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## Cover

# R700 and R900 Series Full-digital Multi-channel ECG Machines.

## Service Manual

Version 1.0

P/N: M508B-IS001

# 1 Preface

# 1.1 Revision History

Version	Revision Date	Revision Description	Effective Date
1.0	2024-12-9	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.



are the registered trademarks owned by Mindray.

#### 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: 888888Factory maintenance: 332888

• Demo mode: 2088

## 1.6 Safety Information



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



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.



- 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 oxygenrich 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.

#### **A**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.	<u>^</u>	Universal warning symbol
(h)	Standby	$\odot$	Switch-on (only for one part of the device)
	Manufacturer	$\sim$	Manufacture date
$\sim$	Alternating current (AC)	<u>-</u>	Battery
4h	CF-type defibrillation prevention application	SN	Serial Number
$\Diamond$	Equipotentiality	I P20	Protected against solid foreign objects with a diameter no less than 12.5 mm
•	USB port	晶	Computer network
<b>2</b>	Humidity limit	<b>€</b>	Air pressure limitation
X	Temperature limit	(( <u>`</u> ))	Non-ionizing radiation
<u>n</u>	Maximum number of stack layers	<del></del>	To be protected from rain
<u>††</u>	This way up	Ţ	Fragile articles to handle with care

20)	Environmental protection service life of electronic products (20 years)	UDI	Unique identification of medical devices
EC REP	Authorized representative in the European Community	<b>C€</b> <sub>1639</sub>	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

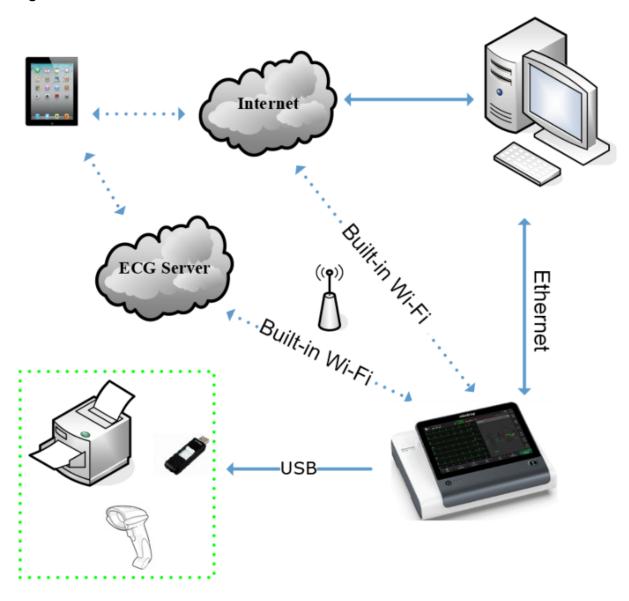
#### 2.1.1 Overview

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

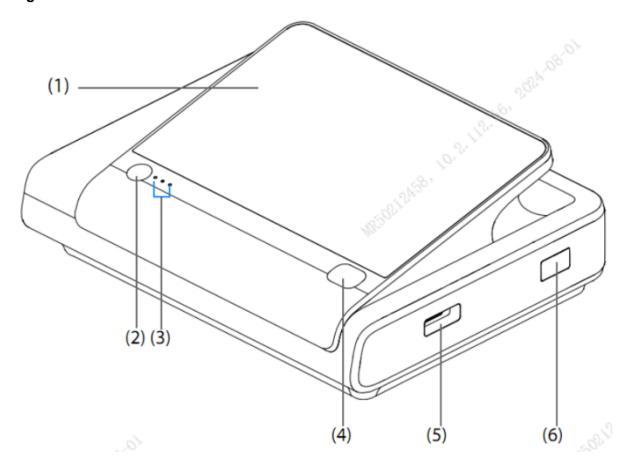


### 2.1.2 Peripheral Ports

R700/R900 Input and Output Ports

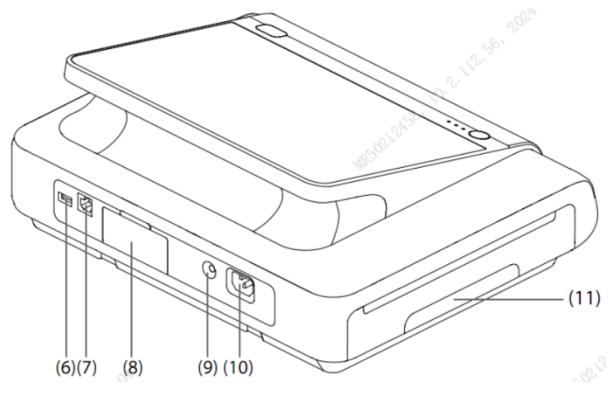
Front view:

Figure2-2



Rear view:

Figure2-3



- LCD/Touch Screen: Allows input of patient information and viewing of ECG waveforms through the touch and LCD screens.
- 2. Power switch: Used to turn the equipment on or off.
- 3. Indicator: Includes on/off indicator, power indicator, and battery indicator.
- 4. ECG button: Starts or stops ECG data collection.
- 5. Cable port: Connects to the ECG machine cables.
- 6. USB port: Connects to USB Flash drives or barcode scanners.
- 7. Network port: Standard RJ45 port for connecting to a CMS or other devices through a standard Ethernet cable.
- 8. Battery compartment: Houses the batteries.
- 9. Equipotential terminal: When another device is used together with this equipment, wires should be used to connect the other device with equipotential terminals of this equipment to eliminate the potential difference between different devices and ensure safety.
- 10. AC power socket
- 11. Thermal recorder: Prints ECG reports.

#### NOTICE

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

#### 2.1.3 Architecture Diagram of Hardware System

The R900/R700 series ECG machines are designed based on a unified hardware and software platform, with most core materials being reused components. Both R900 and R700 models are 12-lead ECG machines with the primary difference being the screen tilt angle. The main differences are as follows:

- Screen:
  - Both R900 and R700 feature a 12.1-inch display with 1280x800 resolution, designed with a flat capacitive touchscreen.
- · Battery:
  - Both R900 and R700 use rechargeable smart batteries that support tool-free installation and removal.
- Wireless:
  - Both R900 and R700 come standard with Wi-Fi 6 modules.
- Thermal recording:
  - The R900 is equipped with a 216 mm thermal module that supports thermal printing on A4 or letter-sized paper.
  - The R700 is equipped with a 216 mm thermal module but offers configurations without thermal recording functionality.

The hardware architecture diagram for the R900/R700 series is as follows:

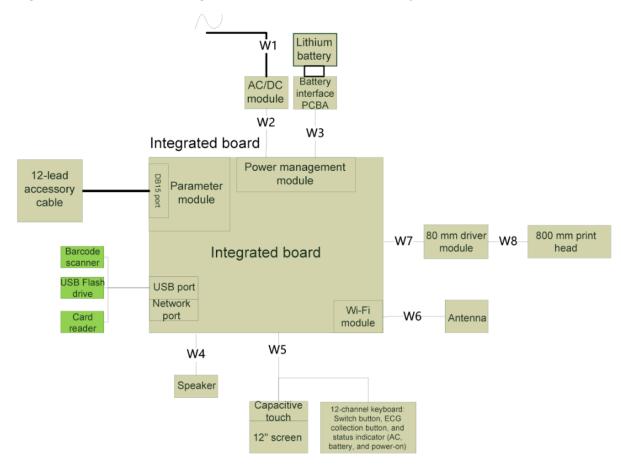


Figure2-4 Architecture diagram of R700/R900 hardware system

# 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:
- 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.

#### **Switch Keyboard**

The R700/R900 switch keyboard mainly consists of a switch and three work indicators.

#### Wi-Fi

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

#### AC/DC power module

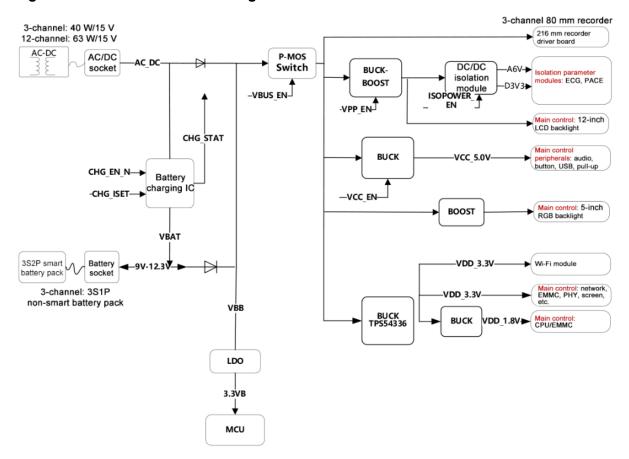
It converts AC power to DC power for output.

#### Recorder module

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

#### 2.1.4 Power Architecture Diagram

Figure2-5 Power Architecture Diagram



Main unit battery: The R700/R900 uses a smart battery with an output voltage ranging from 9 V to 12.3 V.

The AC-DC output voltage is 15 V, and R700/R900 is a 65W module.

The VBUS voltage ranges from 10 V to 15 V, which powers the recorder power part.

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

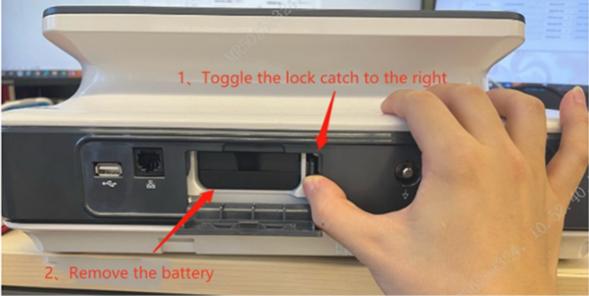
#### 2.2.1 Installing the Battery

#### Installing the BnenHeart R900/R90/R700/R70 battery:

Open the battery door on the back of the machine manually. Slide the latch inside to the right and remove the battery. When installing the battery, there is no need to adjust the latch. You can simply push the battery in directly.

Figure2-6





#### 2.2.2 Installing the Parameter Accessories

Refer to online instructions or manual.

#### 2.2.3 Peripheral Installation (If Applicable)

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:

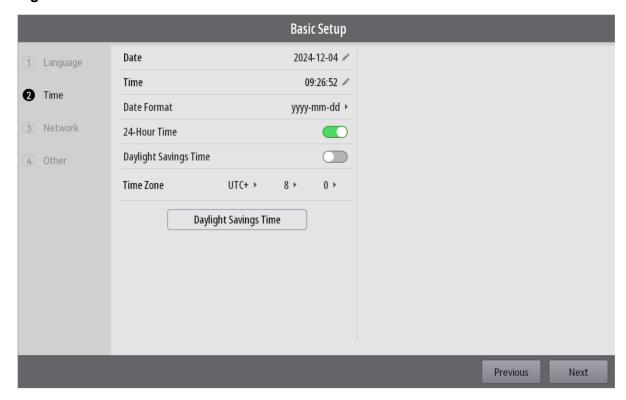
1. Choose your preferred language, such as English/English. After selection, click Next to proceed.

Figure2-7



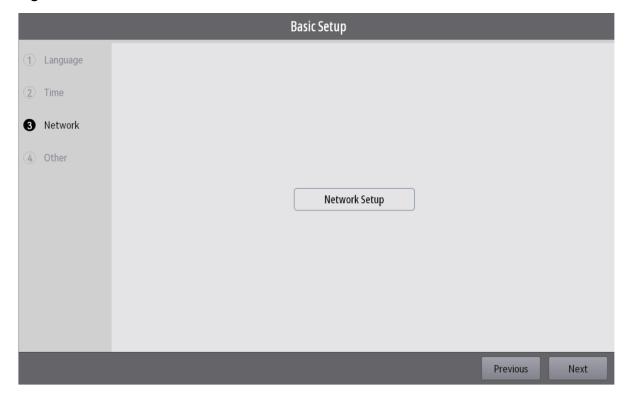
2. Configure the required time, time zone, and date format.

Figure2-8



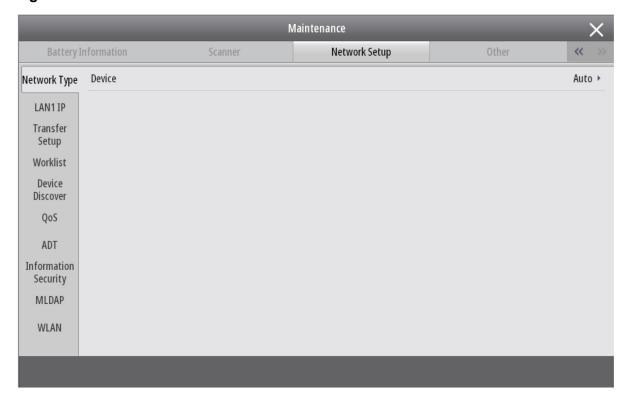
3. Select Network and click Network Setup.

Figure2-9



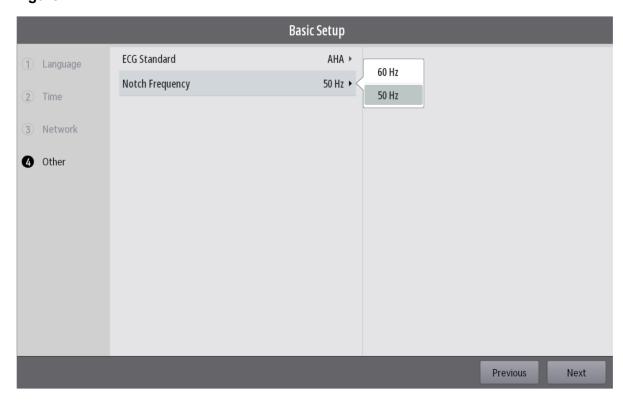
Choose the network type according to actual conditions (defaulted to automatic).

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 Installing Components and Rolling Stand

The ECG machine has optional components and a compatible rolling stand. For detailed installation instructions, see the ECG Machine Rolling Stand Installation Manual.

# 3 Maintenance and Test

# 3.1 Introduction

### 3.1.1 Device Test

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.



- · 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.

See the test sections below.

## 3.1.2 Test Report

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

### 3.1.3 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.

## 3.1.4 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		When the machine is installed for the first time or every time it is reinstalled     Following any repair or parts replacement for the main unit
ECG test	Performance Test  Module calibration	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
Electrical Safety Test	Shell leakage current test  Earth leakage current  Patient leakage current  Patient auxiliary current	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
Recorder Test		When the recorder is repaired or replaced
Battery Test	Function Check  Performance Checks	Upon first installation     When battery is replaced  Every 3 months or when the
		battery's operating time is significantly reduced

## 3.1.5 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 Visual Check

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.

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.

### 3.2.2 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.
- 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 Ground Resistance Test



- 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.

#### **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

1. Plug the analyzer power cord plug into the socket and turn on the power button to enter the startup screen.

Connect to protective ground terminal or any exposed conductive surface on the chassis.

Connect ESA612 to the ground power socket.

Connect the AC power cable of the device to be tested to the equipment output of the analyzer.

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

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).

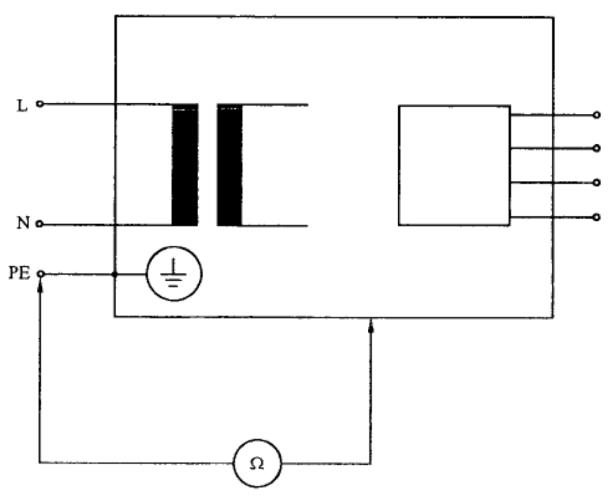


Figure3–2 Schematic Diagram of Ground Resistance Test

#### **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 2 softkey on the panel.
- 3. Connect one end of the test lead wire to the jack and the other end of the test
  - lead wire to the // (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 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.

## 3.4.2 Device Leakage Current Test (Normal State)

#### **Preparation before Testing**

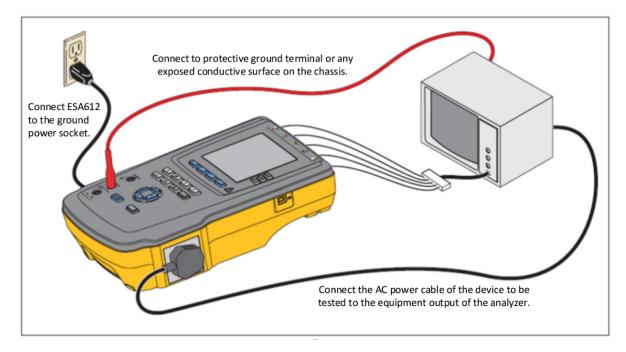
Electrical safety tests in this manual are performed in accordance with the IEC62353 (equivalent to YY/T0841) standard.

Test equipment: Fluke ESA612 or ESA615 or equivalent equipment.

#### Connection Diagram of the Device Under Test and the Test Equipment

1. Plug the analyzer power cord plug into the socket and turn on the power button to enter the startup screen.

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



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).

L(N)
MP
AP
O
N(L)
S1
MD

Figure3-4 Schematic Diagram of Device Leakage Current Test

#### **Test Procedure**

Steps to perform a device leakage current test:

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.



- 3. The direct device test is the default mode and should already be selected.
- 4. Press 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.

## 3.4.3 Device Leakage Current Test (Single Fault)

#### **Preparation before Testing**

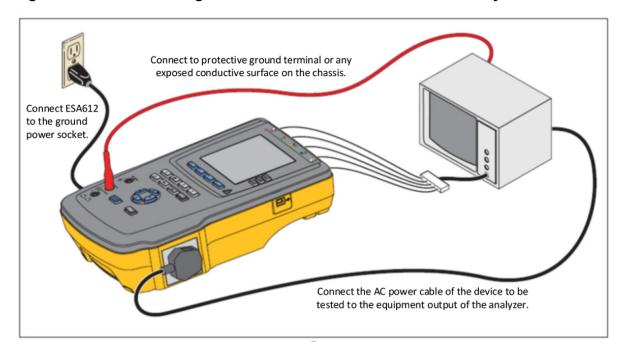
Electrical safety tests in this manual are performed in accordance with the IEC62353 (equivalent to YY/T0841) standard.

Test equipment: Fluke ESA612 or ESA615 or equivalent equipment.

#### Connection Diagram of the Device Under Test and the Test Equipment

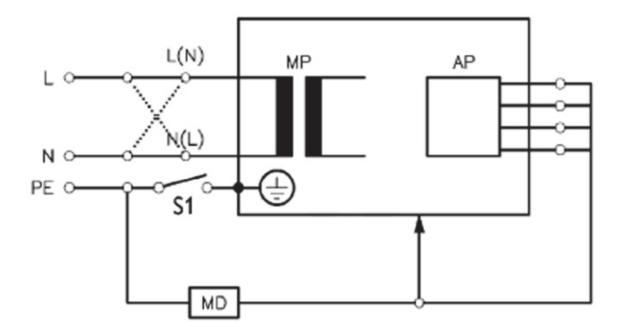
1. Plug the analyzer power cord plug into the socket and turn on the power button to enter the startup screen.

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



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



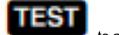
#### **Test Procedure**

Steps to perform a device leakage current test:

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
- 3. The direct device test is the default mode and should already be selected.



- 4. Press 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  $\mu A$  in single fault state.

## 3.4.4 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:

- 1.1. Connect the parameter accessory to be tested (for example, SpO<sub>2</sub>) 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 SpO<sub>2</sub> and other accessories, wrap the SpO<sub>2</sub> 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
- 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  $oldsymbol{\Theta}$  or  $oldsymbol{\Theta}$  to select the appropriate test configuration for the applied part.
- 7. Press to apply the test voltage and read the current on the screen.
- 8. Press  $oldsymbol{\Theta}$  or  $oldsymbol{\Theta}$  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  $\mu$ A. For BF-type equipment, the leakage current should not exceed 5000  $\mu$ A.

# 3.5 Recorder Test

## 3.5.1 Preparation before Testing

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

None

### 3.5.2 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 Preparation before Testing

This test is main used to measure the battery status.

None

### 3.6.2 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**

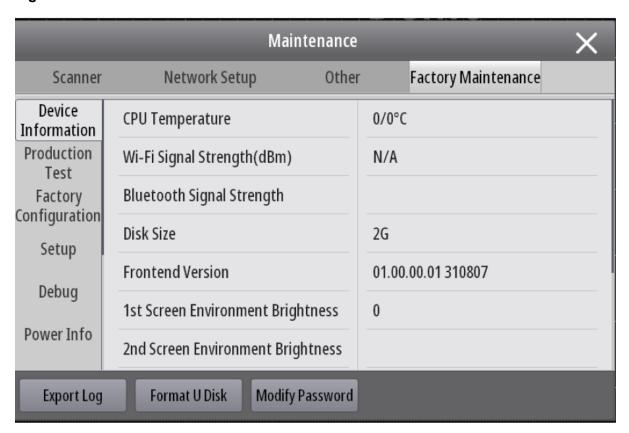
Check that the battery power supply time meets the specifications by referring to the relevant content in the *battery* chapter of the user manual.

# 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.

### 3.7.9 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 da	te of calibration
Test Items		Test Records	Test Result (Pass/Fail)
Visual Check		1	1
ECG machine shell, scree	en, keys, power cord, wall-		
mounted bracket, and acc	cessories 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 Calibra			+
The touch screen calibrat	ion is successful.		
Recorder Test		<u> </u>	
rine data can be printed riprinting effect.	ormally, with clear and correct		
printing enect.			ĺ

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,	
•	
When the AC power supply is accidentally disconnected,	

Test conclusion:

Result: (Yes/No)

Tested by: Date:

# 4 Upgrade

# 4.1 Software Upgrade

## 4.1.1 Network Upgrade

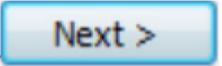
Functions of this ECG machine and its peripheral firmware can be upgraded through a PC network or a USB Flash disk.

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.

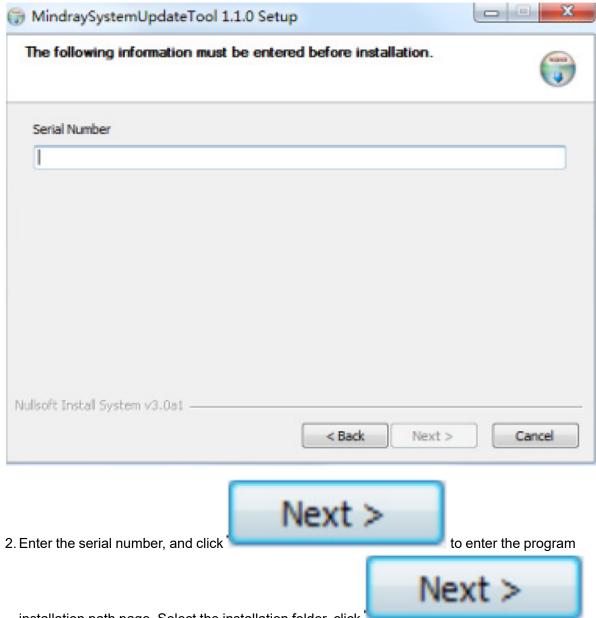
#### How to Install the Tool Software

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



to enter the Serial Number page.

Figure4-1



installation path page. Select the installation folder, click and perform following steps as instructed.

Appendix: Multi-language Reference Table

Language (English Reference)	Language (Chinese Reference)	Remarks
ENGLISH	English	1
SIM.CHINESE	Simplified Chinese	1
FRENCH	French	1
GERMAN	German	1
ITALIAN	Italian	1

Language (English Reference)	Language (Chinese Reference)	Remarks
POLISH	Polish	1
SPANISH	Spanish	1
PORTUGUESE	Portuguese	1
RUSSIAN	Russian	1
CZECH	Czech	1
TURKISH	Turkish	1
HUNGARIAN	Hungarian	1
Danish	Danish	1
Dutch	Dutch	1
Finnish	Finnish	1
Norwegian	Norwegian	1
Swedish	Swedish	1
Romanian	Romanian	1
Serbian	Serbian	1
GREEK	Greek	1
TRA.CHINESE	Traditional Chinese	1
Japanese	Japanese	1

#### 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

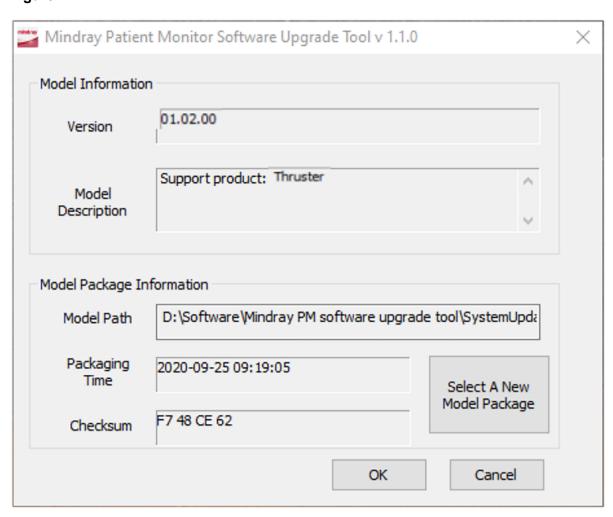
To ensure successful upgrade, before running the upgrade program, set the IP address to 77.77.1.xx. There is no restriction on the gateway and DNS addresses. For example, you can set the IP address to 77.77.1.13 and the subnet mask to 255.255.255.0.

### **Software Tool Upgrade**

Set the system software upgrade package as follows:

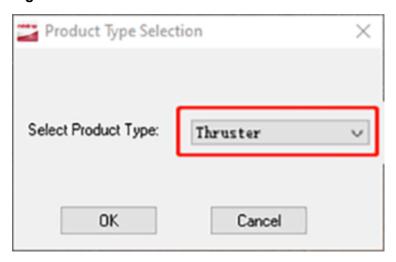
 Download the ECG machine system software package to the model package path, run the installed system or network upgrade tool software, and then click Select a New Model Package, select Thruster.Tool model package, open it, and then click OK.

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.

## 4.1.2 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.

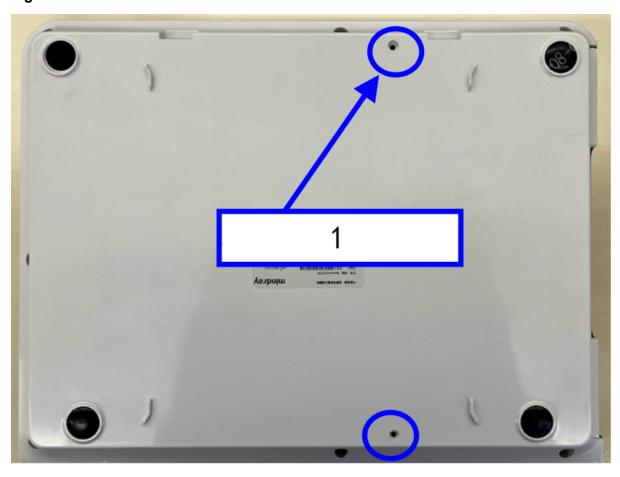
# 5 FRU Replacement

# 5.1 Disassembly

# 5.1.1 Removing the Paper Shell (Optional for Certain Models)

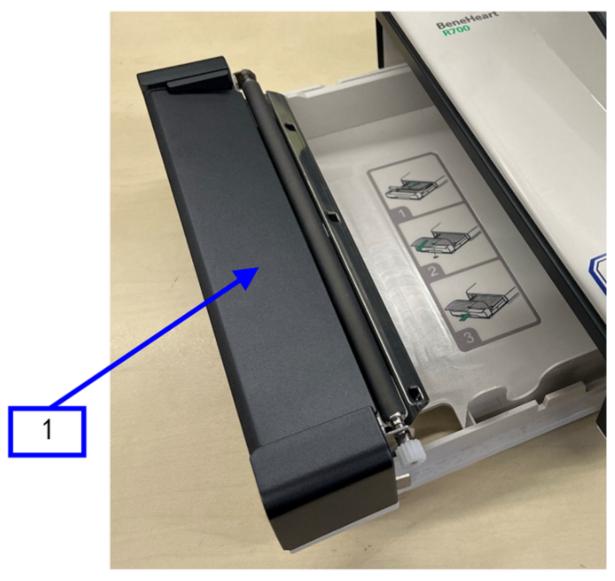
For machines equipped with a recorder, the paper shell needs to be removed first. As shown in the figure, use a screwdriver to unscrew the two M3×40 pan head cross recessed screws located at the bottom of the machine. Slide out the paper shell.

Figure5-1



1 Two M3×40 pan head screws

Figure5-2



1 Paper shell

# 5.1.2 Disassembly of Upper and Lower Cover Assemblies

1. Open the battery door as shown in the figure. Slide the lock on the right side of the battery to release it, and then remove the battery.

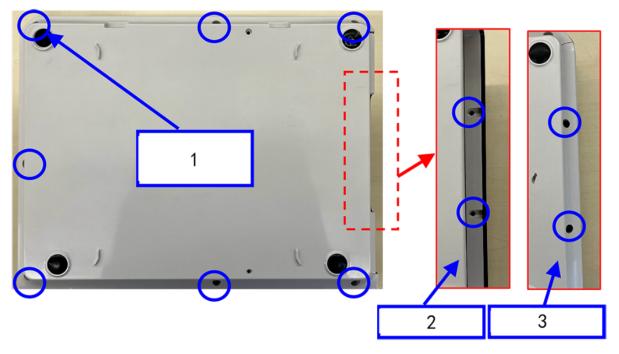
Figure5-3





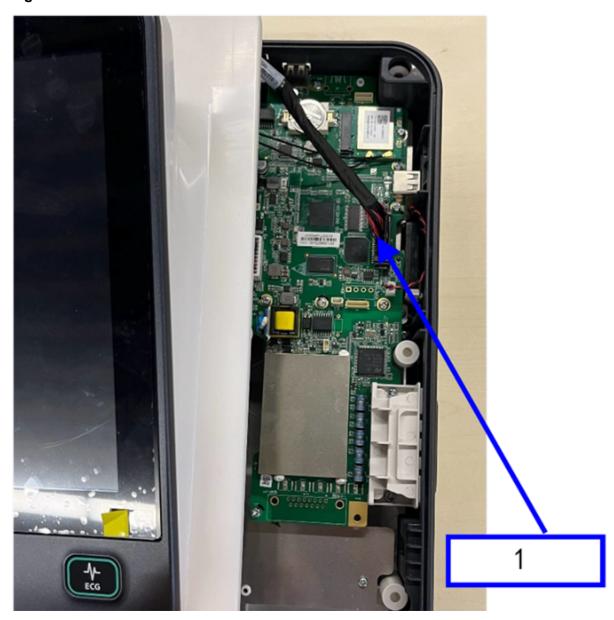
- 1 Battery door
- 2 Lock
- 3 Battery
- 2. As shown in the figure, use a screwdriver to unscrew the nine M4×8 pan head cross recessed screws located at the bottom of the machine. Note: For both recorder-equipped and non-recorder-equipped configurations, the two screws on the right side must be unscrewed.

Figure5-4



- 1 Nine M4×8 pan head cross recessed screws
- 2 Recorder-equipped configuration
- 3 Non-recorder-equipped configuration
- 3. Open the upper cover of the machine and disconnect the front-rear cover connector from the main control board. Remove the upper cover of the machine.

Figure5-5



1 Front-rear shell connector

# 5.1.3 Disassembly of Screen and Bottom Cover (R700 Series)

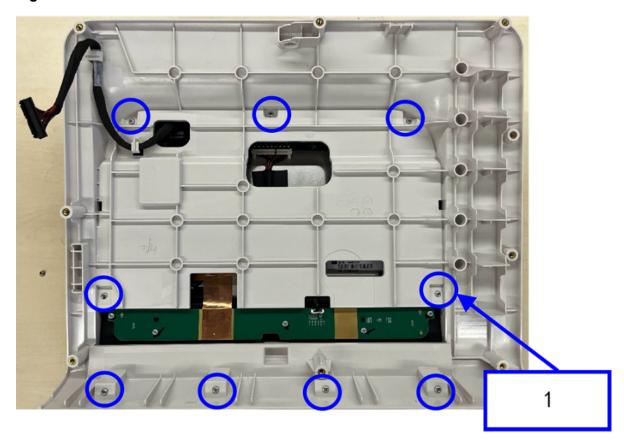
1.

NOTE

R700 series models refer to R700, R750, R70, and R75 models.

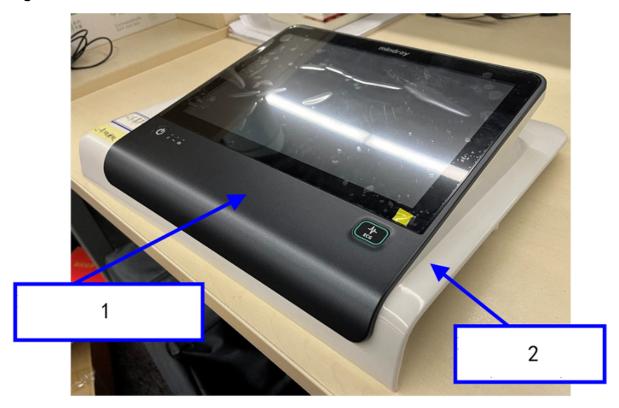
2. As shown in the figure, use a screwdriver to unscrew the nine K3×8 self-tapping screws on the upper cover of the machine. Remove the front-rear cover connector from the cable trough. Separate the screen bottom cover from the upper cover of the machine.

Figure5-6



1 Nine K3×8 self-tapping screws

Figure5-7



- 1 R700 series screen bottom cover (gray part)
- 2 R700 series machine upper cover (white part)

# 5.1.4 Disassembly of Screen and Bottom Cover (R900 Series)

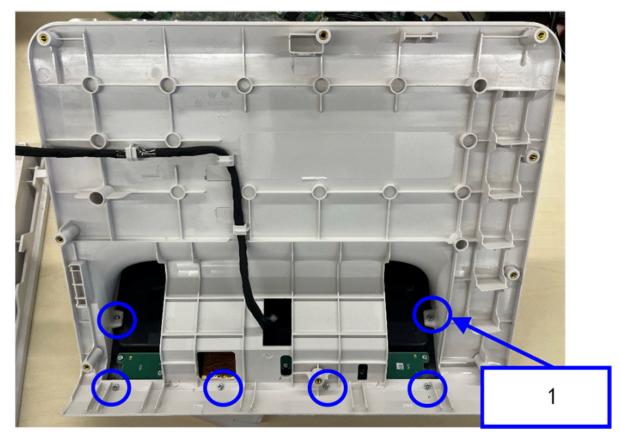
1.

### NOTE

R900 series models refer to R900, R950, R90, and R95 models.

2. As shown in the figure, use a screwdriver to unscrew the six K3×8 self-tapping screws on the upper cover of the machine. Remove the front-rear cover connector from the cable trough. Separate the screen bottom cover from the upper cover of the machine.

Figure5-8



1 Six K3×8 self-tapping screws

Figure5-9

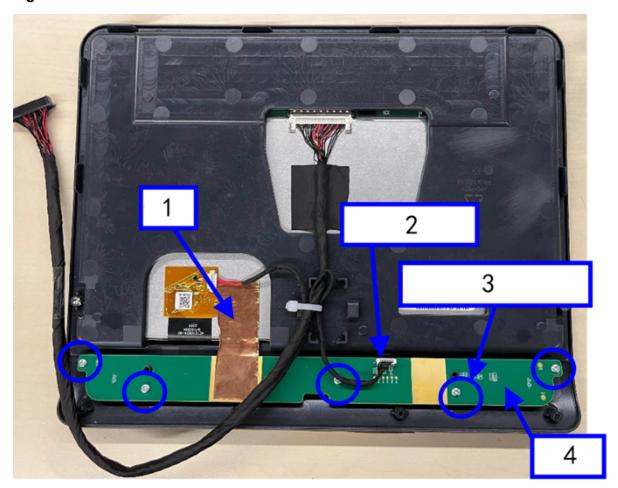


- 1 R900 series screen bottom cover (gray part)
- 2 R900 series machine upper cover (white part)

# 5.1.5 Disassembly of Keyboard and Silicone Buttons

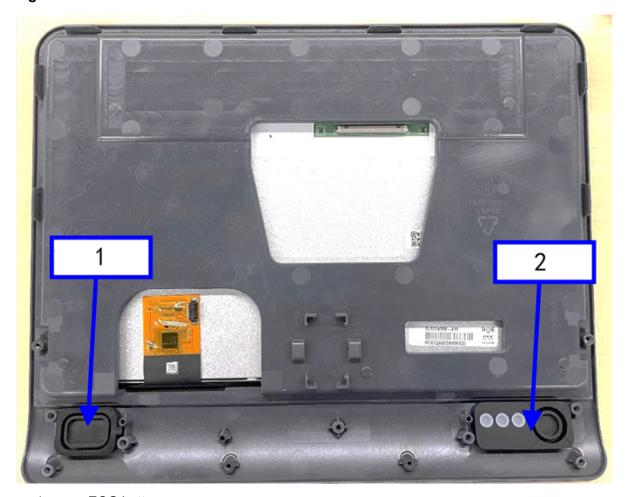
1. As shown in the figure, peel off the copper foil. Disconnect the keyboard connecting cable. Use a screwdriver to unscrew the five K3×8 self-tapping screws on the keyboard, and then remove the keyboard.

Figure5-10



- 1 Copper foil
- 2 Keyboard connecting cable
- 3 Five K3×8 self-tapping screws
- 4 Keyboard
- 2. After removing the keyboard, remove the ECG button and the power button.

Figure5-11

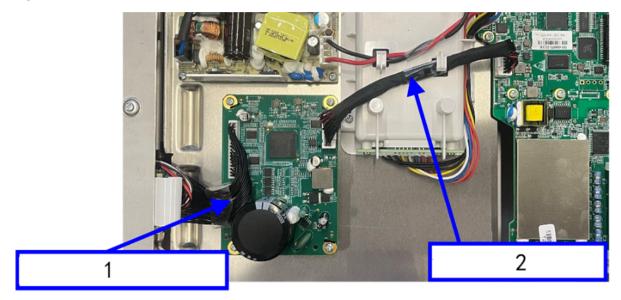


- 1 ECG button
- 2 Power button

# **5.1.6 Disassembly of Recorder Board (Optional for Certain Models)**

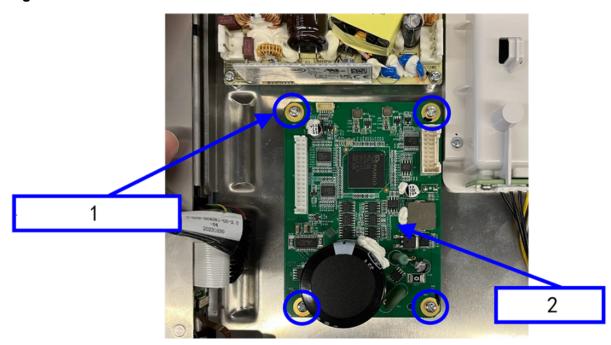
1. For machines equipped with a recorder, disconnect the recorder driver board wire and the connecting cable from the driver board to the thermal module, as shown in the figure.

Figure5-12



- 1 Connecting cable from the driver board to the thermal module
- 2 Recorder driver board connecting cable
- 2. Use a screwdriver to unscrew the four M3×8 pan head screws on the recorder driver board, and then remove the recorder driver board.

Figure5-13



- 1 Four M3×8 pan head screws
- 2 Recorder board

# 5.1.7 Disassembly of Battery Shell

1. As shown in the figure, disconnect the power board connecting cable, battery connector board connecting cable, and Wi-Fi antenna from the main control board.

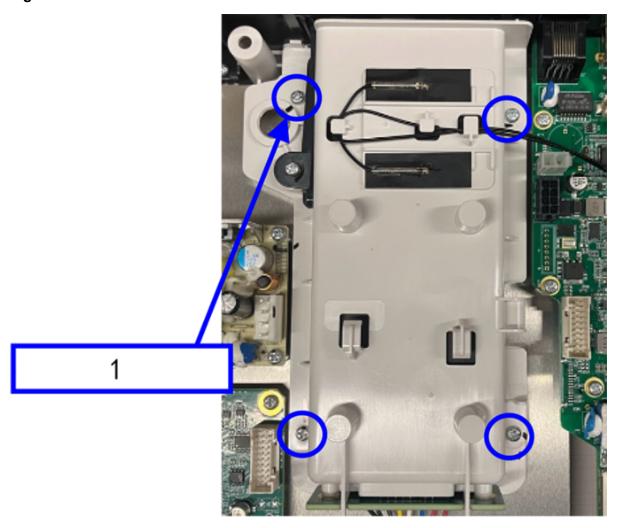
Figure5-14



- 1 Power board connecting cable
- 2 Battery connector board connecting cable
- 3 Wi-Fi antenna
- 2. Use a screwdriver to unscrew four M3×8 pan head screws from the battery shell and take off the battery shell.

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Figure5-15

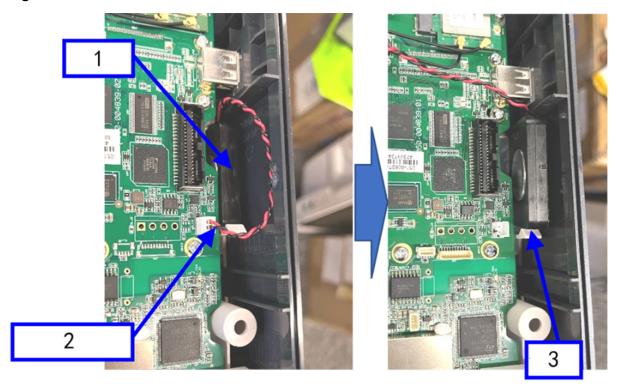


4 M3×8 pan head screws

# 5.1.8 Disassembly of the Speaker

As shown in the figure, disconnect the speaker connecting cable from the main control board. Press the buckle located under the speaker to release it, and then remove the speaker.

Figure5-16

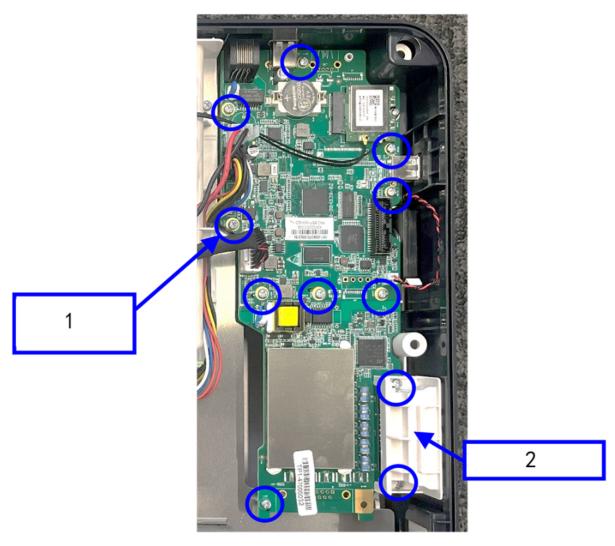


- 1 Speaker
- 2 Speaker connecting cable
- 3 Buckle

# 5.1.9 Disassembly of Main Control Board

As shown in the figure, use a screwdriver to unscrew the 11 M3×8 pan head screws on the main control board. Remove the ECG connect, and then remove the main control board.

Figure5-17

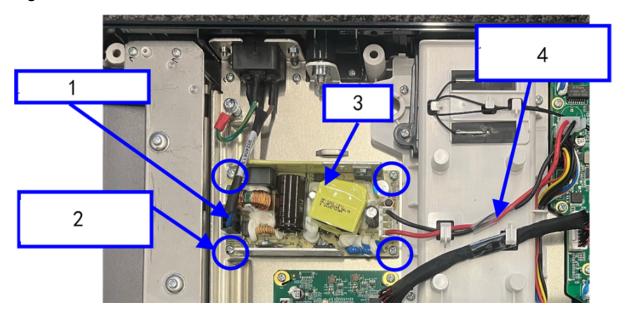


- 1 11 M3×8 pan head screws
- 2 ECG connect

# 5.1.10 Disassembly of the Power Board

As shown in the figure, disconnect the following cables: AC socket and power board connecting cable, and AC input wire. Use a screwdriver to unscrew the four M3×8 pan head cross recessed screws from the power board. Remove the power board.

Figure5-18

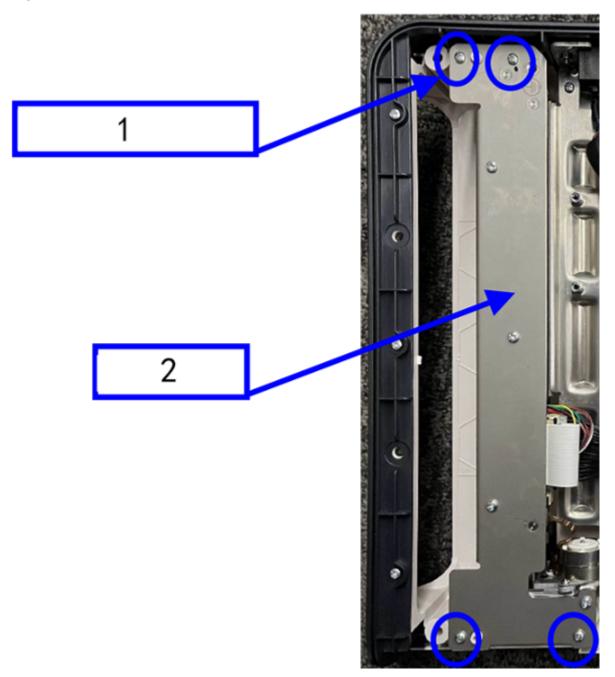


- 1 AC input wire
- 2 Four M3×8 pan head cross recessed screws
- 3 Power board
- 4 AC socket and power board connecting cable

# **5.1.11 Disassembly of the Print Head (Optional for Certain Models)**

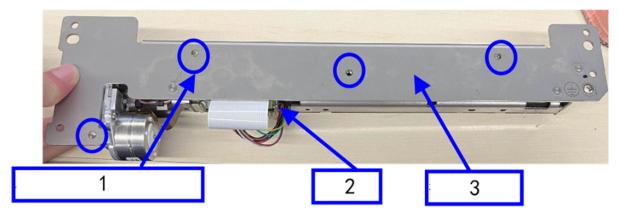
1. For machines equipped with a recorder, use a screwdriver to unscrew the four K3×8 self-tapping screws on the print head sheet metal, as shown in the following figure. Remove the print head along with the print head sheet metal.

Figure5-19



- 1 Four K3×8 self-tapping screws
- 2 Print head sheet metal
- 2. As shown in the figure, use a screwdriver to unscrew the four M3×8 pan head cross recessed screws located on the print head sheet metal. Remove the print head.

Figure5-20



- 1 Four M3×8 pan head cross recessed screws
- 2 Print head
- 3 Print head sheet metal

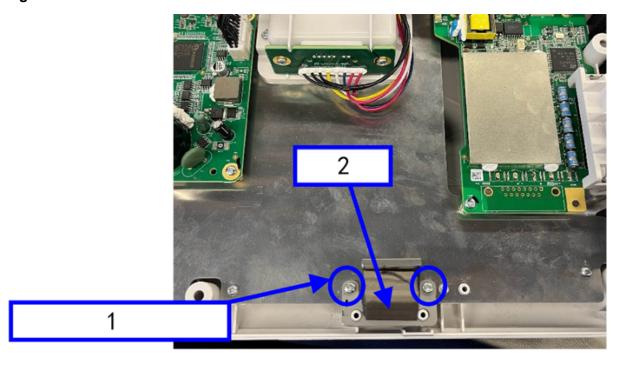
# 5.1.12 Disassembly of Grounding Sheet Metal

As shown in the figure, use a screwdriver to unscrew the two M3×8 pan head cross recessed screws located on the grounding sheet metal. Remove the grounding sheet metal.

**NOTICE** 

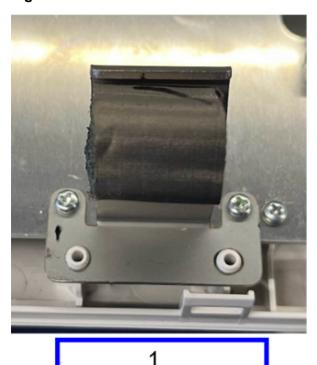
The grounding sheet metal structures of the R700 series and R900 series are different.

Figure5-21



- 1 Two M3×8 pan head cross recessed screws
- 2 Grounding sheet metal

Figure5-22



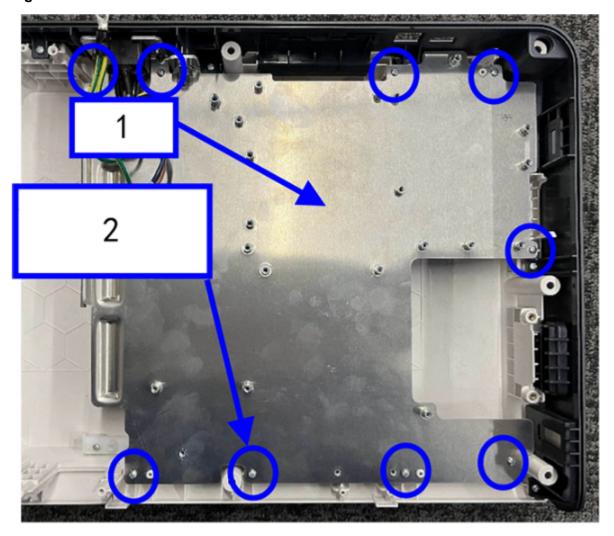


- 1 R900 series grounding sheet metal
- 2 R700 series grounding sheet metal

# **5.1.13 Disassembly of Main Sheet Metal**

As shown in the figure, use a screwdriver to unscrew the nine K3×8 self-tapping screws on the main sheet metal. Remove the main sheet metal.

Figure5-23

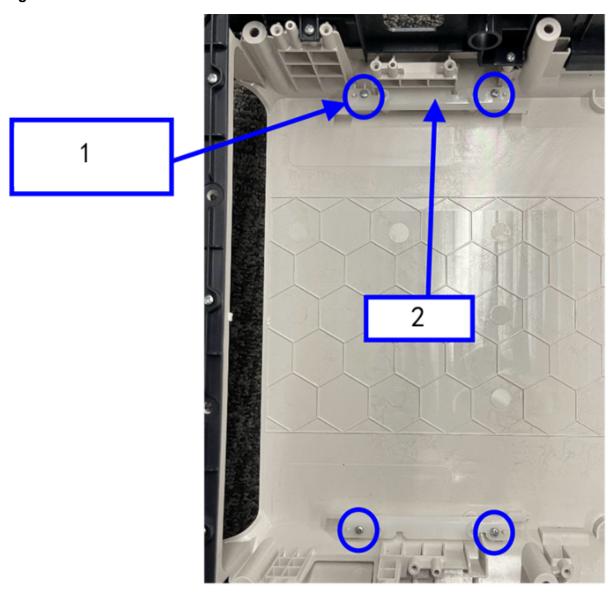


- 1 Main sheet metal
- 2 Nine K3×8 self-tapping screws

# **5.1.14 Disassembly of Paper Shell Guide (Optional for Certain Models)**

For machines equipped with a recorder, use a screwdriver to unscrew the four K3×8 self-tapping screws on the paper shell guide, as shown in the following figure. Remove the guide.

Figure5-24

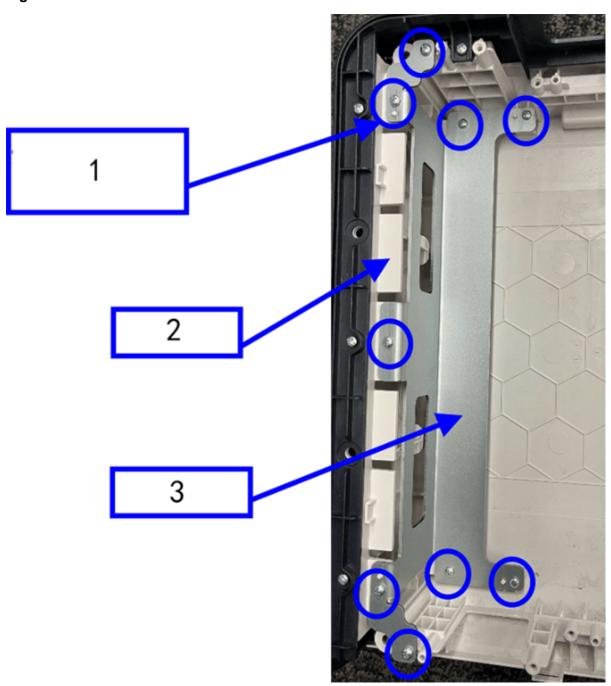


- 1 Four K3×8 self-tapping screws
- 2 Paper shell guide

# 5.1.15 disassembly of the Decorative Door and Sheet Metal (Optional for Certain Models)

For machines equipped with a recorder, use a screwdriver to unscrew the nine K3×8 self-tapping screws on the decorative door, as shown in the following figure. Remove the decorative door sheet metal and then the decorative door.

Figure5-25



- 1 Nine K3×8 self-tapping screws
- 2 Decorative door
- 3 Decorative door sheet metal

# 5.1.16 Tool

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

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# 5.1.17 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.



- 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 reassembly.
- 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.

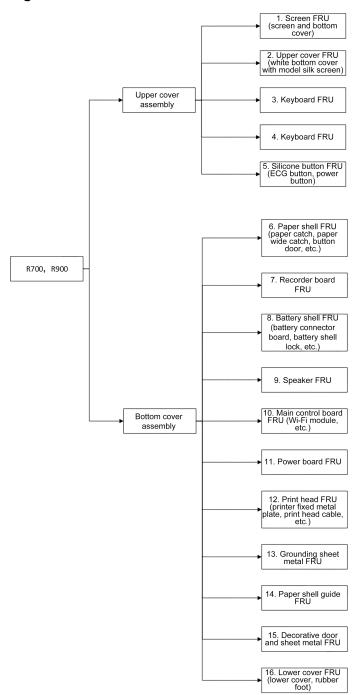
# 5.1.18 Whole Machine Disassembly Flowchart

#### Disassembly Flowchart for R700/R900 Series

For the R700/R900 series products, follow the flowchart below to perform maintenance and disassembly for the corresponding FRUs.

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Figure5-26



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# 5.1.19 Main Unit Disassembly



- Place the removed components on a smooth plane without any objects that may scratch the touch screen.
- All operations must be performed by professionals. Wear insulating gloves during the operations.

# 5.2 FRU Replacement

### 5.2.1 M508 switch button screen

#### 5.2.1.1 Basic Information

Figure5-27



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-020806-00	M508 switch button	None	None
	screen		

## 5.2.1.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the keyboard, refer to **5.1.5** Disassembly of Keyboard and Silicone Buttons.

#### **Specific Steps**

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- 1. Take a new switch button and place it in the corresponding position on the upper cover. Reinstall the keyboard in place.
- 2. Re-install the equipment according to the disassembly steps.

#### 5.2.1.3 Commissioning and Verification

The button can respond normally, and the machine can be turned on normally.

# 5.2.2 M508-ECG key screen printing

#### 5.2.2.1 Basic Information

Figure5-28



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-020807-00	M508-ECG key screen printing	None	None

# 5.2.2.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- For the disassembly of the keyboard, refer to 5.1.5 Disassembly of Keyboard and Silicone Buttons.

#### **Specific Steps**

- 1. Take the new ECG button and place it in the corresponding position on the upper cover. Reinstall the keyboard in place.
- 2. Re-install the equipment according to the disassembly steps.

# 5.2.2.3 Commissioning and Verification

After the machine is powered on, the buttons respond properly.

# 5.2.3 R900 upper cover FRU(Without screen)

#### 5.2.3.1 Basic Information

Figure5-29



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108255-00	R900 upper cover FRU (Without screen)	None	None

# 5.2.3.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the screen and bottom cover, refer to **5.1.4** Disassembly of Screen and Bottom Cover (R900 Series).

#### **Specific Steps**

- 1. Take a new R900 upper cover and install the screen along with its bottom cover. Check that the screen bottom cover is securely and tightly attached to the upper cover.
- 2. Re-install the equipment according to the disassembly steps.

## 5.2.3.3 Commissioning and Verification

None

# 5.2.4 R90 upper cover FRU(Without screen)

#### 5.2.4.1 Basic Information

Figure5-30



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108256-00	R90 upper cover FRU (Without screen)	None	None

# 5.2.4.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the screen and bottom cover, refer to **5.1.4** Disassembly of Screen and Bottom Cover (R900 Series) .

#### **Specific Steps**

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- 1. Take a new R90 upper cover and install the screen along with its bottom cover. Check that the screen bottom cover is securely and tightly attached to the upper cover.
- 2. Re-install the equipment according to the disassembly steps.

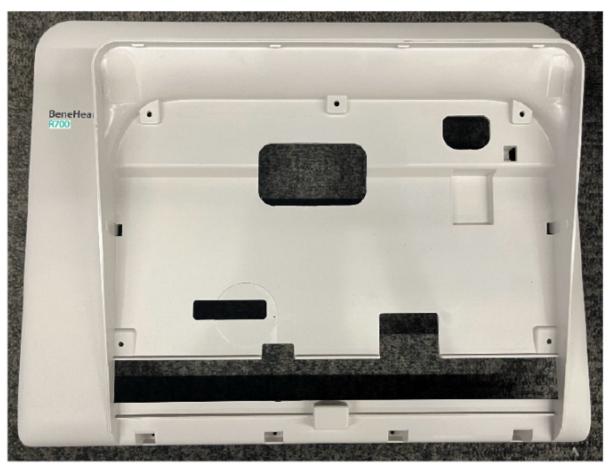
## 5.2.4.3 Commissioning and Verification

None

# 5.2.5 R700 upper cover FRU(Without screen)

#### 5.2.5.1 Basic Information

Figure5-31



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108257-00	R700 upper cover FRU (Without screen)	None	None

# 5.2.5.2 Removing and Installing

1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).

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- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the screen and bottom cover, refer to **5.1.3** Disassembly of Screen and Bottom Cover (R700 Series) .

#### **Specific Steps**

Service Manual

- 1. Take a new R700 upper cover and install the screen along with its bottom cover. Check that the screen bottom cover is securely and tightly attached to the upper cover.
- 2. Re-install the equipment according to the disassembly steps.

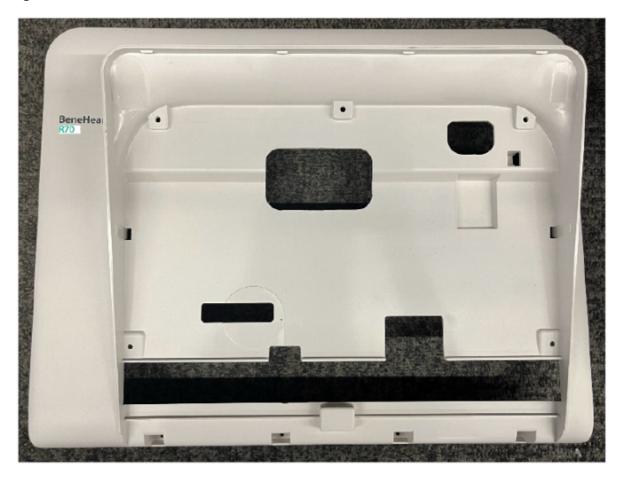
## 5.2.5.3 Commissioning and Verification

None

# 5.2.6 R70 upper cover FRU(Without screen)

#### 5.2.6.1 Basic Information

Figure5-32



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108258-00	R70 upper cover FRU (Without screen)	None	None

## 5.2.6.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the screen and bottom cover, refer to **5.1.3** Disassembly of Screen and Bottom Cover (R700 Series).

#### **Specific Steps**

- 1. Take a new R70 upper cover and install the screen along with its bottom cover. Check that the screen bottom cover is securely and tightly attached to the upper cover.
- 2. Re-install the equipment according to the disassembly steps.

#### 5.2.6.3 Commissioning and Verification

None

# 5.2.7 12-inch KeyBoard PCBA FRU

#### 5.2.7.1 Basic Information

Figure5-33



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108259-00	12-inch Keyboard PCBA FRU	None	None

# 5.2.7.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the keyboard, refer to **5.1.5** Disassembly of Keyboard and Silicone Buttons.

4. If the copper foil does not adhere properly, you will need to remove the screen and its bottom cover. For details about the disassembly steps, refer to **5.1.3** Disassembly of Screen and Bottom Cover (R700 Series) and **5.1.4** Disassembly of Screen and Bottom Cover (R900 Series).

#### **Specific Steps**

- 1. Take a new keyboard and secure it to the upper cover using five K3×8 self-tapping screws.
- 2. Reattach the copper foil. One end of the copper foil should be attached to the keyboard area. The other end should be attached to the metal part on the back of the screen assembly. Ensure that the copper foil does not touch the chip, and avoid attaching it outside the designated area or in a misaligned manner.
- 3. Re-install the equipment according to the disassembly steps.

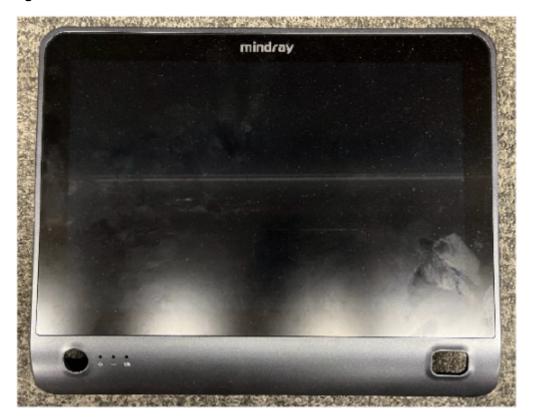
#### 5.2.7.3 Commissioning and Verification

After the machine is powered on, the buttons respond properly.

#### 5.2.8 R900 series Screen FRU-With bottom cover

#### 5.2.8.1 Basic Information

Figure5-34



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108260-00	R900 series Screen	None	None
	FRU-With bottom		
	cover		

#### 5.2.8.2 Removing and Installing

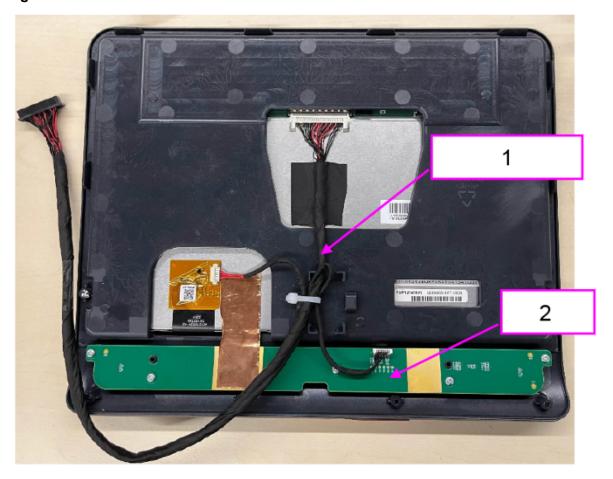
- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the screen and bottom cover, refer to **5.1.4** Disassembly of Screen and Bottom Cover (R900 Series).
- For the disassembly of the keyboard and silicone buttons, refer to 5.1.5 Disassembly of Keyboard and Silicone Buttons.
- 5. Remove the front-rear cover connector.

#### **Specific Steps**

- 1. Take a new screen bottom cover and properly connect the front-rear cover connector. This cable is a 1-to-3 connecting cable. Insert the screen cable into the screen socket, and then attach the conductive tape to the back of the screen assembly. Insert one end of the touch screen connecting cable (red wire) into the touch screen socket, and one end of the keyboard connecting cable (black wire) into the keyboard socket. For details about the operations, refer to 009-017126-00 R900 12-channel analyzer wire 5.2.45.2 Removing and Installing.
- 2. Sequentially install the silicone buttons and the keyboard as shown in the figure.

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Figure5-35



- 1 Front-rear shell connector
- 2 Keyboard
- 3. Re-install the equipment according to the disassembly steps.

## 5.2.8.3 Commissioning and Verification

After the machine is powered on, the screen displays normally, and the touch function works properly.

## 5.2.9 R700 series Screen FRU-With bottom cover

#### 5.2.9.1 Basic Information

Figure5-36



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108261-00	R700 series Screen	None	None
	FRU-With bottom		
	cover		

# 5.2.9.2 Removing and Installing

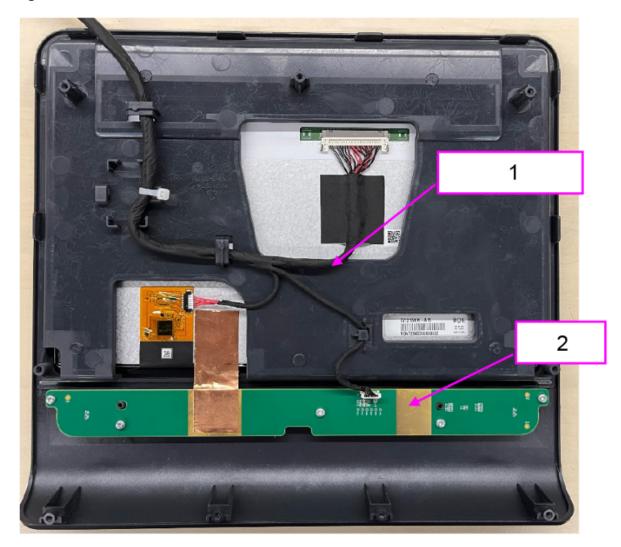
- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the screen and bottom cover, refer to **5.1.3** Disassembly of Screen and Bottom Cover (R700 Series).

- 4. For the disassembly of the keyboard and silicone buttons, refer to **5.1.5** Disassembly of Keyboard and Silicone Buttons.
- 5. Remove the front-rear cover connector.

#### **Specific Steps**

- 1. Take a new screen bottom cover and properly connect the front-rear cover connector. This cable is a 1-to-3 connecting cable. Insert the screen cable into the screen socket, and then attach the conductive tape to the back of the screen assembly. Insert one end of the touch screen connecting cable (red wire) into the touch screen socket, and one end of the keyboard connecting cable (black wire) into the keyboard socket. For details about the operations, refer to 009-017126-00 R900 12-channel analyzer wire 5.2.45.2 Removing and Installing.
- 2. Sequentially install the silicone buttons and the keyboard as shown in the figure.

Figure5-37



- 1 Front-rear shell connector
- 2 Keyboard
- 3. Re-install the equipment according to the disassembly steps.

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### 5.2.9.3 Commissioning and Verification

After the machine is powered on, the screen displays normally, and the touch function works properly.

# 5.2.10 M508 battery door

#### 5.2.10.1 Basic Information

Figure5-38

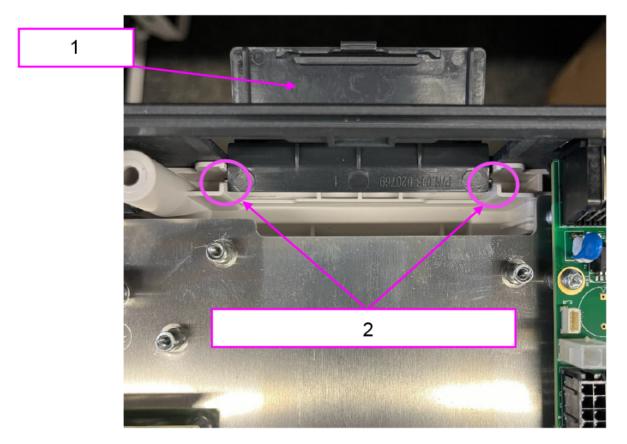


FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
043-023879-00	M508 battery door	None	None

# 5.2.10.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the battery shell, refer to 5.1.7 Disassembly of Battery Shell.
- 4. Push the rotating shafts on both sides of the battery door out of the buckles on the bottom cover of the machine to remove the battery door. See the figure below.

Figure5-39



- 1 Battery door
- 2 Push the rotating shafts on both sides of the battery door out of the buckles.

### **Specific Steps**

- 1. Take a new battery door and install it on the bottom cover of the machine.
- 2. Install the battery shell.
- 3. Re-install the equipment according to the disassembly steps.

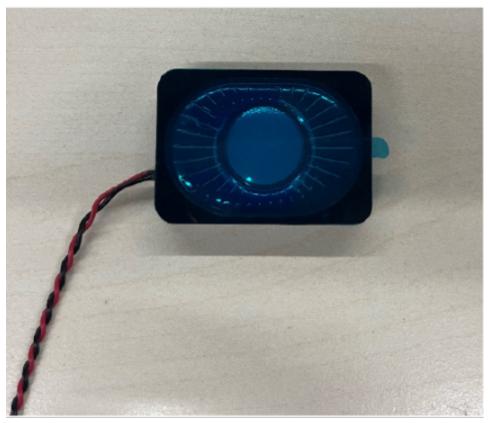
# 5.2.10.3 Commissioning and Verification

The battery door opens and closes properly.

# 5.2.11 Speaker $4\Omega$ 2W 500hz with wire

#### 5.2.11.1 Basic Information

Figure5-40



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
020-000085-00	Speaker 4Ω 2W 500hz with wire	None	None

# 5.2.11.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the speaker, refer to **5.1.8** Disassembly of the Speaker.

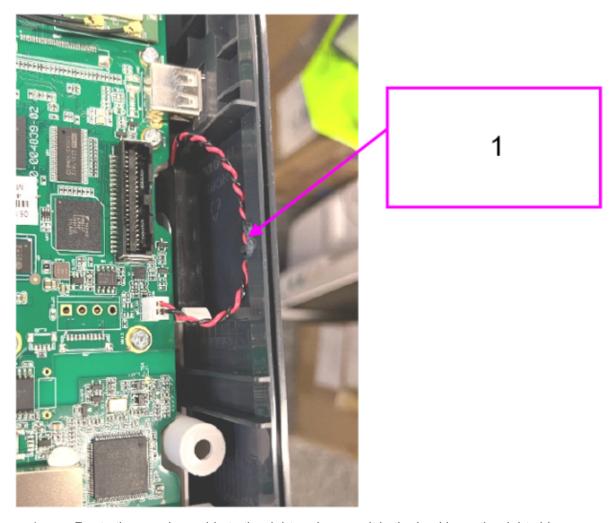
#### **Specific Steps**

1. Take a new speaker. Peel off the transparent film on the surface of the speaker. Then, insert the speaker into the corresponding slot in the lower cover, on the right side of the main control board. Ensure that the magnet side of the speaker is facing inward, with the speaker cable facing up. Then, push the speaker down into place. Ensure that the buckle securely holds the speaker in place, fixing it in the lower cover. Insert the speaker cable into the

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J5 socket on the main control board, route the cable to the right and secure it in the buckle on the right side.

Figure5-41



- 1 Route the speaker cable to the right and secure it in the buckle on the right side.
- 2. Re-install the equipment according to the disassembly steps.

# 5.2.11.3 Commissioning and Verification

None

#### **5.2.12 POWER SUPPLY BOARD 15V 63W**

#### 5.2.12.1 Basic Information

Figure5-42



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
022-000159-00	POWER SUPPLY	None	None
	BOARD 15V 63W		

# 5.2.12.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the power board, see **5.1.10** Disassembly of the Power Board.

#### **Specific Steps**

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

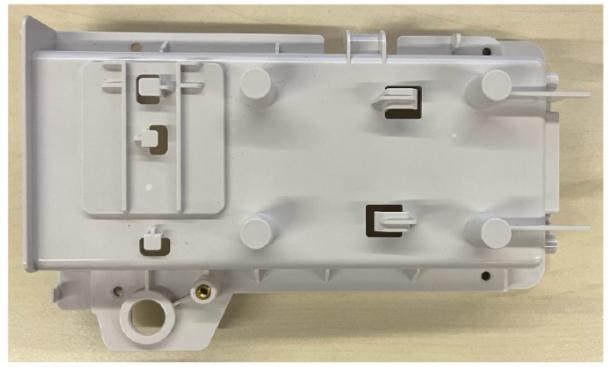
# 5.2.12.3 Commissioning and Verification

None

# 5.2.13 battery shell

#### 5.2.13.1 Basic Information

#### Figure5-43

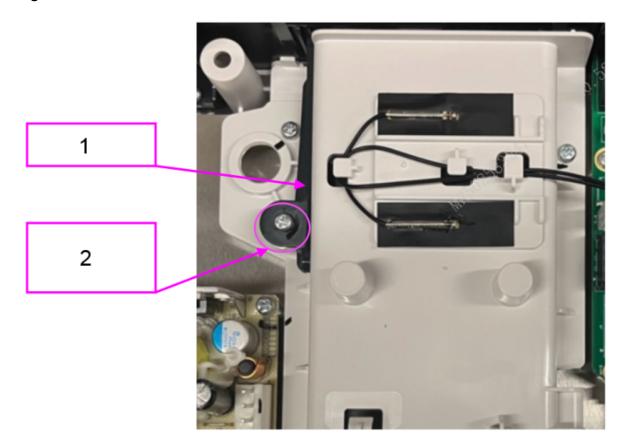


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-020770-00	Battery shell	None	None

# 5.2.13.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the battery shell, refer to 5.1.7 Disassembly of Battery Shell.
- 4. Use a screwdriver to unscrew one M3×8 pan head screw from the battery shell and take off the battery shell lock, as shown in the figure.

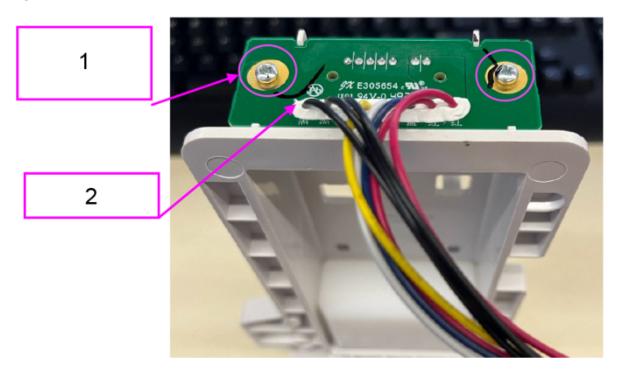
Figure5-44



- 1 Battery shell lock
- 2 One M3×8 pan head screw
- 5. Use a screwdriver to unscrew two K3×8 self-tapping screws from the battery shell and take off the battery connector board, as shown in the figure.

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Figure5-45



- 1 Two K3×8 self-tapping screws
- 2 Battery connector board

#### **Specific Steps**

- 1. Take a new battery shell and sequentially install the battery connector board and the battery shell lock.
- 2. Remove the Wi-Fi antenna from the old battery shell. Be careful not to damage the Wi-Fi antenna. Attach the Wi-Fi antenna to the new battery shell. For details about the operations, refer to 024-000751-00, embedded wireless antenna 5.2.44.2 Removing and Installing.
- 3. Re-install the equipment according to the disassembly steps.

# 5.2.13.3 Commissioning and Verification

After the lithium battery is installed in the battery shell, it can supply power normally.

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## 5.2.14 battery shell lock

#### 5.2.14.1 Basic Information

Figure5-46

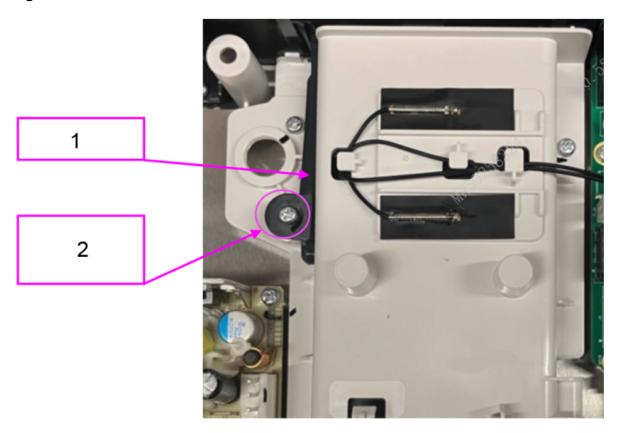


FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
043-020772-00	M508 battery shell lock	None	None

### 5.2.14.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. Use a screwdriver to unscrew one M3×8 pan head screw from the battery shell and take off the battery shell lock, as shown in the figure.

Figure5-47



- 1 Battery shell lock
- 2 One M3×8 pan head screw

#### **Specific Steps**

Take a new battery shell lock. Re-install the machine according to the disassembly steps.

## 5.2.14.3 Commissioning and Verification

The battery shell lock can be operated normally. After the lithium battery is installed, the lock securely locks the battery in place.

### 5.2.15 ECG connect

#### 5.2.15.1 Basic Information

Figure5-48



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-020943-00	ECG connect	None	None

## 5.2.15.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the ECG connect, refer to **5.1.9** Disassembly of Main Control Board.

#### **Specific Steps**

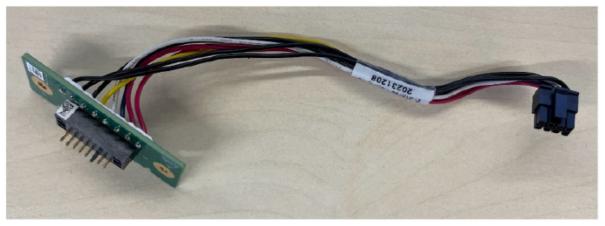
Take a new ECG connect. Re-install the machine according to the disassembly steps.

# **5.2.15.3 Commissioning and Verification**

## 5.2.16 M508 battery interface PCBA

#### 5.2.16.1 Basic Information

Figure5-49



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
051-006101-00	M508 battery interface PCBA	None	None

### 5.2.16.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the battery shell, refer to 5.1.7 Disassembly of Battery Shell.
- 4. For the disassembly of the battery connector board (also known as battery interface board), refer to 043-020770-00, battery shell 5.2.13.2 Removing and Installing. Note: The battery connector board uses two slots to position it. Place it firmly and then tighten the screws.

#### **Specific Steps**

Take a new battery connector board. Re-install the equipment according to the disassembly steps.

## 5.2.16.3 Commissioning and Verification

After the lithium battery is installed in the battery shell, it can supply power normally.

# 5.2.17 M508 decorative door (paperless)

#### 5.2.17.1 Basic Information

Figure5-50



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
043-020865-00	M508 decorative door (paperless)	None	None

### 5.2.17.2 Removing and Installing

- 1. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 2. For the disassembly of the decorative door and decorative door sheet metal, refer to **5.1.15** disassembly of the Decorative Door and Sheet Metal (Optional for Certain Models).

#### **Specific Steps**

Take a new decorative door. Re-install the machine according to the disassembly steps.

# 5.2.17.3 Commissioning and Verification

# 5.2.18 screw plug(M508)

### 5.2.18.1 Basic Information

Figure5-51



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
047-049240-00	Screw plug (M508)	None	None

# 5.2.18.2 Removing and Installing

This material is only used for non-recorder-equipped configuration. The assembly position is on the bottom cover of the machine to block the screw holes. See the figure below.

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Figure5-52



1 Screw plug assembly position

# 5.2.18.3 Commissioning and Verification

None

# 5.2.19 M508 printer fixed matel plate

### 5.2.19.1 Basic Information

Figure5-53



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
042-052782-00	M508 printer fixed metal plate	None	None

### 5.2.19.2 Removing and Installing

- 1. For the disassembly of the paper shell, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the print head, refer to **5.1.11** Disassembly of the Print Head (Optional for Certain Models).

### **Specific Steps**

- 1. Take a new print head sheet metal and install the print head. For details, refer to 115–108325–00 print head FRU 5.2.34.2 Removing and Installing
- 2. Re-install the equipment according to the disassembly steps.

## 5.2.19.3 Commissioning and Verification

### 5.2.20 216mm recorder driver board

#### 5.2.20.1 Basic Information

Figure5-54



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
051-006072-00	216 mm recorder driver board	None	None

# 5.2.20.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.

3. For the disassembly of the recorder driver board, refer to **5.1.6** Disassembly of Recorder Board (Optional for Certain Models).

#### **Specific Steps**

- 1. Take a new recorder driver board and secure it with four M3×8 pan head screws. **Make sure** to plug the connecting cable into place.
- 2. Re-install the equipment according to the disassembly steps.

#### 5.2.20.3 Commissioning and Verification

None

## 5.2.21 M508 printer unlock matel plate

#### 5.2.21.1 Basic Information

Figure5-55

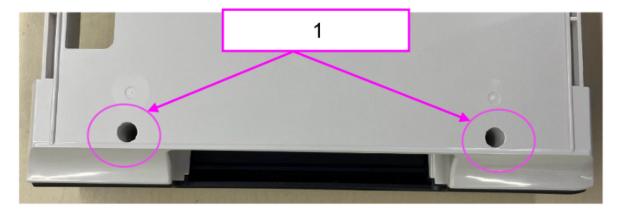


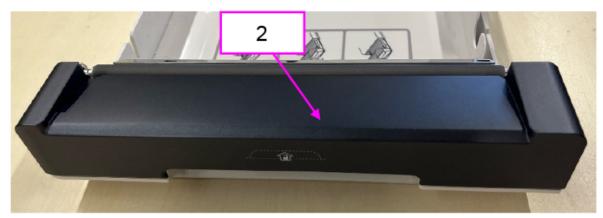
FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
042-052783-00	M508 printer unlock metal plate	None	None

## 5.2.21.2 Removing and Installing

- 1. For the disassembly of the paper shell, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. Use a screwdriver to unscrew the two K3×8 self-tapping screws at the bottom of the paper shell. Remove the paper shell button door. See the figure below.

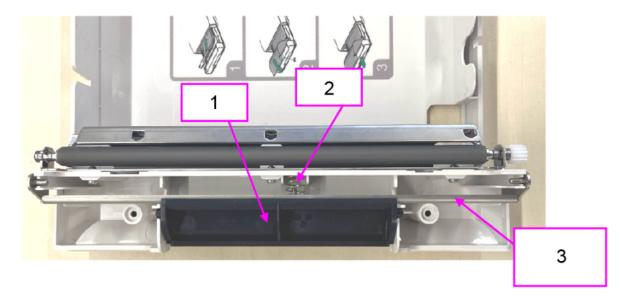
Figure5-56





- 1 Two K3×8 self-tapping screws
- 2 Button door
- 3. Remove the unlock structure and printer unlock metal plate in turn, as shown in the figure. **Be** careful not to lose the spring.

Figure5-57



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- 1 Unlock structure
- 2 Spring
- 3 Printer unlock metal plate

#### **Specific Steps**

1. Take a new printer unlock metal plate. Put the spring onto the middle column of the unlock metal plate, pinch the spring slightly with your hand, buckle the right hook of the unlock metal plate into the slot of the paper shell, and then buckle the left hook of the unlock metal plate into the slot of the paper shell. See the figure below.

### Figure5-58



- 1 Buckle this side into the slot first.
- 2. Install the unlock structure and button door in sequence.
- 3. Re-install the equipment according to the disassembly steps.

## 5.2.21.3 Commissioning and Verification

## 5.2.22 M508 paper shell

#### 5.2.22.1 Basic Information

Figure5-59

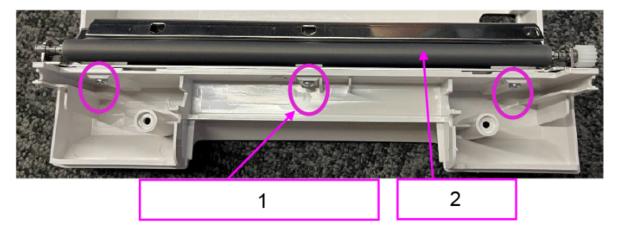


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-020773-00	M508 paper shell	None	None

# 5.2.22.2 Removing and Installing

- 1. For the disassembly of the paper shell, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the button door, unlock structure, and printer unlock metal plate, refer to 042-052783-00, M508 printer unlock metal plate 5.2.21.2 Removing and Installing.
- 3. Use a screwdriver to unscrew four M3×8 pan head screws from the battery shell and take off the printer head roller, as shown in the figure.

Figure5-60



- 1 Three M3×8 cross pan head screws
- 2 Printer head roller

### **Specific Steps**

- 1. Take a new paper shell and sequentially install the printer head roller, printer unlock sheet metal, spring, unlock structure, and button door.
- 2. Re-install the equipment according to the disassembly steps.

### 5.2.22.3 Commissioning and Verification

None

### 5.2.23 M508 unlock structure

#### 5.2.23.1 Basic Information

Figure5-61



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-020775-00	M508 unlock structure	None	None

### 5.2.23.2 Removing and Installing

- 1. For the disassembly of the paper shell, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For subsequent disassembly steps, refer to 042–052783–00, M508 printer unlock metal plate 5.2.21.2 Removing and Installing.

#### **Specific Steps**

- 1. Take a new unlock structure and sequentially install the paper shell, printer unlock sheet metal, spring, and button door.
- 2. Re-install the equipment according to the disassembly steps.

### 5.2.23.3 Commissioning and Verification

None

## 5.2.24 M508 paper catch

#### 5.2.24.1 Basic Information

Figure5-62

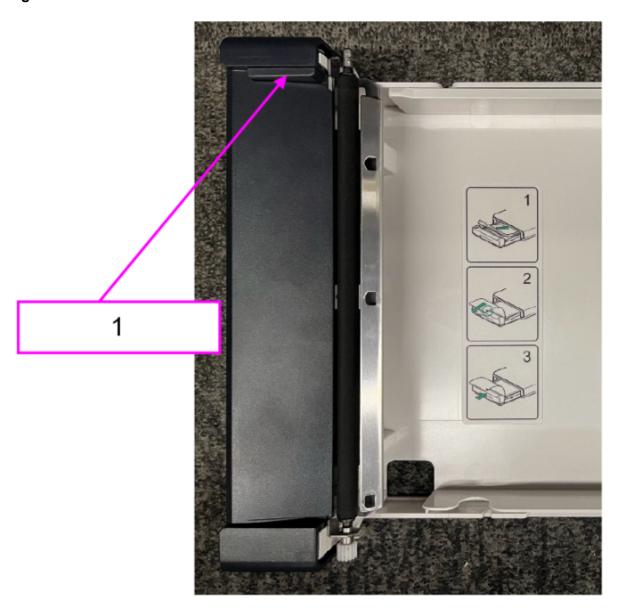


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-020776-00	M508 paper catch	None	None

## 5.2.24.2 Removing and Installing

Pull out a section of the paper shell to replace the parts. The location is shown in the figure.

Figure5-63



1 Paper catch

# 5.2.24.3 Commissioning and Verification

# 5.2.25 paper wide catch

### 5.2.25.1 Basic Information

Figure5-64

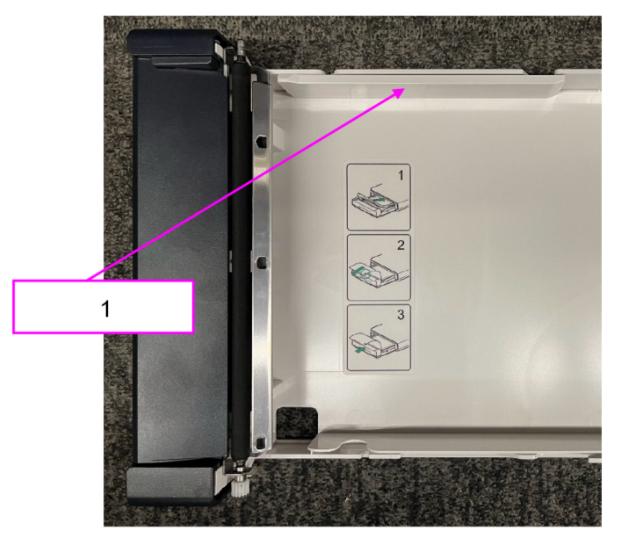


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-020777-00	Paper wide catch	None	None

## 5.2.25.2 Removing and Installing

Pull out a section of the paper shell to replace the parts. The location is shown in the figure.

Figure5-65



1 Paper wide catch

# 5.2.25.3 Commissioning and Verification

## 5.2.26 M508 Dark button door screen print

#### 5.2.26.1 Basic Information

#### Figure5-66



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
043-020801-00	M508 dark button door screen print	None	None

### 5.2.26.2 Removing and Installing

- 1. For the disassembly of the paper shell, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For subsequent disassembly steps, refer to 042–052783–00, M508 printer unlock metal plate 5.2.21.2 Removing and Installing.

#### **Specific Steps**

- 1. Take a new button door and sequentially install the paper shell, printer unlock sheet metal, spring, and unlock structure.
- 2. Re-install the equipment according to the disassembly steps.

# 5.2.26.3 Commissioning and Verification

### 5.2.27 WXT5CM2803 WiFi6E module

#### 5.2.27.1 Basic Information

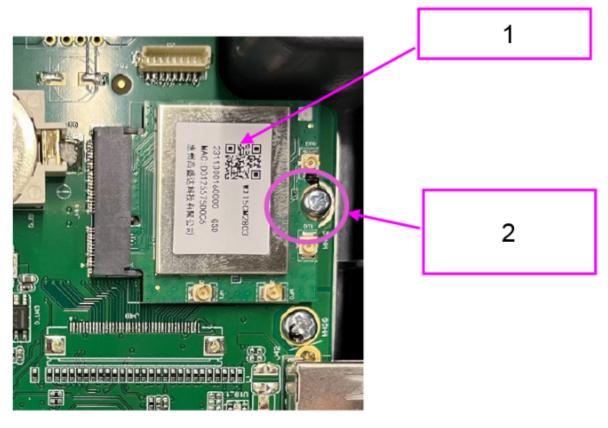
#### Figure5-67



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

## 5.2.27.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. Disconnect the Wi-Fi antenna from the Wi-Fi module connection socket.
- 4. 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.



- 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.

2



- 1 Route the Wi-Fi antenna beneath the buckle.
- Wi-Fi antenna buckle (at any connection point)
- 3. Re-install the machine according to the disassembly steps.

# 5.2.27.3 Commissioning and Verification

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

## 5.2.28 R900 series grounding sheet metal FRU

#### 5.2.28.1 Basic Information

Figure5-68



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108311-00	R900 series grounding sheet	None	None
	metal FRU		

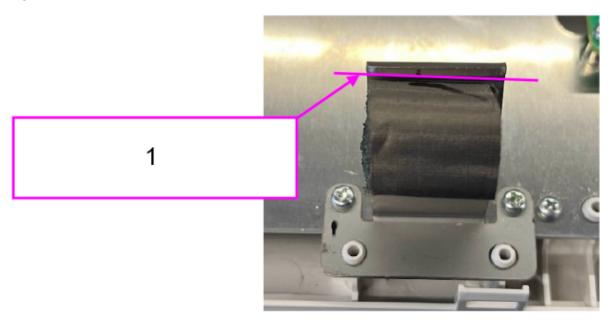
### 5.2.28.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the grounding sheet metal, refer to **5.1.12** Disassembly of Grounding Sheet Metal.

#### **Specific Steps**

- 1. Take a new R900 grounding sheet metal and secure it to the main sheet metal using two M3×8 pan head cross recessed screws.
- 2. Attach the conductive foam to the top area of the grounding sheet metal. **Ensure that the foam is aligned along the upper edge of the sheet metal**, as shown in the figure.

Figure5-69



- 1 Attach the conductive foam along the upper edge of the sheet metal.
- 3. Re-install the equipment according to the disassembly steps.

## 5.2.28.3 Commissioning and Verification

None

# 5.2.29 R700 series grounding sheet metal FRU

### 5.2.29.1 Basic Information

Figure5-70



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108313-00	R700 series grounding sheet	None	None
	metal FRU		

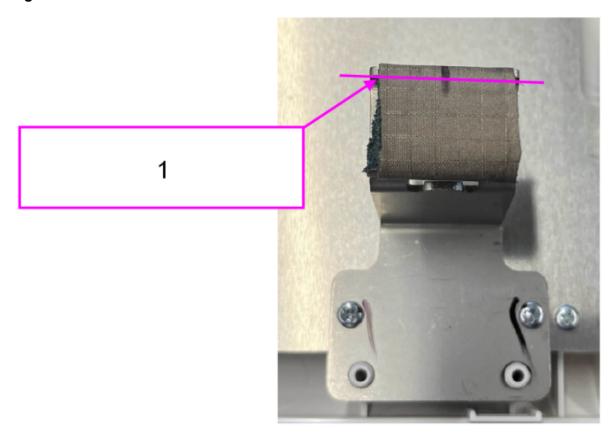
### 5.2.29.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the grounding sheet metal, refer to **5.1.12** Disassembly of Grounding Sheet Metal.

#### **Specific Steps**

- 1. Take a new R700 grounding sheet metal and secure it to the main sheet metal using two M3×8 pan head cross recessed screws.
- 2. Attach the conductive foam to the top area of the grounding sheet metal. **Ensure that the foam is aligned along the upper edge of the sheet metal**, as shown in the figure.

Figure5-71



- 1 Attach the conductive foam along the upper edge of the sheet metal.
- 3. Re-install the equipment according to the disassembly steps.

### 5.2.29.3 Commissioning and Verification

None

# 5.2.30 R900 Integrated Board PCBA FRU(CE)

#### 5.2.30.1 Basic Information

Figure5-72





FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108319-00	R900 Integrated	None	None
	Board PCBA FRU		
	(CE)		

## 5.2.30.2 Removing and Installing

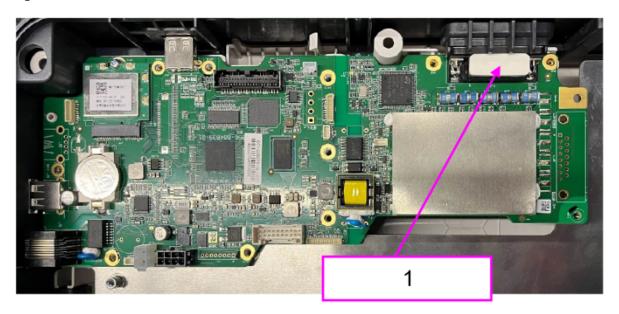
- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the battery shell, refer to 5.1.7 Disassembly of Battery Shell.
- 4. For the disassembly of the main control board, refer to 5.1.9 Disassembly of Main Control Board.

#### **Specific Steps**

Service Manual

- 1. Take a new main control board and place it in its corresponding position on the main sheet panel.
- 2. Attach an ECG pressing silicone pad above the ECG port on the main control board, as shown in the figure.

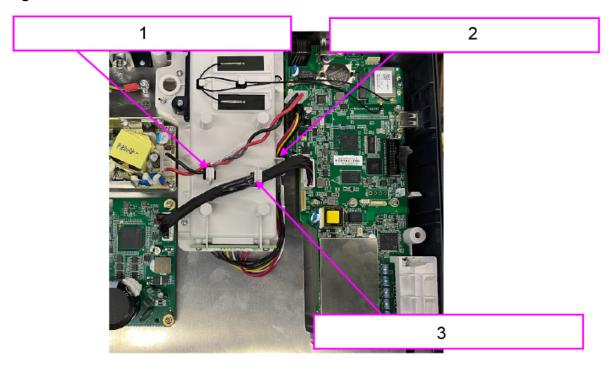
#### Figure5-73



- 1 ECG pressing silicone pad
- 3. Position the ECG connect on the ECG port of the main control board. Secure the main control board using 11 M3×8 pan head cross recessed screws.
- 4. Install the battery shell following the steps in 043–020770–00 battery shell 5.2.13.2 Removing and Installing.
- 5. Insert the battery connector board connecting cable and secure it into the side cable trough.
- 6. Insert the ACDC to main control board cable and secure it into the left cable trough on the top of the battery shell.
- 7. For machines equipped with a recorder, connect the recorder driver board connecting cable and secure it into the right cable trough on the top of the battery shell. The following figure shows the completed cable connection.

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Figure5-74



- 1 ACDC to main control board cable, snapped into the left buckle
- 2 Battery connector board connecting cable, snapped into the side cable trough
- 3 Recorder driver board connecting cable, snapped into the right buckle
- 8. 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 5.2.27.2 Removing and Installing
- 9. Re-install the equipment according to the disassembly steps.

## 5.2.30.3 Commissioning and Verification

# 5.2.31 R90 Integrated Board PCBA FRU(CE)

### 5.2.31.1 Basic Information

Figure5-75





FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108320-00	R90 Integrated Board PCBA FRU (CE)	None	None

## 5.2.31.2 Removing and Installing

For details about the operations, refer to 115–108319–00 R900 Integrated Board PCBA FRU(CE) 5.2.30.2 Removing and Installing

# **5.2.31.3 Commissioning and Verification**

# 5.2.32 R700 Integrated Board PCBA FRU(CE)

## 5.2.32.1 Basic Information

Figure5-76





FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108322-00	R700 Integrated	None	None
	Board PCBA FRU		
	(CE)		

## 5.2.32.2 Removing and Installing

### **Specific Steps**

For details about the operations, refer to 115–108319–00 R900 Integrated Board PCBA FRU(CE) 5.2.30.2 Removing and Installing

# 5.2.32.3 Commissioning and Verification

# 5.2.33 R70 Integrated Board PCBA FRU(CE)

### 5.2.33.1 Basic Information

Figure5-77





FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108323-00	R70 Integrated Board PCBA FRU (CE)	None	None

# 5.2.33.2 Removing and Installing

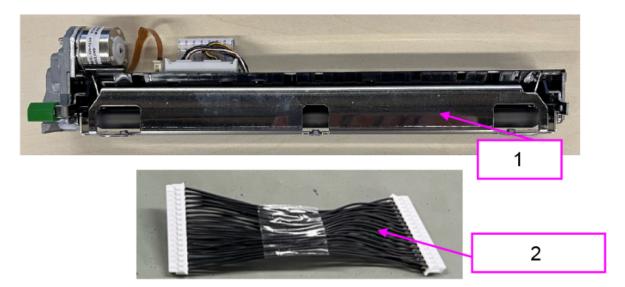
For details about the operations, refer to 115–108319–00 R900 Integrated Board PCBA FRU(CE) 5.2.30.2 Removing and Installing

# **5.2.33.3 Commissioning and Verification**

#### 5.2.34 Print head FRU

#### 5.2.34.1 Basic Information

#### Figure5-78



- 1 Print head
- 2 Print head cable

FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108325-00	Print head FRU	None	None

## 5.2.34.2 Removing and Installing

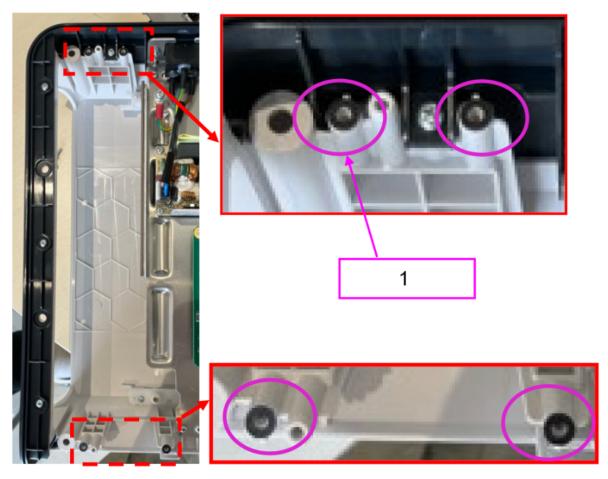
#### Note:

- 1. If the original machine is determined to have a damaged printer head, use the designated maintenance package and replace both the printer head and the connecting cable together.
- 2. If the printer head connecting cable is damaged, replace it by referring to 115–108333–00, New Beiyang print head cable package 5.2.48.2 Removing and Installing and 115–108334–00, Fujitsu print head cable package 5.2.49.2 Removing and Installing.

#### Disassembly and Assembly of Print Head and Connecting Cable

- 1. Disassemble the paper shell. For the disassembly of the paper shell, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the print head, refer to **5.1.11** Disassembly of the Print Head (Optional for Certain Models).
- 4. Check whether PC spacers are attached to the print head metal plate. If present, **remove the PC spacers**, as shown in the figure.

Figure5-79

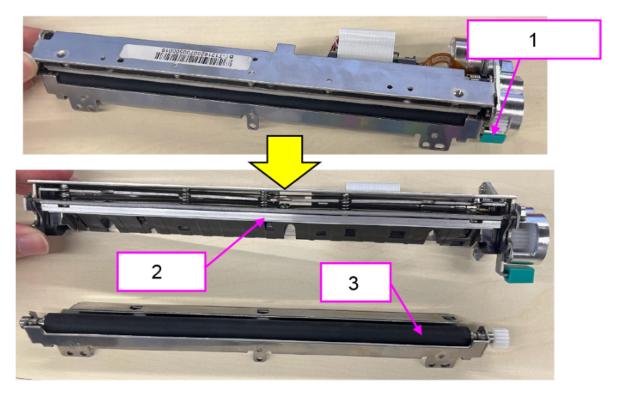


1 4 PC spacers

### **Specific Steps**

1. Take a new print head, push down the print head latch, and remove the roller from the print head, as shown in the figure. For the disassembly of the roller, refer to 043–020773–00, M508 paper shell 5.2.22.2 Removing and Installing.

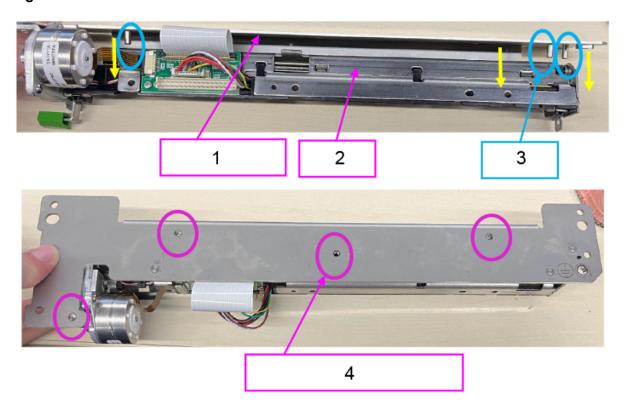
Figure5-80



- 1 Push down the print head latch
- 2 Print head
- 3 Roller
- 2. According to the three positioning posts of the print head sheet metal, install the print head sheet metal above the print head. The positioning columns need to be against the periphery of the print head. Then, tighten four M3×8 pan head cross recessed screws to lock the print head on the print head sheet metal. See the figure below.

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Figure5-81

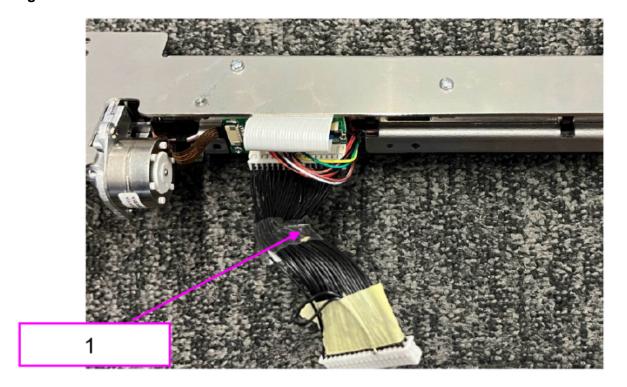


- 1 Print head sheet metal
- 2 Print head
- 3 Positioning post
- 4 Lock four M3×8 pan head cross recessed screws
- 3. Take a new print head cable and insert one end of the cable into the corresponding socket of the print head until it is in place, as shown in the figure.

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Figure5-82

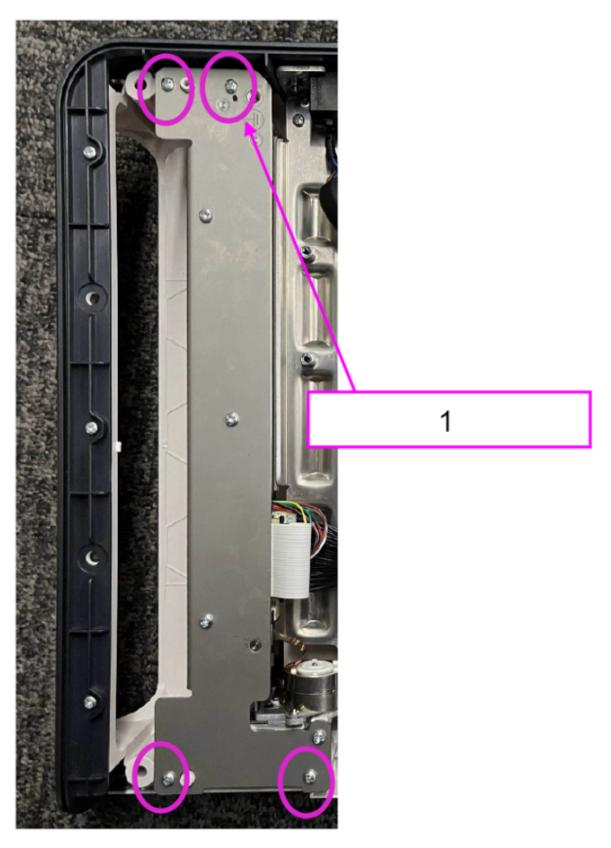


#### 1 Print head cable

4. Install the print head assembly to the corresponding position of the lower cover, and use four K3×8 self-tapping screws to fix the print head assembly to the lower cover, as shown in the figure.

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Figure5-83



1 Lock four K3×8 self-tapping screws

- 5. Plug the other end of the print head cable into the recorder driver board.
- 6. Re-install the equipment according to the disassembly steps.

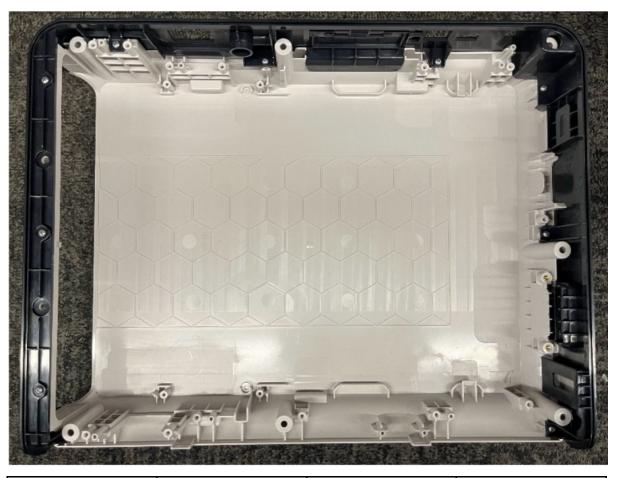
### 5.2.34.3 Commissioning and Verification

None

### 5.2.35 Lower cover FRU

### 5.2.35.1 Basic Information

Figure5-84



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108324-00	Lower cover FRU	None	None

## 5.2.35.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.

- 3. For the disassembly of the battery shell, refer to 5.1.7 Disassembly of Battery Shell.
- 4. For the disassembly of the main control board, refer to **5.1.9** Disassembly of Main Control Board.
- 5. For the disassembly of the grounding sheet metal, refer to **5.1.12** Disassembly of Grounding Sheet Metal.
- 6. For the disassembly of the main sheet metal, refer to 5.1.13 Disassembly of Main Sheet Metal.
- 7. For machines equipped with a recorder, to disassembly the printer head and guide, refer to Disassembly of Print Head and Disassembly of Paper Shell Guide.
- 8. For machines not equipped with a recorder, to disassembly the decorative door and sheet metal, refer to Disassembly of the Decorative Door and Sheet Metal.

### **Specific Steps**

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

### 5.2.35.3 Commissioning and Verification

None

## 5.2.36 R900 Glasgow upgrade package(CE)

### 5.2.36.1 Basic Information

Figure5-85



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108326-00	R900 Glasgow	None	None
	upgrade package		
	(CE)		

## 5.2.36.2 Removing and Installing

For details about the operations, refer to **5.2.30.2** Removing and Installing**115-108319-00 R900 Integrated Board PCBA FRU(CE) 5.2.30.2** Removing and Installing

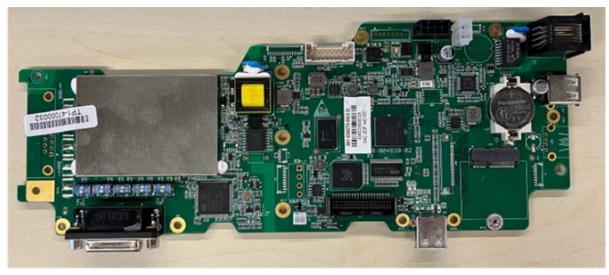
## 5.2.36.3 Commissioning and Verification

None

## 5.2.37 R90 Glasgow upgrade package(CE)

### 5.2.37.1 Basic Information

Figure5-86



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108327-00	R90 Glasgow upgrade package (CE)	None	None

### 5.2.37.2 Removing and Installing

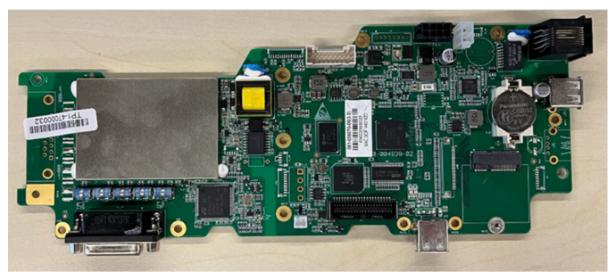
For details about the operations, refer to **5.2.30.2** Removing and Installing**115-108319-00 R900 Integrated Board PCBA FRU(CE) 5.2.30.2** Removing and Installing

## 5.2.37.3 Commissioning and Verification

## 5.2.38 R700 Glasgow upgrade package(CE)

### 5.2.38.1 Basic Information

Figure5-87



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108328-00	R700 Glasgow upgrade package (CE)	None	None

## 5.2.38.2 Removing and Installing

For details about the operations, refer to **5.2.30.2** Removing and Installing**115-108319-00 R900** Integrated Board PCBA FRU(CE) **5.2.30.2** Removing and Installing

## 5.2.38.3 Commissioning and Verification

## 5.2.39 R70 Glasgow upgrade package(CE)

### 5.2.39.1 Basic Information

Figure5-88



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108329-00	R70 Glasgow upgrade package (CE)	None	None

## 5.2.39.2 Removing and Installing

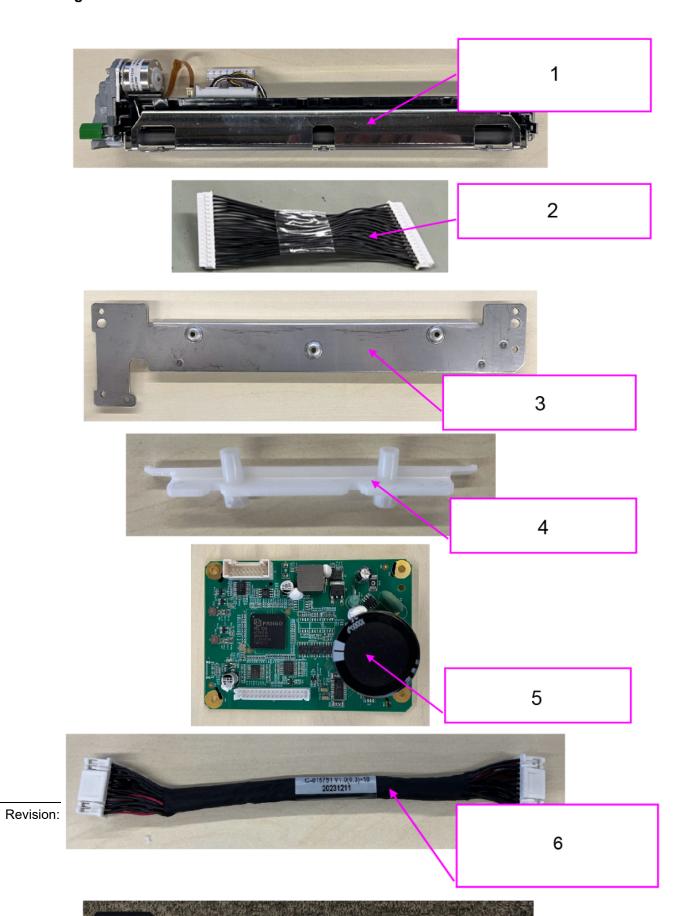
For details about the operations, refer to **5.2.30.2** Removing and Installing**115-108319-00 R900** Integrated Board PCBA FRU(CE) **5.2.30.2** Removing and Installing

## 5.2.39.3 Commissioning and Verification

## **5.2.40 Printing Function Upgrade Package**

## 5.2.40.1 Basic Information

Figure5-89



- 1 Print head (full name: Thermal print head 8 dots/mm 216mm 60mm/sec)
- 2 Print head cable (full name: Main control board and thermal module connecting cable)
- 3 Print head cable (full name: M508 printer fixed metal plate)
- 4 Paper shell guide (full name: M508 Plastic Guide)
- 5 Recorder driver board (full name: 216mm recorder driver board)
- 6 Print head driver board wire (full name: 216 mm recorder driver board connecting cable)
- 7 Paper shell (full name: paper shell assembly)

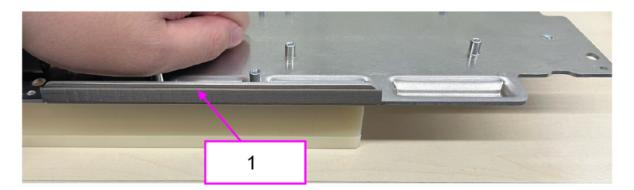
FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
115-108330-00	Printing Function Upgrade Package	009-015791-00	216 mm recorder driver board connecting cable
		042-052782-00	M508 printer fixed metal plate
		043-020936-00	M508 plastic guide
		051-006072-00	216 mm recorder driver board

### 5.2.40.2 Removing and Installing

- 1. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 2. For the disassembly of the battery shell, refer to 5.1.7 Disassembly of Battery Shell.
- 3. For the disassembly of the main control board, refer to 5.1.9 Disassembly of Main Control Board.
- 4. For the disassembly of the grounding sheet metal, refer to **5.1.12** Disassembly of Grounding Sheet Metal.
- 5. For the disassembly of the main sheet metal, refer to **5.1.13** Disassembly of Main Sheet Metal.
- 6. For the disassembly of the decorative door and sheet metal, refer to **5.1.15** disassembly of the Decorative Door and Sheet Metal (Optional for Certain Models).

### **Specific Steps**

- 1. Take a new paper shell guide and install it on the bottom cover of the machine. For specific steps, refer to **5.1.14** Disassembly of Paper Shell Guide (Optional for Certain Models) in the whole machine disassembly process.
- 2. At the bend of the side of the main sheet metal, attach a conductive foam with the upper edge of the sheet metal as the reference, as shown in the figure.



#### 1 Conductive foam

- 3. Install the main sheet metal on the bottom cover of the machine, and then install the grounding sheet metal, main control board, and battery shell on the main sheet metal in turn.
- 4. Install the recorder driver board on the main sheet metal. For specific steps, refer to **5.1.6**Disassembly of Recorder Board (Optional for Certain Models) in the whole machine disassembly process. Pay attention to the installation direction of the recorder driver board.
- 5. Assemble the print head and the print head sheet metal together, and then install them on the bottom cover of the machine. For specific steps, refer to 115–108325–00, print head FRU 5.2.34.2 Removing and Installing.
- 6. Install the print head roller on the paper shell. For specific steps, refer to 043–020773–00, M508 paper shell 5.2.22.2 Removing and Installing
- 7. Install the upper and lower cover assemblies. For specific steps, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies in the whole machine disassembly process.
- 8. Install the assembled paper shell assembly into the bottom cover of the machine along the guide, and tighten two M3×40 pan head screws as captive screws for the paper shell. For specific steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models) in the whole machine disassembly process.

## 5.2.40.3 Commissioning and Verification

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## 5.2.41 compression spring

### 5.2.41.1 Basic Information

Figure5-90



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
0621-20-69591	Compression spring	None	None

## 5.2.41.2 Removing and Installing

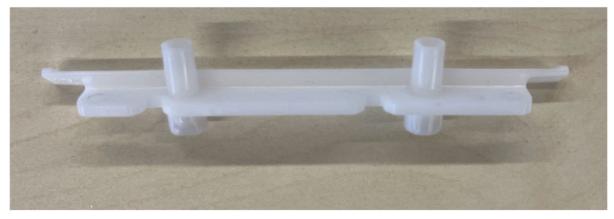
This spring is the internal spring of the paper shell. For the disassembly steps, refer to **5.2.21.2** Removing and Installing**042-052783-00**, **M508** printer unlock metal plate **5.2.21.2** Removing and Installing.

## 5.2.41.3 Commissioning and Verification

### 5.2.42 M508 Plastic Guide

#### 5.2.42.1 Basic Information

#### Figure5-91



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-020936-00	M508 plastic guide	None	None

### 5.2.42.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the battery shell, refer to **5.1.7** Disassembly of Battery Shell.
- 4. For the disassembly of the main control board, refer to 5.1.9 Disassembly of Main Control Board.
- 5. For the disassembly of the grounding sheet metal, refer to **5.1.12** Disassembly of Grounding Sheet Metal.
- 6. For the disassembly of the main sheet metal, refer to 5.1.13 Disassembly of Main Sheet Metal.
- 7. For the disassembly of the paper shell guide, refer to **5.1.14** Disassembly of Paper Shell Guide (Optional for Certain Models).

### **Specific Steps**

Take a new paper shell guide. Re-install the machine according to the disassembly steps.

## 5.2.42.3 Commissioning and Verification

The paper shell slides smoothly without any jamming.

### 5.2.43 216 mm recorder drive board wire

### 5.2.43.1 Basic Information

#### Figure5-92



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
009-015791-00	216 mm recorder driver board connecting cable	None	None

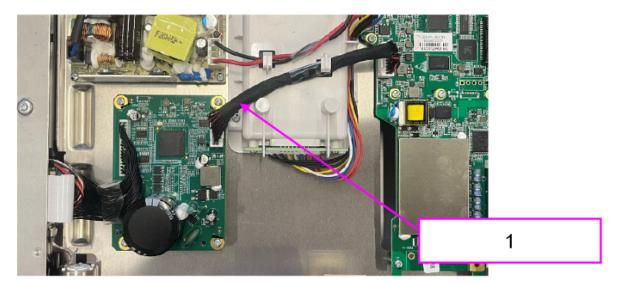
### 5.2.43.2 Removing and Installing

- 1. For the disassembly of the paper shell, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the recorder driver board connecting cable, refer to **5.1.6** Disassembly of Recorder Board (Optional for Certain Models).

#### **Specific Steps**

1. Take the new recorder driver board connecting cable and properly insert the it following the disassembly steps. Then, secure the buckle on the right side of the battery shell. **Note: The cable ends are identical, indicating there is no distinction between the front and back.** 

Figure5-93



- 1 Recorder driver board connecting cable
- 2. Re-install the machine according to the disassembly steps.

## 5.2.43.3 Commissioning and Verification

None

## 5.2.44 Embedded Wireless Antenna

### 5.2.44.1 Basic Information

Figure5-94



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

### 5.2.44.2 Removing and Installing

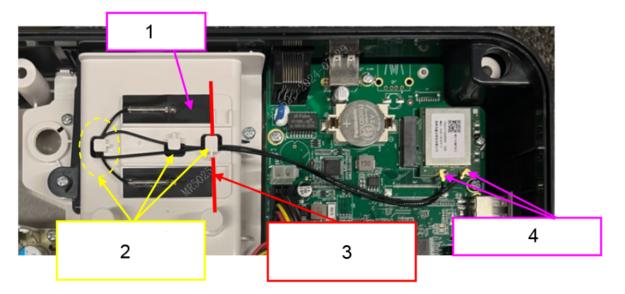
- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. Disconnect the Wi-Fi antenna from the Wi-Fi module connection socket, and peel the Wi-Fi antenna off the battery shell.

#### Specific Steps

Service Manual

1. Take a new Wi-Fi antenna and peel off the back adhesive. Align the antenna according to the rib position on the back of the battery shell, and attach it to the battery shell. The antenna routing should follow the path shown in the figure. Clip the dual antennas onto the Wi-Fi module as shown in the figure.

Figure5-95



- 1 Wi-Fi antenna
- 2 Route the Wi-Fi antenna beneath the buckle.
- 3 Align the Wi-Fi antenna with the left rib of the battery shell.
- 4 Wi-Fi antenna buckle
- 2. Re-install the machine according to the disassembly steps.

## 5.2.44.3 Commissioning and Verification

## 5.2.45 R900 12-channel analyzer wire

#### 5.2.45.1 Basic Information

#### Figure5-96



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-017126-00	R900 12-channel analyzer wire	None	None

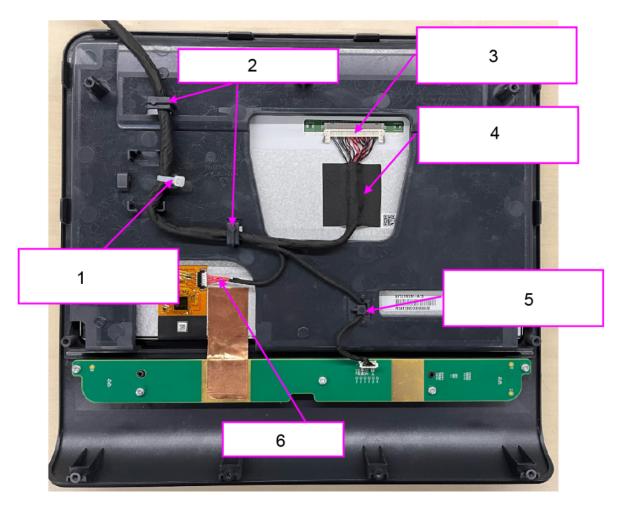
## 5.2.45.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the screen and bottom cover, refer to **5.1.3** Disassembly of Screen and Bottom Cover (R700 Series) and **5.1.4** Disassembly of Screen and Bottom Cover (R900 Series).
- 4. Remove the front-rear cover connector.

### **Specific Steps**

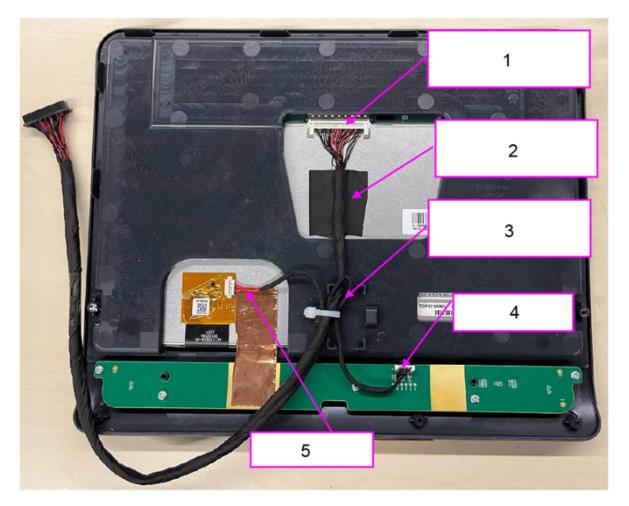
1. For R700 series models, take a new R900 12-channel analyzer wire and plug it in. This cable is a 1-to-3 connecting cable. Insert the screen cable into the screen socket, and then attach the conductive tape to the back of the screen assembly. Insert one end of the touch screen connecting cable (red wire) into the touch screen socket, and one end of the keyboard connecting cable (black wire) into the keyboard socket. Route the cables as shown in the figure and secure them in the appropriate cable troughs. Use a cable tie to secure the connecting cable to the bottom cover of the screen. See the figure below.

Figure5-97



- 1 Use a cable tie to secure the connecting cable to the bottom cover.
- 2 Secure the cables in the appropriate cable troughs.
- 3 Place the screen connecting cable with the FPC side facing up.
- 4 Attach the conductive tape to the metal on the back of the screen assembly.
- 5 Ensure the keyboard connecting cable is secured in the cable trough.
- 6 Touch screen wire
- 2. For R900 series models, take a new R900 12-channel analyzer wire and plug it in. This cable is a 1-to-3 connecting cable. Insert the screen cable into the screen socket, and then attach the conductive tape to the back of the screen assembly. Insert one end of the touch screen connecting cable (red wire) into the touch screen socket, and one end of the keyboard connecting cable (black wire) into the keyboard socket. Use a cable tie to secure the connecting cable to the bottom cover of the screen. See the figure below.

Figure5-98



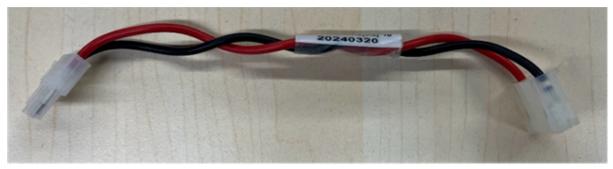
- 1 Place the screen connecting cable with the FPC side facing up.
- 2 Attach the conductive tape to the metal on the back of the screen assembly.
- 3 Bend the keyboard connecting cable slightly and secure it with a cable tie as well.
- 4 Keyboard connecting cable
- 5 Touch screen wire
- 3. Re-install the machine according to the whole machine disassembly steps.

## **5.2.45.3 Commissioning and Verification**

## 5.2.46 ACDC output wire (63W)

### 5.2.46.1 Basic Information

#### Figure5-99



FRU Code	FRU Name	Lower-Level FRU	Lower-Level FRU
		Code	Name
009-015795-00	ACDC output wire (63W)	None	None

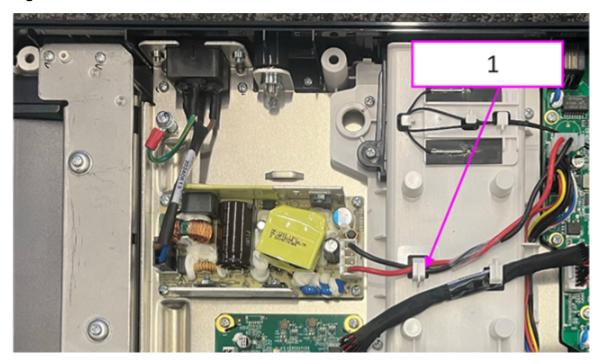
### 5.2.46.2 Removing and Installing

- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the ACDC output wire (also known as AC socket and power board connecting cable), refer to **5.1.10** Disassembly of the Power Board.

### **Specific Steps**

1. Take the new ACDC output wire and properly insert the it following the disassembly steps. Then, secure the buckle on the left side of the battery shell.

Figure5-100



- 1 ACDC output wire
- 2. Re-install the machine according to the disassembly steps.

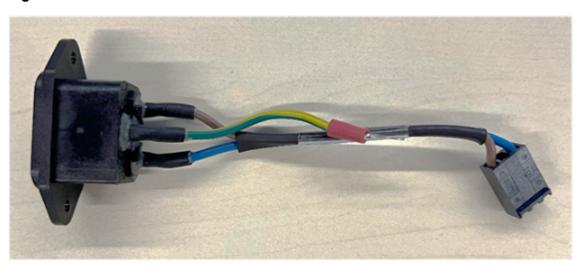
## 5.2.46.3 Commissioning and Verification

None

## 5.2.47 AC input wire (63W)

### 5.2.47.1 Basic Information

Figure5-101

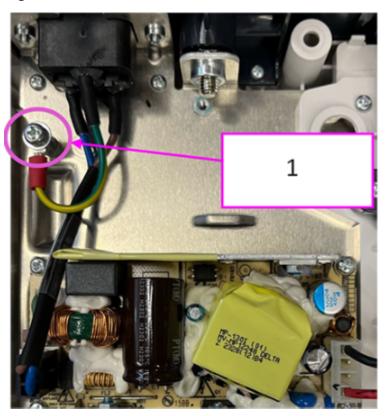


FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
009-015797-00	AC input wire (63W)	None	None

### 5.2.47.2 Removing and Installing

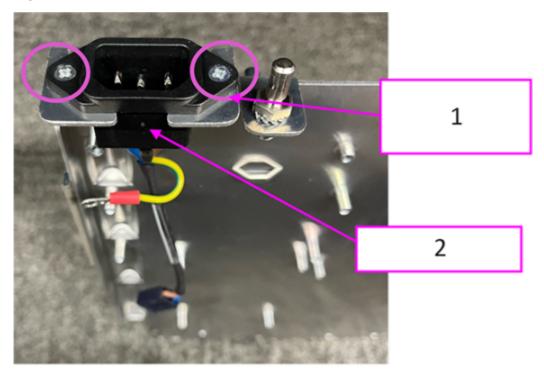
- 1. If the machine has a paper shell, remove the paper shell first. For details about the disassembly steps, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the battery shell, refer to 5.1.7 Disassembly of Battery Shell.
- 4. For the disassembly of the main control board, refer to **5.1.9** Disassembly of Main Control Board.
- 5. For the disassembly of the grounding sheet metal, refer to **5.1.12** Disassembly of Grounding Sheet Metal.
- 6. For the disassembly of the main sheet metal, refer to 5.1.13 Disassembly of Main Sheet Metal.
- 7. Use a screwdriver to unscrew one M4×8 pan head combination screw on the main sheet metal, as shown in the figure.

#### Figure5-102



- 1 One M4×8 pan head combination screw
- 8. Use a screwdriver to unscrew two M3×8 countersunk head cross recessed screws from the side of main sheet metal. Take out the AC input wire, as shown in the figure.

Figure5-103



- 1 Two M3×8 countersunk head cross recessed screws
- 2 AC input wire

### **Specific Steps**

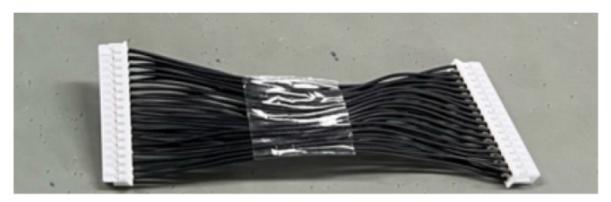
Take a new AC input wire. Re-install the machine according to the disassembly steps.

## 5.2.47.3 Commissioning and Verification

## 5.2.48 New Beiyang print head cable package

#### 5.2.48.1 Basic Information

Figure5-104



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108333-00	New Beiyang print head cable package	None	None

### 5.2.48.2 Removing and Installing

Note: There are two types of print head cables: New Beiyang print head cable (material code: 009-004051-00) and Fujitsu print head cable (material code: 009-015792-00). Before replacing the print head cable, you need to confirm the material code of the print head cable on the original machine, and then replace it with the cable with the same code.

- 1. For the disassembly of the paper shell, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the print head cable, refer to **5.1.6** Disassembly of Recorder Board (Optional for Certain Models).

### **Specific Steps**

- 1. Take a new print head cable and plug it in according to the disassembly steps. **Note: The cable ends are identical, indicating there is no distinction between the front and back.**
- 2. Re-install the machine according to the disassembly steps.

## 5.2.48.3 Commissioning and Verification

## 5.2.49 Fujitsu print head cable package

#### 5.2.49.1 Basic Information

#### Figure5-105



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
115-108334-00	Fujitsu print head cable package	None	None

### 5.2.49.2 Removing and Installing

Note: There are two types of print head cables: New Beiyang print head cable (material code: 009-004051-00) and Fujitsu print head cable (material code: 009-015792-00). Before replacing the print head cable, you need to confirm the material code of the print head cable on the original machine, and then replace it with the cable with the same code.

- 1. For the disassembly of the paper shell, refer to **5.1.1** Removing the Paper Shell (Optional for Certain Models).
- 2. For the disassembly of the upper and lower covers, refer to **5.1.2** Disassembly of Upper and Lower Cover Assemblies.
- 3. For the disassembly of the print head cable, refer to **5.1.6** Disassembly of Recorder Board (Optional for Certain Models).

### **Specific Steps**

- 1. Take a new print head cable and plug it in according to the disassembly steps. Note: The cable ends are identical, indicating there is no distinction between the front and back.
- 2. Re-install the machine according to the disassembly steps.

## 5.2.49.3 Commissioning and Verification

## 5.2.50 white caster with a lock

### 5.2.50.1 Basic Information

Figure5-106



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
034-001173-00	White caster with a lock	None	None

## 5.2.50.2 Removing and Installing

None

## 5.2.50.3 Commissioning and Verification

None

## 5.2.51 rolling stand button(BeneHeart R900)

## 5.2.51.1 Basic Information

Figure5-107



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-024016-00	Rolling stand button (BeneHeart R900)	None	None

## 5.2.51.2 Removing and Installing

None

## 5.2.51.3 Commissioning and Verification

## 5.2.52 yoke holder

### 5.2.52.1 Basic Information

Figure5-108



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-004232-00	Yoke holder	None	None

## 5.2.52.2 Removing and Installing

None

## 5.2.52.3 Commissioning and Verification

## 5.2.53 Barcode Reader Holder package

### 5.2.53.1 Basic Information

Figure5-109



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
045-001370-00	Barcode Reader Holder package	None	None

## 5.2.53.2 Removing and Installing

None

## **5.2.53.3 Commissioning and Verification**

## 5.2.54 No handle basket(BeneHeart R900)

### 5.2.54.1 Basic Information

Figure5-110



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
043-024059-00	No handle basket (BeneHeart R900)	None	None

## 5.2.54.2 Removing and Installing

None

## 5.2.54.3 Commissioning and Verification

## 5.2.55 yoke upright

### 5.2.55.1 Basic Information

Figure5-111



FRU Code	FRU Name	Lower-Level FRU Code	Lower-Level FRU Name
045-006680-00	Yoke upright	None	None

## 5.2.55.2 Removing and Installing

None

## 5.2.55.3 Commissioning and Verification

# 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 aftersales 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. 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. 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.
- 4. Replace the main control board. For details, see 5.2.30.2 Removing and Installing.

### 6.2.2 LCD failure

#### 6.2.2.1 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. The connection cable is faulty.
- 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, see 5.2.30.2 Removing and Installing.
- 3. Replace the LCD.

### 6.2.2.2 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**

None

#### **Solution**

- 1. Replace the main control board or use the downloaded upgrade 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. For details, refer to **5.2.7.2** Removing and Installing.

### 6.2.4 Sound Issues

### 6.2.4.1 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. For details, refer to 5.2.11.2 Removing and Installing.
- 4. Replace the main control board. For details, see 5.2.30.2 Removing and Installing.

## 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. For details, refer to **5.2.16.2** Removing and Installing.

### 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

Thermal 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.

## 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**

#### **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.

## 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, see 5.2.30.2 Removing and Installing.

### 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, see 5.2.30.2 Removing and Installing.

### 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, see 5.2.30.2 Removing and Installing.

### 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).

### 6.2.10 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.
- 4. Replace the Wi-Fi module.

#### 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.
- 5. Replace the Wi-Fi module.
- 6. Replace the main control board. For details, see 5.2.30.2 Removing and Installing.

## **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, see 5.2.30.2 Removing and Installing.

### 6.2.11.2 Unable to Upgrade Program

### **Fault Description**

Unable to Upgrade Program

#### **Possible Causes**

- 1. There is a connection error.
- 2. The program upgrade package is incorrect.
- 3. The IP address of the PC is not set correctly.

#### Involved FRU

#### **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.

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