCBA FRU

5.2.12.1 General Information

Figure5–35



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108242-00	12-inch Keyboard PCBA FRU	None	None

5.2.12.2 Disassembly and Assembly

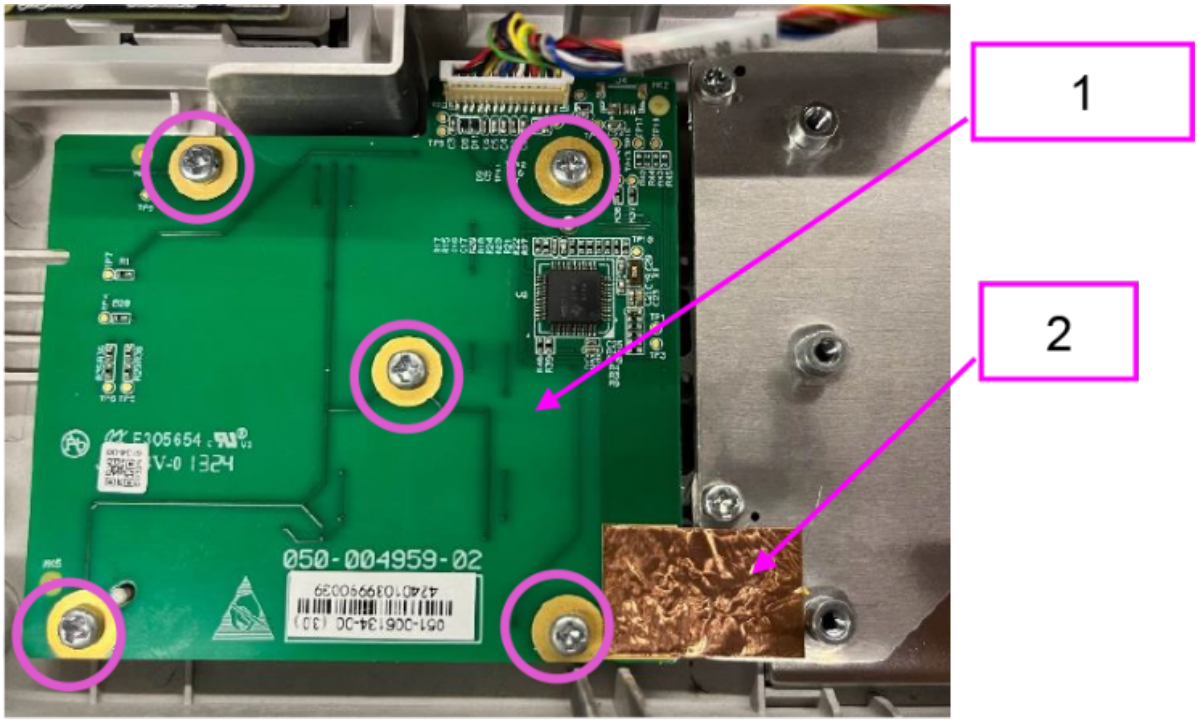
1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the main control board, refer to **5.1.2** Disassembly of Main Control Board.
3. For the disassembly of the keyboard, refer to **5.1.4** Disassembly of Keyboard.

Specific Steps

1. Take a new keyboard and insert the keyboard connecting cable into the keyboard first. Take a new keyboard, align it with the positioning holes on the upper cover, and secure the board with five PT3×6 cross-head flat tail self-tapping screws.
2. Paste a piece of copper foil on the exposed copper area ofthe keyboard and the main sheet metal, as shown in the figure. **Note: The left side of the copper foil should not exceed the exposed copper area of the keyboard.**

3. Install the keyboard insulation sheet on the keyboard. **Note: The insulation sheet is a transparent sheet. Therefore, do not miss it during assembly.**

Figure5–36



1 Keyboard

2 Copper foil

4. Re-install the equipment according to the disassembly steps.

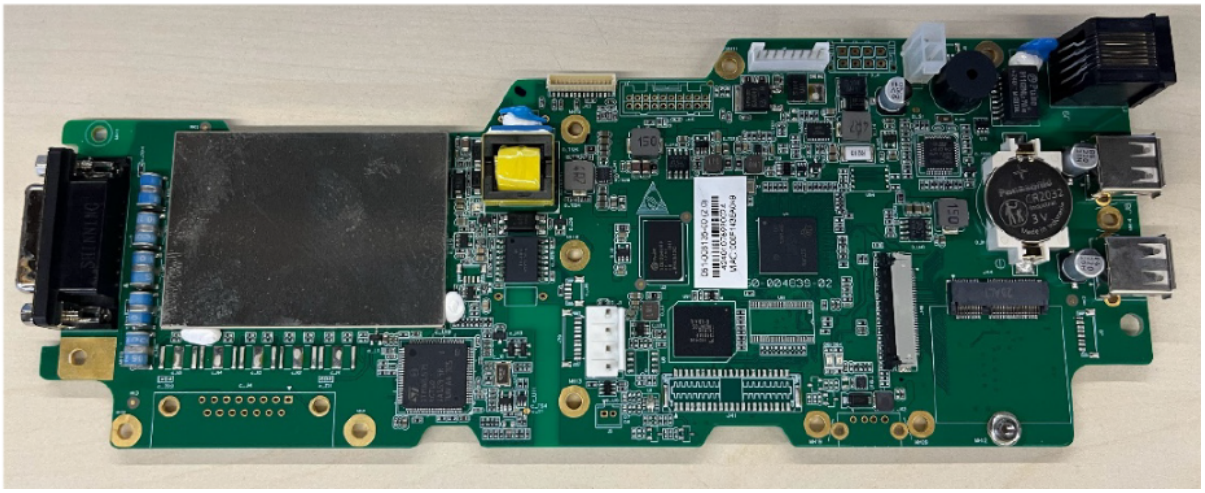
5.2.12.3 Commissioning and Verification

After turning on the machine, test the button functionality to ensure they are working properly.

5.2.13 R300 Integrated Board PCBA FRU(CE)

5.2.13.1 General Information

Figure5–37



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108243-00	R300 Integrated Board PCBA FRU (CE)	None	None

5.2.13.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the main control board, refer to **5.1.2** Disassembly of Main Control Board.

Specific Steps

1. Take a new main control board, insert the ECG connect into the upper cover of the machine, and then put the board down. **Be careful not to press the screen FPC line and Wi−Fi antenna (if any) when putting down the board.** Arrange the screen FPC line and Wi-Fi antenna on the top of the main control board. Put the ECG connect shell on the corresponding position of the board. **Be careful not to miss the ECG connect shell.** Secure the main control board using eight M3×6 pan head cross recessed screws.
2. Plug the screen FPC line into the J40 socket of the main control board and buckle the socket cover. Cut out a fiber tape with a length of 35±2 mm and attach it on the J40 socket of the screen.
3. Plug in the keyboard connecting cable, print head cable, and power board connecting cable.
4. **Check whether there is a sticker on the buzzer. If there is, you need to tear off the sticker.** See the figure below.

Figure5–38

1 If there is a sticker on the buzzer, tear off the sticker.

5. If the original main control board has a Wi-Fi module, remove it and install it on the new board. Connect the Wi-Fi antenna properly. For details about the operations, refer to **025−000052−00, WXT5CM2803 WiFi6E module** **5.2.8.2** Disassembly and Assembly
6. Re-install the equipment according to the disassembly steps.

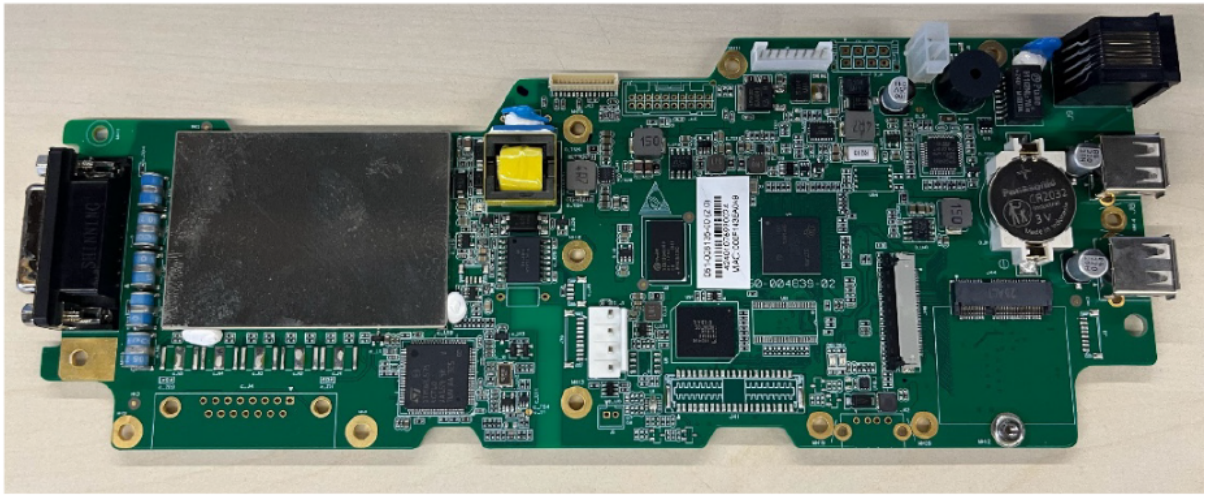
5.2.13.3 Commissioning and Verification

None

5.2.14 R30 Integrated Board PCBA FRU(CE)

5.2.14.1 General Information

Figure5–39



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108248-00	R30 Integrated Board PCBA FRU (CE)	None	None

5.2.14.2 Disassembly and Assembly

For details about the operations, refer to 115-108243-00 **R300 Integrated Board PCBA FRU (CE)** **5.2.13.2** Disassembly and Assembly.

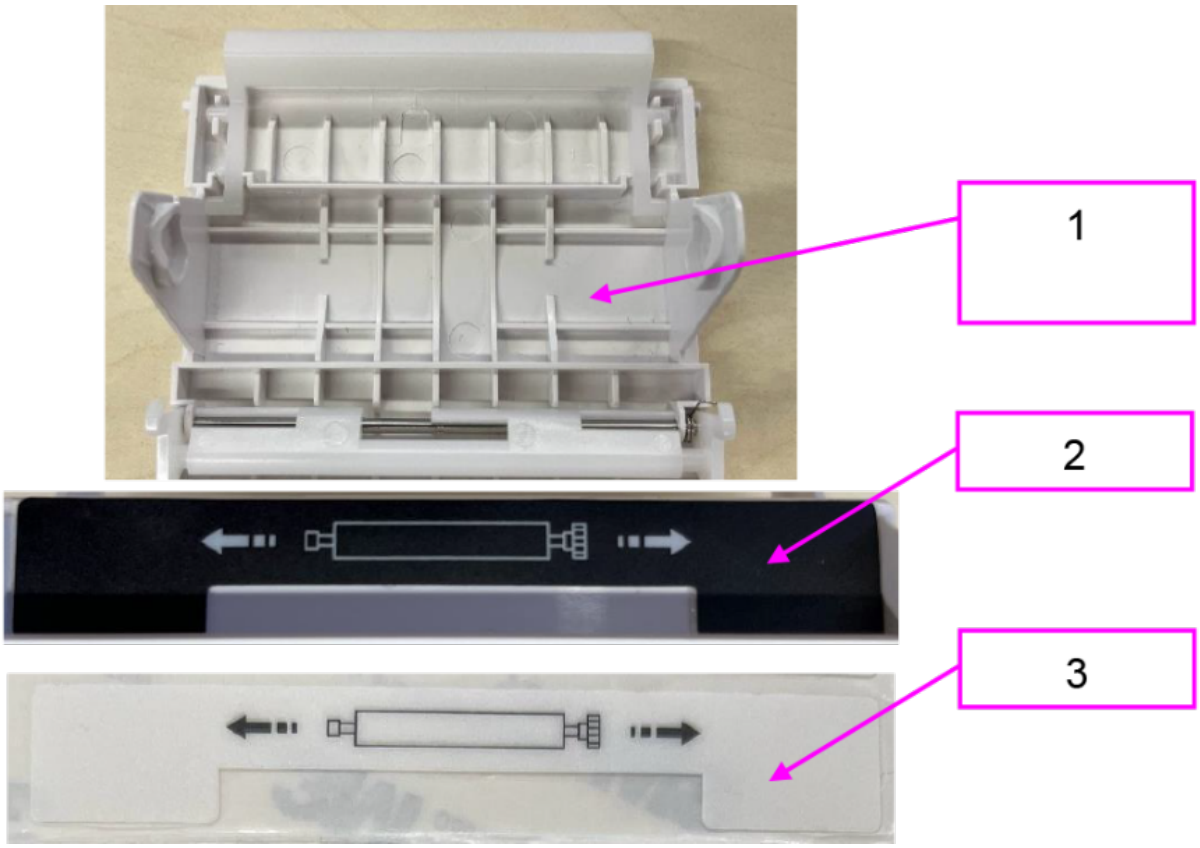
5.2.14.3 Commissioning and Verification

None

5.2.15 Recorder door assembly FRU(W/O roller)

5.2.15.1 General Information

Figure5–40



1	Recorder door assembly
2	Black overlay
3	White overlay

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108249-00	Recorder door assembly FRU (W/O roller)	043-002861-00	Fan fold paper platen

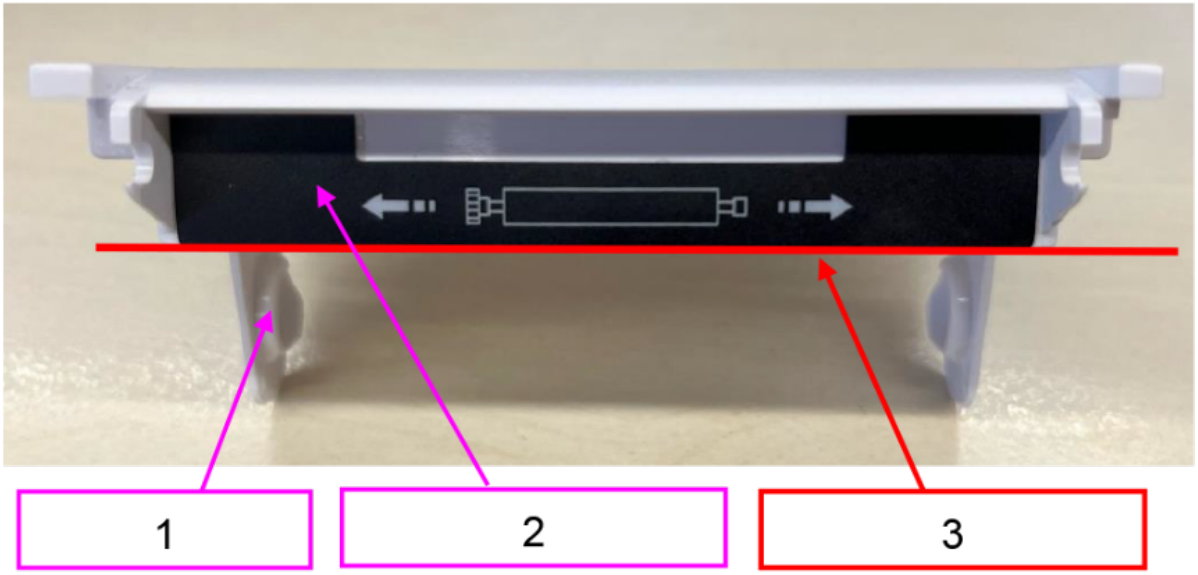
5.2.15.2 Disassembly and Assembly

For the disassembly of the recorder door, refer to **5.1.9** Disassembly of Recorder Door. (It is unnecessary to disassemble the upper and lower covers of the machine.)

Specific Steps

1. Take a new recorder door assembly and attach the recorder roller indication overlay on the recorder door. **Note: The recorder roller indication overlay is available in black and white. You need to choose the correct color according to the overlay on the repaired machine.** When attaching the overlay, ensure that the notch of the overlay is in the same direction as the figure below and do not extend beyond the edge of the recorder door.

Figure5–41



1 Recorder door assembly

2 Recorder roller indication overlay

3 Do not exceed the edge when pasting.

2. Remove the roller from the old recorder door and install it. **Note that the assembly direction of the roller must be consistent with the indication overlay.**
3. Install the recorder door assembly onto the upper cover of the machine.

5.2.15.3 Commissioning and Verification

Press the recorder door button to ensure the recorder door opens and closes smoothly.

5.2.16 fan fold paper platen

5.2.16.1 General Information

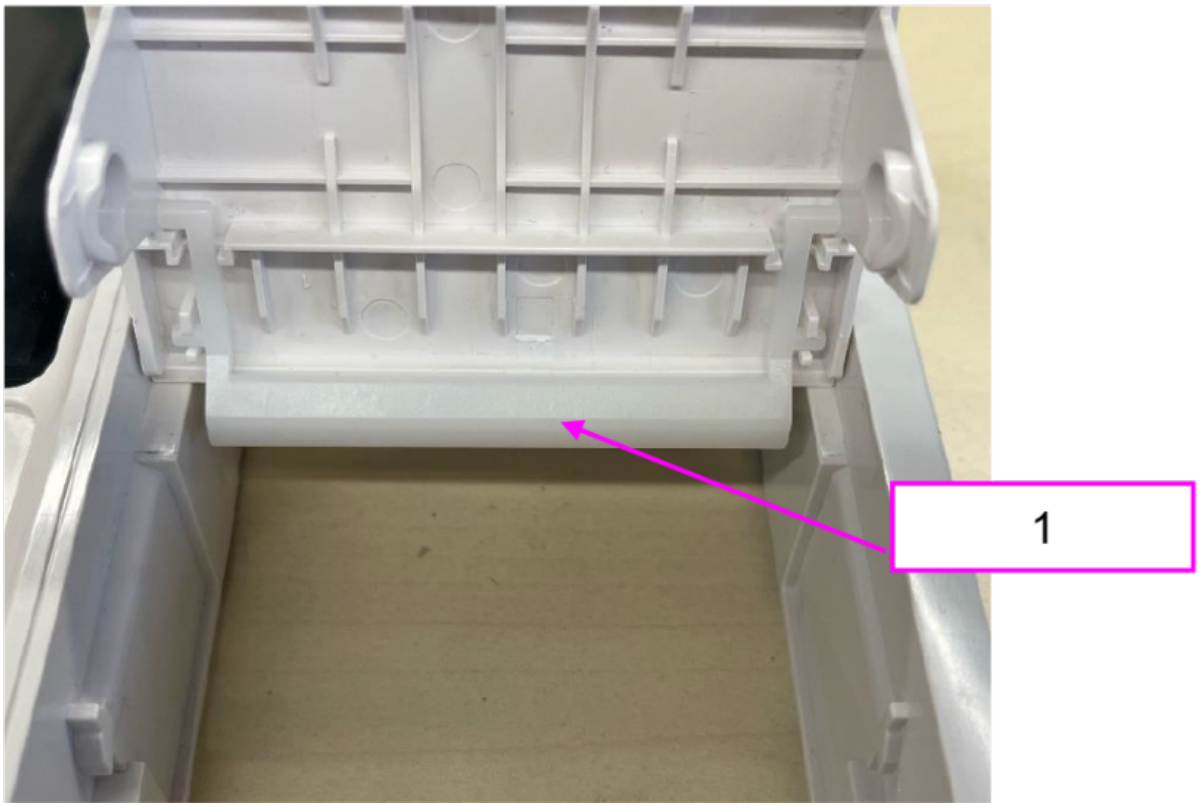
Figure5–42

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-002861-00	Fan fold paper platen	None	None

5.2.16.2 Disassembly and Assembly

Open the recorder door and directly remove the fan fold paper platen. (It is unnecessary to disassemble the upper and lower covers of the machine.)

Figure5–43



1 Fan fold paper platen

Specific Steps

Take a new fan fold paper platen. Install it according to the disassembly steps.

5.2.16.3 Commissioning and Verification

None

5.2.17 R300 Battery door

5.2.17.1 General Information

Figure5–44

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-021758-00	R300 battery door	None	None

5.2.17.2 Disassembly and Assembly

For the disassembly of the battery door, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.

Specific Steps

1. Take a new battery door and plug in the lithium battery cable.
2. Secure the battery door with an M3×6 pan head cross recessed screw.

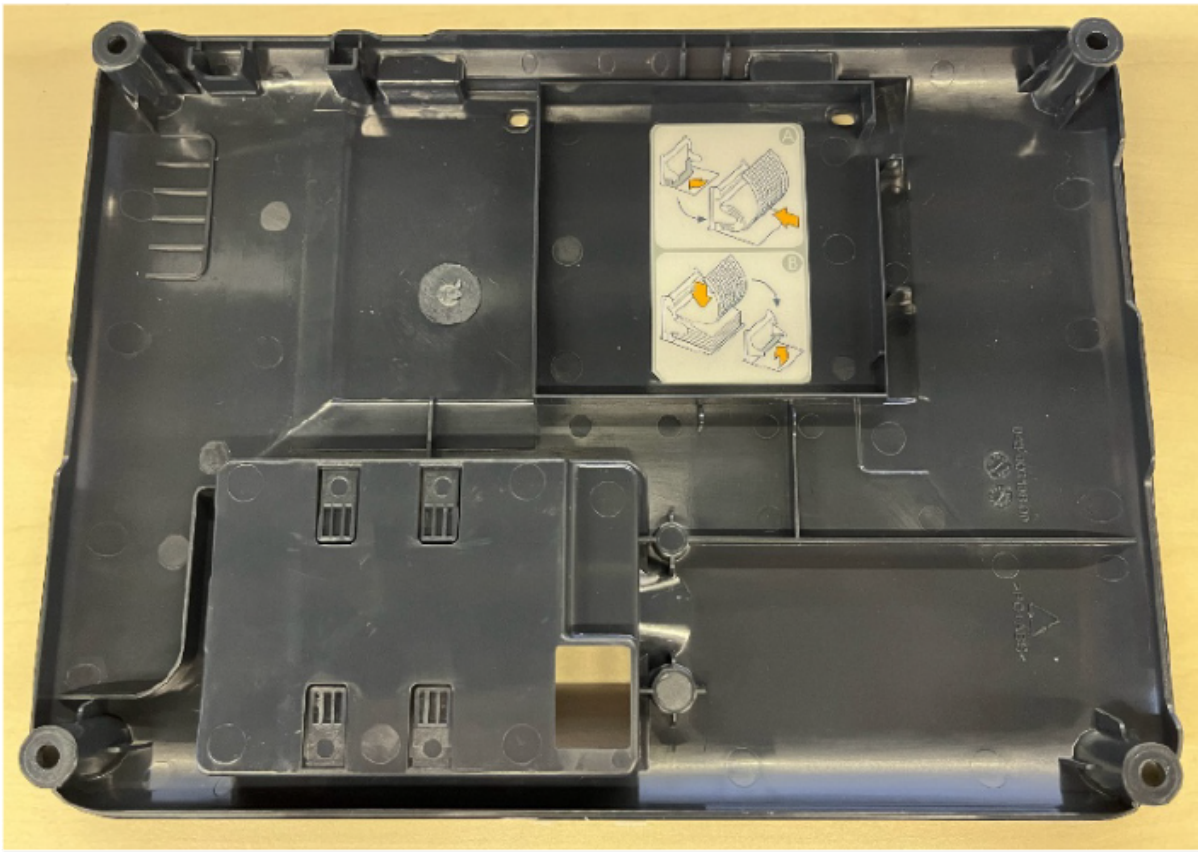
5.2.17.3 Commissioning and Verification

None

5.2.18 Lower cover FRU

5.2.18.1 General Information

Figure5–45



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108251-00	Lower cover FRU	049-000540-00	Rubber foot

5.2.18.2 Disassembly and Assembly

For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.

Specific Steps

1. Take a new lower cover, close it with the upper cover, and tighten it with four M4×10 pan head cross recessed screws.
2. Assemble the lithium battery and battery door.

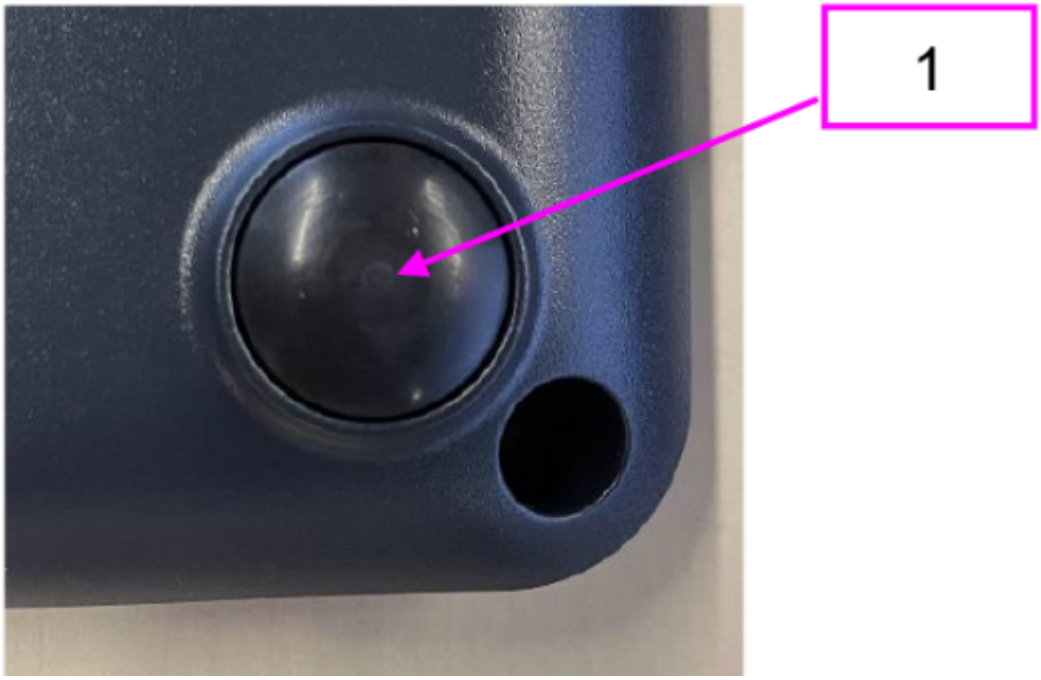
5.2.18.3 Commissioning and Verification

None

5.2.19 Rubber foot

5.2.19.1 General Information

Figure5–46



1 Rubber foot

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
049-000540-00	Rubber foot	None	None

5.2.19.2 Disassembly and Assembly

Glue the rubber foot to the corresponding position on the bottom cover of the machine.

5.2.19.3 Commissioning and Verification

None

5.2.20 WIFI material package

5.2.20.1 General Information

Figure5–47

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108252-00	WiFi Material Kit	025-000052-00	WXT5CM2803 WiFi6E module
		024-000751-00	Embedded wireless antenna

5.2.20.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the main control board, refer to **5.1.2** Disassembly of Main Control Board.
3. For the disassembly of the main sheet metal, refer to **5.1.5** Disassembly of Main Sheet Metal.

Specific Steps

1. Take a new Wi-Fi antenna and attach it on based on the engraved line on the upper cover. For details, refer to **embedded wireless antenna** **5.2.21.2** Disassembly and Assembly.
2. Install the main sheet metal and main control board in sequence.

3. Install the Wi-Fi module. For details, refer to **WXT5CM2803 WiFi6E module** **5.2.8.2** Disassembly and Assembly.
4. Re-install the machine according to the disassembly steps.

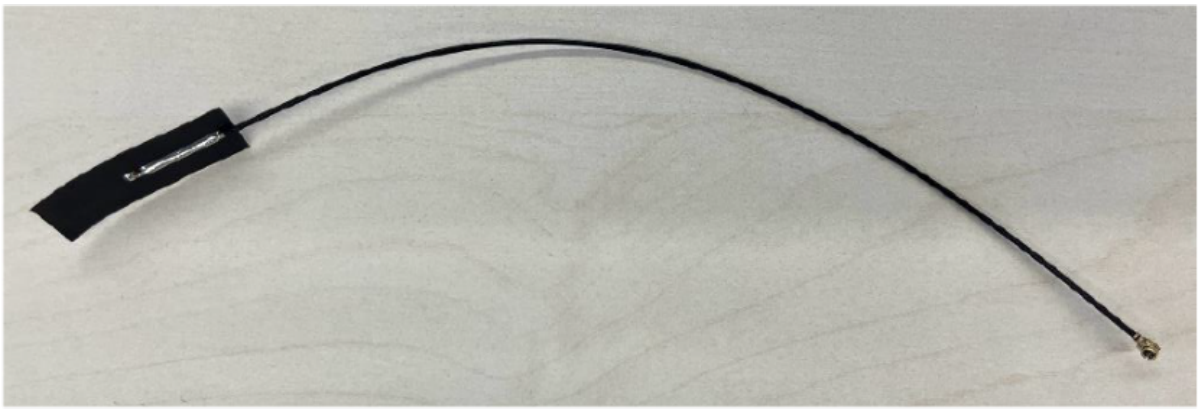
5.2.20.3 Commissioning and Verification

After powering on the machine, verify the Wi-Fi connection functionality to ensure it is working correctly.

5.2.21 Embedded Wireless Antenna

5.2.21.1 General Information

Figure5–48



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
024-000751-00	Embedded wireless antenna	None	None

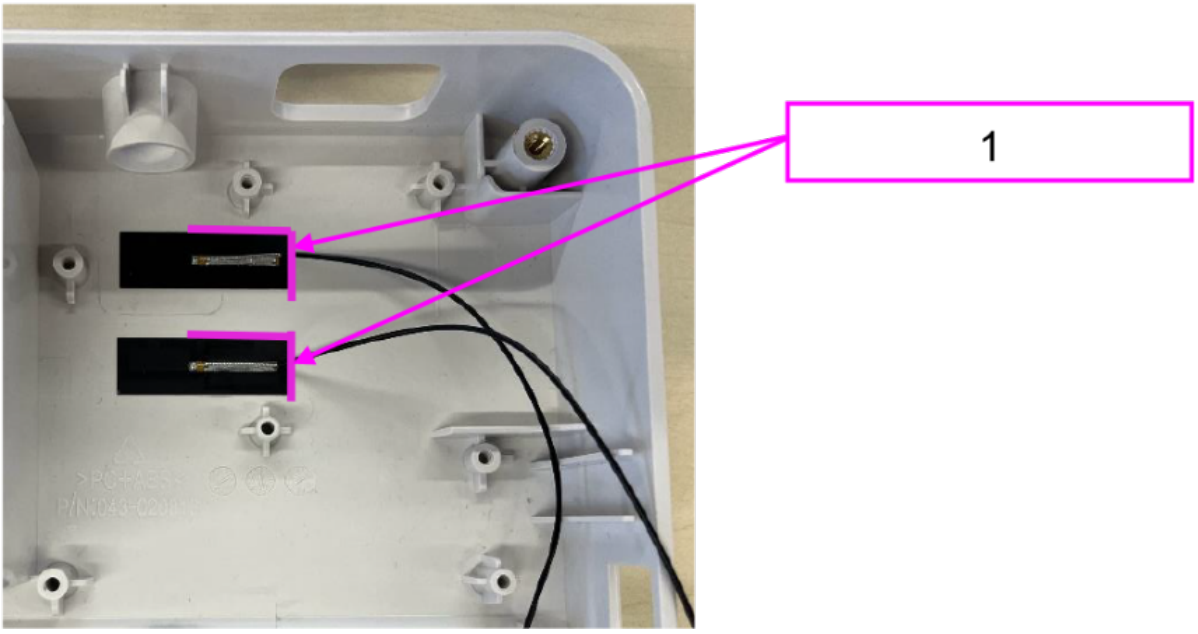
5.2.21.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the main control board, refer to **5.1.2** Disassembly of Main Control Board.
3. For the disassembly of the main sheet metal, refer to **5.1.5** Disassembly of Main Sheet Metal.
4. Tear off the old Wi-Fi antenna pasted on the upper cover.

Specific Steps

1. Take a new Wi-Fi antenna and paste it based on the engraved line on the upper cover, as shown in the figure.

Figure5–49



1 The antenna is pasted based on this reference.

2. Install the main sheet metal, main control board, and other components in sequence. For the routing method of the Wi-Fi antenna, refer to **WXT5CM2803 WiFi6E module** **5.2.8.2** Disassembly and Assembly.

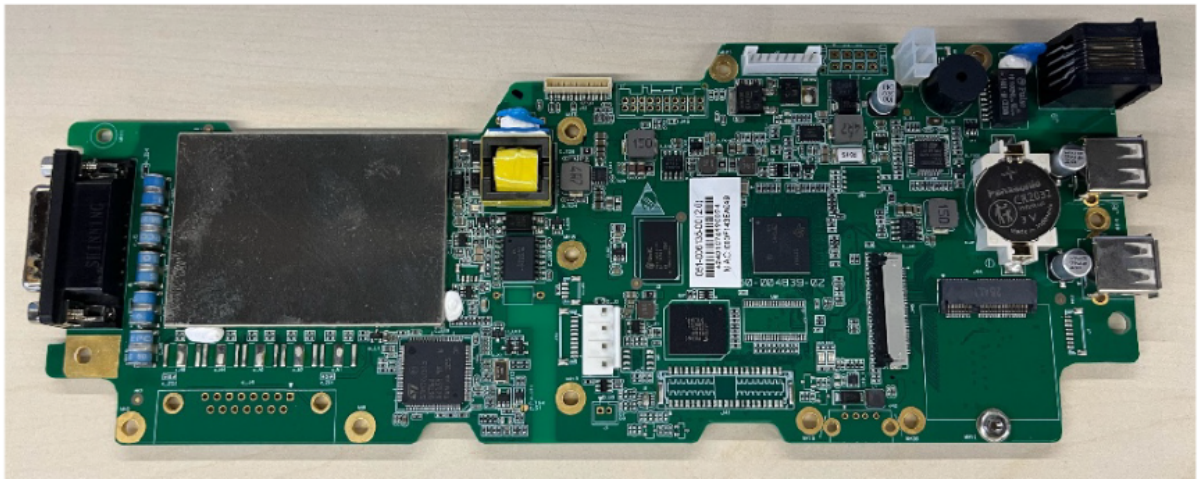
5.2.21.3 Commissioning and Verification

None

5.2.22 R300 Glasgow upgrade package(CE)

5.2.22.1 General Information

Figure5–50



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108253-00	R300 Glasgow upgrade package (CE)	None	None

5.2.22.2 Disassembly and Assembly

For details about the operations, refer to 115-108243-00 **R300 Integrated Board PCBA FRU (CE)** **5.2.13.2** Disassembly and Assembly.

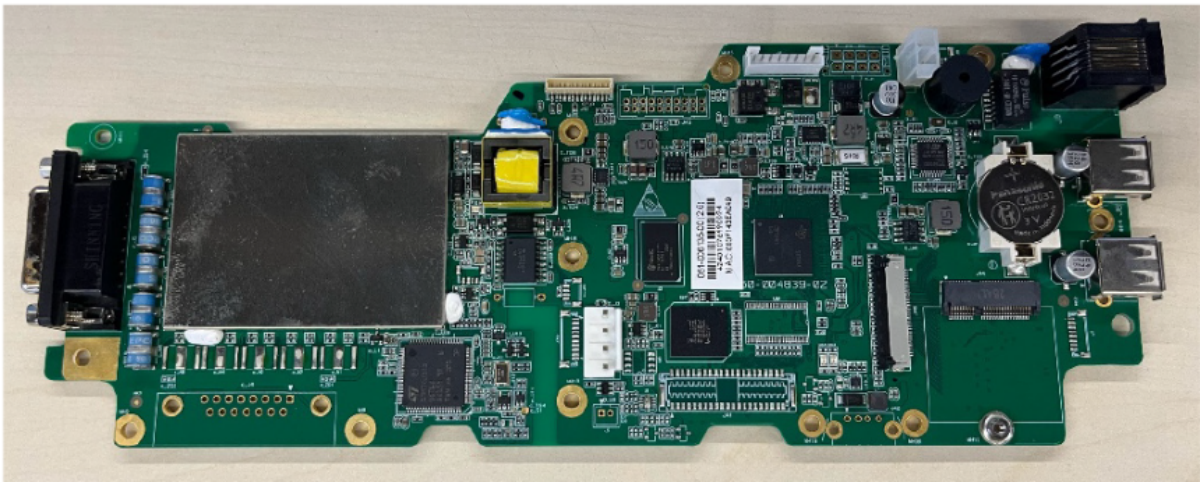
5.2.22.3 Commissioning and Verification

None

5.2.23 R30 Glasgow upgrade package(CE)

5.2.23.1 General Information

Figure5–51



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108254-00	R30 Glasgow upgrade package (CE)	None	None

5.2.23.2 Disassembly and Assembly

For details about the operations, refer to 115-108243-00 **R300 Integrated Board PCBA FRU (CE)** **5.2.13.2** Disassembly and Assembly.

5.2.23.3 Commissioning and Verification

None

5.2.24 Cable for to keypad

5.2.24.1 General Information

Figure5–52

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-003326-00	Cable connecting the keyboard to the main control board	None	None

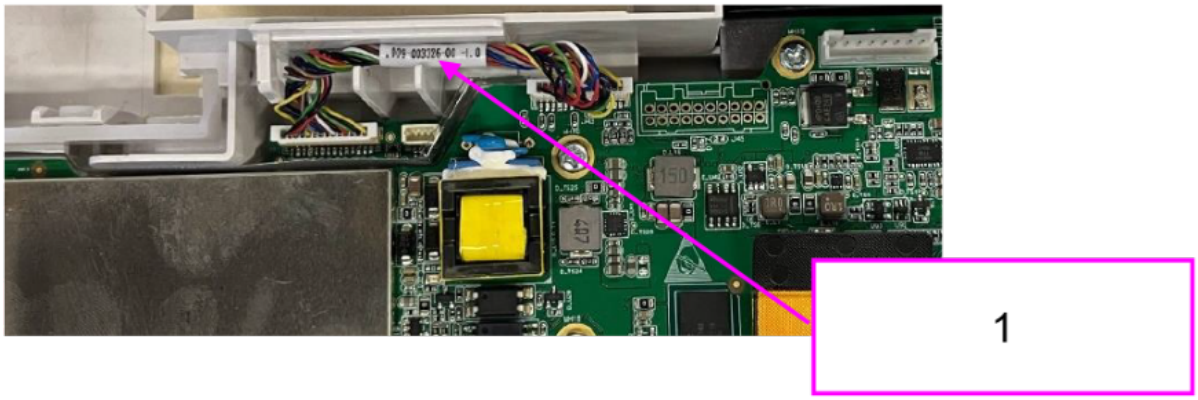
5.2.24.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the keyboard connecting cable, refer to **5.1.2** Disassembly of Main Control Board.

Specific Steps

1. Take a new keyboard cable, plug it in according to the disassembly steps, and then snap it into the slot. **Note: The cable ends are identical, indicating there is no distinction between the front and back.**

Figure5–53



1 Take a cable to connect the keyboard to the main control board, and then snap it into the slot.

2. Re-install the machine according to the disassembly steps.

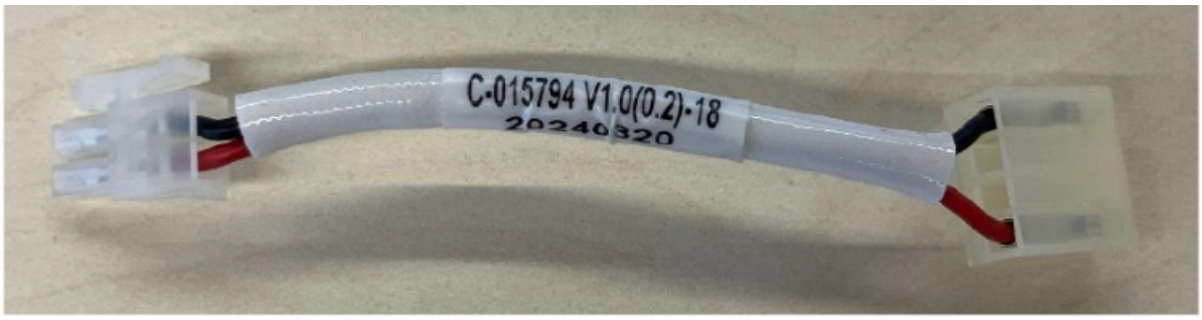
5.2.24.3 Commissioning and Verification

After turning on the machine, test the button functionality.

5.2.25 ACDC output wire (40W)

5.2.25.1 General Information

Figure5–54



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-015794-00	ACDC output wire (40W)	None	None

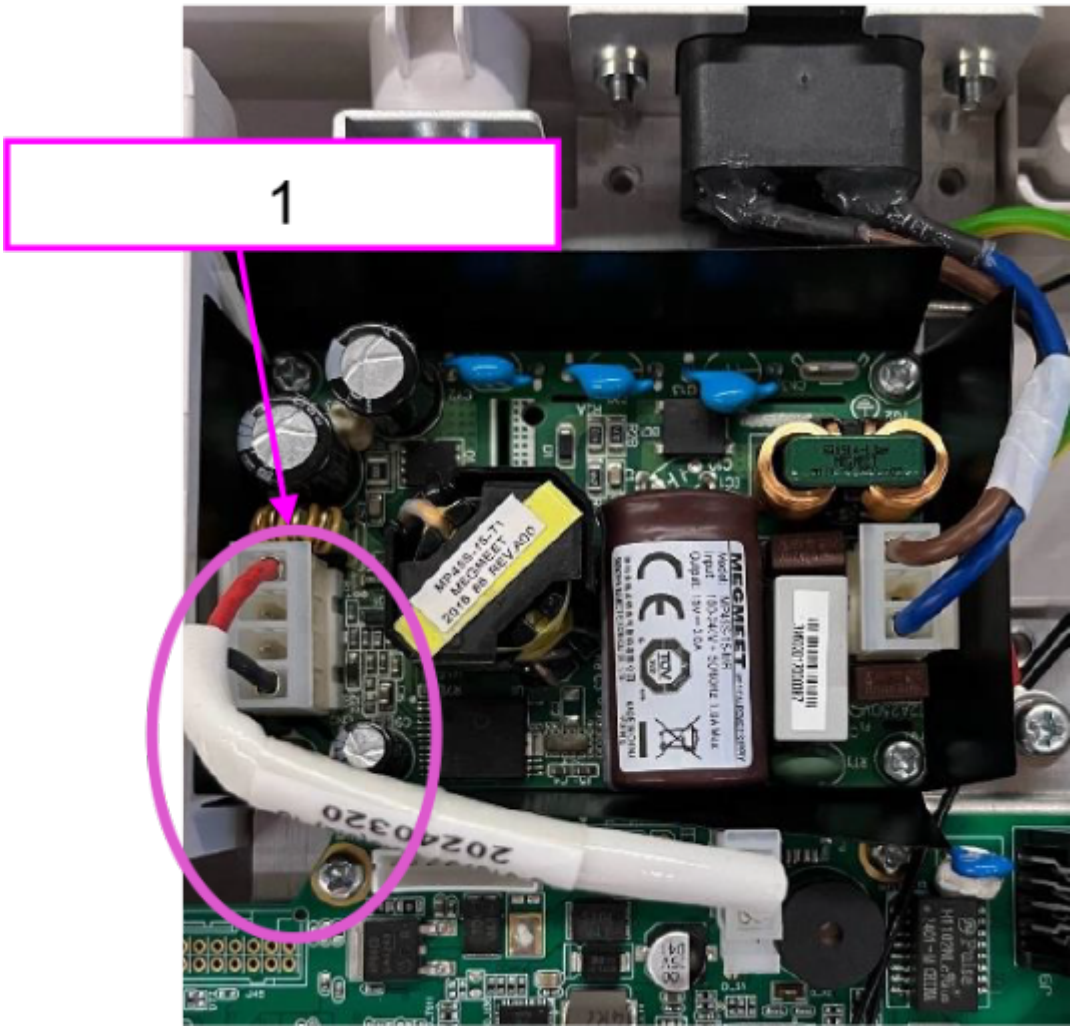
5.2.25.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the ACDC output wire (from the power board to the main control board), refer to **5.1.2** Disassembly of Main Control Board.

Specific Steps

1. Take a new ACDC output wire, plug it in according to the disassembly steps, and press the left side of the cable.

Figure5–55



1 Press the cable here.

2. Re-install the machine according to the disassembly steps.

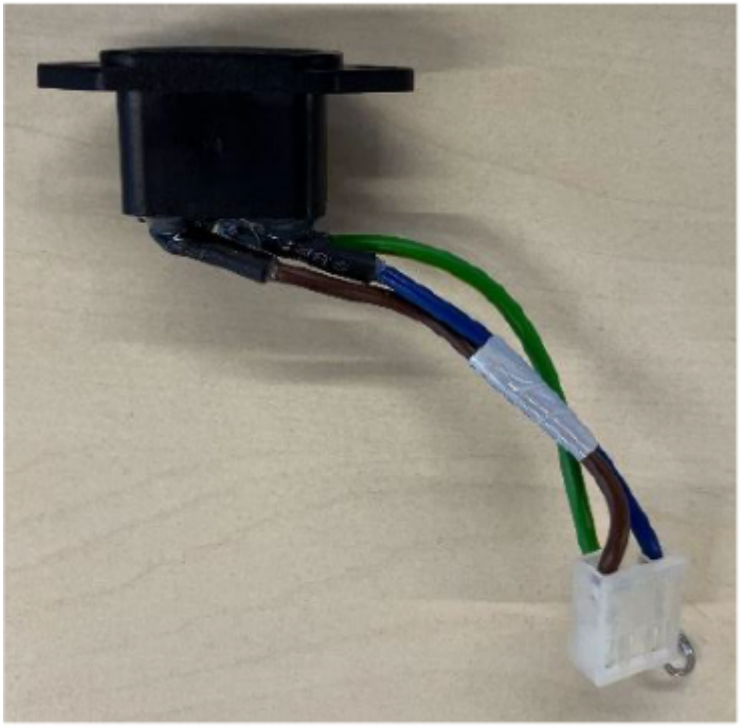
5.2.25.3 Commissioning and Verification

Ensure that the machine can power on normally.

5.2.26 AC input wire (40W)

5.2.26.1 General Information

Figure5–56

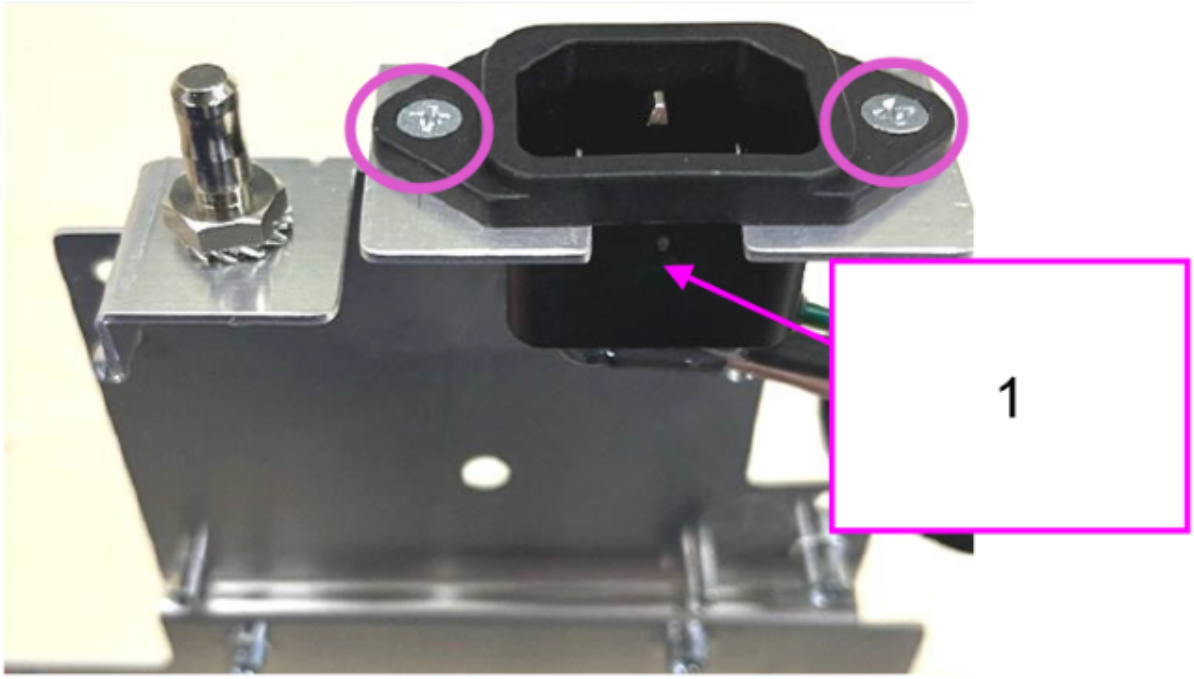


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-016538-00	AC input wire (40W)	None	None

5.2.26.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the main control board, refer to **5.1.2** Disassembly of Main Control Board.
3. For the disassembly of the main sheet metal, refer to **5.1.5** Disassembly of Main Sheet Metal.
4. Use a screwdriver to unscrew the two M3×8 countersunk screws on the AC socket and remove the AC input wire from the main sheet metal.

Figure5–57



1 Connect the AC input wire to the main sheet metal.

Specific Steps

Take a new AC input wire. Re-install the machine according to the disassembly steps.

5.2.26.3 Commissioning and Verification

Ensure that the power cord can be connected to the machine properly, and the machine powers on normally.

5.2.27 80 mm recorder drive board wire

5.2.27.1 General Information

Figure5–58

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-015793-00	80 mm recorder driver board connecting cable	None	None

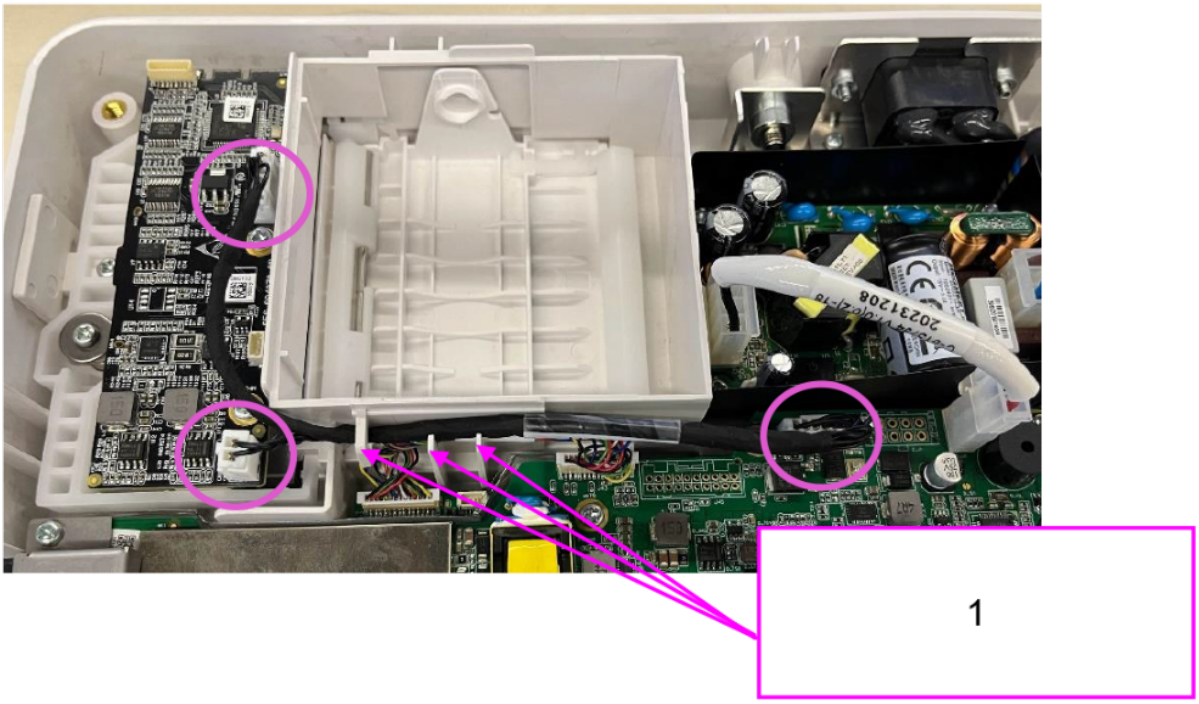
5.2.27.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the recorder driver board connecting cable, refer to **5.1.2** Disassembly of Main Control Board.

Specific Steps

1. Take a new recorder driver board connecting cable, plug it in according to the disassembly steps, and then snap it into the slot and press it over the cable for keyboard.

Figure5–59



1 The connecting cable from the recorder driver board to the integrated board is snapped in the three card slots and pressed over the cable for keyboard.

2. Re-install the machine according to the disassembly steps.

5.2.27.3 Commissioning and Verification

After powering on the machine, test the printing function to ensure the printer is working correctly.

5.2.28 underplate of Rolling Stand

5.2.28.1 General Information

Figure5–60

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
045-006536-00	Underplate of Rolling Stand	None	None

5.2.28.2 Disassembly and Assembly

None

5.2.28.3 Commissioning and Verification

None

5.2.29 Basket Assembly

5.2.29.1 General Information

Figure5–61

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
045-006535-00	Basket assembly	None	None

5.2.29.2 Disassembly and Assembly

None

5.2.29.3 Commissioning and Verification

None

5.2.30 3"Casters With Brakes And Threads

5.2.30.1 General Information

Figure5–62

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
034-000728-00	3" casters with brakes and threads	None	None

5.2.30.2 Disassembly and Assembly

None

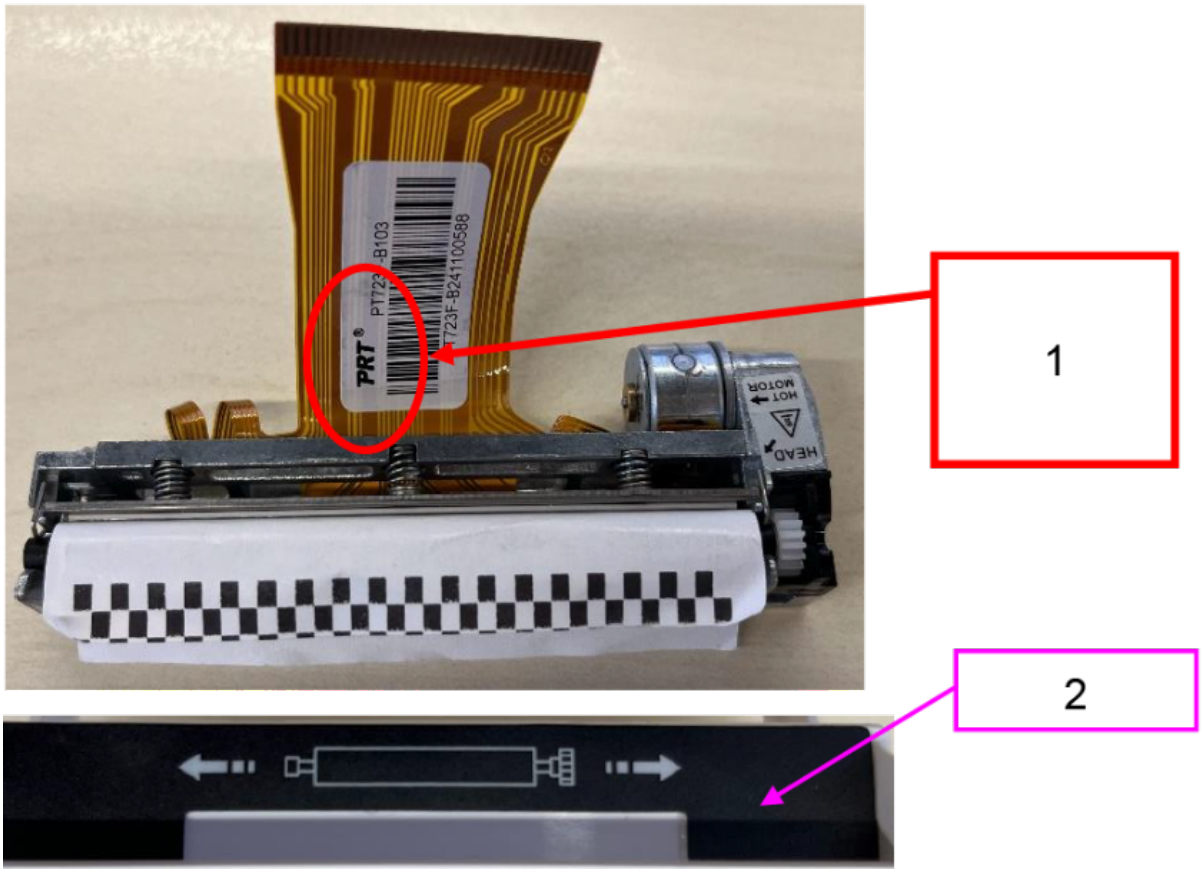
5.2.30.3 Commissioning and Verification

None

5.2.31 PRT Print head FRU (with black overlay)

5.2.31.1 General Information

Figure5–63



1 There is a "PRT" mark on the PRT print head.

2 Black overlay

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-111405-00	PRT Print head FRU (with black overlay)	None	None

NOTICE

Note: Please order the correct print head according to the color of the print head roller overlay of the repaired machine. When the original machine's print head roller overlay is black, the print head is a PRT print head (there is "PRT" on the print head FPC), and you should order the 115-111405-00 *PRT Print head FRU (with black overlay)*. When the original machine's print head roller overlay is white, the print head is an FTP print head (there is "FTP" on the side of the print head), and you should order the 115-111406-00 *FTP Print head FRU (with white overlay)*.

5.2.31.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the recorder driver board, refer to **5.1.7** Disassembly of Recorder Board.
3. For the disassembly of the print head, refer to **5.1.8** Disassembly of Print Head.

Specific Steps

1. Take a new print head, pass the FPC line of the print head through the hole of the mounting plate, and then fix the print head to the print head mounting plate with two M2×6 pan head cross recessed screws.
2. Use two M3×6 pan head cross recessed screws to install the assembled print head and mounting plate back to the upper cover of the machine.
3. Re-install the equipment according to the disassembly steps.

5.2.31.3 Commissioning and Verification

None

5.2.32 FTP Print head FRU (with white overlay)

5.2.32.1 General Information

Figure5–64

1 There is an "FTP" mark on the FTP print head.

2 White overlay

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-111406-00	FTP Print head FRU (with white overlay)	None	None

NOTICE

Please order the correct print head according to the color of the print head roller overlay of the repaired machine. When the original machine's print head roller overlay is black, the print head is a PRT print head (there is "PRT" on the print head FPC), and you should order the 115-111405-00 *PRT Print head FRU (with black overlay)*. When the original machine's print head roller overlay is white, the print head is an FTP print head (there is "FTP" on the side of the print head), and you should order the 115-111406-00 *FTP Print head FRU (with white overlay)*.

5.2.32.2 Disassembly and Assembly

1. For the disassembly of the upper and lower covers, refer to **5.1.1** Disassembly of Upper and Lower Cover Assemblies.
2. For the disassembly of the recorder driver board, refer to **5.1.7** Disassembly of Recorder Board.
3. For the disassembly of the print head, refer to **5.1.8** Disassembly of Print Head.

Specific Steps

1. Take a new print head, pass the FPC line of the print head through the hole of the mounting plate, and then fix the print head to the print head mounting plate with two M2×6 pan head cross recessed screws.
2. Use two M3×6 pan head cross recessed screws to install the assembled print head and mounting plate back to the upper cover of the machine.
3. Re-install the equipment according to the disassembly steps.

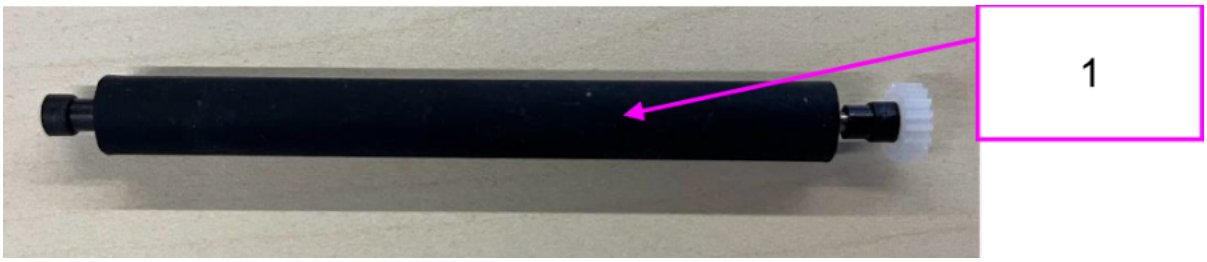
5.2.32.3 Commissioning and Verification

None

5.2.33 PRT80mm Print head roller(black overlay)

5.2.33.1 General Information

Figure5–65



1 Printer head roller

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-111407-00	PRT80mm Print head roller (black overlay)	None	None

NOTICE

You can place an order for 115-111407-00 *PRT80mm Print head roller (black overlay)* only when the original machine is a PRT print head (the recorder roller overlay is black)

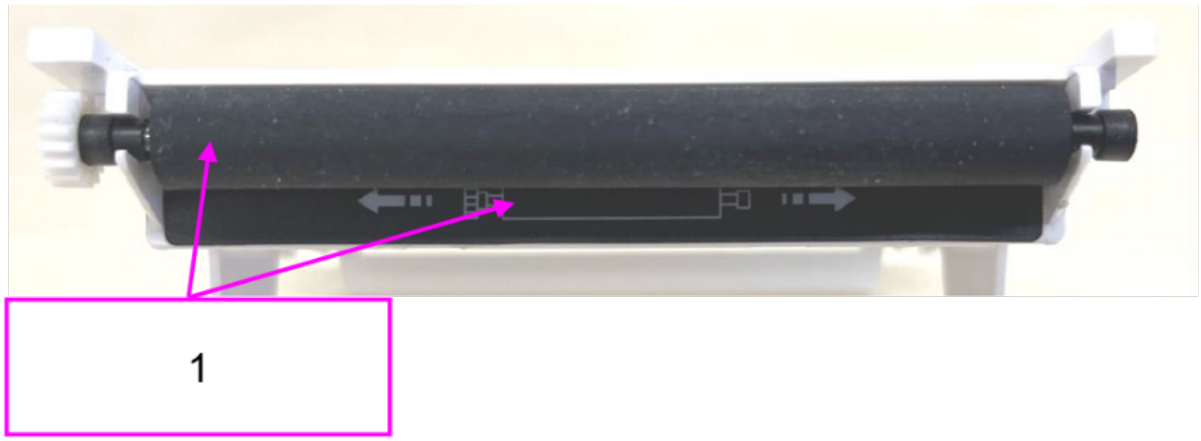
5.2.33.2 Disassembly and Assembly

Open the recorder door and remove the print head roller of the original machine (if any).

Specific Steps

Take a new print head roller and insert the roller into the slots on both sides of the recorder door according to the indication overlay direction. **Note that the assembly direction of the roller must be consistent with the indication overlay.**

Figure5–66



1 The assembly direction of the roller must be consistent with the indication overlay.

5.2.33.3 Commissioning and Verification

None

6 Troubleshooting

6.1 Troubleshooting

6.1.1 Overview

This chapter classifies faults according to the faulty components and fault phenomena in the ECG machine system for troubleshooting. The faults shall be checked, located, and rectified 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 case of any fault that is not described in this chapter, contact Mindray after-sales service department.

6.1.2 Part Replacement

Printed circuit boards (PCBs) and other major parts and components in the ECG machine are replaceable. After faulty circuit board assemblies are located, follow the instructions in *Disassembly and Maintenance* section to replace the circuit board assemblies. Then, check whether the fault is eliminated or whether the ECG machine passes related tests. 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.

6.1.3 Checks of ECG Machine Before Power-on

After the AC power supply is connected, check whether the AC indicator is turned on. If not, confirm whether the AC cable is connected to the socket and ECG machine reliably. If both the AC external power supply and power cord are connected normally, but the AC indicator is off, the AC-DC power module or main control board of the main unit may be damaged. At this time, insert the battery to see if the equipment can be turned on. If it cannot be turned on, the main control board may be damaged, or the internal board is abnormal, resulting in power protection. If the equipment can be powered on with the battery, the AC-DC power module is damaged.

In addition, check the appearance for damages before powering on. Particularly, when the touchscreen of the display assembly is There is a main control board PCBA in the machine damaged, stop using the monitor immediately.

6.1.4 Viewing the Software Version

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

1. 1. Choose **Main Menu**. In **System**, select **Maintenance**. Enter Manufacturer Maintenance Password. Select **Version Information**. In the menu displayed, you can check the version information of the system software.
2. 2. Choose **Main Menu**. In **System**, select **Maintenance**. Enter User Maintenance Password. Select **Version Information**. In the menu displayed, you can check the version information of the system software. In the menu displayed, you can check the version information of the system software and module programs.

6.1.5 Technical Alarms and Diagnosis

Before troubleshooting, check whether the ECG machine displays any prompt information. If there is prompt information, eliminate the prompt information and then troubleshoot according to the following content to avoid unnecessary equipment disassembly.
For prompt information, causes and countermeasures, refer to the user manual.

6.2 Troubleshooting Guide

6.2.1 Power-On/Off Fault

6.2.1.1 Unable to Power-On

Fault Description

Unable to Power-On

Possible Causes

1. The AC power supply is not connected, or the battery level is low.
2. The connection cable is faulty.
3. The power board is damaged.
4. The main control board is damaged.

Involved FRU

Power board and main control board

Solution

1. Check whether the AC power supply is connected correctly or the battery power is sufficient.
2. Check whether the cable connecting the keyboard to the main control board is connected properly.
3. Replace the power board. For details, refer to **5.1.3** Disassembly of the Power Board.
4. Replace the main control board. For details, refer to the R300 main control board maintenance kit (domestic) **5.2.13.2** Disassembly and Assembly.

6.2.2 LCD failure

6.2.2.1 No Response on Touch Screen

Fault Description

No Response on Touch Screen

Possible Causes

1. The touch function is disabled.
2. The connection cable is faulty.
3. The main control board is damaged.
4. The touch screen is damaged.

Involved FRU

Main control board and screen assembly

Solution

1. Unlock the screen.
2. Check whether the cable connecting the screen assembly to the main control board is connected properly.
3. Replace the main control board. For details, refer to the R300 main control board maintenance kit (domestic) .
4. Replace the LCD assembly. For details, refer to the LCD maintenance kit .

6.2.2.2 Black Screen or White Screen

Fault Description

Black Screen or White Screen

Possible Causes

1. The connection cable is faulty.
2. The main control board is faulty.

3. The screen is damaged.

Involved FRU

Main control screen and LCD

Solution

1. Connection cable fault:

1) Check whether the signal line and backlight line from the LCD to the main control board are connected properly.

2) Check whether the connecting lines and connectors are damaged.

2. Replace the main control board. For details, refer to the R300 main control board maintenance kit (domestic) **5.2.13.2** Disassembly and Assembly.
3. Replace the LCD. For details, refer to the LCD maintenance kit **5.2.11.2** Disassembly and Assembly.

6.2.2.3 Overlapping or Distorted Images on the Screen

Fault Description

Overlapping or Distorted Images on the Screen

Possible Causes

1. The main control board malfunctions.
2. The connection cable is faulty.

Involved FRU

CPU board

Solution

1. Replace the main control board. For details, refer to the R300 main control board maintenance kit (domestic) **5.2.13.2** Disassembly and Assembly. Alternatively, use the software to update or upgrade the main control board.
2. Check whether the signal line and backlight line from the LCD to the main control board are connected properly.

6.2.3 Button Fault

6.2.3.1 Unresponsive Button

Fault Description

Unresponsive Button

Possible Causes

1. The connection cable is faulty.
2. The keyboard is damaged.

Involved FRU

Keyboard

Solution

1. Check whether the cable connecting the keyboard to the main control board is connected properly.
2. Replace the keyboard board. For details, refer to the keyboard board maintenance kit **5.2.12.2** Disassembly and Assembly.

6.2.4 Sound Issues

6.2.4.1 Button or Knob Encoder Functions Normally, but There Is No Sound or Abnormal Sound

None

6.2.4.2 No Alarm Sound or Abnormal Alarm Sound

Fault Description

No Alarm Sound or Abnormal Alarm Sound

Possible Causes

1. The alarm volume is set to 0.
2. The connection cable is faulty.
3. The speaker is damaged.
4. The main control board is damaged.

Involved FRU

Speaker and main control board

Solution

1. Choose **Main Menu>System>Maintenance**. Enter User Maintenance Password. Select **Alarm**. On the menu displayed, adjust **Minimum Alarm Volume** to an appropriate value. On the main menu, choose **Alarm>Setup**. Adjust the alarm volume.
2. Check the connection between the speaker and the main control board.
3. Replace the speaker.
4. Replace the main control board. For details, refer to the R300 main control board maintenance kit (domestic) **5.2.13.2** Disassembly and Assembly.

6.2.5 Battery Fault

6.2.5.1 Battery Cannot Charge or Discharge

Fault Description

Battery Cannot Charge or Discharge

Possible Causes

1. The battery is damaged.
2. The connection cable is faulty.
3. The battery interface board is damaged.

Involved FRU

Battery and battery interface board

Solution

1. Replace the battery.
2. Check whether the connecting cable between the battery interface board and the main control board is securely connected.
3. Replace the battery interface board.

6.2.6 Recorder Fault

6.2.6.1 Recorder Cannot Print

Fault Description

Recorder Cannot Print

Possible Causes

1. The printing paper is installed incorrectly.
2. The connection cable is faulty.
3. The thermal print head is damaged.

Involved FRU

Print head

Solution

1. Reinstall the printing paper correctly.
2. Check whether the connecting cable between the recorder and the main control board is securely connected.
3. Replace the thermal print head. Refer to PRT 80 mm Thermal Print Head Roller (compatible with black-coated surfaces) **5.2.33.2** Disassembly and Assembly.

6.2.6.2 Poor Print Quality or Abnormal Paper Feed in Recorder

Fault Description

Poor Print Quality or Abnormal Paper Feed in Recorder

Possible Causes

1. The printing paper is not installed correctly.
2. The thermal print head is dirty.
3. The thermal print head is damaged.

Involved FRU

Print head

Solution

1. Stop printing and reinstall the paper correctly.
2. The thermal print head is dirty.

1) Check for any foreign objects on the thermal print head and the platen roller.

2) Use an appropriate cleaning solution to clean the thermal print head.

3. Replace the thermal print head. Refer to PRT 80 mm Thermal Print Head Roller (compatible with black-coated surfaces) **5.2.33.2** Disassembly and Assembly.

6.2.7 Output Interface Fault

6.2.7.1 Unable to Use USB Device

Fault Description

Unable to use USB Flash drive to export data or transfer patient data.

Possible Causes

The main control board is damaged.

Involved FRU

CPU board

Solution

Replace the main control board. For details, refer to the R300 main control board maintenance kit (domestic) **5.2.13.2** Disassembly and Assembly.

6.2.8 Data Storage Fault

6.2.8.1 Unable to View Historical Patient Data

Fault Description

Unable to View Historical Patient Data

Possible Causes

1. Patient data is not properly received. After reboot, patient data is not saved.
2. The main control board is damaged.

Involved FRU

CPU board

Solution

1. Ensure proper reception of patient data.
2. Replace the main control board. For details, refer to the R300 main control board maintenance kit (domestic) **5.2.13.2** Disassembly and Assembly.

6.2.9 Wired Network Malfunction

6.2.9.1 Wired Network Connection Failure

Fault Description

Wired Network Connection Failure

Possible Causes

1. The network cable is not connected properly.
2. The IP address is not set correctly.
3. The main control board is damaged.

Involved FRU

CPU board

Solution

1. Check whether the network cable is properly connected or whether the cable is too long (it should not exceed 50 m).
2. Check for IP conflicts in the network and reconfigure the IP address.
3. Replace the main control board. For details, refer to the R300 main control board maintenance kit (domestic) **5.2.13.2** Disassembly and Assembly.

6.2.9.2 Frequent Network Disconnections

Fault Description

Frequent Network Disconnections

Possible Causes

The network cable is not connected properly.

Involved FRU

None

Solution

Check whether the network cable is properly connected or whether the cable is too long (it should not exceed 50 m).

6.2.9.3 Network Connected But Other Bed Observation Cannot Be Implemented

None

6.2.10 Wi-Fi Network Malfunction

6.2.10.1 Wi-Fi Frequently Drops or Disconnects

Fault Description

Wi-Fi Frequently Drops or Disconnects

Possible Causes

1. The Wi-Fi signal in the area is unstable.
2. The internal Wi-Fi antenna has come loose or the Wi-Fi antenna is not securely attached to the module.
3. The antenna is damaged.
4. The Wi-Fi module malfunctions.

Involved FRU

Antenna and Wi-Fi module

Solution

1. Check the Wi-Fi signal strength in the hospital area.
2. Disassemble the device and secure the Wi-Fi antenna.
3. Replace the antenna. For details, refer to the Wi-Fi material kit **5.2.20.2** Disassembly and Assembly.
4. Replace the Wi-Fi module. For details, refer to WXT5CM2803 WiFi6E Module **5.2.8.2** Disassembly and Assembly.

6.2.10.2 Unable to Connect to Wi-Fi

Fault Description

Unable to Connect to Wi-Fi

Possible Causes

1. The IP address is not set correctly.
2. The Wi-Fi signal in the area is unstable.
3. The internal Wi-Fi antenna is loose or not properly connected to the Wi-Fi module.

4. The antenna is damaged.
5. The Wi-Fi module malfunctions.
6. The main control board is faulty.

Involved FRU

Antenna, Wi-Fi module, and main control board

Solution

1. Check for IP conflicts in the network and reconfigure the IP address.
2. Check the Wi-Fi signal strength in the hospital area.
3. Re-secure the Wi-Fi antenna.
4. Replace the antenna. For details, refer to the Wi-Fi material kit **5.2.20.2** Disassembly and Assembly.
5. Replace the Wi-Fi module. For details, refer to WXT5CM2803 WiFi6E Module **5.2.8.2** Disassembly and Assembly.
6. Replace the main control board. For details, refer to the R300 main control board maintenance kit (domestic) **5.2.13.2** Disassembly and Assembly.

6.2.11 Software Upgrade Fault

6.2.11.1 Bootloader Upgrade Failed

Fault Description

Bootloader Upgrade Failed

Possible Causes

Power failure or unexpected shutdown occurs during the bootloader upgrade process.

Involved FRU

CPU board

Solution

Replace the main control board. For details, refer to the R300 main control board maintenance kit (domestic) **5.2.13.2** Disassembly and Assembly.

6.2.11.2 Unable to Upgrade Program

Fault Description

Unable to Upgrade Program

Possible Causes

1. Connection error.
2. The program upgrade package is incorrect.
3. The IP address of the PC is not set correctly.

Involved FRU

None

Solution

1. Connection error

1) Ensure that the PC is correctly connected to the ECG machine's network interface using the Ethernet cable.

2) Ensure that the hub or switch is functioning properly and check the connection of the hub’s Ethernet cable or crossover cable.

2. Select the appropriate upgrade package for the program to be upgraded. The program upgrade package should have the .pkg file extension.
3. Set a fixed IP address for the ECG machine to be upgraded. It is recommended not to perform program upgrade within a multi-PC network.

6.2.11.3 Abnormal Battery Display After Power Management Program Upgrade

Fault Description

Abnormal Battery Display After Power Management Program Upgrade

Possible Causes

After the power board software is upgraded, the system is not fully powered off and restarted.

Involved FRU

None

Solution

Upgrade the power management software again. After completing the upgrade, fully power off and restart the system.

6.2.12 Technical Alarm Warning Information

6.2.12.1 Technical Alarm Warning Information

Please refer to the user manual.

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