

BeneFusion eDS
BeneFusion eDS ex

Infusion Supervision System

Service Manual

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Declaration

Mindray has the final right to interpret this manual.

Only when all of the following requirements are met, Mindray is responsible for the safety, reliability and performance of the product, namely:

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

Foreword

Description

This Service Manual presents detailed information on the hardware composition, installation, disassembly, test and troubleshooting of the product and relevant accessories to help service personnel effectively address common problems. Comprehensive briefings on product structure and design principle are not included. For issues that could not be addressed, contact our Customer Service Department.

The product introduction described in this Service Manual is based on a fully configured product. Therefore, certain content may not be applicable to your product. If you have any question, please contact us.

Please carefully read this Service Manual and fully understand the content before performing product maintenance. Otherwise, incorrect operation may cause personal injury or damage to product.

Intended Audience

This Service Manual is geared for professional biomedical engineers, authorized service personnel and after-sales representatives responsible for product maintenance.

Password

A password may be required to access different modes within the Dock. The passwords are listed below:
Dock setting password: 8868@m, the password can be modified.

Version Information

The version of this Service Manual is subject to update without notice due to changes in software or technical specifications. The version information of this Service Manual is as follows:

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1 Safety

1.1 Safety Information

This chapter lists the basic safety information that should be paid attention to and observed by users when they use the Dock. The identical or similar safety information and/or the safety information related to specific operations will be described in each chapter.

WARNING

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

CAUTION

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

NOTE

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

1.2 WARNING

WARNING

- BeneFusion eDS Infusion Supervision System (Hereinafter referred to as Dock) can only be connected to a power socket with a protective ground, and no removable multi-hole socket is allowed. If the power socket is not connected to a grounding wire, please do not use the socket.
 - To avoid explosion hazard, do not use the equipment in an oxygen-rich environment or with the presence of flammable anaesthetics, vapours or liquids.
 - This device is not suitable for use in a nuclear magnetic resonance (MR) environment.
 - 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 enclosure of the device, otherwise there may be a risk of electric shock. The maintenance or upgrade of the device must be performed by the trained and authorized service personnel of the company.
 - Please carefully place the power cord and cables of various accessories to prevent the patient from being entangled or suffocated, prevent the cables from being entangled, or prevent electrical interference.
 - Do not touch the patient and the device interface at the same time, otherwise the patient may be injured due to leakage current.
 - During the defibrillation process, please do not touch the patient and other non-anti-defibrillation
-
-

equipment, so as to avoid electric shock. During the defibrillation process, the basic performance of the device will not be affected by defibrillation.

- When the device is transferred inside the hospital, please make sure that there are more than two personnel to propels and handle it, so as not to damage the device or cause the whole device to roll over, resulting in injury accident.
 - This device supports up to 4 module racks for cascade expansion. Make sure that each level of module rack is reliably fixed when in use.
 - All devices connected to this device must meet the requirements of IEC 60950. This device can only be connected to products specified by our company. To ensure the safety of patients, do not connect the devices which are not appointed by Mindray to this device or its interfaces.
-

1.3 CAUTION



- During the use of the device, please ensure continuous power supply. Sudden power failure may cause some settings unable to be saved and hence data loss.
 - Electromagnetic field will affect performance of the equipment. Therefore, other devices used around this equipment must conform to the corresponding EMC requirements. Mobile phones, X-ray devices or MRI devices are possible sources of interference as they may emit higher levels of electromagnetic radiation.
 - Always install or carry the equipment properly to avoid damage caused by drop, impact, strong vibration or other mechanical force. After the device falls, the user must confirm whether the device can work normally, otherwise the device cannot be used.
 - This device must be wiped dry immediately after being exposed to rain or splashing water.
-

1.4 NOTE

NOTE

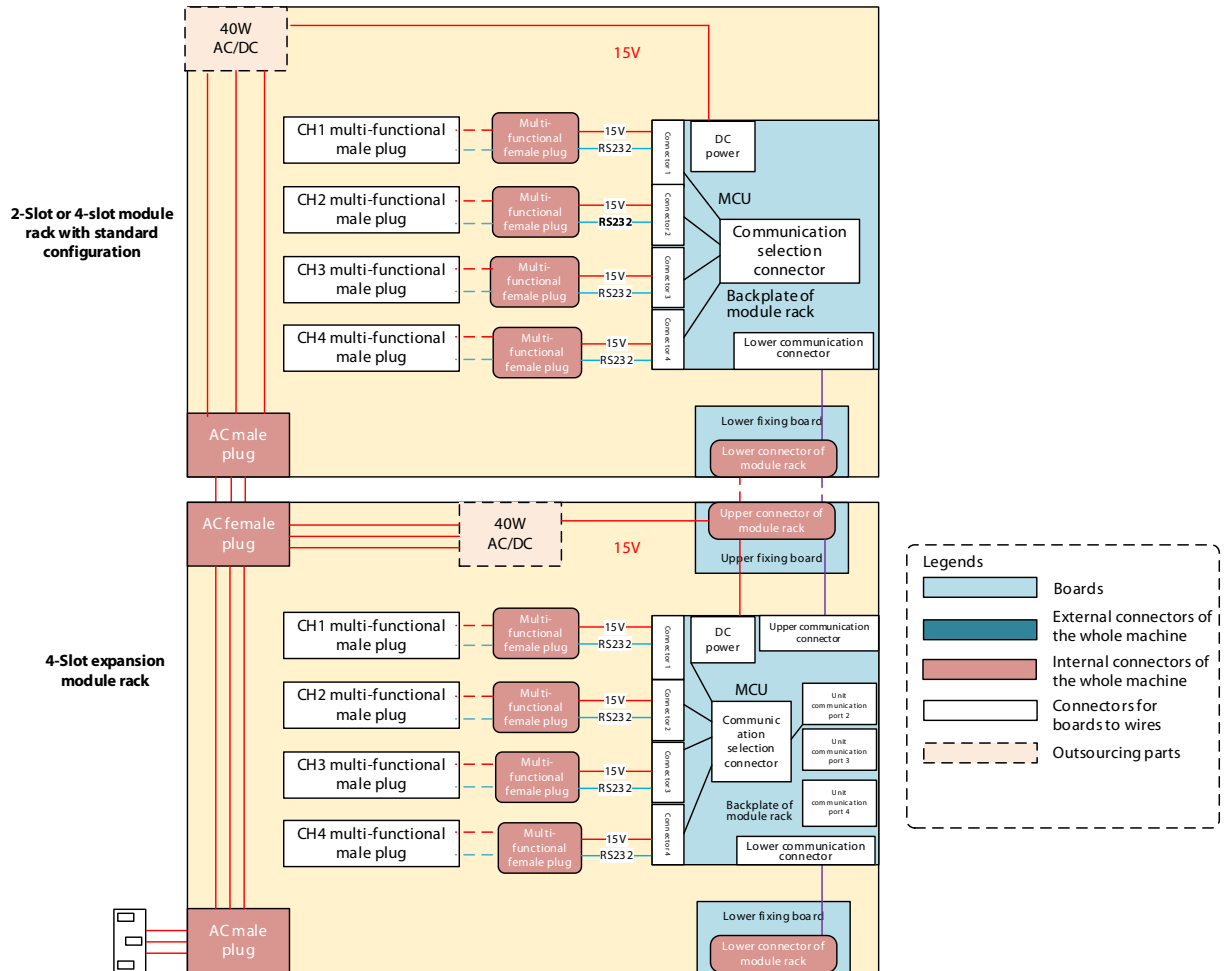
- The software of this device is developed in accordance with the requirements of the IEC62304 standard.
 - This manual describes this product with the complete configuration. The product you purchase may not have some configuration or functions.
-

1.5 Equipment Symbols

For the symbols of this device, please refer to *BeneFusion eDS User Manual (English)*.

2 Hardware and Principle Description

The architecture of the BeneFusion eDS hardware subsystem is shown in the following figure. It mainly includes a top-level control box, a 2-slot or 4-slot standard module rack, and an optional 4-slot expansion module rack. The control box can be equipped with WiFi function. The hardware board mainly includes: Main control board, adapter board, button board, WiFi carrier board (optional), standard module rack backplate, expansion module rack backplane (optional), upper fixing board (optional), lower fixing plate, etc.



System block diagram

2.1 Upper fixing board

The 4-slot expansion module rack is equipped with an upper fixing board, and it realizes the hard connection with the lower fixing board of the previous module rack through the HRS FX23L series floating BTB socket, so as to support the expansion requirements without tools. The transferred signals include: 15V power supply, 4 channels of RS232 signals, and 4 channels of module rack in-position signals.

2.2 Lower fixing board

The 2-slot and 4-slot standard module racks and 4-slot expansion module rack are all equipped with lower fixing boards for hard connection with the upper fixing board of the next module rack, so as to support the expansion requirements without tools. The transferred signals include: 15V power supply, 4 channels of RS232 signals, and 4 channels of module rack in-position signals.

2.3 Backplate of module rack

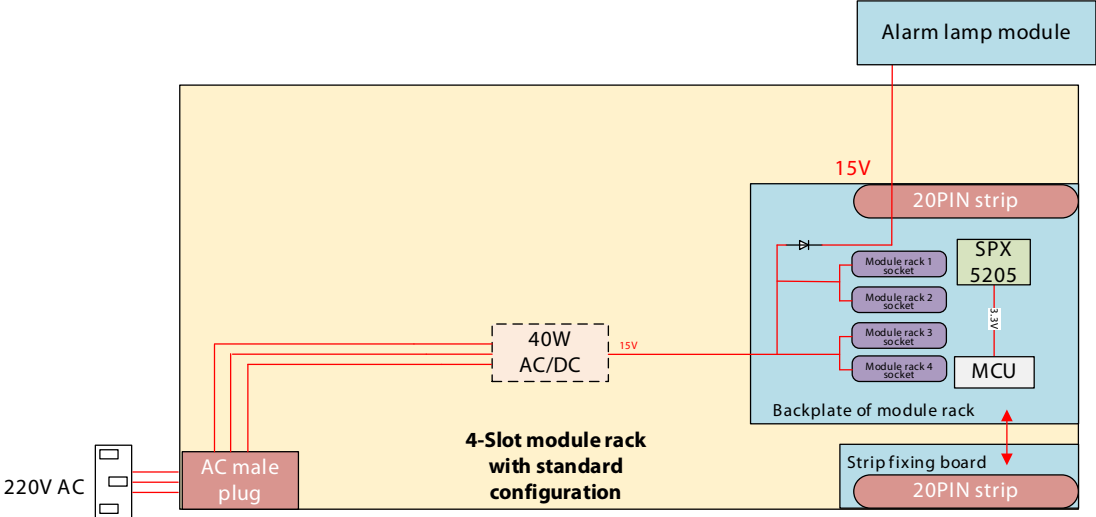
The backplate of the module rack is divided into two types: standard and expansion, which are used in the standard module rack and the expansion module rack. Its main function is to provide the 15V DC power supply after ACDC conversion to the infusion pump and the main control board, and realize the serial communication transfer between the pump and the main control board; the transfer of the entire function is realized through the MCU.

2.4 Alarm lamp module

The alarm lamp module provides green power LED to indicates the power supply status, and red/yellow alarm lamp for alarming.

2.5 Power Architecture

The external 220V AC is connected to the module rack, and the AC-DC module outputs 15V to the backplate of the module rack. The DC-DC of the module rack backplate generates 3.3V for the MCU of the module rack backplate. The charging circuit of battery is powered by a 15V power supply. The power supply mode can be switched between AC and battery based on the AC in-position detection.



3 Installation

3.1 Introduction

To ensure the accurate work of Dock, the installer should confirm Dock to ensure that it meets the customer's requirements. This chapter introduces the installation of Dock and recommends you the appropriate installation tools.

The engineer should confirm with the customer before installation that the installation conditions are met, and start the installation after getting permission.

- Installation services to be provided should be safe, and meet environmental requirements and power requirements.
- The installer must follow the rules and regulations of the hospital when installing the device.
- The installer should complete the device installation according to the requirements of this maintenance manual.

When installing the device, confirm that the customer's installation environment meets the requirements. The contents include:

- Before installation, determine and ensure the safety of the installation site, and the environment and power supply meet the environmental requirements in the product manual.
- The site requires a $1 \times 1 \text{ m}^2$ surface and the environment is safe, so as not to affect the normal treatment of patients during installation.
- There are all necessary sockets at the installation site to support the normal operation of the device.
- Three-core power socket should be provided and its grounding performance should be safe and reliable.
- The hospital shall provide firm and reliable device fixtures, including but not limited to trolley and horizontal and vertical booms.

3.2 Device Unpacking Inspection and Fixing

Tools: Paper cutter

3.2.1 Unpacking

1. Place the package containing the Dock on a stable table to prevent the prototype from falling during disassembly, which will damage the device.
2. Use a knife to cut along the sealing ring of the box. During the cutting process, pay attention to the depth of the cut to prevent it from being too deep after cutting, resulting in scratching the internal device and accessories during the cutting process.

3.2.2 Checking the Device List in the Package

- If the device in the actual packaging is found not meeting the requirements in the list, please record and contact the after-sales department.
- Carry out the physical inspection according to the paper list that comes with the package, and confirm that the model and accessories in the list meet the requirements in the device list.

- The following accessories are included according to the list shipped with the main unit: Power cord, manual, quick operation card, fastening clamp (optional), and module rack.

3.2.3 Checking the Appearance of the Entire System and Accessories

Perform visual inspection on the entire system, including the following aspects:

- The enclosure is clean, without scratches, or obvious color difference, and there is no abnormal noise when the device is being shaken.
- Key operations are sensitive.
- The labels are complete, the content is correct, and the corners of the labels are not upturned.
- There is no light leakage after the screen is turned on.

Perform visual inspection on the accessories, including the following aspects:

- The external packaging of the accessories is neat and clean, without scratches on the surface.
- The joints of the accessories are firm and reliable without cracks.
- Connect the accessories to the main unit respectively, verify that the installation on the main unit is firm and reliable, and the main unit is working properly (see the requirements below for specific acceptance testing).
- If you find that the outer skin of any accessory is damaged or cannot be firmly installed on the main unit, please contact the after-sales engineer.

3.2.4 Device fixing

1. Place the syringe pump upside down on a smooth tabletop, and take care to clean the tabletop to avoid scratching the surface of the Dock with debris.
2. Install the fastening clamp to the Dock rear shell.
3. After installation, hold the clamp firmly and shake the clamp at the same time. Make sure there is no obvious gap between the clamp and the Dock during the shaking process.

4 WLAN Installation

4.1 Introduction

This chapter describes how to install a wireless local area network (WLAN) for infusion pumps/syringe pumps/Dock.

4.2 Network Deployment Process

If a hospital has a WLAN available, follow the network deployment process below.

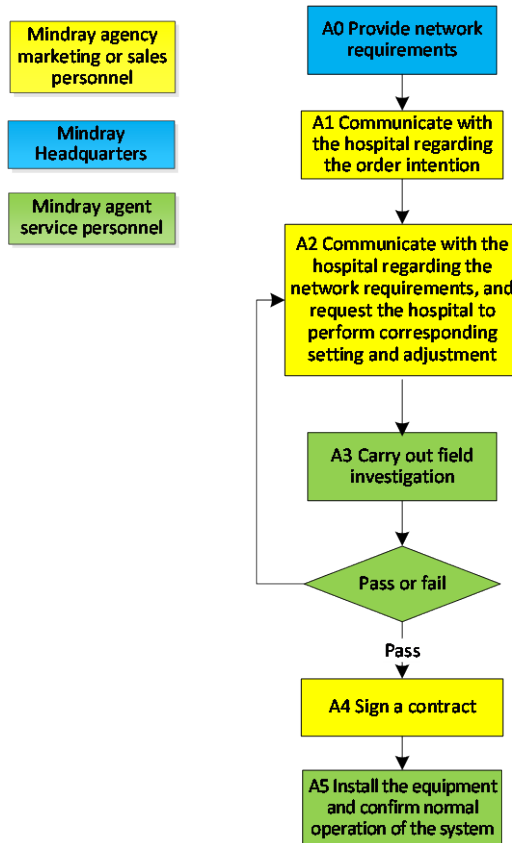


Figure 4-1 Network Deployment Process

If a hospital plans to build a new WLAN for Mindray infusion pumps/syringe pumps/Dock, ensure that at least one Wi-Fi channel is idle. Otherwise, after the new WLAN is built, it cannot meet network requirements of Mindray in terms of co-channel interference. The figure below shows the network deployment process.

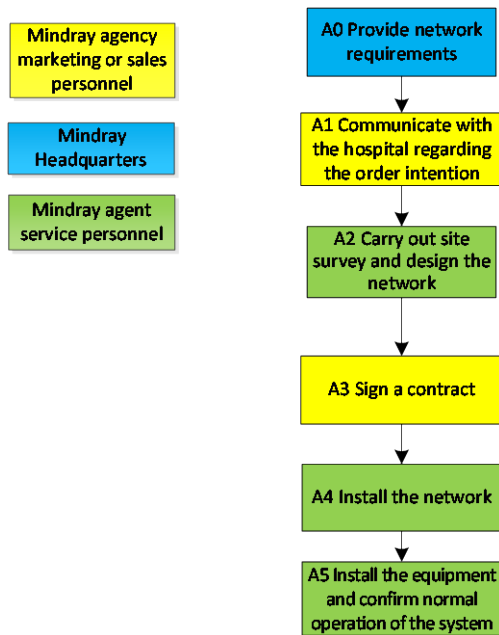


Figure 4-2 New WLAN Installation Process

NOTE

- This document does not contain network design and deployment, which are complex and can be completed only with help of professional IT engineers. This document does not contain this content.

4.3 Network Requirements

The WLAN needs to meet the requirements listed in the table below.

Table 4-1 Wireless Network Requirements

No.	Item	Specific Requirements
Wireless coverage requirements		
1	Wi-Fi coverage signal strength (RSSI)	≥ -65 dBm RSSI is the value displayed on the infusion pump/syringe pump/Dock
2	Co-channel interference	≤ 20 dB (the co-channel interference AP signal is at least 20 dB lower than the AP signal used by the infusion pump/syringe pump/Dock)
3	Ping delay	The average delay is less than 250 ms and the packet loss rate is not greater than 1%.
AP capacity requirement		
1	Device density	A maximum of 16 infusion pumps/syringe pumps/Docks can be connected to one AP at the same time.
WLAN Characteristics		
1	AP channel width	Set the AP channel width to 20 MHz. Do not use HT40 or HT80.
2	Security mode	WPA2-PSK and WPA2-Enterprise are recommended. Use a long password. Hospitals should take internal management measures to strictly control the acquisition of Wi-Fi security settings to prevent unauthorized personnel from acquiring the settings. Do not change WLAN parameter settings at discretion.

The specific requirements are described as follows:

The radio frequency (RF) environment requirements are imposed to ensure the high speed and low packet loss rate during wireless transmission of data. The deployed WLAN must meet the following RF environment indicators:

- RSSI \geq -65dBm
- Ping average delay \leq 250 ms
- Ping packet loss rate \leq 1%
- Co-channel isolation \geq 20 dB

WARNING

-
- **RF environment requirements are vital to the wireless environment quality, and must be met. Otherwise, wireless retransmission, packet loss, and network disconnection will occur. During the use of the infusion pump/syringe pump/Dock, continuously monitor the wireless environment. Private APs/wireless routers are not allowed as they will disconnect the infusion pump/syringe pump/Dock from the WLAN.**
-

RSSI

The received signal strength indicator (RSSI) is one of the important factors that reflect the signal quality and affect the WLAN performance. In areas with low RSSI, wireless clients are almost impossible to establish reliable and high-throughput wireless links with an AP. Mindray requests that the RSSI be greater than or equal to -65 dBm in any position in the area where the infusion pump/syringe pump/Dock is used.

Note that RSSI \geq -65 dBm is the signal strength perceived and displayed by the wireless network interface card (NIC) of the infusion pump/syringe pump/Dock. The signal strength is subject to the RSSI displayed on the infusion pump/syringe pump/Dock during wireless environment survey.

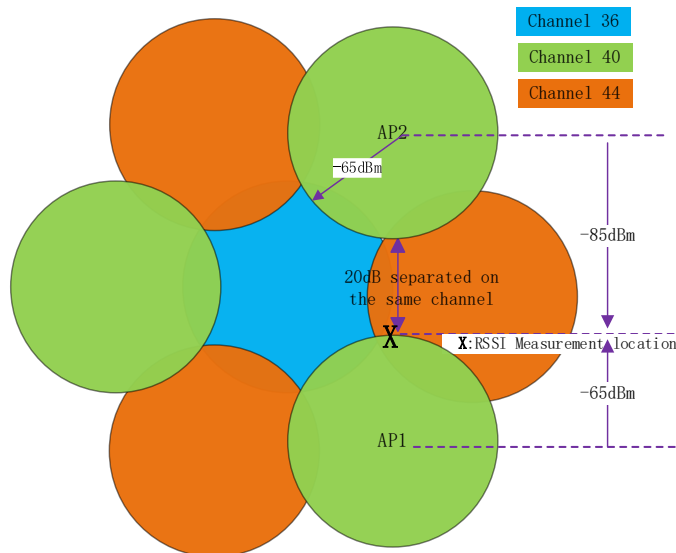
Ping Operation

Ping is a common operation command used to test the network connectivity, evaluate the network quality, and analyze and judge network faults. Windows, Linux, and other OSs support the ping command. Mindray electrocardiographic monitoring equipment uses the ping tool to evaluate the network quality. It is required that the ping average delay is smaller than or equal to 250 ms and the ping packet loss rate is smaller than or equal to 1%.

Co-channel Isolation

Co-channel isolation refers to the difference between signal strengths from different APs in the same channel. Mindray requires that the inter-AP RSSI difference is greater than or equal to 20 dB. That is, the infusion pump/syringe pump/Dock in the coverage of an expected AP can receive signals from other APs in the same channel as the expected AP, and the RSSI must be 20 dB lower than that of the signal from the expected AP.

Take point "X" in the figure below as an example. At this point, the RSSI of the signal from the expected AP1 is -65 dBm. The RSSI of the signal from AP2 in the same channel is -85 dBm, which is 20 dB lower than the RSSI of AP1. Point X is closer to AP1. Therefore, in the coverage area (RSSI \geq -65 dBm) of AP1, the RSSI is 20 dB greater than that of AP2, which meets the co-channel isolation requirement.



NOTE

- The interference is low and there are many channels in the 5 GHz band. It is recommended to use 5 GHz channels.

4.4 Network Acceptance

4.4.1 Network Acceptance Process

Network acceptance is to conduct final acceptance on the entire network. The acceptance process is described as follows:

1. Connect the infusion pump/syringe pump/Dock to Mindray WLAN. Access **Manufacturer Maintenance** and open the WLAN status page. Take a monitor and walk around all edges of the entire wireless coverage area that contains the infusion pump/syringe pump/Dock (including all corners of each room and all areas of the corridor). Confirm that the displayed RSSI value is greater than or equal to -65 dBm.
2. Perform the ping operation to test whether the network connectivity and delay meet requirements.
3. Use a Wi-Fi analyzer to confirm the co-channel isolation (see the following section).

The ping test process is described as follows:

1. Connect the test laptop through the network cable at the network node that will be connected to the server, and connect the test infusion pump/syringe pump/Dock to the Mindray wireless network;
2. Open the CMD window of the test PC and run the following command to ping the monitor address:
 - ping -n 1000 -l 32 -w 1500 IP_Addr > C:\PingTest.txt.
 - Ping parameter description:
 - ◆ -n: Indicates that 1000 packets are sent continuously to ping the monitor
 - ◆ -l: Indicates that the size of each data packet is 32 bytes
 - ◆ -w: The timeout time for ping packet return is 1500 ms
 - ◆ > C:\PingTest.txt: Exports test results as a **PingTest.txt** file in drive C
3. After the ping operation ends, open **C:\PingTest.txt** to view and save test results. The figure below shows an example of test results.

Ping statistics of 196.76.0.1:

Data packets: sent = 1000, received = 1000, lost = 0 (0% lost),

estimated time of the round trip (in milliseconds):

Shortest = 1ms, longest = 211ms, average = 2ms

Remarks: "0% loss" indicates that the packet loss rate is 0% in this test. "average = 2 ms" indicates that the average delay of this test is 2 ms.

Table 4-2 Infusion Pump/Syringe Pump/Dock Installation Confirmation Table

Test Item	Result (Pass, Fail or NA)
Perform the ping command on the PC of the wired network to ping the infusion pump/syringe pump/Dock. Ensure that the average delay is less than 250 ms and the packet loss rate is smaller than 1%.	
Hold the infusion pump/syringe pump/Dock and walk around the coverage scopes of different APs. At a position with worst coverage effect, the RSSI value displayed on the screen is higher than -65 dBm.	
Use the Wi-Fi analyzer to confirm that the co-channel isolation is greater than or equal to 20 dB	

NOTE

- **If the evaluated infusion pump/syringe pump/Dock has a fixed position and does not roam between APs, the test of walking in the coverage area is not required. You only need to place the infusion pump/syringe pump/Dock at the position with the worst signal where it may be installed, and then confirm the RSSI and ping effect.**

4.4.2 Use Method of the Wi-Fi Analyzer

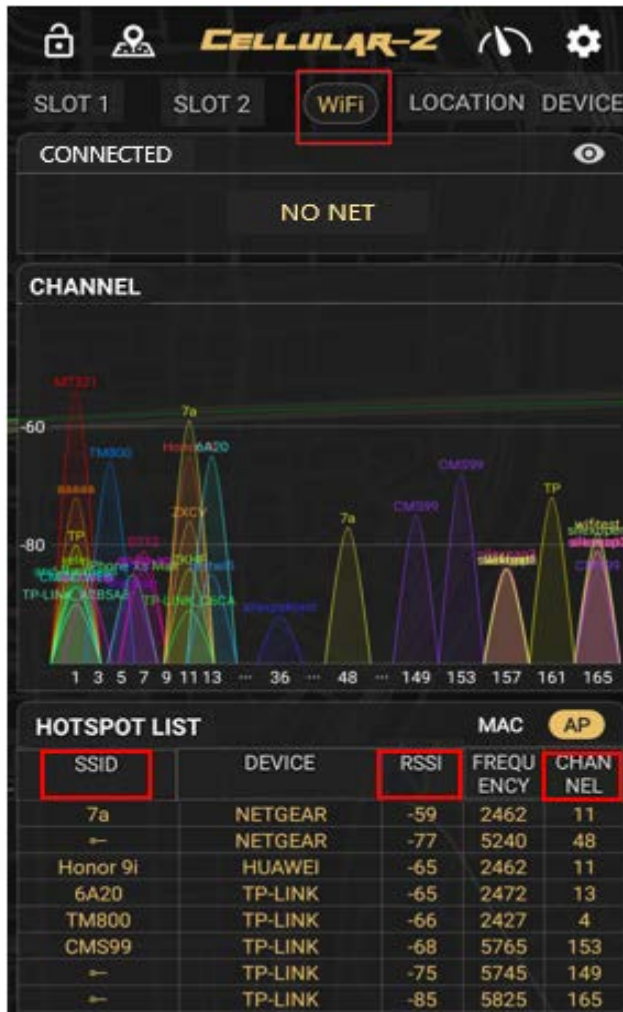
Customer service engineers can use an app on the smartphone to conduct pre-sale network deployment survey. It is recommended to use the following Android phones to coordinate with Cellular-Z Wi-Fi analyzer.

To use the Cellular-Z Wi-Fi analyzer, do as follows:

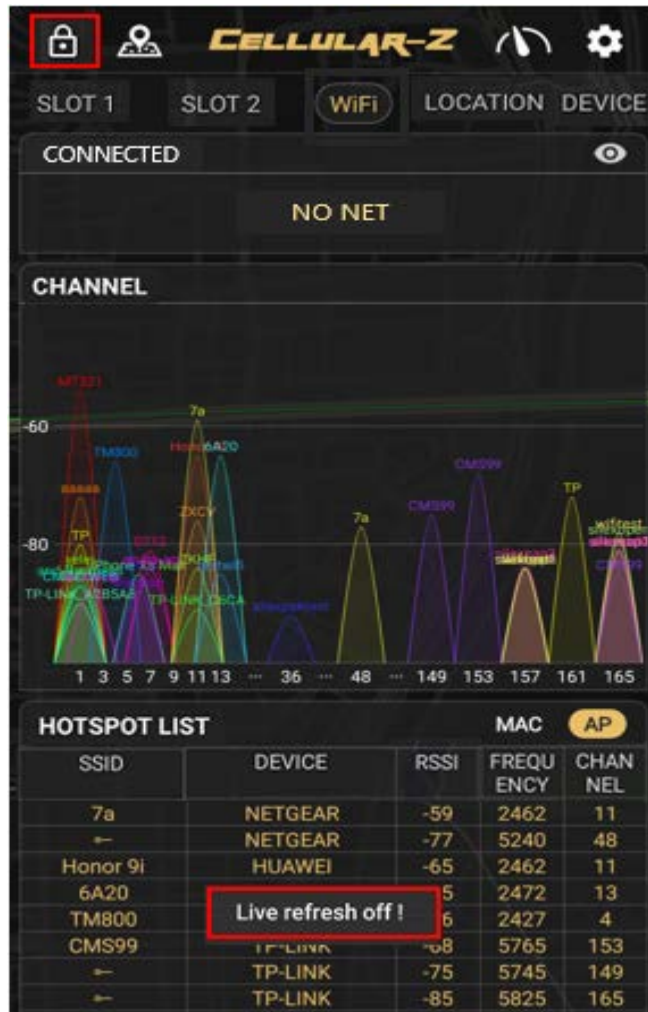
1. Download Cellular-Z from the smartphone application market and install it.



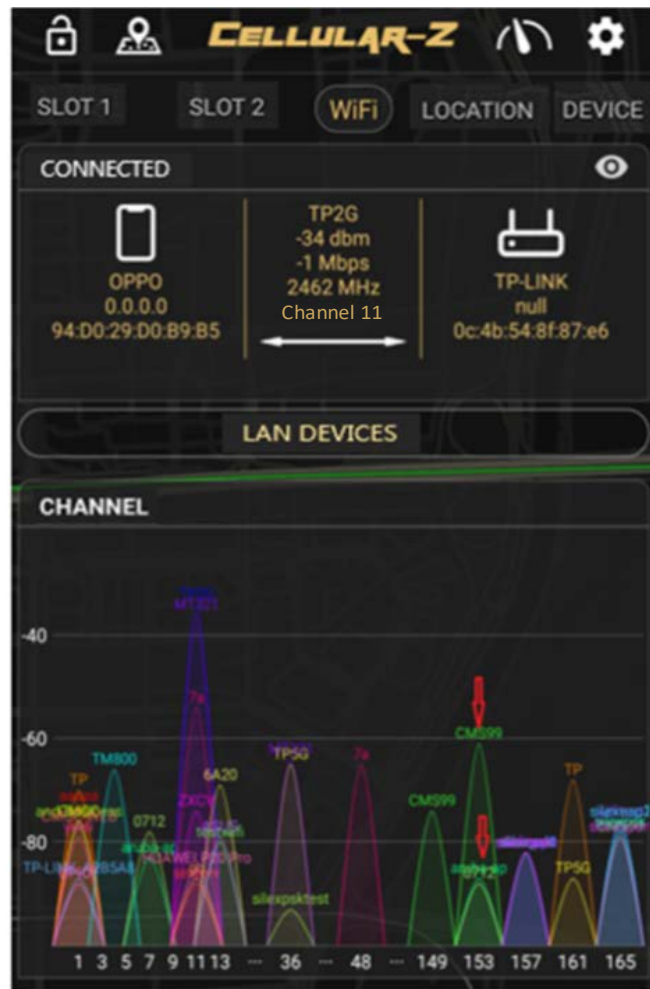
2. Start Cellular-Z. Click the **WiFi** tab and view the SSID of an AP in the name column, channel of the AP in the channel column, and RSSI of the AP in the RSSI column;



- When the RSSI needs to be acquired, disable real-time refresh (real-time refresh is enabled on the app and the refresh frequency varies with the smartphone). After acquiring and recording the RSSI, enable real-time refresh. After refresh is complete, disable real-time refresh and record the value.



- View the RSSIs of channels to judge whether the co-channel interference RSSI is smaller than -85 dBm. As shown in the figure below, In channel 153, the networks with SSID of CMS99, 0712, and aruba-ap work in the same band. Wherein, the signals of 0712 and aruba-ap are emitted by interference APs.



- The hot spot list shows that the RSSI of the network with SSID of 0712 is -89 and the RSSI of the network with SSID of aruba-ap is -88, which are both smaller than -85 dBm. Therefore, channel 153 meets network deployment requirements.

设备	品牌	信道	功率	频点
CMS99	TP-LINK	-58	5765	153
☐	TP-LINK	-75	5745	149
☐	TP-LINK	-78	5825	165
TP5G	TP-LINK	-64	5180	36
☐	TP-LINK	-88	5805	161
TP	NETGEAR	-65	2412	1
☐	NETGEAR	-71	5805	161
TM800	TP-LINK	-67	2427	4
aaaaa	TP-LINK	-70	2412	1
6A20	TP-LINK	-70	2472	13
silexap2	Cisco	-73	5825	165
☐	Cisco	-84	5785	157
silexpsk	Cisco	-73	5825	165
☐	Cisco	-84	5785	157
silexap1	Cisco	-73	5825	165
☐	Cisco	-82	5785	157
silexap3	Cisco	-73	5825	165
☐	Cisco	-84	5785	157
wifitest	Cisco	-73	5825	165
☐	Cisco	-84	5785	157
silexopen	Cisco	-73	5825	165
☐	Cisco	-82	5785	157
and-Business	H3C	-77	2412	1
ZXCV	NETGEAR	-77	2462	11
CMCC	H3C	-78	2412	1
CMCC-WEB	H3C	-78	2412	1
0712	hp	-79	2442	7
☐	hp	-89	5765	153
aabbcc	TP-LINK	-82	2467	12
testwifi	NETGEAR	-82	2472	13
yelei	TP-LINK	-83	2412	1
aruba-ap	hp	-83	2442	7
☐	hp	-88	5765	153
gh	HUAWEI	-88	2462	11

4.5 Recommended Network Devices

Cisco devices listed below are recommended.

Device	Model
Wireless controller	AIR-CT3504-K9
Wireless access point	AIR-AP2802I-K9

4.6 Setting Wireless Parameters of Infusion Pump/Syringe Pump/Dock

Set WLAN parameters for the infusion pump/syringe pump/Dock according to the table below.

Parameter	Recommended Setting	Description
Menu → Maintenance → WiFi Setup → WLAN Setup		
Network Name (SSID)	Enter the actual network name.	/
Security	WPA2-PSK	It should be the same as the security mode of the WLAN deployed for the infusion pump/syringe pump/Dock. If EAP is used, select the security mode according to the WLAN deployment.
Security Key	Enter the actual network	/

Parameter	Recommended Setting	Description
	password.	
Menu → Maintenance.		
IP Address	Enter the actual IP address.	/
Subnet Mask	Enter the actual subnet mask.	/
Default Gateway	Enter the actual gateway.	/
Main Menu → Maintenance → WiFi Setup → WLAN Setup		
WLAN Band	5G	Options: 2.4G, 5G, Auto 2.4G = Only the 2.4 GHz band is used. 5G = Only the 5GHz band is used. Auto = The 2.4 GHz and 5 GHz bands (5 GHz first) are used
Authentication Server type	ACS	Options: ACS and SBR ACS refers to the CISCO access control server. SBR refers to the server different from ACS. This is applicable only when the security type is Enterprise.
BG Channel	Specified channel	Options: all, specified, none You can limit the channels that can be connected to the infusion pump/syringe pump/Dock, so as to improve stability and roaming performance. For example, set the channels to 1, 6, and 11 on a 2.4 GHz network. Then the NIC will not scan or select other channels. The BG channel settings on the infusion pump/syringe pump/Dock must match the channel settings on the AP.
Channel A	Specified channel	Options: all, specified, none You can limit the channels that can be connected to the infusion pump/syringe pump/Dock, so as to improve stability and roaming performance. The 5 GHz channel settings on the infusion pump/syringe pump/Dock must match the channel settings on the WLAN AP.
Main Menu → Maintenance → WiFi Setup → Certificate Maintenance		
Certificate Import	/	Import the certificate in the USB flash drive to the local equipment.
Certificate Deletion	/	Delete the local certificate.
Main Menu → Maintenance → Manufacturer Maintenance → WiFi Setup		
Wireless Regulatory Area	Worldwide	This parameter needs to be set separately for South Korea, Turkey, Russia and Brazil. Select "Worldwide" for other countries and regions. Restart the infusion pump/syringe pump/Dock needs to make the settings of the infusion pump/syringe pump/Dock take effect.
Trigger (Wifi Roam Test page)	-70	The NIC will try roaming when the RSSI is lower than the roaming trigger value.
Scan cycle (Wifi Roam Test page)	5	The detection request period is 5s when the RSSI is lower than the roaming trigger value.

The infusion pump/syringe pump/Dock supports the following security modes:

Menu	Technical Standard	Authentication Mode	Encryption Mode	CCKM Supported or Not
WEP OFF	/	/	/	No
WEP ON	WEP	WEP	WEP/RC4	No
WPA PSK	WPA	PSK	TKIP/RC4	No
WPA2 PSK	WPA2	PSK	CCMP/AES	No
WPA PSK AES	WPA	PSK	CCMP/AES	No
WPA TKIP	WPA	EAP	TKIP/RC4	No
WPA2 AES	WPA2	EAP	CCMP/AES	No
WPA AES	WPA	EAP	CCMP/AES	No
CCKM TKIP	WPA, WPA2	EAP	TKIP/RC4	Yes
CCKM AES	WPA, WPA2	EAP	CCMP/AES	Yes

When you select the EAP authentication mode, the system displays the corresponding configuration items. The following table lists the configuration items for different EAP modes.

	Identity	Anonymous	Password	CA Certificate	User Certificate	PAC Certificate	PAC Password
PEAP-MSCHAPV2	Y	O	Y	Y	N	N	N
PEAP-GTC	Y	O	Y	Y	N	N	N
PEAP-TLS	Y	O	Y	Y	Y	N	N
TTLS	Y	O	Y	Y	N	N	N
TLS	Y	N	Y	Y	Y	N	N
FAST	Y	O	Y	N	N	Y	Y
LEAP	Y	N	Y	N	N	N	N

Note: Y means "Yes", N means "No," and "O" means "Optional".

The configuration items are described as follows:

- Phase2 Auth: When PEAP is selected in the EAP method, users can configure the following PEAP internal methods: EAP-MSCHAPV2, EAP-GTC and EAP-TLS.
- Identity: user identity, which is the user name in AD, LDAP or local user management on the RADIUS server.
- Anonymous: This item does not affect the authentication process. It is used to hide the real name (identity).
- Password: password of the identity.
- CA Certificate: Select the CA certificate from the imported certificates.
- User Certificate: Select the user certificate from the imported certificates.
- PAC Certificate: Select the PAC certificate from the imported certificates when EAP-FAST is selected. If the RADIUS server supports PAC preparation in the band and PAC is prepared for the customer, it is not required to set the PAC certificate and password.
- PAC password: Enter the PAC password for the PAC certificate when EAP-FAST is selected. If the RADIUS server supports PAC preparation in the band and PAC is prepared for the customer, it is not required to set the PAC certificate and password.

4.7 Troubleshooting

Symptom	Possible Cause	Recommended Measures
The infusion pump/syringe pump/Dock cannot connect to an AP, and the Wi-Fi signal icon displayed on the infusion pump/syringe pump/Dock is "X".	The nearby AP is not turned on.	Ensure that the AP has been turned on and serves the WLAN where the infusion pump/syringe pump/Dock is.
	The infusion pump/syringe pump/Dock is not within the coverage of the AP.	Move the infusion pump/syringe pump/Dock to the coverage of the AP and turn on the infusion pump/syringe pump/Dock. Make sure that the RSSI value displayed on the infusion pump/syringe pump/Dock is greater than -65 dBm. Ensure that co-channel interference meets requirements.
	The SSID, IP address acquisition mode, and security mode are not correctly configured on the infusion pump/syringe pump/Dock.	Reconfigure the information as instructed in this manual.
	The work channel specified for the infusion pump/syringe pump/Dock differs from that configured on the AP.	Change settings to ensure that the work channel of the AP is consistent with that specified for the infusion pump/syringe pump/Dock.
	Errors of Infusion Pump/Syringe Pump/Dock	Check whether another infusion pump/syringe pump/Dock can connect to the WLAN. If yes, restart this infusion pump/syringe pump/Dock and ensure that the two infusion pumps/syringe pumps/Docks uses the same configuration. If this infusion pump/syringe pump/Dock still cannot connect to the WLAN, return it to Mindray for repair.
The infusion pump/syringe pump/Dock can connect to the AP but cannot connect the FTP server.	The infusion pump/syringe pump/Dock is not configured to connect to the FTP server.	The infusion pump/syringe pump/Dock is set to connect to the FTP server.
	The infusion pump/syringe pump/Dock cannot obtain any IP address due to configuration errors.	If the problem cannot be solved, contact the IT department.
	Static IP addresses conflict.	Check whether an IP address conflict prompt is displayed on the infusion pump/syringe pump/Dock. If yes, ensure that all network devices have unique IP addresses.
	The network link fails.	Check whether the FTP server can be pinged successfully from a PC or smartphone after the PC or smartphone connects to the AP. If the problem cannot be solved, contact the IT department.
	The service port required by the infusion pump/syringe pump/Dock is disabled on the hospital network.	Check whether the service port required by the infusion pump/syringe pump/Dock is enabled on the hospital network. If no, enable related services (such as some UDP ports and multicast service). If the problem cannot be solved, contact the IT

Symptom	Possible Cause	Recommended Measures
		department.
A single set of infusion pump/syringe pump/Dock is disconnected intermittently.	The infusion pump/syringe pump/Dock moves to the coverage blind spot.	Determine the position of disconnection, and check if the Wi-Fi signal strength is greater than -65 dBm.
	Errors of Infusion Pump/Syringe Pump/Dock	Check whether the infusion pump/syringe pump/Dock is easily disconnected at the same position. If this problem persists after the infusion pump/syringe pump/Dock is restarted, return this infusion pump/syringe pump/Dock to Mindray for repair.
	Static IP addresses conflict.	Check whether an IP address conflict prompt is displayed on the infusion pump/syringe pump/Dock. Check whether the same IP address is assigned to multiple sets of equipment.
Multiple sets of infusion pumps/syringe pumps/Docks are disconnected intermittently.	APs in some areas are damaged.	Ensure that the APs have been turned on and operate properly.
	There is strong interference in some areas.	Use the network survey tool to check if the interference is strong. Remove obvious interference sources or adjust the WLAN deployment to meet the requirements of Mindray.
	Signal coverage is insufficient in some areas.	Use the network survey tool to check the signal coverage. If the signal coverage is insufficient in a certain area, adjust the location of the AP or add APs.
	The AP configuration is improper. The function of frequently kicking Wi-Fi NICs offline and requesting NIC re-authentication is configured.	Change the AP configuration to make an AP kick online Wi-Fi NICs offline once at most on one day.
All infusion pumps/syringe pumps/Docks are disconnected intermittently.	The wired network is not configured properly.	Check the configuration of the wired network. Ensure that the WLAN bandwidth configured on the switch is sufficient, with a 50% surplus.
	There is radio interference.	Use the network survey tool to check if there is any radio interference. Remove obvious interference sources or adjust the WLAN deployment to meet the requirements of Mindray.

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5 Maintenance

5.1 Introduction

To ensure that the Dock always functions properly, qualified service personnel should perform regular inspection, maintenance and test. This chapter provides a checklist of the testing procedures for the Dock with recommended test equipment and inspection schedule. Even if you are only an operator, it is very important to understand the maintenance knowledge in this chapter. The service personnel should perform testing and maintenance for Dock as required and use appropriate test tools.

The procedures are intended to verify that the Dock meets the performance specifications. If a certain module of Dock fails to perform as specified in any test, it must be maintained or replaced in a timely manner. If there is any problem, contact Mindray Customer Service Department.

CAUTION

- **All tests should be performed only by qualified service personnel.**
 - **Before performing the test, the service personnel should ensure the suitability of the test tools and connection cables. The service personnel should be familiar with the use of these test tools.**
 - **If the syringe pump is not maintained on schedule, the product performance and safety may be affected.**
 - **The user should take charge of maintenance. The company only provides maintenance services when there is a service contract.**
-

5.2 Test Equipment and Consumables

See the following sections.

5.3 Test Report

After completing the tests, record the test results in the table described in the last page *Maintenance Test Report* of this section, and deliver the report to our Customer Service Department.

5.4 Preventative Maintenance

5.4.1 Maintenance Cycle

The following tasks can only be performed by the professional maintenance personnel recognized by Mindray. Before test or maintenance, you must clean and disinfect the equipment.

The following maintenance cycle is recommended by the manufacturer. If it conflicts with the hospital management regulations or local regulations, please refer to the hospital regulations or local regulations. It is not recommended to exceed the maintenance cycle recommended by the manufacturer.

Check/Maintenance Item	Recommended Frequency
Daily Inspection	
Appearance of the entire system	<ol style="list-style-type: none"> 1. Daily inspection is recommended 2. When the syringe pump is installed for the first time or after reinstalled/maintained.
Power-on test	<ol style="list-style-type: none"> 1. Daily inspection is recommended 2. When the syringe pump is installed for the first time or every time it is reinstalled. 3. Following any repair or parts replacement of the main unit.
Battery power supply test (Model with battery) (optional)	<ol style="list-style-type: none"> 1. At least every two months. 2. When the syringe pump is installed for the first time or every time the battery is replaced. 3. After the infusion pump is repaired or when the battery is suspected to be the source of failure
Cleaning and Disinfection	<ol style="list-style-type: none"> 1. After the patient is replaced. 2. Before storage 3. Follow the infection regulations of the hospital
Regular Maintenance	
Functionality test	<ol style="list-style-type: none"> 1. Once every two years. 2. Following any repair or parts replacement of the main unit.
Electrical safety test	<ol style="list-style-type: none"> 1. Once every two years. 2. Every time the power module is maintained.

5.5 Daily Inspection

Before daily inspection, please refer to the operation manual to complete cleaning and disinfection.

5.5.1 Appearance of the Entire system

Inspect the Dock thoroughly for obvious damage. The test is passed if the Dock has no obvious damage.

Test Tools: None

The specific test contents are as follows:

- Carefully inspect the Dock enclosure, LCD, buttons and knob for physical damage.
- Inspect the power cord, PCA controller and fastening clamp for physical damage.
- Whether the external connection cables such as the power cord and the PCA controller are plugged in tightly.
- Whether the data interface and USB interface protection cap are physically damaged.
- Whether the safety label and nameplate are clearly legible.

5.5.2 Power-on Test

The power-on test is used to confirm whether the Dock can be started normally. If the Dock can be started according to the following steps, the power-on test passes.

Test Tools: None

Follow the procedure below to mark the AP position:

1. Connect the Dock to the AC mains. The AC mains LED and battery LED (Model with optional battery)light up; Dock is powered on automatically.
2. The speaker gives one "Di" sound.

3. During the power-on process, you can see the red and yellow alarm lamps flashing in sequence.
4. The icons such as network connection and the Volume are displayed in the LCD.
5. The fan in the module rack turns suddenly.
6. During the above operation, there is no alarm.

5.5.3 Battery Power Supply Test

Select the model with battery to ensure normal battery power supply.

Test Tools: None

Follow the procedure below to mark the AP position:

1. The Dock works properly when running on AC power.
2. Remove the AC power cord , and verify that the Dock still works properly, which indicates **Battery in Use**.
3. After confirming that it is normal, reinstall the power cord.

5.6 Regular Maintenance

Before regular maintenance, please complete daily maintenance and cleaning & disinfection.

5.6.1 Functionality Test

Test equipment and consumables: None.

No.	Test Item	Test Step	Acceptance Criteria
1	Inspection of System Date and Time	View system date and time	The system date and time are consistent with the local real-time ones
2	Button Inspection	Press various buttons	Each button can rebound normally, and the machine can give corresponding response
3	Indicator check	Connect the AC power Check the controller battery indicator and AC indicator	If the model with optional battery is selected, the battery indicator is always on. If the model without battery is not selected, the battery indicator is off. The AC indicator is always on.
4	Unlocking structure	Insert a pump to each slot	The pump can be inserted and unlocked normally
5	LCD check (optional)	Check the display area of the LCD	The LCD icon is normal, and the screen is not white, black or garbled
6	Test connected with the pump	Insert a pump to each slot	The pump can recognize that it is inserted into the Dock, there is no alarm, and the pump AC and DC indicators are always on
7	LAN communication test	Connect to the Central Monitoring System (CMS) via the LAN	The connection is successful
8	Wi-Fi Module Detection (Optional)	Connect the machine to a WIFI hotspot	The connection is successful

5.6.2 Electrical Safety Test

Please refer to Appendix A Electrical safety test.

5.7 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			
Software Version			
Test equipment	Model/No.	Effective date of calibration	
Maintenance Test Content			
No.	Maintenance Test Item	Acceptance Criteria of Maintenance Test	Test Conclusion
Appearance of the entire system			
1	Cleaning and Disinfection	/	<input type="checkbox"/> Completed <input type="checkbox"/> Not involved
2	Appearance of the main unit	1. The parts of the machine are complete, without physical damage 2. There is no abnormal noise when the machine is shaken	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
3	Power Interface and Power Cord	1. The interface has no rust, no foreign matter, and no trace of ablation 3. The power cord is not damaged, and the interface can be tightly connected with the pump	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
4	Fastening clamp	1. The fastening clamp is complete, without cracks 2. The machine can be independently fixed on the infusion stand	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
5	Data Interfaces (External multi-functional connector, USB interface, network port, expansion	1. The interfaces are complete, without physical damage 2. There is no drug residue on the interfaces 3. The protection cap of USB interface is not lost	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:

	Dock interface)		
6	Identification of Machine	The label and nameplate are clear and free of damage	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
Power-on test			
1	Power LED	When the pump is connected to AC power, the AC power indicator and battery indicator are always on	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
2	Sound Prompt	During the startup process, you can hear the "Di" sound from the speaker	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
3	Yellow and Red Alarm Lamps	During the power-on process, you can see the red and yellow alarm lamps flashing in sequence	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
4	Others	During the power-on test operation, there is no alarm	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
Battery power supply test			
1	AC Power	The Dock works properly when running on AC power	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
2	The battery supplies power (Optional)	Remove the AC power cord and verify that the Dock still works properly	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
Functionality test			
1	System Date and Time	The system date and time are consistent with the local real-time ones	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
2	Button Inspection	Each button can rebound normally, and the machine can give corresponding response	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
3	Indicator check	If the model with optional battery is selected, the battery indicator is always on. If the model without battery is not selected, the battery indicator is off. The AC indicator is always on.	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
4	Unlocking structure	The pump can be inserted and unlocked normally	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
5	LCD check	The LCD icon is normal, and the screen is not white, black or garbled	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
6	Test connected with the pump	The pump can recognize that it is inserted into the Dock, there is no alarm, and the pump AC and DC indicators are always on	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
7	LAN communication test	Connection to the Central Monitoring System is successful	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
8	Wi-Fi Module Detection (Optional)	The machine is connected to a WIFI hotspot successfully	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:
Electrical safety test			
1	Ground resistance	$\leq 0.2 \Omega$	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks: Ground resistance Ω
2	Earth Leakage Test	Normal condition $\leq 347 \mu A$ Model reverse of normal condition $\leq 347 \mu A$	<input type="checkbox"/> Passed <input type="checkbox"/> Failed <input type="checkbox"/> Not involved Remarks:

		<p>Single fault zero line disconnection $\leq 694 \mu\text{A}$</p> <p>Model reverse of single fault zero line disconnection $\leq 694 \mu\text{A}$</p>	<p>Normal condition μA</p> <p>Model reverse of normal condition μA</p> <p>Single fault zero line disconnection μA</p> <p>Model reverse of single fault zero line disconnection μA</p>
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6 Repair and Disassembly

NOTE

- **Wear ESD bracelets when maintaining and disassembling the equipment.**
 - **This manual only shows the disassembly method and sequence, and the operations can be reversed during assembly.**
 - **When assembling, please pay attention to keeping the direction of the wiring, the routing path and the fixed position of the wire the same as before disassembly.**
 - **Please pay attention to keeping the sealing ring, sponge pad, etc. during assembly the same as before disassembly.**
-

6.1 Tools Preparation

During part disassembly and replacement, the following tools may be used:

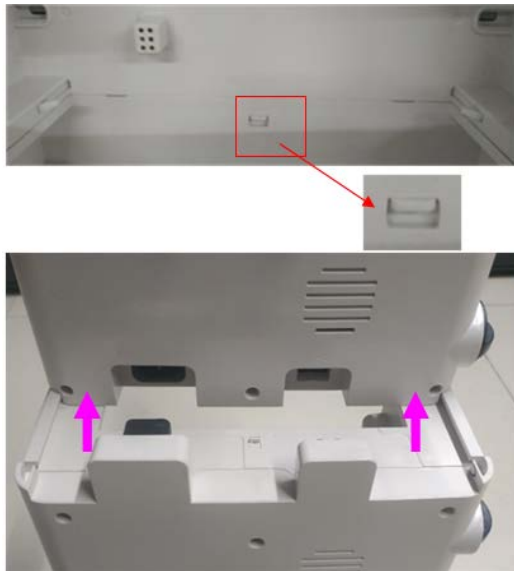
- Phillips screwdriver (Size 102)
- Phillips screwdriver (Size 107)
- Slotted screwdriver (size 107)
- ESD bracelet
- Tweezers

6.2 Disassembly Procedure of Four-Slot Rack (RACK-2, RACK-3, RACK-4)

Upgrade Package

6.2.1 Remove the four-slot module rack (RACK-2, RACK-3, RACK-4) upgrade kit, fan assembly (FRU), rear shell assembly of the module rack (four-slot expansion) (FRU) and clamp cover assembly FRU

1. If there are other four-slot module racks under the two-slot main unit or the four-slot main unit, the four-slot module rack (RACK-2) upgrade kit, the four-slot module rack (RACK-3) upgrade kit, and the four-slot module rack (RACK-4) upgrade kit ordered from the main unit down. Press the spring lock on the front at the connection part of the module rack by hand, and press it to the end. Then push the module rack so that its two sides slowly slide out of the rails, and the four-slot module rack upgrade kit can be removed.



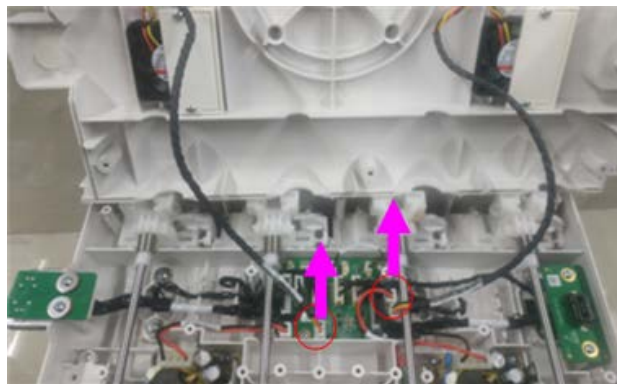
2. Use tweezers to remove the nine screw plugs on the back of the module rack, and use a small-head Phillips screwdriver to unscrew the nine M3 × 8 mm self-tapping screws; then use a large-head screwdriver to unscrew the four M4 × 12 combination screws in the middle, gently remove the rear shell of the module rack, and place it under the front shell side.



3. Use a Phillips screwdriver to unscrew the seven M3 × 8 mm self-tapping screws on the internal sheet metal.



4. Unplug the two fans from the PCBA board, that is, remove the rear shell assembly of the module rack (four-slot expansion).



5. Use a small-head Phillips screwdriver to unscrew the four M3 × 8 mm self-tapping screws on the rear shell of the module rack and remove the fan assembly (FRU). The remaining parts are the rear shell assembly of the module rack (Four-slot expansion) (FRU).

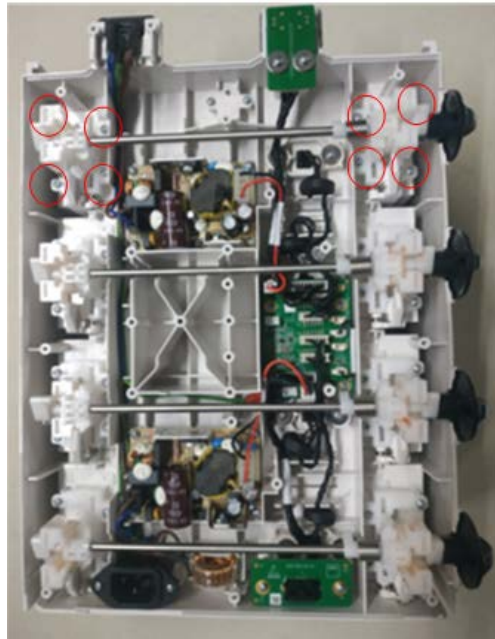


6. Use a small-head Phillips screwdriver to unscrew one M3 × 8 mm self-tapping screw on the rear shell of the module rack, and remove the clamp cover assembly (FRU).



6.2.2 Removing the Unlocking Mechanism Assembly (FRU)

Use a small-head Phillips screwdriver to unscrew a total of eight M3 × 8 mm self-tapping screws on both sides of the set of unlocking mechanisms on the front shell of the module rack, and remove the unlocking mechanism assembly FRU. Then remove the other 3 sets of unlocking mechanism assemblies FRU using this method.



6.2.3 Removing the Upper Fixing Board Assembly (FRU), Lower Fixing Board Assembly (FRU) and the Backplate PCBA Assembly (FRU) of the Expansion Module Rack

1. Use a small-head Phillips screwdriver to unscrew the two M3 × 8 mm self-tapping screws on the PCBA board at the uppermost part of the front shell of the module rack, and remove the corresponding wires from the intermediate adapter board. Then remove the upper fixing board assembly (FRU).



2. Use a small-head Phillips screwdriver to unscrew the two M3 × 8 mm self-tapping screws on the lowermost PCBA board of the front shell of the module rack, and unplug the corresponding wires from the adapter board in the middle. Then remove the lower fixing board assembly (FRU).

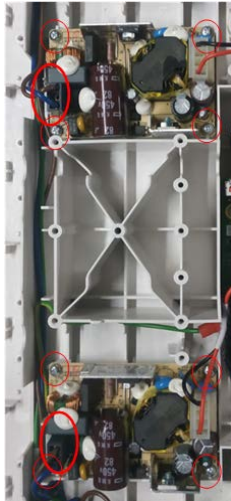


3. Unplug all the wires of the adapter board on the right side of the middle of the front shell of the module rack, and use a small-head Phillips screwdriver to unscrew the four M3 × 8 mm self-tapping screws on the top. Then remove the PCBA (FRU) of the backplate of the expansion module rack.

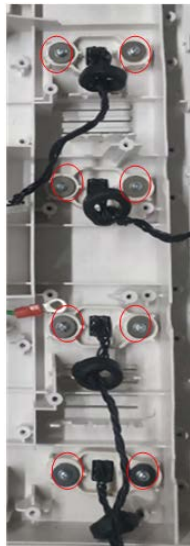


6.2.4 Removing the Power Module Assembly (FRU), and Multi-Functional Connector Assembly (FRU)

1. Unplug the wires on the left side of the two power modules on the front shell of the module rack, and at the same time unplug the wires at the output end of the power module from the PCBA of the backplate. Use a small cross screwdriver to unscrew the four M3 × 8 mm tapping screws on each power module. Remove the power module assembly (FRU).

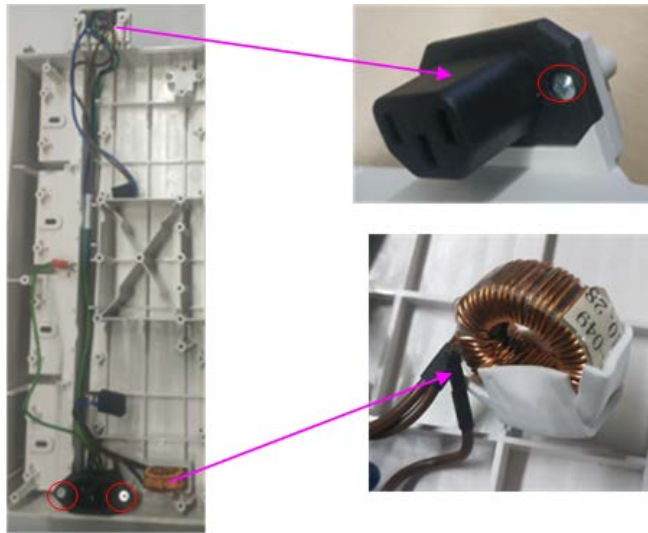


2. Use a small-head Phillips screwdriver to unscrew two M3 × 8 mm self-tapping screw at both sides of the multifunctional connector on the front shell of the module rack, and remove the multifunctional connector assembly (FRU). Remove the other three multifunctional connector assemblies (FRU) in the same way.



6.2.5 Removing the Power Cord Assembly (Four-Slot Expansion) (FRU) and Front Shell Assembly of the Module Rack (Expansion) (FRU)

1. Use a small-head Phillips screwdriver to unscrew a total of four M3 × 10 mm self-tapping screws on both ends of the power cord on the front shell of the module rack, and remove the magnetic ring from the slot. Then remove the power cord assembly (four-slot expansion) (FRU).



2. The remaining parts are the front shell assembly (expansion) (FRU) of the module rack.

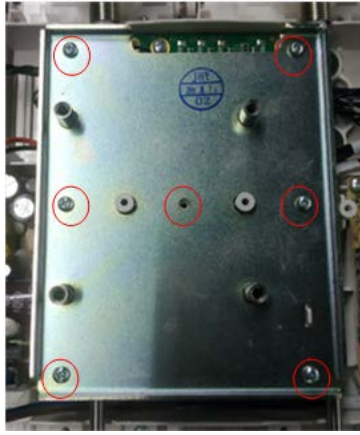
6.3 Disassembling the 4-Slot Main Unit

6.3.1 Removing the Rear Shell Assembly of the Module Rack (Four-Slot Non Expansion) (FRU), Fan Assembly (FRU) and Clamp Cover Assembly (FRU)

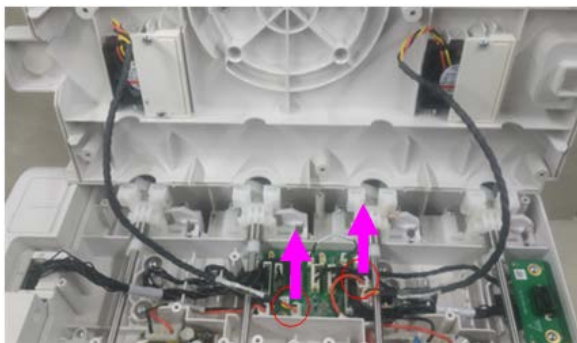
1. Use tweezers to remove the nine screw plugs on the back of the module rack, and use a small-head Phillips screwdriver to unscrew the nine M3 × 8 mm self-tapping screws; then use a large-head screwdriver to unscrew the four M4 × 12 combination screws in the middle, gently remove the rear shell of the module rack, and place it under the front shell side.



2. Use a Phillips screwdriver to unscrew the seven M3 × 8 mm self-tapping screws on the internal sheet metal.



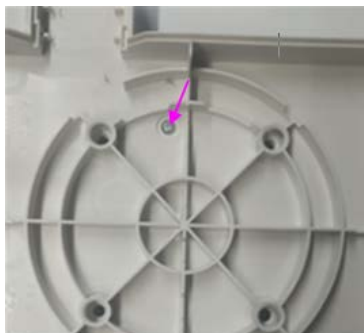
3. Unplug the two fans from the PCBA board, that is, remove the rear shell assembly of the module rack (four-slot expansion).



4. Use a small-head Phillips screwdriver to unscrew the four M3 × 8 mm self-tapping screws on the rear shell of the module rack and remove the fan assembly (FRU). The remaining parts are the rear shell assembly of the module rack (Four-slot non expansion) (FRU).

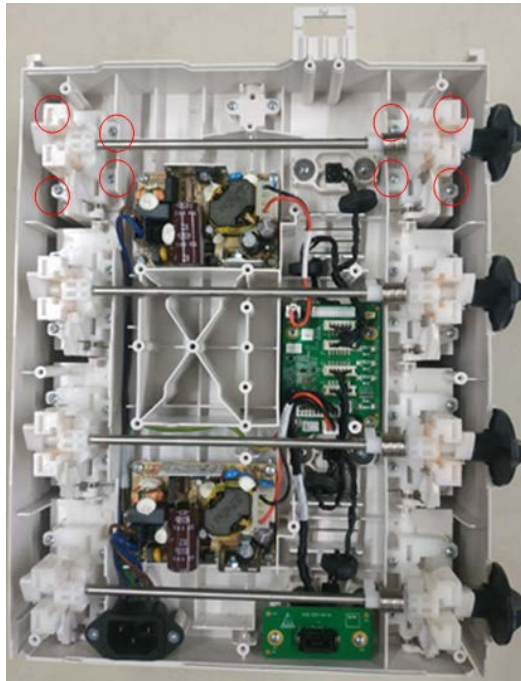


5. Use a small-head Phillips screwdriver to unscrew one M3 × 8 mm self-tapping screw on the rear shell of the module rack, and remove the clamp cover assembly (FRU).



6.3.2 Removing the Unlocking Mechanism Assembly (FRU)

Use a small-head Phillips screwdriver to unscrew a total of eight M3 × 8 mm self-tapping screws on both sides of the set of unlocking mechanisms on the front shell of the module rack, and remove the unlocking mechanism assembly FRU. Then remove the other 3 sets of unlocking mechanism assemblies FRU using the same method.



6.3.3 Removing the Fixing Board Assembly (FRU) and the PCBA Assembly of the Backplate of the Standard Module Rack (FRU)

1. Use a small-head Phillips screwdriver to unscrew the two M3 × 8 mm self-tapping screws on the lowermost PCBA board of the front shell of the module rack, and unplug the corresponding wires from the adapter board in the middle. Then remove the lower fixing board assembly (FRU).



2. Unplug all the wires of the adapter board on the right side of the middle of the front shell of the module rack, and use a small-head Phillips screwdriver to unscrew the four M3 × 8 mm self-tapping screws on the top. Then remove the PCBA assembly of (FRU) of the backplate of the standard module rack.



6.3.4 Removing the Power Module Assembly (FRU), and Multi-Functional Connector Assembly (FRU)

1. Unplug the wires on the left side of the two power modules on the front shell of the module rack, and at the same time unplug the wires at the output end of the power module from the PCBA of the backplate. Use a small cross screwdriver to unscrew the four M3 × 8 mm tapping screws on each power module. Remove the power module assembly (FRU).



2. Use a small-head Phillips screwdriver to unscrew two M3 × 8 mm self-tapping screw at both sides of the multifunctional connector on the front shell of the module rack, and remove the multifunctional connector assembly (FRU). Remove the other three multifunctional connector assemblies (FRU) in the same way.



6.3.5 Removing the Power Cord Assembly (Four-Slot Non-Expansion) (FRU), Control Box and Front Shell Assembly of the Module Rack (Non-Expansion) (FRU)

1. Use a small-head Phillips screwdriver to unscrew a total of two M3 × 10mm self-tapping screws on both ends of the power cord on the front shell of the module rack. Then remove the power cord assembly (four-slot non expansion) (FRU).



2. Follow the above steps, unplug the wires connected to the back of the control box from the backplate of the module rack (if connected), and then dial the spring lock on the front at the connection part of the module rack by hand to the end. Then push the control box so that both sides slowly slide out of the rails and remove the control box.



3. The remaining parts are the front shell assembly (non-expansion) (FRU) of the module rack.

6.4 Disassembling the Control Box

6.4.1 Removing the Handle Assembly (FRU)

Use a blade or tweezers to gently lift the side of the veneer from one side, and then gently tear off the veneer slowly. The screws at the bottom of the control box are exposed. Then use a large-head Phillips screwdriver to unscrew the four M4 × 20 mm screws, remove the sheet metal, etc., and remove the handle assembly (FRU) from the top shell of the control box.



7 Part

7.1 Main Unit

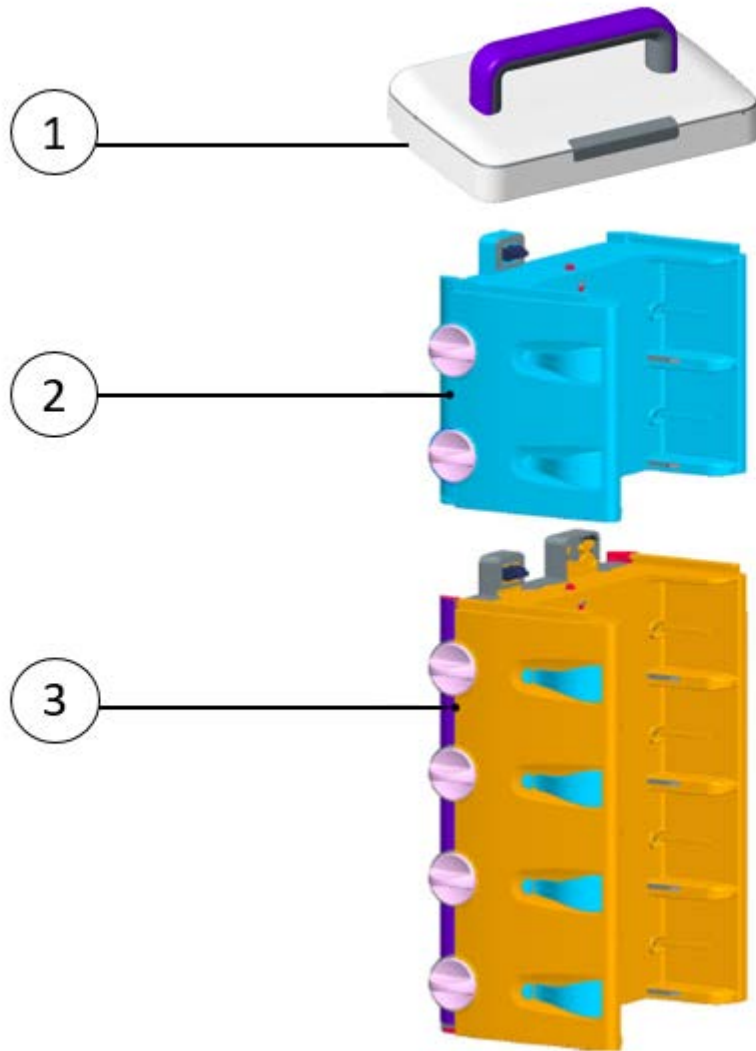


Table 1 Materials List of Main Unit

No.	Material Code	Material Description	Remarks
1	115-072729-00	Control box	1
2	115-072773-00	2-Slot module rack	1
3	115-072757-00	4-Slot module rack	1

7.2 Control Box Main Unit

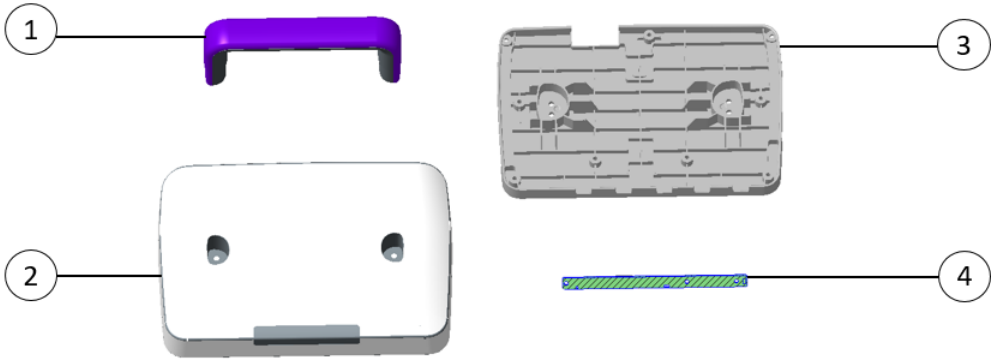


Table 2 Materials List of the Controller Main Unit

No.	Material Code	Material Description	Qty
1	115-075200-00	Handle assembly (FRU)	1
2	115-075196-00	Top shell assembly of the mid-range control box (eDS) (FRU)	1
	115-075197-00	Top shell assembly of the mid-range control box (eDS ex) (FRU)	1
3	115-075199-00	Bottom shell assembly of the mid-range control box (FRU)	1
4	115-075195-00	Alarm lamp assembly of mid-range DOCK (FRU)	1

7.3 Module Rack Assembly

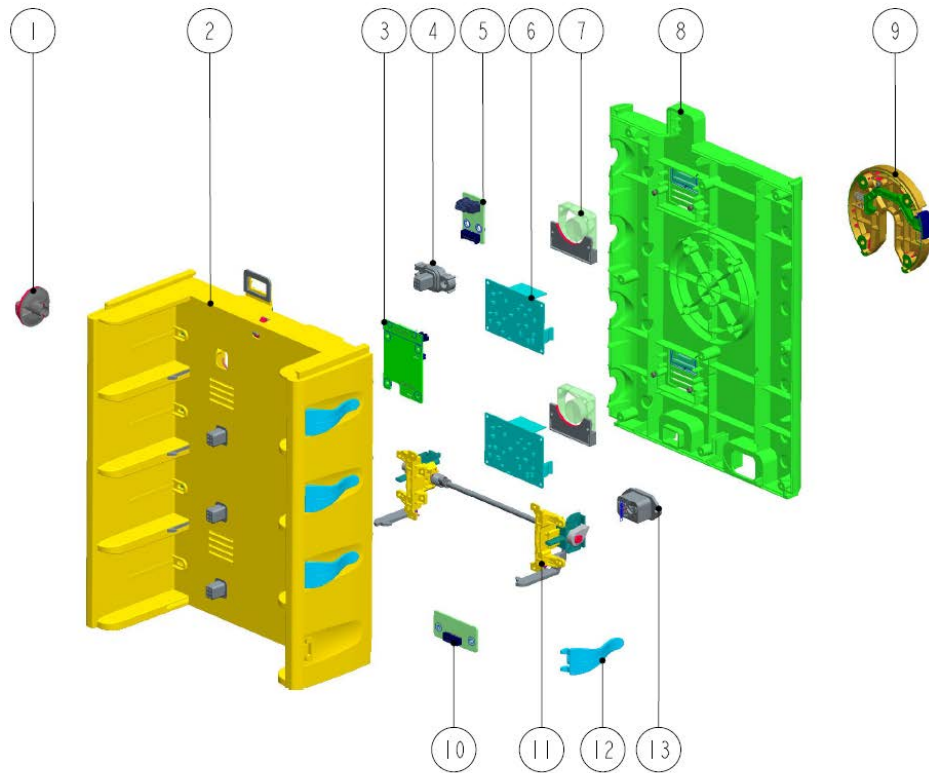


Table 3 Material List of Module Rack Assembly

No.	Material Code	Material Description	Qty
1	043-011669-00	DOCK unlocking knob	4
2	115-069089-00	Front shell assembly of the module rack (Expansion) (FRU)	1
	115-075215-00	Front shell assembly of the four-slot module rack (Non expansion) (FRU)	1
3	051-003959-01	Backplate PCBA of mid-range module rack	1
4	115-069091-00	Multifunctional connector board assembly (FRU)	4
5	115-075216-00	Upper fixing board assembly (FRU)	1
6	115-069096-00	Power module assembly (FRU)	1
7	115-069104-00	Fan assembly (FRU)	2
8	115-069098-00	Rear shell assembly of the module rack (Four-slot expansion) (FRU)	1
	115-069099-00	Rear shell assembly of the module rack (Four-slot non expansion) (FRU)	1
9	115-069100-00	Clamp cover assembly (FRU)	1
10	115-075218-00	Lower fixing board assembly (FRU)	1
11	115-069097-00	Unlocking mechanism assembly (FRU)	4
12	043-011954-00	DOCK infusion set hook	4
13	115-070313-00	Power cord assembly (FRU)	1

7.4 Others

Table 4 Other Materials List

No.	Material Code	Material Description	Qty
1	009-011169-00	Connection cable from the mid-range DOCK fixing board to backplate	1
2	009-009684-00	DC output cable of the power module (shared by 4-/2-slot)	1
3	009-009681-00	Serial selection cable of the module rack	1
4	009-009685-00	Connection cable from the AC socket to the power module (2-slot module rack)	1
5	043-012240-00	DOCK rear shell waterproof parts	2
6	115-075202-00	Dock support sheet metal components	1
7	115-070312-00	Front shell assembly of the module rack (Two-slot non expansion) (FRU)	/
8	115-070314-00	Rear shell assembly of the module rack (Two-slot non expansion) (FRU)	/
9	115-069741-00	DOCK repair accessories package	/

8 Troubleshooting

8.1 Overview

In this chapter, device problems are listed along with possible causes and recommended corrective actions. Refer to the tables to check the device and identify and eliminate these problems.

The recommended solutions given in this chapter address most of the equipment problems you encounter, but do not include any problems that may arise. Contact us if you have a problem that is not covered in this section.

8.2 Part Replacement

Printed circuit boards (PCBs) and other major parts and components in the device are replaceable. After a faulty PCB is located, follow the instructions in **6 Repair and Disassembly** to replace the PCB. Then, check whether the fault is eliminated or whether the device passes related tests. If the failure is eliminated, it indicates that the original PCB is damaged. In this case, send the defective PCB to us for repair. If the fault persists, reinstall the PCB and continue troubleshooting as directed in this chapter.

8.3 Check Before Dock 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 Dock 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 of the first rack or main control board of the controller may be damaged. If Dock is equipped with a battery optionally, see if it can be turned on with the battery. If it cannot be turned on, the battery has been overdischarged or the main control board of the controller is damaged. If the syringe pump 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 there is any damage, stop using the monitor immediately.

8.4 Software Version Check

Some troubleshooting tasks may involve software version compatibility. For information about the configuration and software version of Dock, contact Mindray After-sales Service. To check the software version, do as follows:

1. Turn on the Dock, and insert a pump.
2. Operate the pump as follows: Select **Menu** → **Dock Setup** → enter the user maintenance password → **Version Information**. In the displayed menu, you can check the version information of the system software.

8.5 Troubleshooting Guide

When the Dock fails, it will manifest itself in various ways.

After the alarm occurs, confirm the running status of the Dock according to the alarm prompt or refer to the Alarm chapter of the operation manual and deal with it as soon as possible. If the alarm cannot be processed or the fault that

needs repair is confirmed, you can follow this troubleshooting guide.

This device will save some key operations as historical records during use. In the **Dock Setup** → **History Record** menu of the subordinate pump, you can view alarm and operational information. This information may help you to locate and restore the fault.

This device supports exporting history record files via USB drive, which can be easily viewed via PC. The methods are as follows:

1. Insert the USB drive into the USB port of the device.
2. Use your finger to swipe down from the top of the screen in the subordinate pump → select **Menu** → select **Dock Setup** → enter the user maintenance password.
3. Select Export History Record.

There are two main types of device failures:

1. **Intuitive performance class** -- Such failures are subdivided according to the specific performance of the faulty machine (e.g.: unable to turn on, blurred screen, unable to communicate with the pump, etc.)
2. **Technical alarm class**-- The system will display the fault ID code (The fault code will be displayed on the screen Dock screen, and the Dock history can be viewed through the subordinate pump without the screen Dock).

8.5.1 Intuitive Performance Class

8.5.1.1 Power Supply Failures

Fault Symptom	Possible Cause	Troubleshooting
Without external power supply, there is no response at startup (Model with battery) (optional)	The battery is overdischarged.	Plug in AC to charge the battery.
	The battery cable is loose.	Check if the battery cable is loose, if it is, reinsert it.
	The battery is damaged.	Replace a new battery.
	The main board is faulty.	Replace the main board.
With external power supply, there is no response at startup	The module racks are not well aligned.	Re-align the module racks.
	Check the connection cables.	Check whether the cables inside the module rack and the cables from the module rack to the main control board are loose, and if so, reinsert them.
	The backplate in the first module rack is damaged.	Replace the module rack backplate.
	The power module in the first module rack is damaged.	Replace the power module.
	The main board is faulty.	Replace the main board.
The battery cannot be charged	The battery is damaged.	Replace a new battery.
	The power module is damaged.	Replace the power module.
	The main board is faulty.	Replace the main board.

8.5.1.2 Display Failures

Fault Symptom	Possible Cause	Troubleshooting
The power supply is normal, the LCD is black	The wires between the LCD and the adapter board are loose.	Check the wires of the LCD and the adapter board, re-plug and see if the device can be

or white; during normal operation, the LCD is black or white		recovered.
	The adapter board is faulty.	Replace the adapter board.
	The LCD assembly is damaged.	Replace the LCD assembly.
	The main board is faulty.	Replace the main board.
There are errors in the displayed texts or pictures	The software package is damaged.	Reburn the software.

8.5.1.3 Overall Unit Failures

Fault Symptom	Possible Cause	Troubleshooting
Unable to unlock/unable to rotate the knob	The unlocking structure is damaged.	Replace the unlocking structure in the faulty slot.
The pump cannot be inserted into the slot	The unlocking structure is damaged.	Replace the unlocking structure in the faulty slot.
No response when the pump is inserted into the Dock	The cable from the multifunctional connector to the backplate is loose.	Check whether the connection cable from the multifunctional connector to the backplate is loose, if so, then plug it in again.
	The multifunctional connector is damaged.	Replace the multifunctional connector in the faulty slot.
	The backplate of the module rack is damaged.	Replace the module rack backplate.
The fan does not turn	Fan failure	Replace the fan.
	The wire from the fan to the backplate is loose.	Check whether the connection cable from the fan to the backplate is loose, if so, then plug it in again.
	The backplate of the module rack is damaged.	Replace the module rack backplate.
The button is invalid	Button board damage.	Replace the button board.
	The connection cable from the button board to the main control board is loose.	Check whether the connection cable from the button board to the main control board is loose, if so, then plug it in again.
	The adapter board is faulty.	Replace the connector board.
	The main board is faulty.	Replace the main control board.
Unable to upgrade/export data with USB drive	Software failure.	Try to upgrade Dock to the latest software version with a LAN.
	The main board is faulty.	Replace the main board.
Unable to upgrade with a LAN	Software failure.	Try to upgrade Dock to the latest software version with a USB drive.
	The main board is faulty.	Replace the main board.
Unable to connect the WLAN	Too far from AP, and too weak WIFI signal.	Try to move the Dock to a location with strong WIFI signal and reconnect to the hotspot, and observe whether it can be connected normally.
	The wire between the WIFI carrier board with the backplate is loose or damaged.	Check whether the wire from the WIFI board to the main control board is loose, if so, then plug it in again.
	WIFI antenna damage.	Replace the WIFI antenna.

	Failure in WiFi carrier board.	Replace the WiFi carrier board.
	The main board is faulty.	Replace the main board.
Unable to connect the LAN	Network cable damage.	Replace the network cable.
	Dirty LAN interface.	Clean the LAN interface of the Dock.
	The main board is faulty.	Replace the main board.
Unable to recognize the expansion module rack	For details, please refer to the flowchart of unrecognizable expansion module rack related faults.	
Unable to connect the expansion Dock	The expansion Dock communication cable is not connected or damaged.	Re-connect the expansion Dock communication cable, and observe if the function is recovered.
	The expansion Dock communication interface is dirty.	Clean the expansion Dock communication interface.
	The main board is faulty.	Replace the main board.
Unable to recognize the PCA controller	The external multi-functional connector of the main control board is dirty.	Clean the external multi-functional connector of the main control board.
	The PCA controller is damaged.	Replace the nurse call cable.
	The main board is faulty.	Replace the main board.

8.5.1.4 Alarm Prompt Failures

Fault Symptom	Possible Cause	Troubleshooting
The speaker sound is invalid or hoarse	The speaker cable is loose or is not inserted.	Check if the speaker cable is loose, if it is, reinsert it.
	The speaker gets water in or damaged.	Replace the speaker.
	The main board is faulty.	Replace the main board.
Red/yellow alarm lamp failure	The wires are loose.	Check the wires from the alarm lamp to the adapter board and from the adapter board to the main control board, re-plug the wires and see if the device can be recovered.
	Alarm lamp failure.	Replace the alarm lamp.
	The adapter board is faulty.	Replace the adapter board.
	The main board is faulty.	Replace the main board.
LED is off	The wires are loose.	Check the wires from the button board to the adapter board and from the adapter board to the main control board, re-plug the wires and see if the device can be recovered.
	Button board damage.	Replace the button board.
	The adapter board is faulty.	Replace the adapter board.
	The main board is faulty.	Replace the main board.

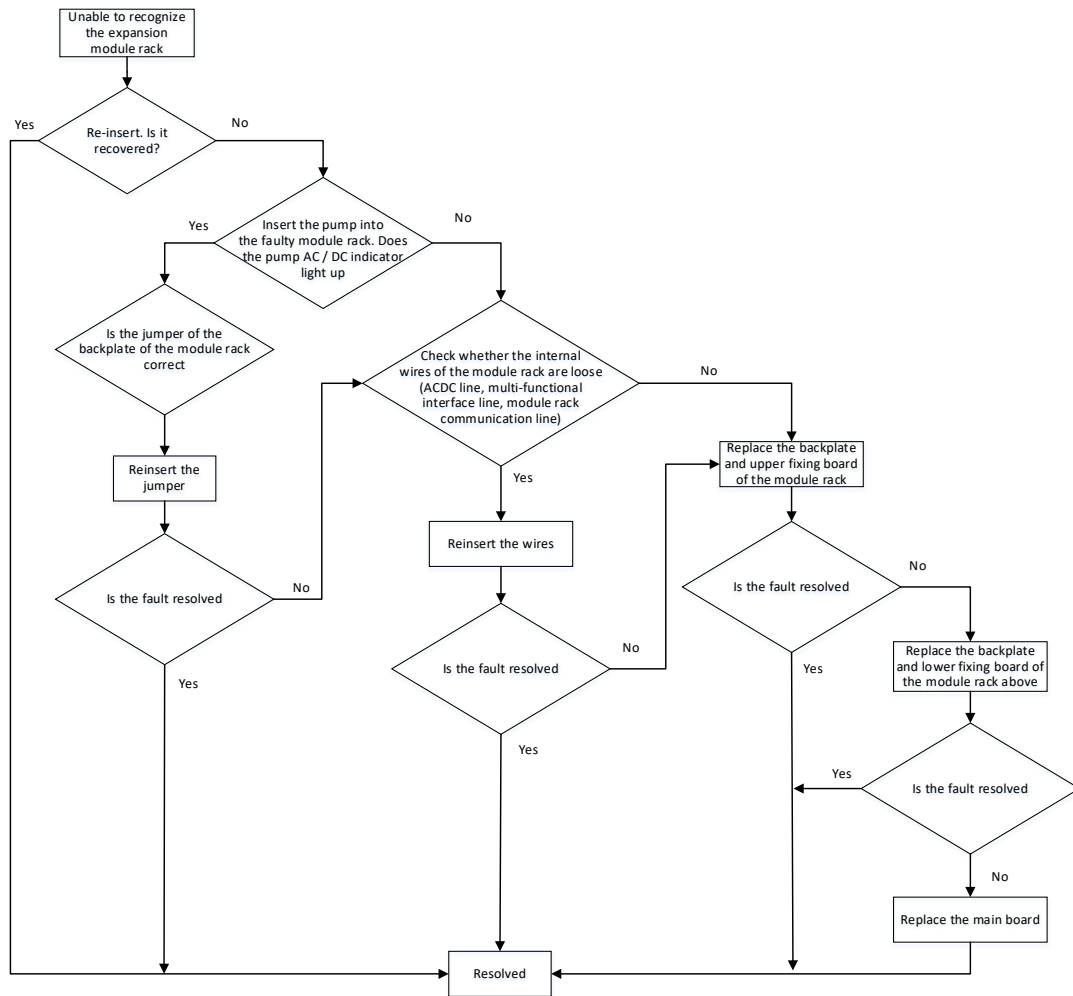
8.5.2 Technical Alarm Class

The system can monitor and report some faults and abnormal alarm by itself. Maintenance personnel can find the corresponding alarm description in the table below based on the alarm number to help locate the fault.

Fault Code	Cause	Troubleshooting
ID701	Battery Failure.	Replace the battery.
ID702	Battery temperature over high.	Turn off the device, turn on the device after the temperature of the device is reduced to normal

		temperature, and observe whether the device continues to alarm.
	Battery Failure.	Replace the battery.
ID705	Battery Failure.	Replace the battery.
	The main board is faulty.	Replace the main board.
ID707	Battery Failure.	Replace the battery.
	The main board is faulty.	Replace the main board.
ID709	The main board is faulty.	Replace the main board.
ID714		
ID717		
ID719		
ID720		
ID718	The main board is faulty.	Replace the main board.
	The backplate of the first module rack is faulty.	Replace the module rack backplate.
ID712	Module rack interconnection problem.	Check whether the module rack is directly docked, and try to dock the module rack again.
	The lower fixing board of the module rack above the faulty module rack is damaged.	Replace the lower fixing board.
	The upper fixing board of the faulty module rack is damaged.	Replace the upper fixing board.
	The module rack backplate of the faulty module rack is damaged.	Replace the module rack backplate.
ID716	The wire of the ACDC power module of the faulty module rack is loose.	Check the wire of the ACDC power module, re-plug and see if the device can be recovered.
	The ACDC power module of the faulty module rack is damaged.	Replace the ACDC power module.
	The module rack backplate of the faulty module rack is damaged.	Replace the module rack backplate.
ID721	The main board is faulty.	Replace the main board.
	The LCD screen is damaged.	Replace the LCD.
ID722	The wire of the loudspeaker is loose.	Check the wire of the speaker module, re-plug and see if the device can be recovered.
	The loudspeaker is damaged.	Replace the speaker.
	The main board is faulty.	Replace the main board.

8.5.2.1 For details, please refer to the flowchart of unrecognizable expansion module rack related faults



8.6 Fault Repair Test

In the process of troubleshooting and repair, it may involve the disassembly&installation and replacement of related parts. To ensure the performance of the device, after the repair is completed, it is necessary to perform the related tests to ensure that the fault has been repaired.

The following table summarizes the tests required after disassembly & installation, and replacement of related spare parts. For the specific test content and steps, please refer to the maintenance section.

No.	Material Code	Description	Test	Remarks
1	115-069075-00	Top shell assembly of the control box (nDS ex with LCD) (FRU)	Power-on test	/
2	115-069076-00	Top shell assembly of the control box (nDS with LCD) (FRU)	Power-on test	/
3	115-069077-00	Top shell assembly of the control box (nDS ex without LCD) (FRU)	Power-on test	/
4	115-069078-00	Top shell assembly of the control box (nDS without LCD) (FRU)	Power-on test	/
5	115-069079-00	Button assembly (FRU)	Power-on test	/
6	115-070182-00	LCD assembly (nDS with LCD) upgrade	Functionality	/

		package	test	
7	115-070183-00	LCD assembly (nDS ex with LCD) upgrade package	Functionality test	/
8	115-069082-00	Adapter board assembly (without LCD) (FRU)	Power-on test	/
9	115-069084-00	Bottom shell assembly of the control box (FRU)	Power-on test	/
10	115-069085-00	Dock Lithium battery 7.2V 2500 mAh (Shipped separately)	Battery power supply test	/
11	115-069086-00	Speaker assembly (FRU)	Power-on test	/
12	115-069087-00	Wifi Assembly (FRU)	Functionality test	/
13	115-069088-00	Handle assembly (FRU)	Power-on test	/
14	115-069089-00	Front shell assembly of the module rack (Expansion) (FRU)	Functionality test	Disassembly will involve the unlocking mechanism and the backplate of the module rack, please perform the relevant tests
15	115-069090-00	Front shell assembly of the module rack (Non expansion) (FRU)	Functionality test	Disassembly will involve the unlocking mechanism and the backplate of the module rack, please perform the relevant tests
16	115-069091-00	Multifunctional connector board assembly (FRU)	Functionality test	/
17	115-069092-00	Upper fixing board assembly (FRU)	Functionality test	/
18	115-069093-00	Lower fixing board assembly (FRU)	Functionality test	/
19	115-069094-00	Power cord assembly (Four-slot expansion) (FRU)	Functionality test	/
20	115-069095-00	Power cord assembly (Four-slot non-expansion) (FRU)	Functionality test	/
21	115-069096-00	Power module assembly (FRU)	Functionality test	/
22	115-069097-00	Unlocking mechanism assembly (FRU)	Functionality test	/

23	115-069098-00	Rear shell assembly of the module rack (Four-slot expansion) (FRU)	Power-on test	/
24	115-069099-00	Rear shell assembly of the module rack (Four-slot non expansion) (FRU)	Power-on test	/
25	115-069100-00	Clamp cover assembly (FRU)	/	/
26	115-069101-00	Main control board assembly (FRU)	Power-on detection + functionality test	/
27	115-069102-00	PCBA assembly of the backplate of the expansion module rack (FRU)	Functionality test	/
28	115-069103-00	PCBA assembly of the backplate of the standard module rack (FRU)	Functionality test	/
29	115-069104-00	Fan assembly (FRU)	Power-on test	/
30	115-070312-00	Front shell assembly of the module rack (Two-slot non expansion) (FRU)	Power-on test	/
31	115-070314-00	Rear shell assembly of the module rack (Two-slot non expansion) (FRU)	Power-on test	/
32	115-070313-00	Power cord assembly (Two-slot non-expansion) (FRU)	Functionality test	/
33	043-012240-00	Dock rear shell waterproof parts	/	/
34	043-011669-00	Dock unlocking knob	/	/
35	043-011954-00	Dock infusion set hook	/	/
36	009-009893-00	Connection cable from the main control board to the WiFi carrier board	Functionality test	/
37	049-001908-00	Dock Open button (silk screen)	/	/
38	009-009679-00	Connection cable from the display signal transfer board to button board	Power-on test	/
39	009-009680-00	Connection cable from the backplate of the module rack to the strip fixing board (4-slot)	Power-on test	/
40	009-009684-00	DC output cable of the power module (shared by 4-/2-slot)	Functionality test	/
41	009-009681-00	Serial selection cable of the module rack	Power-on test	/
42	009-009892-00	Connection cable from the backplate of the module rack to the main control board	Functionality test	/

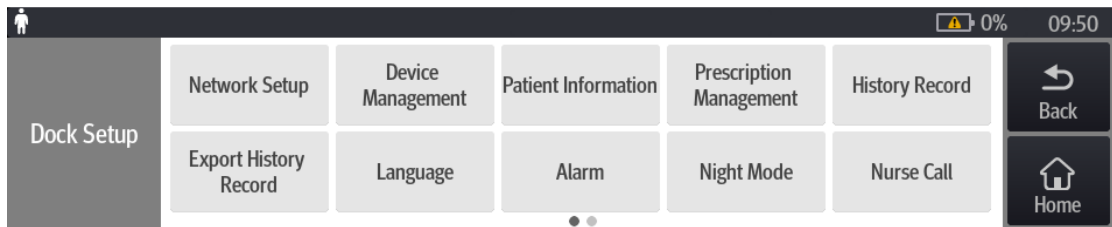
43	009-009685-00	Connection cable from the AC socket to the power module (2-slot module rack)	Functionality test	/
44	009-009678-00	Connection cable from the main control board to the display signal transfer board	Power-on test	/
45	011-000333-00	Led module red and yellow with Guide beam	Power-on test	/

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9 Software Upgrade

9.1 Setting

How to set language, time, department name, infusion pump name, patient category, alarm setup, and alarm key volume.



Language:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, and select **Language**, you can set the system language.

Time:

After the pump is inserted into the Dock, the time of the first inserted pump is automatically synchronized to the Dock and other pumps on the Dock.

Device Management:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, and select **Device Management**; you can set the hospital name, department name and device name.

Patient Information

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, and select **Patient Information**; you can set the **Data Source**, **Patient ID** and **Visit Number**.
4. Turn on the pump, swipe down from the top of the screen with your finger, select **Menu** and select **Patient Management**; you can set **Room No.**, **Bed No.**, **Patient ID / Visit Number**, **Last Name**, **First Name**, **Height**, **Weight**, **Date of Birth**, **Patient Category**, and **Gender**.

Alarm Volume:

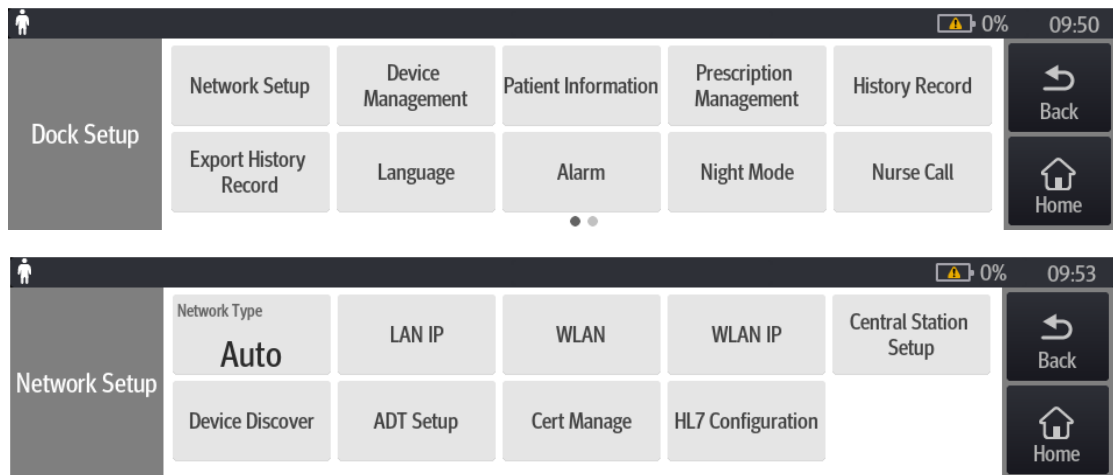
The   buttons on the side of the Dock control box can adjust the Dock alarm volume.

Alarm Setup:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, and select **Alarm**, you can set the alarm sound.

9.2 How to Set Wired and Wireless Networks

(Optional, you must set this when the central station is connected)



9.2.1 WLAN Setup: A Pump Is Inserted to the Dock

Dock Network Type:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, select **Network Setup**, select **Network Type**, and set it to **WLAN**.

Set the WLAN:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, select **Network Setup** and select **WLAN**; you can enter the SSID, Encryption, Password, EAP Method, Phase2 Auth, Identity, Anonymous, CA Certificate, User Certificate and WLAN Setup (set the frequency band) corresponding to the AP.

Configure the WLAN IP:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, select **Network Setup** and select **WLAN IP Setup**; you can set the machine's IP address, subnet mask, and gateway.

Configure the Central Station Setup:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, select **Network Setup** and select **Central Station Setup**; you can set the IP address of the central station.

Device Discover:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.

3. Enter the password, select Network Setup, and select Device Discover; you can set Multicast TTL, Multicast Address, and Master Server Address; and view the Connected Status.

9.2.2 LAN Setup: A Pump Is Inserted to the Dock

Dock Network Type setup:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, select **Network Setup**, select **Network Type**, and set it to **LAN**.

Set the LAN:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, select **Network Setup** and select **LAN**; you can set the DHCP Switch, IP Address, Subnet Mask, Gateway, DNS Switch, Preferred DNS Server, and Alternate DNS Server.

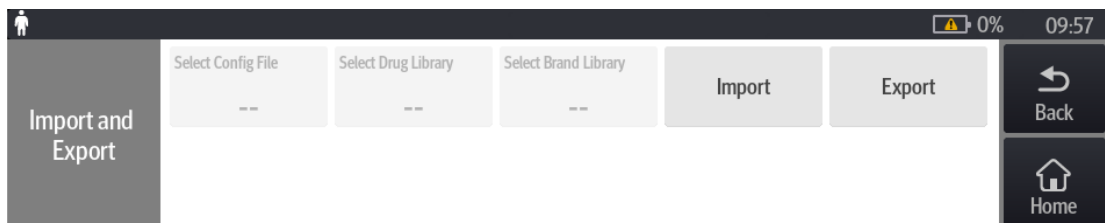
Configure the Central Station Setup:

1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, select **Network Setup** and select **Central Station Setup**; you can set the IP address of the central station.

Device Discover:


1. The pump is inserted to the Dock.
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu** and select **Dock Setup**.
3. Enter the password, select Network Setup, and select Device Discover; you can set Multicast TTL, Multicast Address, and Master Server Address; and view the Connected Status.

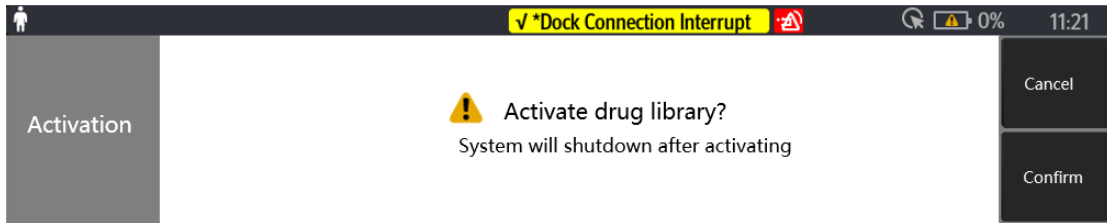
9.3 DERS System Configuration Method



DERS:

1. First use the drug library tool (G-110-007724-00) on the PC side, edit the drug library, save the drug library file, and export it to the root directory of the USB drive.
2. Start the pump, and insert the USB into the device.
3. Use your finger to swipe down from the top of the screen at the pump, select **Menu**→, select **User Maintenance**, enter the password, and select **Import and Export**.
4. Click **Select Drug Library** and select the drug library file from the list;

5. Click **Import**, tick the drug library, click **OK**, wait for the prompt of successful import, click **OK**;
6. After the import is successful, an **Activate** icon will appear in the upper left corner of the main interface of the pump  ;
7. When the pump is turned off, the prompt of **Activate drug library?** will pop up, select **Yes**;
8. The pump restarts and the drug library is activated.

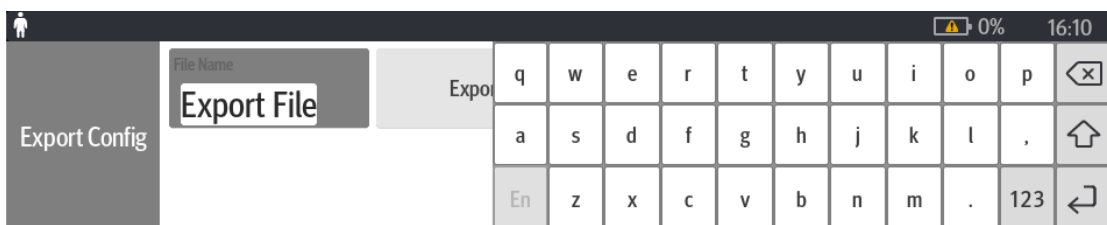
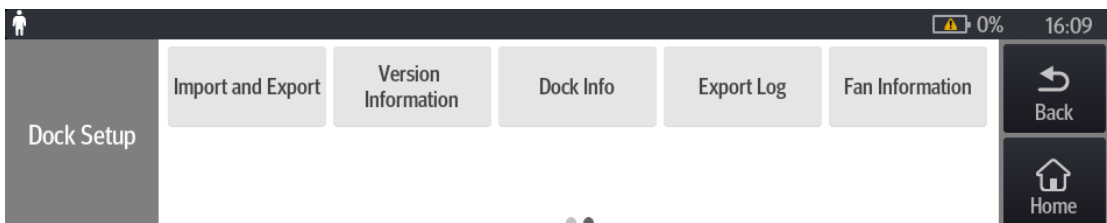


9.4 How to Customize the Configuration Required by the Customer and Set the Default Configuration

9.4.1 Export Configuration

Required tools: Ordinary USB drive FAT format;

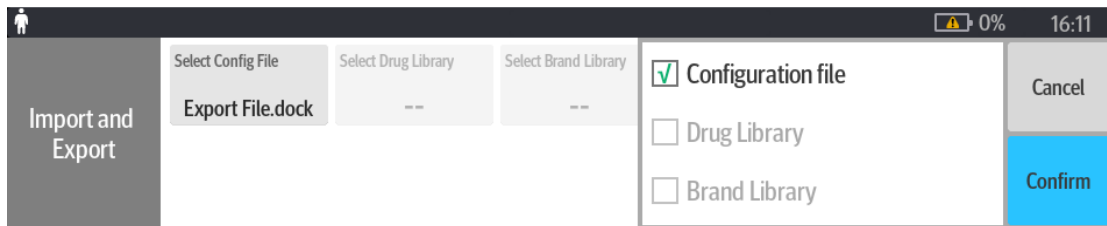
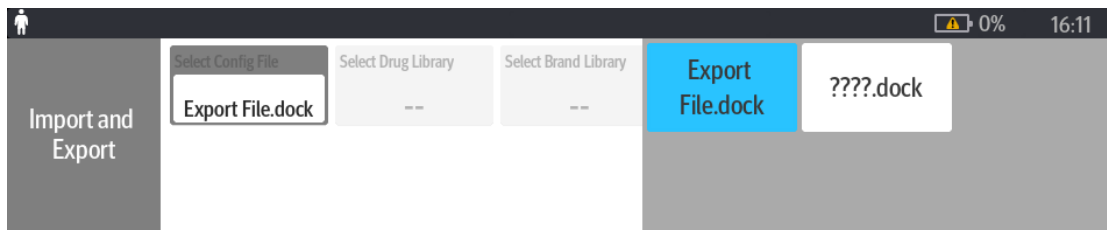
1. Modify the configuration at the Dock end (according to customer needs);
2. A USB flash drive is inserted to the DOCK end;
3. The pump is inserted to the DOCK;
4. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu**→ and select **Dock Setup**;
5. Enter the password, select **Import and Export** →, select **Export Configuration**, name the file name, and click the **Export** button; the exported file is located in the BatchConfig folder.



9.4.2 Import Configuration

1. Insert the USB into other Dock;
2. Power on the pump, use your finger to swipe down from the top of the screen, select **Menu**→ and select **Dock Setup**.

3. Enter the password, select **Import and Export** →, select the configuration file to be imported and **Import Configuration**, tick the configuration file →, click **OK** and wait for the prompt of **Import Successfully**, and click **OK**.



9.5 Software Upgrade

9.5.1 Preparing the Upgrade Directory Structure of USB Drive

Required tools: Ordinary USB drive FAT format.

1. Create a new file directory under the root directory of the USB drive: **UPGRADE_AMP\Docking** (note the case of the file name);
2. Place the USB drive upgrade tool Installers.dat in UPGRADE_AMP\Docking;
3. Place the Dock system software in UPGRADE_AMP\Docking (Note: Do not put several software, currently only one software upgrade can be supported).

9.5.2 To Upgrade USB, Proceed as Follows

1. Turn off the Dock, and insert the USB into the device.
2. Press and hold the Volume + and Volume -, and press the power button at the same time, the alarm lamp lights up red, then release your hand, the alarm lamp blinks yellow, the machine starts to upgrade;
3. The alarm lamp is steady on yellow. Then the upgrade is complete, and the Dock will automatically shut down;
4. Restart and check whether the software version is correct (**Menu-> Dock Setup-> Version Information**).

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10 Hardware Upgrade

NOTE

- The machine should be powered off before the upgrade.

The optional accessories of this Dock that can be upgraded are:

Optional Accessory	PN	Name and Specification	Remarks
Fastening clamp	045-004327-00	Infusion pump - Fastening clamp assembly	/
Battery	115-069085-00	Dock lithium battery 7.2 V 2500 mAh	/
Wireless	115-069087-00	Wifi Assembly (FRU)	/
LCD assembly	115-070182-00	LCD assembly (nDS with LCD)	/
	115-070182-00	LCD assembly (nDS ex with LCD)	/
Module rack	120-022012-00	4-Slot module rack-2 upgrade package (English)	/
	120-022013-00	4-Slot module rack-3 upgrade package (English)	/
	120-022014-00	4-Slot module rack-4 upgrade package (English)	/
Communication cable	009-009935-00	Expansion DOCK communication cable	/
Scanning gun	023-001550-00	Handheld 2D barcode scanner (with USB cable)	/

This product is configured with wireless network functions and can be connected to network through wireless AP. The authorized personnel of our company are required to connect and set up the wireless network, and then carry out the performance test.

10.1 Upgrading WiFi Assembly

10.1.1 Material Application

The WiFi assembly (FRU) material code is 115-069087-00. This upgrade package contains the following materials:

1. Dock WiFi carrier board, as shown in the figure below:



WiFi Carrier Board

- WiFi cable, as shown in the figure below:



WiFi connection cable

- Sticker dual-band antenna (024-000751-00), as shown in the figure below:



Wi-Fi antenna

10.1.2 Tools Preparation

You may need the following tools to complete this upgrade function:

- Phillips screwdrivers
- Tweezers
- Burin
- ESD bracelet

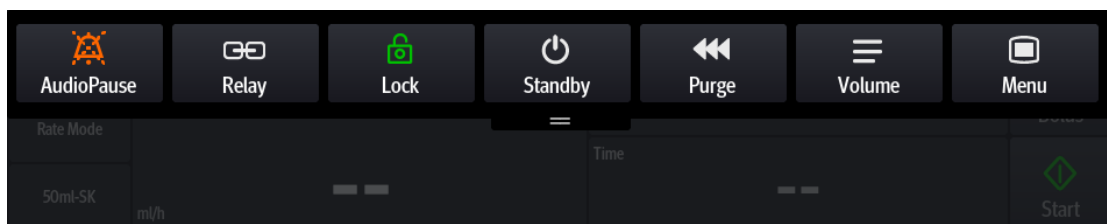
10.1.3 Upgrade Procedure

The software version required after the WiFi module upgraded is the same as the software version without the WiFi module, so it is unnecessary to upgrade the software functions. Just install the hardware assemblies.

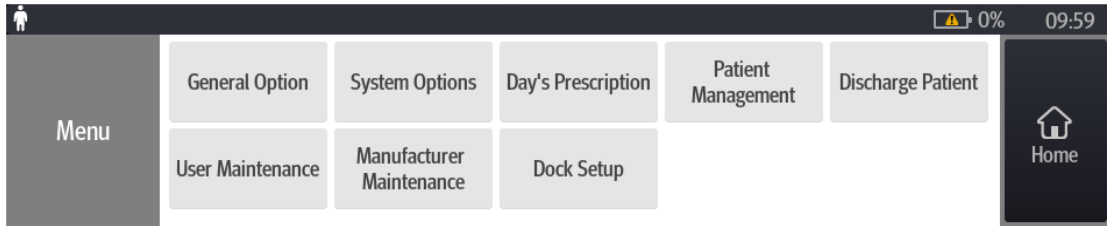
10.1.4 Test after Upgrade

After upgrading, test the WiFi function as follows:

- Insert one pump into the Dock. In the drop-down menu on the touch screen of the pump, open the **Menu** option.



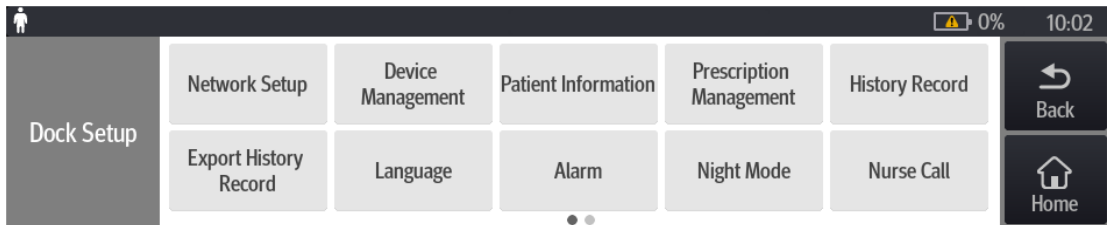
- Open **Dock Setup** from the **Menu**.



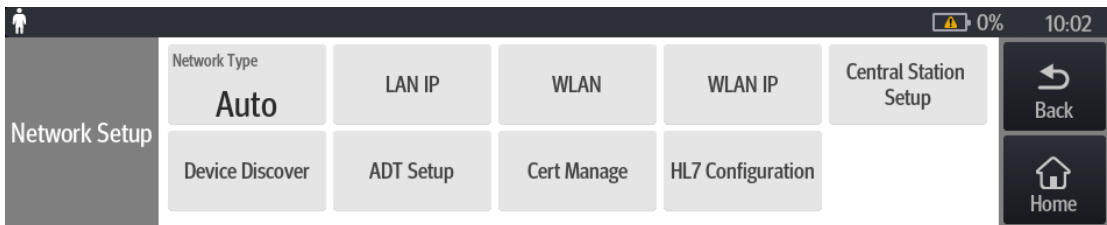
- Enter the password to enter the screen.



- In **Dock Setup**, enter **Network Setup**.



- The network type can be selected wired or wireless, and can also be selected automatically (if there is a network cable connection, it is set to LAN; if there is no network cable connection, the default value is a WLAN), the following figure takes the WLAN as an example.



- After entering the **WLAN** screen, the SSID is the account of the AP, and the security key is the password of the corresponding AP. Users can set the security of AP.



- In **WLAN Setup**, users can set the 2.4G or 5G frequency band according to actual needs. After completing all settings, a normal WiFi logo appears on the DOCK display, as shown in the figure, which means that the wireless function has been configured.

10.2 Upgrading Li-ion Battery

10.2.1 Material Application

The material code of the Dock lithium ion battery (7.2 V 2500 mAh) is 115-069085-00.



Lithium ion battery

10.2.2 Tools Preparation

You may need the following tools to complete this upgrade:

- Phillips screwdrivers
- Burin
- ESD bracelet

10.2.3 Upgrade Procedure

To upgrade the battery assembly, it is unnecessary to upgrade the software version. Install the battery assembly directly on the bottom shell of the control box with the connection port facing right.

10.2.4 Test after Upgrade

After the battery is installed, connect the AC power source. If the battery indicator on the side of the control box lights up, then the battery pack has been upgraded successfully.

10.3 Upgrading LCD Assembly (nDS with LCD/nDS ex with LCD)

10.3.1 Material Application

The material code of the LCD assembly (nDS with LCD) is 115-070182-00.

The material code of the LCD assembly (nDS ex with LCD) is 115-070183-00.

10.3.2 Tools Preparation

You may need the following tools to complete this upgrade:

- Phillips screwdrivers
- Burin
- Double-sided tape
- ESD bracelet

10.3.3 Upgrade Procedure

After removing the original non-screen lens silkscreen, clean the remaining glue on the surface of the top shell, install the screen lens silkscreen, and replace the original adapter board with an adapter board assembly with a LCD. The software version for screen and non screen lens are the same, and hence it is unnecessary to upgrade the software version.

10.3.4 Test after Upgrade

After the installation is complete, the Dock is connected to the AC and powered on. The LCD can display normally, which means that the LCD upgrade has been completed.

10.4 Four-Slot Module Rack (Module Rack Upgrade Part)

10.4.1 Material Application

The material code of four-slot module rack-2 upgrade package (English) is 120-022012-00.

The material code of four-slot module rack-3 upgrade package (English) is 120-022013-00.

The material code of four-slot module rack-4 upgrade package (English) is 120-022014-00.

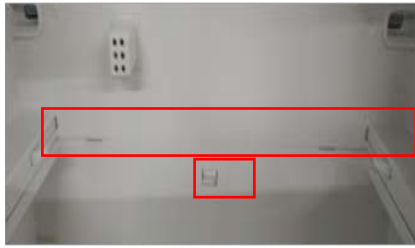
10.4.2 Upgrade Procedure

1. Follow the slide rails on both sides at the top of the expansion module rack to connect the upper and lower module racks. When you hear a click, it means that the connecting spring locks of the upper and lower module racks have been engaged.



2. Check the connection between the front and back of the upper and lower module racks. They should be completely aligned, and the spring lock is at the highest position.

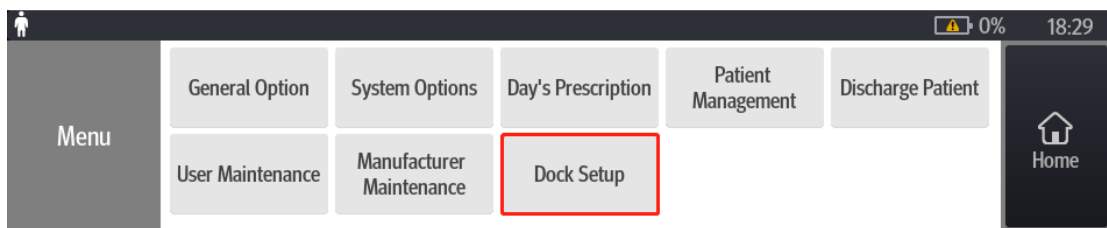




3. Sorting: The expansion module racks are connected and combined according to their numbers -2/-3/-4 from top to bottom.

10.4.3 Test after Upgrade

Insert a single pump into the connected module rack and open the pull-down menu on the pump screen. If Dock Setup is displayed, it means that the upgrade connection has been successful.



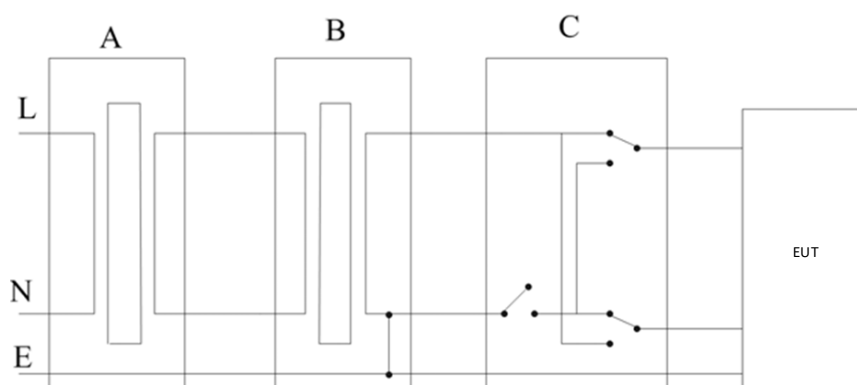
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A Electrical Safety Test

CAUTION

- **Electrical safety tests are 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.**
 - **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. And electrical safety tests on these devices must be implemented in accordance with the test interval of the device.**
 - **Electrical safety tests are used to timely detect potential electrical safety risks that might cause injuries to patients, operators or maintenance personnel. Electrical safety tests must be carried out in the environment (including temperature, humidity and barometric pressure) specified in this manual.**
 - **The electrical safety tests described in this chapter take ESA620 safety analyzer as an example. The safety analyzer used in different regions may vary. Make sure that the electrical safety test scheme you adopted is applicable.**
-

Device connection is shown in the following figure.



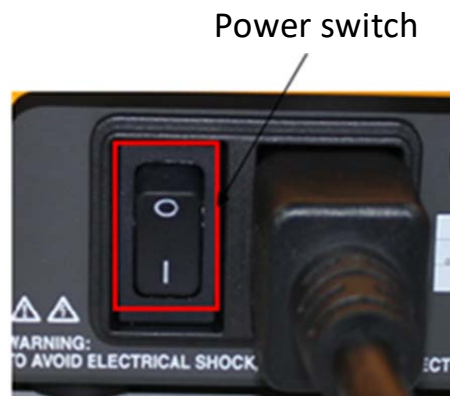
A: AC power supply (programmable, frequency control) B: Isolation transformer on leakage current test tooling C: Safety tester

Tools required:

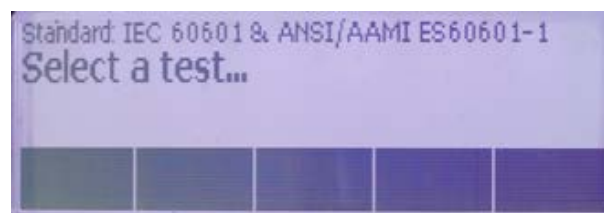
- Safety analyzer (ESA620)
- Isolation transformer

A.1 Preparation before Testing

1. Connect the leakage current tester and the network power supply with the power cord built in the ESA620.
2. Press the Power switch, as shown in the figure below. The leakage current tester starts.



3. After the tester is started, a series of self-tests will be performed. During the self-test, the high-voltage indicator will briefly light up. After the self-tests are completed, the message shown in the following figure will be displayed on the screen, and the high-voltage indicator will be off (if the high-voltage indicator still remains on after the self-tests are completed, the system is problematic, and the following tests cannot be performed).

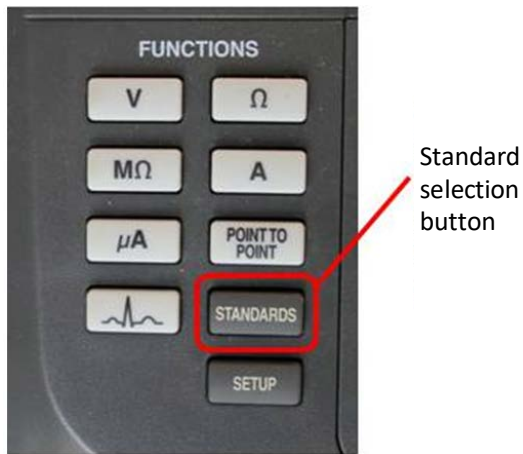


A.2 Earth Leakage Current Test

1. Connect the ESA620 safety analyzer to a 264 V AC 60 Hz power supply.
2. Use the power cord to connect the EUT to the auxiliary power output connector of the ESA620 safety analyzer.



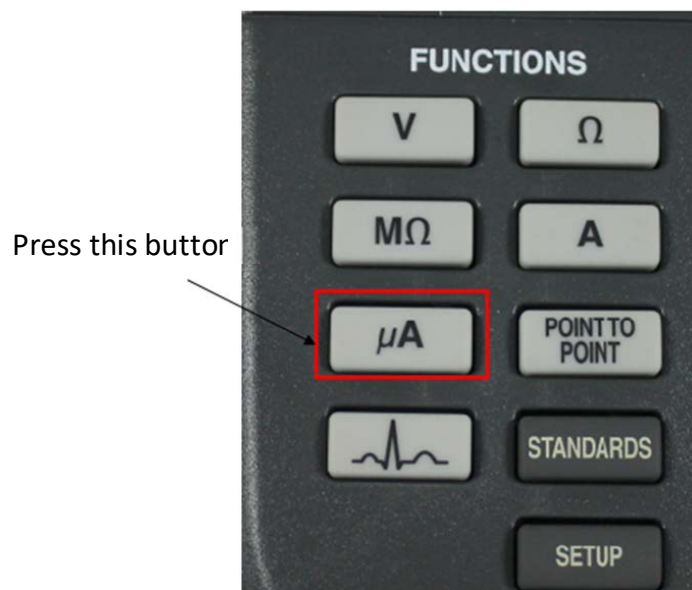
3. Turn on the power of the ESA620 safety analyzer, press the **STANDARDS** button on the tester panel, as shown in the figure below, to start the standard selection:

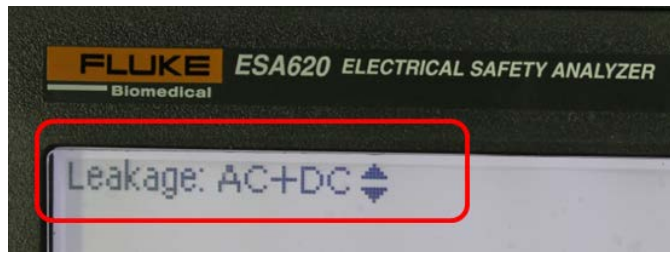


4. Press the **Up** and **Down** keys on the tester panel to select the **IEC 60601 & ANSI/AAMI ES60601-1** standard:



5. Press the **uA** button on the tester panel and select the **AC + DC** leakage current test:

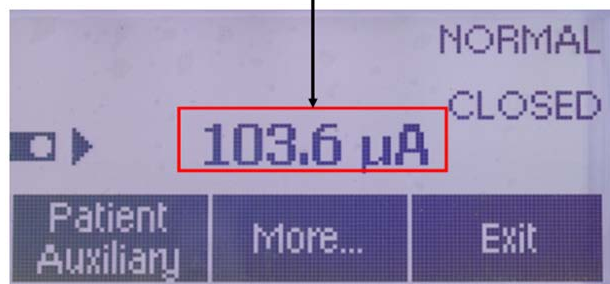




6. Press the **POLARITY** button to change its status to **NORMAL**, as shown in the figure below, and the state of the **NEUTRAL** button is **CLOSED** at this time; observe the leakage current value displayed on the screen; at this time, the leakage current should be $\leq 347 \mu\text{A}$.



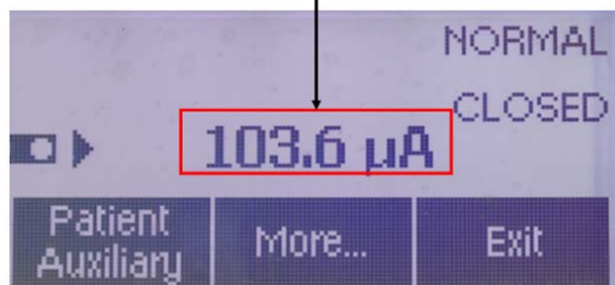
Measured leakage current value



7. Press the **POLARITY** button again to change its status to **REVERSE** (that is, reverse the polarity), as shown in the figure below. Observe the leakage current value displayed on the screen; at this time, the leakage current should be $\leq 347 \mu\text{A}$.



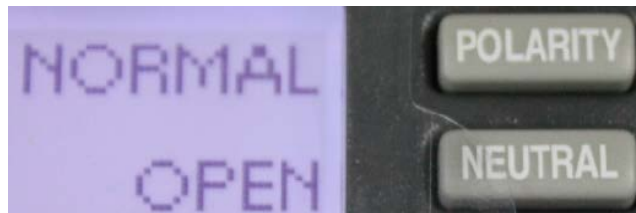
Measured leakage current value



8. Keep the **POLARITY** button in the **REVERSE** status, and press the **NEUTRAL** button to change its status to **OPEN** (that is, disconnect the zero line); as shown in the figure below. Observe the leakage current value displayed on the screen; at this time, the leakage current should be $\leq 694 \mu\text{A}$.



9. Keep the **NEUTRAL** button in the **OPEN** state, and then press the **POLARITY** button to change its status to **NORMAL**, as shown in the following figure. Observe the leakage current value displayed on the screen; at this time, the leakage current should be $\leq 694 \mu\text{A}$.



Description: The gap between the plastic shell and the internal circuit meets the requirements of creepage distance and electrical clearance, and there is no risk of leakage current.

