Foreword

Introduction

This Operator's Manual provides a detailed introduction of the hardware components, installation, dismantling, testing and troubleshooting of this product and its parts, which may effectively help repair staff handle commonly seen problems. It does not provide in-depth information on the structure and design of the product. If you experience problems that cannot be solved, please contact our after-sale service department.

Information in this Operator's Manual is based on a fully configured product, some of which may not be applicable to the product you're repairing. If you have any questions, please contact our after-sale service department.

Before carrying out any repair work, please ensure that you can properly repair the product by carefully reading and fully understanding the content of this Operator's Manual. This way, damage to the product or physical injuries may be avoided.

For use by:

Professional biomedical engineers responsible for the maintenance of this product, authorized repair staff or after-sale service representatives.

Version Information

The version number of this Operator's Manual may be updated without notice at any time due to changes in software or technical specifications. The version information of this Operator's Manual is as follows.

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- Time of Publication: 2013-11
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Chapter 1 Safety

1.1 Safety Information

The safety statements presented in this chapter refer to basic safety information that the operator must pay attention to and abide by during maintenance operations of the infusion pump. There are additional safety statements in other chapters or sections, which may be the same as or similar to the following, or specific to particular operations.

⚠️ DANGERS

- Indicates an imminent hazard that, if not avoided, could result in death, serious injury or damage to product/property.

⚠️ WARNING

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

⚠️ CAUTION

- Indicates a potential hazard or unsafe maintenance practice that, if not avoided, could result in minor personal injury, product malfunction or damage to product/property.

NOTE

- Provides application tips or other useful information to ensure that you achieve better maintenance of the product.
1.1.1 Dangers

⚠️ DANGERS

- The infusion tube must be installed straight and level in the bottom of the groove on the infusion pump.

1.1.2 WARNING

⚠️ WARNING

- Only authorized professional maintenance technicians can disassemble the Infusion pump; Pump maintenance and upgrades must be carried out by maintenance technicians trained and licensed by the manufacturer.
- To prevent fire or explosion, do not operate this infusion pump in the presence of anesthetic, flammable or explosive materials.
- This infusion pump belongs to Class II (type of electric shock protection); the supplied Type I power cord PE earth terminal should not be used as ground protection and functional earthing.
- The packaging materials must be disposed of in compliance with local laws and regulations or the hospital policy on waste management. They must be kept out of the reach of children.
1.1.3 CAUTION

⚠️ CAUTION

- Electromagnetic fields may influence the performance of the infusion pump. Therefore, equipment or devices used in the vicinity of the infusion pump must meet the EMC standard. Mobile phones, X ray and MRI equipment are all potential interference sources because of their high-intensity electromagnetic radiation.

- Avoid exposing this infusion pump to high-pressure sterilization or chemical materials.

- Before the infusion pump is connected to the power supply, make sure the voltage and frequency of the power supply comply with the label on the pump or the specific requirements outlined in this Operator’s Manual.

- In the maintenance process, please pay attention to protect the pump from damage from drops, impacts, violent shaking or other external mechanical forces.

1.1.4 NOTE

NOTE

- For detailed operating instructions and other information about the infusion pump, please refer to the Operator's Manual.

- This Service Manual describes all the settings and functions of the infusion pump in its most complete functional configuration. The infusion pump you are handling may not have some of the settings or functions described herein.

- Do not insert devices that are not specified by the manufacturer into the data ports.
1.2 Equipment Symbols

- **Attention!** Refer to the manual
- **Class II equipment**
- **Class BF device**
- **IP21**
- **Alternating current power supply (AC)**
- **Direct current power supply (DC)**
- **Splash-proof**
- **Batch number**
- **Serial number**
- **Date of manufacture**
- **Manufacturer**
- **Electronic equipment:** dispose of separately to avoid polluting the environment
- **Wireless transceiver**
- **Up or increase value**
- **Down or decrease value**
- **Confirm**
- **Set**
- **Stop**
- **Cancel alarm**
- **Start**
- **Bolus**
- **Clear**
- **Select**
- **Turning on the pump**
- **Turning off the pump**
- **Decimal point**
- **Protect from rain during transport**
- **Fragile item, handle with care**
- **Keep upright during transport**
- **Maximum stack height without additional packaging:** 5 layers
- **CE marked product, complies with EU directive MDD 93/42/EEC and annex I thereof.**
Chapter 2 Design

2.1 Description

This infusion pump is for use in wards, operating theaters, and observation rooms for accurate and continuous infusion to patients.

2.2 System decomposition

The system is decomposed according to Machinery, Hardware and Software three aspects, with the composition chart as follows:
System Board connection diagram is as follows:
2.3 Hardware configuration

Functional block diagram:

The core of the system is the Control Board. Screen display and power supply is carried out by Control Board; measurements and status information for each module are sent to the Control module after treatment in the Driver module, and finally displayed on the computer screen by Control Board; Control Board is also responsible for controlling Buzzer and Status indicator lights. Current supply for all the modules are provided by the Power Board; the Driver module is also responsible for driving of the motor, measurement of each sensor and integrated treatment of the status information.
2.3.1 Control Board

Control Board is information integration of the entire system, providing resources and support for the entire system. It controls the LCD, keypad input, buzzer sounds and set the parameter's storage capabilities.

2.3.1.1 Functional block diagram

![Functional block diagram of Control Board](image)

2.3.1.2 Function introduction

- Control Board makes communications with the Power module or the ZIGBEE wireless module on the Control Board through the serial ports of the logical gate circuit extension modules;
- Control Board provides display information for the display screen, and detects key-press to implement user interface;
- Control Board controls the Buzzer to realize the function of alarm tone and key tone;
- Control Board controls running of the indicator light via the logical circuit;
- SRAM realizes data staging and procedures operation, and EEPROM serves as machine configuration memory.
2.3.2 Pump body

Pump body device is the power provider of the whole system and the power source for liquid transportation. During work, the stepper motor driven camshaft rotation makes the pump moving up and down according to a certain order and motion law, such as waves to squeeze the intravenous infusion tube, and let the fluid inside make a directional flow at a certain speed.

Functional schematic diagram
2.3.3 Control Board

Control Board synthesizes the functional information detected from Bubble pressure board and then sends it to CPU, and it also sends an information to drive the stepper motor. Control Board also converts the input power (including mains and battery) into the power required for each board, and supports the battery charging simultaneously.

2.3.3.1 Functional block diagram
2.3.3.2 Function introduction

After the AC input enters Control Board, it changes into 12V DC voltage first after passing a safety power supply modules, then the DC voltage serves as the primary input for DC/DC converter and the charging circuit, to charge the lithium-ion battery, and also after 5 v DC/DC converter, 3.3V LDO, 18.9V boost DC/DC converter circuit transformation it turns to be DC 5V, 3.3V, and 18.9V respectively.

Power supply module, in addition to completion of the power supply function, the on-board MCU is also responsible for integrated synthesis of the measurement from the sensors and the status messages to send to the Control Board. Besides, it controls operation of the stepper motor according to orders from the Control Board.

2.3.4 Bubble pressure board

Bubble pressure board provides detection functions for bubble, blocking, and the handle door-opening detection. It detects air bubbles according to ultrasonic attenuation of different materials, and detects the degree of blocking using a pressure sensor.

2.3.4.1 Functional block diagram

2.3.4.2 Function introduction

CPU on the ultrasonic pressure board processes the signals collected from the door-opening detection according to the ultrasonic circuit and sends it to the MCU on Power Board; Pressure amplifying circuit amplifies weak voltage signal from the pressure sensor and sends it to the Power Board.
2.3.5 Door-opening detection board

In the Door-opening detection board lays a micro switch, the closing status of which is affected by the handle status. So by detecting how much the micro-switch is closed you can know the handle status at this time.

2.3.6 Drop rate sensor

Functional block diagram:

![Functional block diagram](image)

The Drop rate sensor is fixed on the liquid filter; the measuring methodology is that when a water droplet drops in the liquid filter, it will block the rate sensor from receiving of infrared light; using the pulse signals generated by different intensities of infrared light reception for the conversion from drug liquid droplets frequency into infusion flow rate. Besides, this signal also offers actual transfusion condition of infusion pump, which can detect whether there is liquid leakage situation.
Chapter 3 Testing and maintenance

3.1 Description

To ensure long-term stability of the infusion pump, maintenance personnel must provide it with regular inspection, maintenance and testing. In this chapter

You will understand the basic testing methods for the infusion pump as well as recommended testing frequency and testing tools. Maintenance personnel should choose proper testing tools and carry out inspection and testing according to the actual needs.

The tests and testing methods provided in this chapter are mainly used to verify whether the performance of the infusion pump achieves its specifications. If test results do not meet the specifications, it is an indication that a functional module has failed, which must be repaired or replaced immediately. If you have any other questions, please contact our after-sale service department.

⚠️ CAUTION

- All tests must only be performed by qualified maintenance personnel.
- Please be scrupulous to set and change the contents in the "Advanced settings" menu, as it may result in loss of data.
- Prior to testing, maintenance personnel must ensure the applicability of the testing tools and connecting cables, and they should also be familiar with the use of these tools.
3.1.1 Testing report

After tests performed by maintenance personnel approved by this Company, please make a record according to the following test report, and send it back to our service department.

<table>
<thead>
<tr>
<th>Testing equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test record</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test verdict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass or No Pass:</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

3.1.2 Recommended frequency

<table>
<thead>
<tr>
<th>Inspection/Maintenance Items</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual inspection</td>
<td>First installation, or after each re-installation.</td>
</tr>
</tbody>
</table>
| Startup test                | 1. First installation, or after each re-installation.  
                              | 2. After each repair or replacement of host components. |
| Infusion Flow test          | Check the infusion flow volume every 6 months using a measuring cylinder and stopwatch. |
| Pressure sensor test        | 1. When the user suspects that the measurement of pressure blocking is not accurate.  
                              | 2. After repair or replacement of the relevant module.  
                              | 3. Every 6 months |
| Battery performance test    | 1. It should be checked annually.  
                              | 2. Before the infusion pump is sent for maintenance or if the user suspects the battery to be the source of failure. |
| Electrical safety test      | 1. After the power module is repaired or replaced.  
                              | 2. At least once every two years. |
| Housing leakage current test| 1. |  
                              | 2. Patient leakage current test |
| Cleaning and Disinfection   | 1. Recommendation: once every month.  
                              | 2. Thoroughly clean the infusion pump casing before or after long storage periods. |
3.2 Visual inspection

Visual inspection mainly performs a comprehensive inspection of outlook of the infusion pump. If infusion pumps have no apparent physical damage, then the visual inspection passed. Specific test content are as follows:

- Is there physical damage in the casing, display and keypad of the pump?
- Is there wear in the AC power plugs and wires; Is the power socket PIN loose or warped?
- Is the peripheral interfaces of infusion pump loose, or is there PIN distortion.
- Are security labels and nameplates clearly distinguishable or not.

3.3 Startup test

Startup test is used to determine whether the infusion pump can boot correctly. If the infusion pump can follow the following steps to finish startup, power test passed. To do this, proceed as follows:

1. Connect the infusion pump to an AC power source.
2. Press key and the infusion pump plays "drip..." boot music.
3. System emits a "beep" sound (alarm self-test passed); all LED lights on the Panel; LED at the top left then get off (alarm lamp self-test passed).
4. When boot screen disappears and the system enters the main interface, the normal startup is complete.
3.4 Infusion Flow test

Use combinations of the following speed and preset value. Since beginning of infusion, use a stopwatch for timing and a dosage cup to receive liquid outflow from the infusion pump until the due time (recommended measurement time for low rate flow is 30min, and 6min for medium and maximum rate; low, medium and high flow rate for different modules see following a), b), and c) description) Stop infusion, record time and dosage cup volume, and calculate infusion rate with formula (1). The results should meet requirements provided in 4.3.2.

\[
\text{Infusion rate} = \frac{\text{Infusion liquid volume}}{\text{measured time}} \quad \text{...(1)}
\]

Select 5ml/h, 100ml/h, 600ml/h as test points, and perform measurement for each point three times to get the maximum error values.

NOTE: In the above), b), c) tests, prior to each test, please adjust the pinch position of infusion device or replace the infusion device.
3.5 Pressure sensor test

Testing tools:
- Infusion bottles
- Tube
- Precision pressure gauge: has been calibrated

Testing steps are as follows:
1. As shown in the following figure, connect the infusion pump, infusion tube and the precision pressure gauge.

2. Before the transfusion, the pressure gauge should read zero. If it is not zero, then disconnect the fluid connection, make it to zero and then connect.

3. In the advanced settings mode, press simultaneously the key (Clear) and key (Settings) into the pressure calibration interface as shown in the following figure.

4. Press key (Start) to start infusion, verify that the maximum error between any points within the measurement range of the pressure sensor and the pressure gauge is not exceeding ±30KPa.
5. Use infusion pumps to inject fluids into the pressure gauge until its internal pressure reaches to 60kPa, repeat step 4.

6. Use infusion pumps to inject fluids into the pressure gauge until its internal pressure reaches to 100kPa, repeat step 4.

7. Use infusion pumps to inject fluids into the pressure gauge until its internal pressure reaches to 140kPa, repeat step 4.

If any pressure calibration error exceeds ±30Kpa, please contact our technical support staff.

3.6 Battery performance test

Battery function may deteriorate as it is used, it is recommended to charge and discharge the battery every 3 months, and implement regular battery checks.

Please follow the steps below when checking the battery:

1. Connect the pump to the AC power, charging continuously for 8 to 14 hours.

2. Disconnect the AC power supply and let the machine operate with an infusion rate of 25ml/h on battery power until it switches off due to the battery being exhausted.
   ◆ If the battery works for over 200 minutes, the battery is in good condition.
   ◆ If the battery works for 60 to 200 minutes, the battery is close to the end of its life.
   ◆ If the battery works for less than 60 minutes, the battery has reached the end of its life and needs to be replaced.

3. Please charge the battery for future usage after performing this check.

NOTE

- If the battery only provides power for a short time after being fully charged, it may be damaged or faulty. The battery’s power supply time depends on the usage frequency of the pump and its setting parameters. For example: extended use of the display backlight.

- If the battery has obvious damage (e.g. misshapen, dented, leaking) or cannot hold charge, it should be replaced and recycled.
3.7 Electrical safety test

⚠️ WARNING

- Electrical safety test is a verified test for electrical safety of the monitoring devices; it is designed to detect abnormal electrical hazards which, if not discovered, may cause injury to the patient or the operator.
- Commercially available testing devices such as the safety analyzer may be used for electrical safety tests. Please ask the maintenance personnel to ensure the applicability, functional integrity and safety of such devices as well as to familiarize themselves with the use of these devices.
- Electrical safety tests shall be in accordance with the latest version of the following criteria: EN 60601-1.
- If local regulations provide provisions otherwise, please follow the provisions when performing relevant electrical safety tests.
- In the patient area, all devices that are connected to the mains supply as well as to medical equipment must comply with the IEC 60601-1 standards, and must be tested for electrical safety in accordance with the test interval for monitoring devices.

Electrical safety tests are used to detect hazards that may pose electrical safety threats to the patients, operators and maintenance personnel. Please perform electrical safety tests in a normal environment (including temperature, humidity and atmospheric pressure).

While the 601 safety analyzer is used as an example in the electrical safety test described in this chapter, different safety analyzers may be used in different regions. Please ensure the applicability of the electrical safety test you would like to conduct.
Device connection diagram is as follows:

![Device Connection Diagram]

Testing tools:
- Safety analyzer
- Isolation transformer

### 3.7.1 Housing leakage current test

1. Connect the 601 safety analyzer to a power supply of 264VAC and 60Hz.
2. Using the connection tooling of the application section, connect the application section of the tested device and connect the SUM end of the connection tooling of the application section to the RA end of the safety analyzer.
3. Connect the tested device, via a power line, to the auxiliary power output jack of the 601 safety analyzer.
4. Connect one end of the red test lead to the "Red input terminal" of the safety analyzer and clip the other end to the metal foil attached to the surface of the housing of the tested device.
5. Power on the 601 safety analyzer, press "5-Enclosure leakage" on the panel of the 601 safety analyzer, starting the interface for the housing leakage current test.
6. Housing leakage current is less than 100μA under normal condition and less than 300μA under single-fault condition.

### 3.7.2 Patient leakage current test

1. Connect the 601 safety analyzer to a power supply of 264VAC and 60Hz.
2. Using the connection tooling of the application section, connect the application section of the tested device and connect the SUM end of the connection tooling of the application section to the RA end of the safety analyzer.

3. Connect the tested device, via a power line, to the auxiliary power output jack of the 601 safety analyzer.


5. Continuously press the "APPLIED PART" key to select AC and DC measurements; "DC" is shown following the limit value of direct current.

6. Patient leakage current is less than $10\mu A$ under normal condition and less than $50\mu A$ under single-fault condition.

If the electrical safety test fails, please contact our technical support team.

### 3.8 Cleaning and Disinfection

The pump must be cleaned or disinfected using the materials and methods listed in this chapter. Otherwise, our company will not be responsible for any damage or accident caused by cleaning and disinfection using other materials and methods.

The manufacturer shall not be held responsible for the efficacy of the following chemicals or methods for infection control. Please contact your hospital's infection prevention department or epidemiology specialists for advice on infection control practices.

Please keep the infusion pump and accessories free of dust, and comply with the following provisions to prevent damage to the pump:

- Dilute all cleaning agents and disinfectants in accordance with the manufacturer’s instructions, or use as low a concentration as possible.
- Do not submerge the pump in liquid.
- Do not pour liquid onto the device or its accessories.
- Avoid liquid entering the pump body.
- Do not use abrasive materials (such as steel wool or silver polishing agent) or any strong xylene or acetone-type solvent, in order to prevent damage to the outer casing.

⚠️ **WARNING**
Turn off the power and disconnect the AC power supply before cleaning the infusion pump.

The infusion pump should be cleaned regularly. The cleaning frequency should be increased in areas with serious environmental pollution or in very windy or sandy areas. Before cleaning, consult or refer to the hospital's specific regulations concerning medical device cleaning.

The recommended cleaning agents and disinfectants are:

- Warm water
- Dilute soapy water
- Dilute aqua ammonia
- Sodium hypochlorite (bleaching powder for washing)
- Hydrogen peroxide (3%)
- Ethanol (70%)
- Isopropanol (70%)

Recommended procedure for cleaning and disinfection:

1. Turn off the power and disconnect the power cord.
2. Use a piece of soft cloth dampened with warm water to wipe the surface of the infusion pump if any liquid is spilled on it.
3. Wipe the surface of the pump with a soft cloth soaked in 75% ethanol.
4. Keep the pump in a cool and ventilated environment to dry.

The above steps are for reference only. The effects of disinfection should be checked according to the relevant method.

⚠️ CAUTION

Do not use ethylene oxide (EtO) gas or formaldehyde for disinfection.
Chapter 4 Common failures and Troubleshooting

4.1 Overview

In this chapter faults of infusion pump are classified according to the components and faulty phenomena. Please refer to the relevant Fault Table when troubleshoot and examine, identify and troubleshoot the fault in sequence.

The recommended solutions should help you solve most of the equipment faults you will encounter but not all possible problems. In the case of a fault not covered in this chapter, please contact our after-sale service department.

4.2 Components replacement

You may replace the circuit board components and other major components or parts of this infusion pump. Once you have identified the faulty circuit board component, you may follow the steps described in Chapter 5 Maintenance and Disassembly to replace the circuit board component. Then you may check whether the fault has been eliminated or whether the infusion pump will pass relevant tests. If the fault has been eliminated, which shows that the original circuit board was faulty, then please return the components of the original circuit board to the Company for repair. If the fault remains, please reassemble the original circuit board and troubleshoot according to other possible causes.

If you would like to know about the replacement parts you need, please refer to Chapter 6 Parts.
4.3 Common failures and Troubleshooting

Before troubleshooting, please note whether there is technical alarm information of the infusion pump. If yes, please remove technical alarm first, then follow the contents of 4.3-1 Troubleshooting Guide to eliminate the failure, so that to avoid unnecessary removal of equipments.

4-3-1

<table>
<thead>
<tr>
<th>No.</th>
<th>Failure phenomenon</th>
<th>Failure cause</th>
<th>Treatment methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Battery can not power on</td>
<td>1. the battery has no electricity; 2. the battery is damaged; 3. the Control Board is damaged</td>
<td>1. power on the AC to charge; 2. change the battery; 3. replace the Control Board</td>
</tr>
<tr>
<td>2</td>
<td>AC does not boot up</td>
<td>1. the machine is not connected to AC; 2. faulty Control Board; 3. press key is damaged</td>
<td>1. check the AC; 2. replacement of the Control Board; 3. replacement of the Keyboard</td>
</tr>
<tr>
<td>3</td>
<td>Low-voltage alarm</td>
<td>1. the battery voltage is too low; 2. not able to connect to the AC; 3. the battery is damaged</td>
<td>1. access the AC charge; 2. check the AC; 3. replacement of the battery</td>
</tr>
<tr>
<td>4</td>
<td>Flow rate is too fast</td>
<td>1. redo accuracy calibration; 2. the tubes are too special; 3. foreign objects falls into clamp slot; 4. leakage of liquid into the pump body and it becomes too sticky that causes occlusion; 5. pump body wears</td>
<td>1. please refer to (Precision calibration) Guide; 2. replace the infusion set; 3. clean foreign objects; 4.5. Replacement of pump body</td>
</tr>
<tr>
<td>No.</td>
<td>Failure phenomenon</td>
<td>Failure cause</td>
<td>Treatment methods</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------</td>
<td>---------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>5</td>
<td>Flow rate is too slow</td>
<td>1. redo accuracy calibration; 2. elasticity of the infusion tube is too low; 3. air intake of the bottle is not unobstructed; 4. the fluid is too sticky; 5. control valve of infusion set opens too small</td>
<td>1. please refer to (Precision calibration) Guide; 2. replace the infusion tube or replace the pinch location every 4 hours; 3. ensure that the bottle air intakes are unobstructed; 4. redo accuracy calibration (with this liquid); 5. infusion valve remains open during transfusion</td>
</tr>
<tr>
<td>6</td>
<td>False positive on &quot;Bubbles&quot;</td>
<td>1. the tube is too special; 2. generation of small bubbles due to drug liquid; 3. ultrasonic sensor fault</td>
<td>1. replace with common infusion tube; 2. raise bubble filter level; 3. replacement of ultrasonic sensor or pump components</td>
</tr>
<tr>
<td>7</td>
<td>False positive on &quot;Occlusion&quot;</td>
<td>1. the tube line is not smooth enough; 2. the setting of occlusion level is too low; 3. pressure baseline drifts too much</td>
<td>1. check the tube line; 2. adjust occlusion level; 3. adjustment of pressure value at (50 ± 20)</td>
</tr>
<tr>
<td>8</td>
<td>System Failure</td>
<td>1. Communication errors; 2. abnormal pressure value</td>
<td>1. Replacement of Power Board; 2. Adjustment of pressure value within: (50 ± 20); 3. Replacement of Pressure sensor</td>
</tr>
<tr>
<td>9</td>
<td>Motor Error</td>
<td>1. Pump body failure; 2. Control Board failure</td>
<td>1. Replacement of pump body; 2. Replacement of the Power Board</td>
</tr>
<tr>
<td>No.</td>
<td>Failure phenomenon</td>
<td>Failure cause</td>
<td>Treatment methods</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 10  | Drops Error       | 1. Air in the upper segment of the tube line, the drop bottle does not drop liquid within a certain period;  
                              2. drop speed sensor is not installed correctly;  
                              3. machines, without a drop speed sensor function opens the drop speed function | 1. use new infusion tube and keep the pipeline flowing;  
                              2. install the drop rate sensor correctly according to the Operator's Manual;  
                              3. turning off the drop function |
| 11  | Check Tube        | 1. the tube is not well installed;  
                              2. the tube is too special;  
                              3. ultrasonic wave sensor is damaged;  
                              4. on-process detecting device failure;  
                              5. micros witch in the pump body is damaged | 1. reinstall the infusion tubes according to the Operator's Manual;  
                              2. replace the tube with common infusion tube;  
                              3. replacement of Ultrasonic sensors or pump components;  
                              4. replacement of pump body |
| 12  | Reminder          | 1. When reminder alarm function is open, there is no operation when timeout | 1. turn off the reminder alarm function or press "any key" to cancel alarm |
Chapter 5 Maintenance and Disassembly

5.1 Tools

During disassembly and replacement of parts, you may need the following tools.

- Phillips screwdriver (size 102)
- Phillips screwdriver (size 107)
- Tweezers
- Needle-nosed pliers
- 5.5mm inner hexagonal socket
- Anti-static wrist strap

5.2 Preparation for disassembly

Before disassembly of the infusion pump, please stop infusion to the patient, turn off the infusion pump, and disconnect all accessories and external equipment.

⚠️ CAUTION

- Maintenance personnel should eliminate static prior to disassembly. During disassembly of the parts of certain static-sensitive devices, protective gears such as anti-static wrist strap or gloves should be worn to avoid damage to the parts.
- During re-installation, please make sure the connection wires are plugged in and properly placed to avoid the wires being crushed which may cause a short circuit.
- Note that suitable screws should be used during re-installation. If incorrect screws are screwed in by force, equipment damage may ensue; during the operation after re-installation, screws or parts may fall off and cause unpredictable damage to the product or personal injury.
- A certain order must be followed during disassembly. Instead if the equipment is disassembled not in this order and is done forcibly, irreversible damage to the equipment may ensue.
- When components are disassembled, please ensure that all connection wires are unplugged and avoid breakage or damage to the connectors.
- Please place the screws and other parts and components in separate places in order to find and use them during re-installation, meanwhile avoid falling, contamination or loss.
5.3 Disassembly procedure

5.3.1 Separate the front and rear housing

**NOTE**

- If it is the machine optional drop sensor, first draw the speed sensor plug from rear housing.

1. As shown in Fig. 5-1: First remove the four plastic plugs, then use the screwdriver to remove the four screws.

![Figure 5-1](image1)

2. As shown in Fig. 5-2: Split of the front and rear housings.

![Figure 5-2](image2)
NOTE

- Force should be spent evenly when splitting the housings, and do not use violence to prevent damage of related accessories

3. As shown in Fig. 5-3: Unplug the AC power plug and the battery plug.

4. As shown in Fig. 5-4: Separate the front and rear housing assemblies.

NOTE

- When splitting the front and rear housings, please be careful to avoid pulling off connection cables or damaging plugs.
5.3.2 Disassembly of Control Board

1. As shown in Fig. 5-5, first unplug the associated cables connected with the Control Board, and then slowly pull out the Control Board.

![Figure 5-5](image)

2. As shown in Fig. 5-6, first open the needle seat clip, then unplug the 14pin cable and remove the Power Board.

![Figure 5-6](image)
5.3.3 Removal of the Pump body

1. As shown in Fig 5-7, use tweezers or similar tools to remove the left cover film on the front housing.

![Figure 5-7](image)

**NOTE**

- During removal of the cover film, please be careful to avoid scratching the front housing.

2. The look after removal of the cover film, is as shown in Fig. 5-8.

![Figure 5-8](image)
3. As shown in Fig. 5-9, use screwdrivers to twist off the six screws in the Figure.

![Figure 5-9](image_url)

4. As shown in Fig. 5-10, remove the three screws in fan and take out the fan.

![Figure 5-10](image_url)
5. As shown in Fig. 5-11, twist off the two screws in the Figure.

![Figure 5-11](image)

**NOTE**

- When removing the screws, be careful to prevent screws from falling into the pump body.

6. As shown in Fig. 5-12, first pull the handle, and then take out the components

![Figure 5-12](image)
7. As shown in Fig. 5-13 turn out the screws, and then remove the bushings and connecting rods.

![Figure 5-13](image)

**NOTE:** In installation, the screws should not be tightened (tight in the loose half circle shall prevail).

8. As is shown in Fig. 5-14: remove the pump assembly.

![Figure 5-14](image)
5.3.4 Remove the Sensor board and Pressure sensor

1. As shown in Fig. 5-15, first unplug all connection cables, then loosen the 2 screws as shown in the figure.

Figure 5-15

2. As shown in Fig. 5-16: Remove the screws as shown in the figure.

Figure 5-16
3. As shown in Fig. 5-17: the removed Pressure sensor is like this.

![Figure 5-17](image)

5.3.5 **Change the battery**

1. As shown in Fig. 5-18 Push the two sticking points hard in the direction shown by the arrow to force it open and remove the bezel

![Figure 5-18](image)

2. As shown in Fig. 5-19 Remove the battery

![Figure 5-19](image)
Chapter 6 Components

6.1 Host components

Exploded view
## 6.1.1 Main parts lists

<table>
<thead>
<tr>
<th>No.</th>
<th>Name and specification</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Front housing</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Circuit board semi-finished Control Board</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Pump Assembly</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Large Back Casing Assembly</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Elastic washer 4</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Phillips pan head screws</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Li-Ion battery</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Sensor Board</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Cross recessed pan head tapping screws</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Phillips pan head screws</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Cross recessed pan head tapping screws</td>
<td>4</td>
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<td>12</td>
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<tr>
<td>14</td>
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<td>Cross recessed countersunk head screws</td>
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<tr>
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<td>Cross recessed countersunk head screws</td>
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</tr>
<tr>
<td>20</td>
<td>The left cover film</td>
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</table>
6.2 Pump Body Assembly

Exploded view