Passport 12/Passport 8

Patient Monitor

Service Manual

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Revision History

This manual has a revision number. This revision number changes whenever the manual is updated due to software or technical specification change. Contents of this manual are subject to change without prior notice.

- Revision number: 2.0
- Release time: June 2016

WARNING

- **Federal Law (USA) restricts this device to sale by or on the order of a physician or other practitioner licensed by U.S. state law to use or order the use of this device.Federal Law (USA) restricts this device to sale by or on the order of a physician.**

NOTE

- **This manual describes all features and options. The equipment may not have all of them. Contact Mindray service department for any questions.**

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Mindray is responsible for safety, reliability and performance of this product only in the condition that:

- All installation operations, expansions, changes, modifications and repairs of this product are conducted by Mindray authorized personnel; and
- The electrical installation of the relevant room complies with the applicable national and local requirements; and
- This product is operated under strict observance of this manual.

Warranty

Mindray warrants that components within its products will be free from defects in workmanship and materials for a period of One (1) Year from the date of purchase except that disposable or one-time use products are warranted to be free from defects in workmanship and materials up to a date One (1) Year from the date of purchase or the date of first use, whichever is sooner.

This warranty does not cover consumable items such as, but not limited to, batteries, external cables, and sensors.

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A condition of this warranty is that the equipment or accessories which are claimed to be defective be returned when authorized, freight prepaid to Mindray DS USA, Inc., 800 MacArthur Blvd, Mahwah, NJ 07430 or its authorized representative. Mindray shall not have any responsibility in the event of loss or damage in transit.

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This warranty does not extend to:

- Malfunction or damage caused by improper use or man-made failure.
- Malfunction or damage caused by unstable or out-of-range power input.
- Malfunction or damage caused by force majeure events, such as (i) flood, fire and earthquake or other similar elements of nature or acts of God; (ii) riots, war, civil disorders, rebellions, or revolutions in any country; or (iii) any other cause beyond the reasonable control of Mindray.
- Malfunction or damage caused by improper operation or repair by unqualified or unauthorized service people.
- Malfunction of the instrument or part whose serial number is not legible.
- Others not caused by instrument or part itself.

Return Policy

In the event that it becomes necessary to return a unit to Mindray, follow the instructions below.

1. Obtain a return authorization.

   Contact the Mindray Service Department and obtain a Mindray Customer Service Authorization Number. The Mindray Customer Service Authorization Number must appear on the outside of the shipping container. Return shipments will not be accepted if the Mindray Customer Service Authorization Number is not clearly visible. Please provide the model number, serial number, and a brief description of the reason for return.

2. Freight policy

   The customer is responsible for freight charges when this product is shipped to Mindray for service (including any relevant customs fees or other freight related charges).

3. Return address

   Please send the part(s) or equipment to the address offered by Customer Service Department.

Contact Information

Manufacturer:	Shenzhen Mindray Bio-Medical Electronics Co., Ltd.
Address:	Mindray Building, Keji 12th Road South, Hi-tech Industrial Park, Nanshan, Shenzhen 518057 P.R. China
Tel:	+86 755 81888998
Fax:	+86 755 26582680
Website:	www.mindray.com

Distributor:	Mindray DS USA, Inc.
Address:	800 MacArthur Boulevard, Mahwah, New Jersey 07430, USA
Tel:	1.800.288.2121, 1.201.995.8000
Website:	www.mindray.com

Preface

Manual Purpose

This manual provides detailed information about the assembly, disassembly, and testing of the equipment to support effective troubleshooting and repair. It is not intended to be a comprehensive, in-depth explanation of the product architecture or technical implementation. Observance of the manual is a prerequisite for proper equipment maintenance and prevents equipment damage and personnel injury.

This manual is based on the maximum configuration; Therefore, some contents may not apply to your monitor. If you have any question, please contact our Technical Support Department.

Intended Audience

This manual is for biomedical engineers, authorized technicians or service representatives responsible for troubleshooting, repairing and maintaining the patient monitors.

Passwords

A password may be required to access different modes within the monitor. The passwords are listed below:

- User maintenance: 888888 (User adjustable)
- Configuration mode: 315666 (User adjustable)

It is recommended that the user should change the passwords for user maintenance and configuration mode once they take ownership of the equipment.

FOR YOUR NOTES

Contents

1 Safety

1.1 Safety Information

WARNING

- **Indicates a potential hazard or unsafe practice that, if not avoided, will result in death or serious injury.**

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.**

1.1.1 Warnings

WARNING

- **All installation operations, expansions, changes, modifications and repairs of this product are conducted by Mindray authorized personnel.**
- **There is high voltage inside the equipment. Never disassemble the equipment before it is disconnected from the AC power source or the battery.**
- **When you disassemble/reassemble a parameter module, a patient leakage current test must be performed before it is used again for monitoring.**
- **The equipment must be connected to a properly installed power outlet with protective earth contacts only. If the installation does not provide for a protective earth conductor, disconnect it from the power line and operate it on battery power, if possible.**
- **Disposal of the packaging material should observe the applicable waste control regulations. and keeping it out of children's reach.**

1.1.2 Cautions

CAUTION

- **Make sure that no electromagnetic radiation interferes with the performance of the equipment when preparing to carry out performance tests. Mobile phone, X-ray equipment or MRI devices are a possible source of interference as they may emit higher levels of electromagnetic radiation.**
- **Before connecting the receiver to the power line, check that the voltage and frequency ratings of the power line are the same as those indicated on the unit's label or in this manual.**
- **Protect the equipment from damage caused by drop, impact, strong vibration or other mechanical force during servicing.**

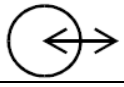
1.1.3 Notes

NOTE

- **Refer to Operator's Manual for detailed operation and other information.**

1.2 Equipment Symbols

Some symbols may not appear on your equipment.

	Caution		
	Refer to instruction manual/ booklet		
	Power ON/OFF (for a part of the equipment)		Battery indicator
	Alternating current		VGA output
	Equipotentiality		Graphical record
	USB connector		Network connector
	Zero key		Input/Output
	Check sensor		Calibrate key
	Measure/standby		Inserted direction
	Gas outlet		Serial number
	DATE OF MANUAFACTURE		Symbol for "MANUFACTURER"
	Catalog number	IPX1	Protected against vertically falling water drops per IEC 60529
	Electrostatic sensitive devices		
	DEFIBRILLATION-PROOF TYPE CF APPLIED PART		
	DEFIBRILLATION-PROOF TYPE BF APPLIED PART		
ETL CLASSIFIED Intertek 3191955	The presence of this label indicates the machine was certified by ETL with the statement: Conforms to AAMI Std ES 60601-1, IEC Std 60601-1-6, IEC Std 60601-1-8, IEC Std 60601-2-25, IEC Std 60601-2-26, IEC Std 60601-2-27, IEC Std 60601-2-34, IEC Std 60601-2-49, IEC Std 80601-2-30, ISO Std 80601-2-55, ISO Std 80601-2-56, ISO Std 80601-2-61 Certified to CSA Std C22.2 NO. 60601-1, NO. 60601-6, NO. 60601-1-8, NO. 60601-2-25, NO. 60601-2-26,NO. 60601-2-27, NO. 60601-2-34, NO. 60601-2-49, NO. 80601-2-30, NO. 80601-2-55, NO. 80601-2-56, NO. 80601-2-61		

FOR YOUR NOTES

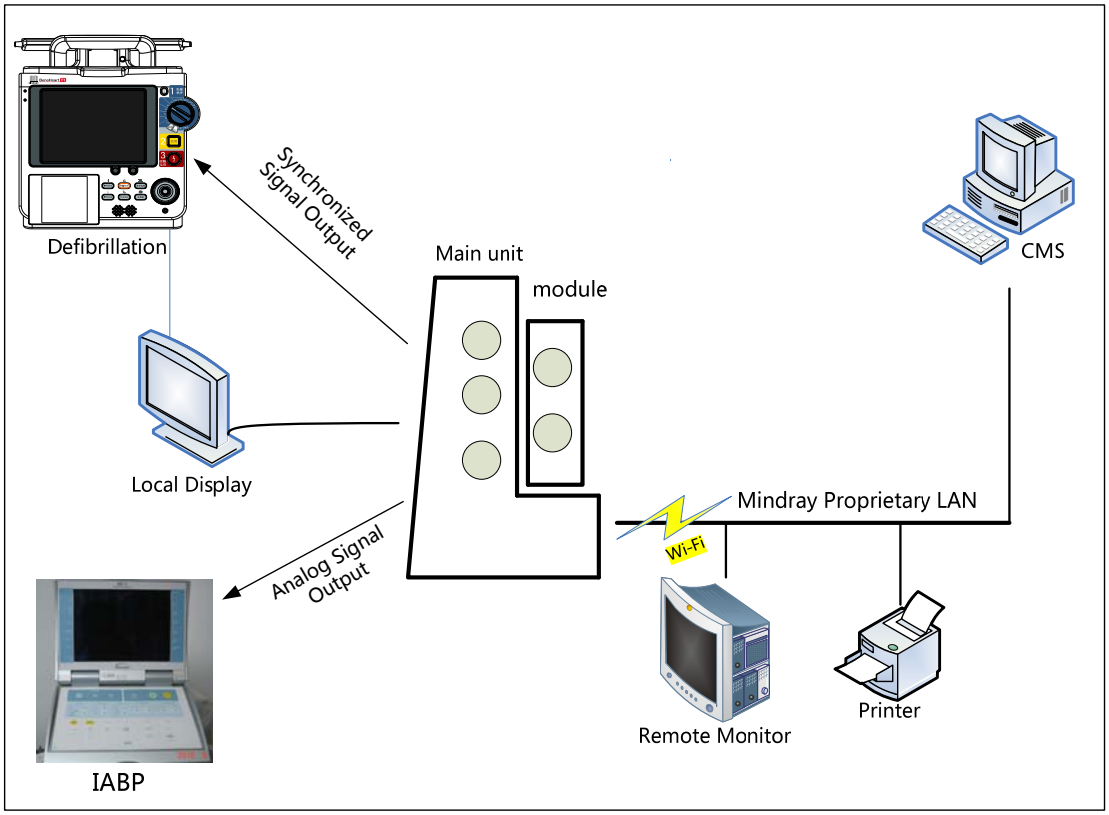
2 Theory of Operation

2.1 The Basics

This monitor is designed to monitor a fixed set of physiological parameters including ECG, respiration (Resp), temperature (Temp), SpO_2, pulse rate (PR), non-invasive blood pressure (NIBP), invasive blood pressure (IBP), cardiac output (C.O.), carbon dioxide (CO_2), and anesthetic gas (AG).

The monitor also:

- Provides audible and visual alarm indications in case of patient or equipment problems.
- Enables displaying, reviewing, storing and transferring of real-time data and wave.
- Incorporates multiple input devices such as buttons, knob, and touchscreen.
- Enables software upgrade over the network.
- Integrates the information of other devices, which include but are not restricted to defibrillator.



The above figure shows a system consists of the Passport 12/8 patient monitor and its peripheral devices. The Passport 12/8 patient monitor:

- Can be used for monitoring the physiological parameters, giving alarms and reviewing patient data, etc.
- Supports recorder.
- Supports nurse call signal, synchronization defibrillation signal, and analog output signal.
- Supports Wi-Fi module, wired network, remote view, and communication with the Hypervisor Central Station (CMS).
- Supports a secondary display.
- Supports AC power source and battery power source (Passport 8 patient monitors additionally supports DC power source).
- Supports clinical data acquisition in two formats: SD card (integral to unit) and USB drive.
  The system software should support data output function, for SD card is a built-in device.

2.2 System Connections

2.2.1 Installation Support

The monitor can be mounted on a wall bracket or on a trolley support. The wall bracket or trolley support can be ordered optionally. Each type of mounting bracket is delivered with a complete set of mounting hardware and instructions. Refer to the documentation delivered with the mounting hardware for instructions on assembling mounts.

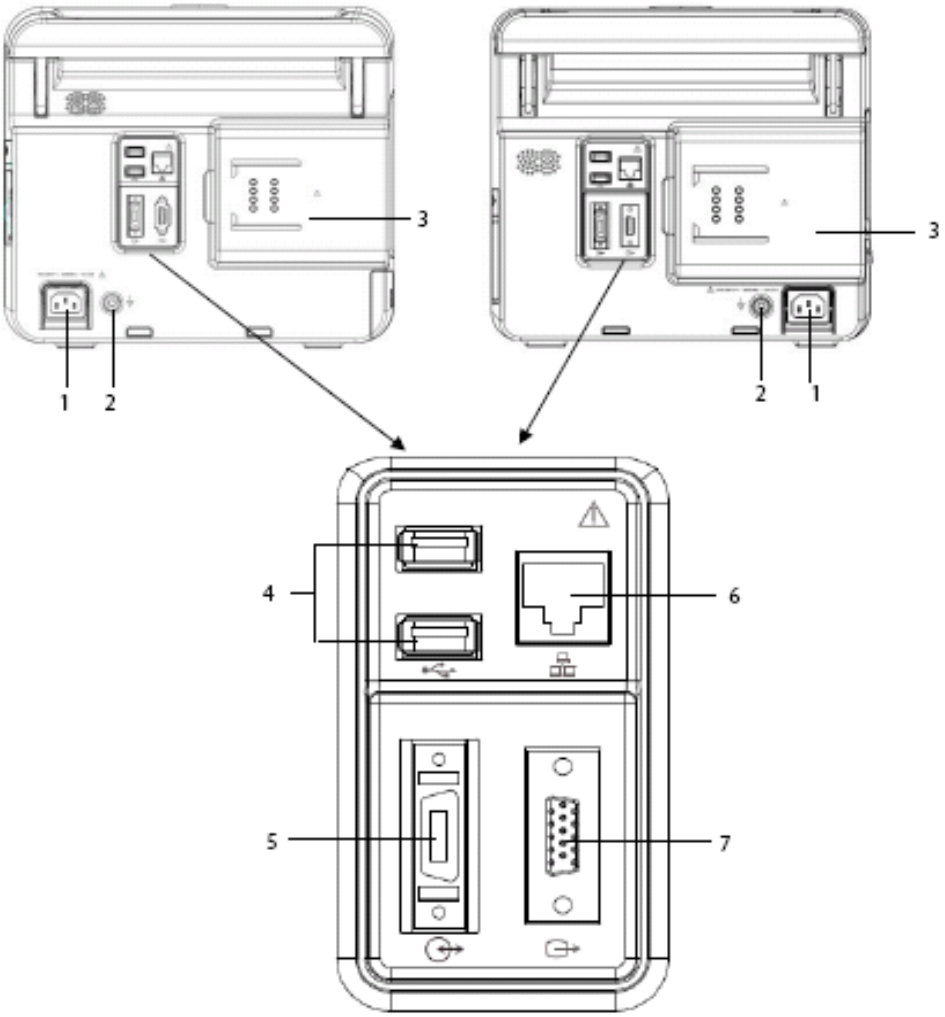
CAUTION

- **Use mounting brackets we supply or approve. If other compatible mounting bracket is used, be sure it can be safely used on the monitor.**
- **The mounting bracket should be installed by our qualified service personnel, or engineers who have adequate knowledge on it.**
- **If other mounting solution is used, the installation personnel and the customer should verify if it can be safely used on the monitor, and the customer will assume the responsibility for any resultant risk. This indicates a potential hazard or unsafe practice that, if not avoided, could result in minor personal injury or product/property damage.**

2.2.2 Connectors for Peripheral Devices

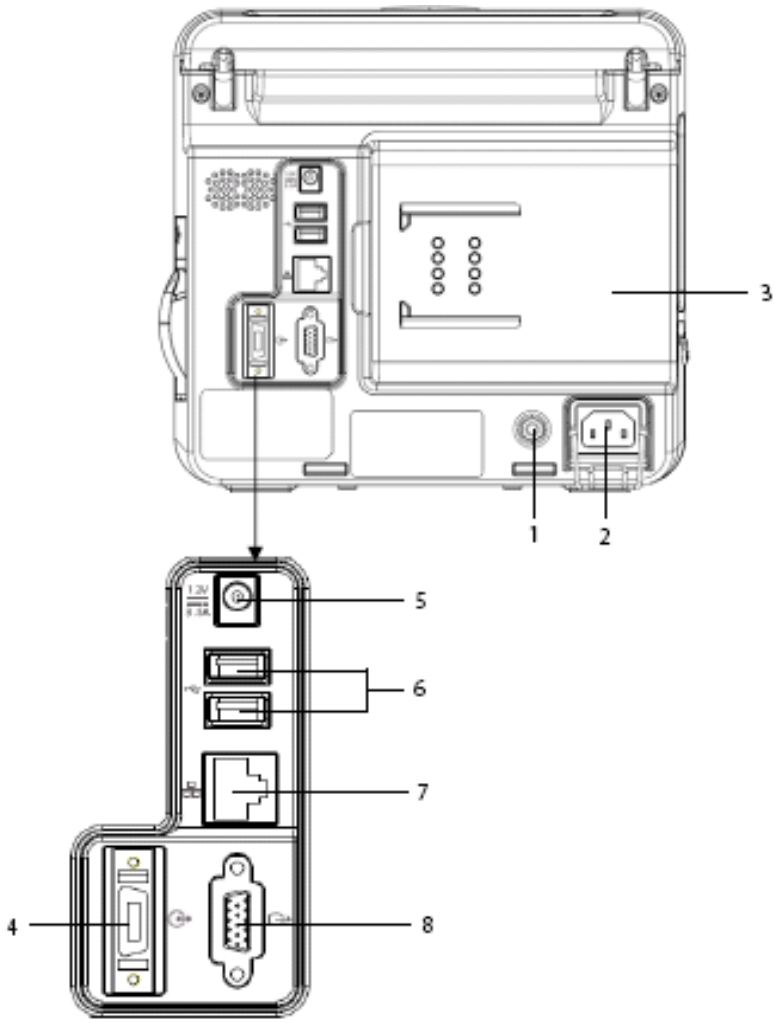
On the back of the monitor you can find all connectors for peripheral devices.

Passport 12 Rear View



1. AC power input: used to connect an AC power source (100 to 240 VAC, 50/60 Hz).
2. Equipotential terminal: used to connect the equipotential terminal of other equipment.
3. Parameter Module slot: used to connect the parameter module.
4. General USB Connector: used to connect any USB-compatible peripheral device.
5. Multifunctional connector:
   - Used to connect external devices and output defibrillator synchronization signals, nurse call signals, analog output signals, measurement numerics, and alarm limits of parameter modules.
   - Communicates with external devices via Datascope Improved ASCII Protocol (DIAP) protocol.
6. Network Connector: an RJ45 connector, used to connect an Ethernet network or a PC.
7. VGA Connector: used to connect a secondary display.

Passport 8 Rear View



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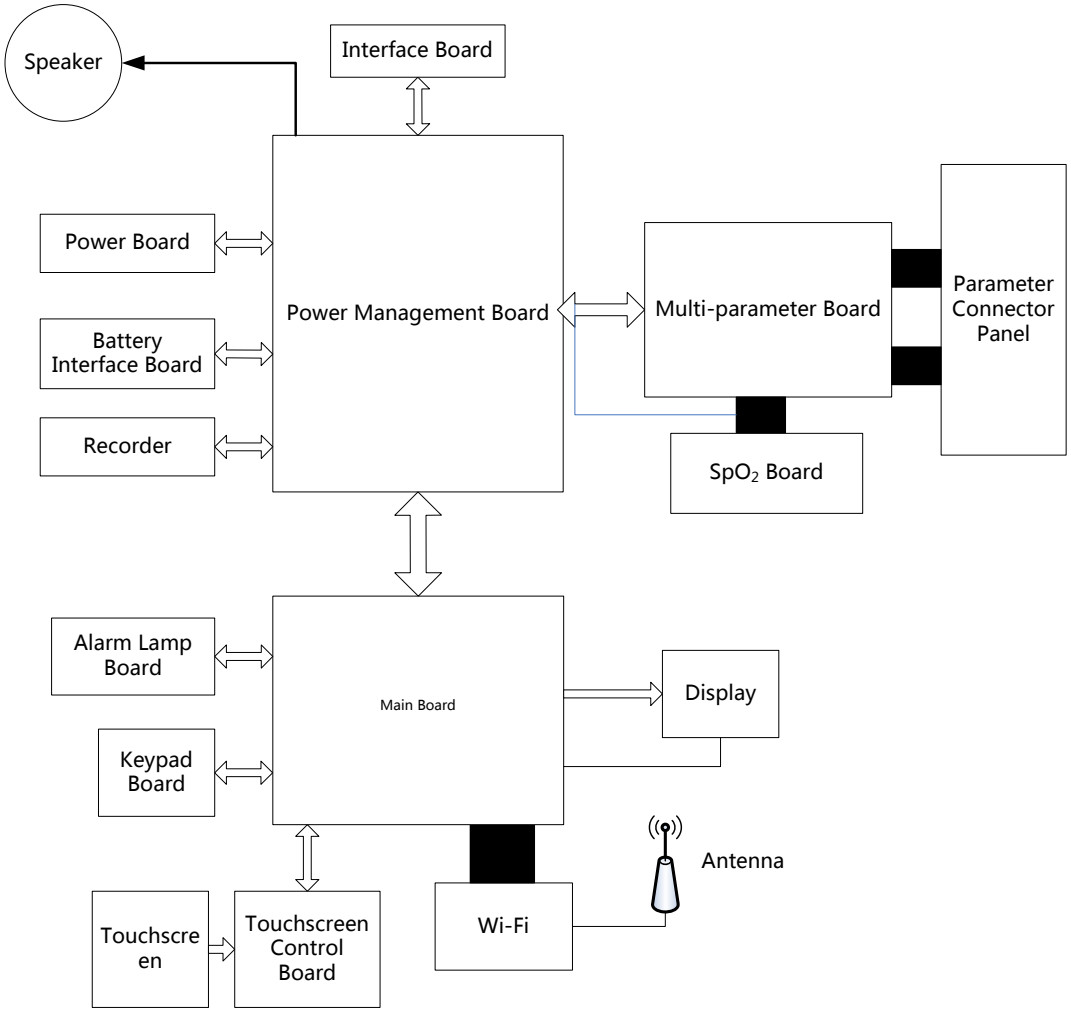
7. Network Connector: an RJ45 connector, used to connect an Ethernet network or a PC.
8. VGA Connector: used to connect a secondary display.

2.3 Main Unit

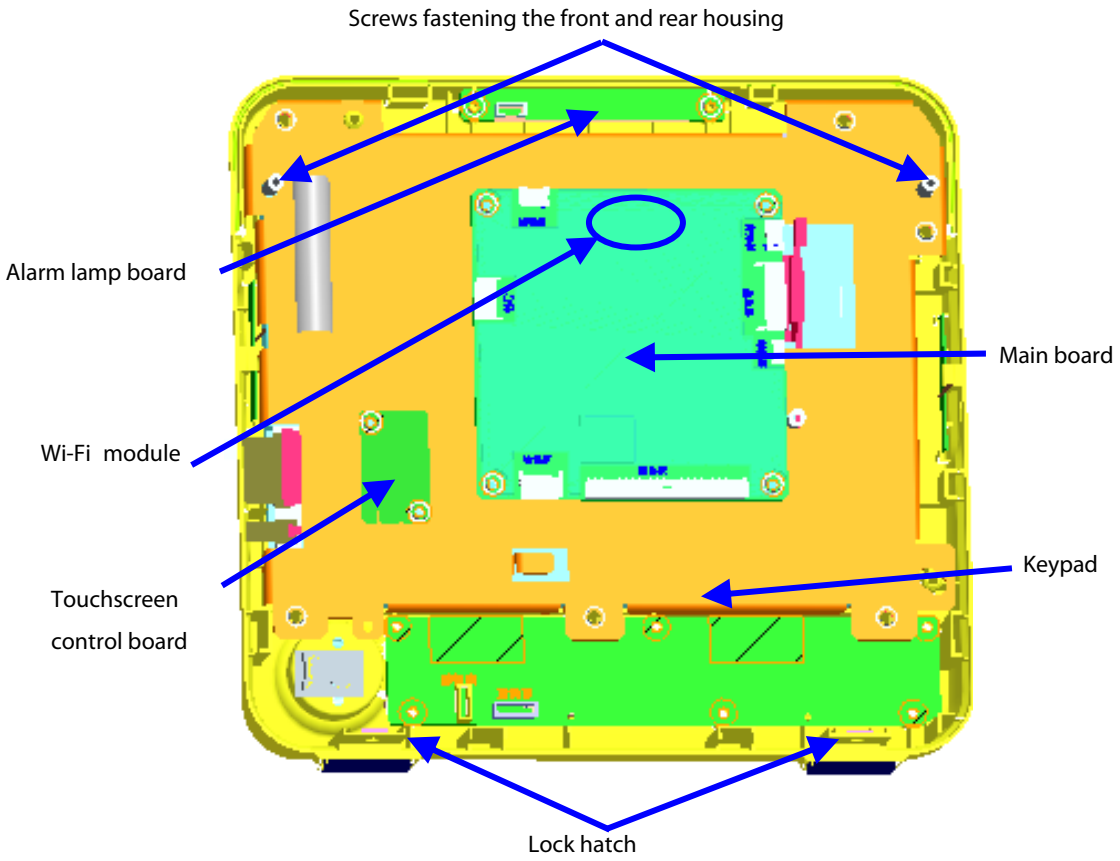
The main unit of the monitor consists of two parts:

- Front housing assembly: main board, keypad board assembly (knob), display, touchscreen, alarm lamp board, power switch, and indicator board.
- Rear housing assembly: power board (AC/DC), power management board, battery pad, interface board, recorder, speaker, and multi-parameter module which includes two types of SpO_2 stacking board.

The following figure shows the main unit architecture of the monitor.



2.4 Front Housing Assembly



2.4.1 Main Board

The main board is the control center of the system. It provides communication, display, and data storage functions, including:

- Display drive and backlight control
- Wired and wireless network
- Data Storage
- Printing
- Serial port communication
- Connection with touchscreen control board
- Audio drive
- EEPROM drive
- USB drive

2.4.2 Keypad

The keypad scans and detects the input of keys and knobs, integrates the power on/off key, and connects AC and battery indicators.

2.4.3 Alarm Lamp Board

The alarm lamp board is located at the top of front housing. It has two-color indicators, red and yellow. The alarm lamp board directly connects the main board through a cable. It is controlled directly by the main board.

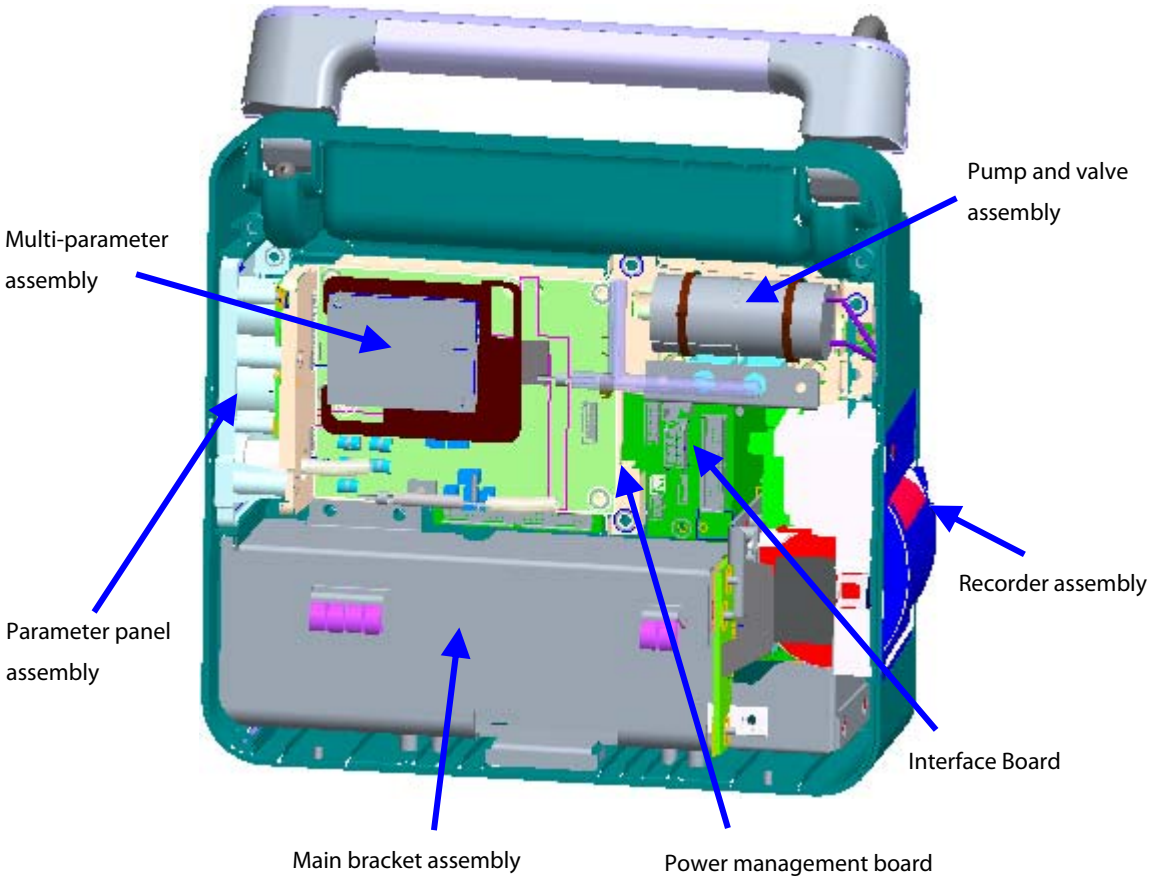
2.4.4 Touchscreen and Touchscreen Control Board

The touchscreen control board drives the touchscreen and implements communication with the monitor.

2.4.5 Wi-Fi Module

The Wi-Fi module enables the monitor to connect to 802.11 g/n wireless network.

2.5 Rear Housing Assembly



The rear housing assembly consists of the parameter panel assembly, multi-parameter assembly, pump and valve assembly, recorder assembly, main bracket assembly (including the battery compartment and battery interface board), power management board, and interface board.

2.5.1 AC/DC Power Board

The AC/DC power board transforms the input AC into DC power, which is the power source for all voltages in the monitor.

2.5.2 Power Management Board

The power management board mainly performs DC/DC conversion, power management, and transmission of external connector signals:

- DC/DC conversion: outputs 12 V and 5 V DC power
- Power on/off control
- Charge/Discharge control
- Signal transmission

2.5.3 Interface Board

The interface board supports the USB ports, network ports, multifunctional ports. and VGA ports.

2.5.4 Battery Interface Board

The battery interface board introduces the battery power to the internal system.

2.5.5 Recorder

The recorder receives data from the main board and sends them to the thermal printhead for printing.

2.5.6 Multi-parameter Board

The multi-parameter board provides the following functions:

- Supports 2-channel 3-/5-lead ECG monitoring, and I/II lead Resp monitoring
- Provides power for and communicates with Nellcor/Masimo SpO_2 board
- Supports 2-channel Temp monitoring
- Supports 2-channel IBP monitoring
- Supports NIBP monitoring
- Processes all algorithms and communicates with the main board via UART
- Realizes analog output (four channels, one for ECG, two for IBP, and one for Defib sync output)
- Isolates the parameter modules from earth ground
- Isolates ECG from other parameters

2.5.7 SpO_2 Board

The multi-parameter module supports Nellcor NELL-1 SpO_2 board and Masimo MS-2013 SpO_2 board.

SpO_2 board is used to collect SpO_2 signals transmitted by the multi-parameter module and process SpO_2 algorithms.

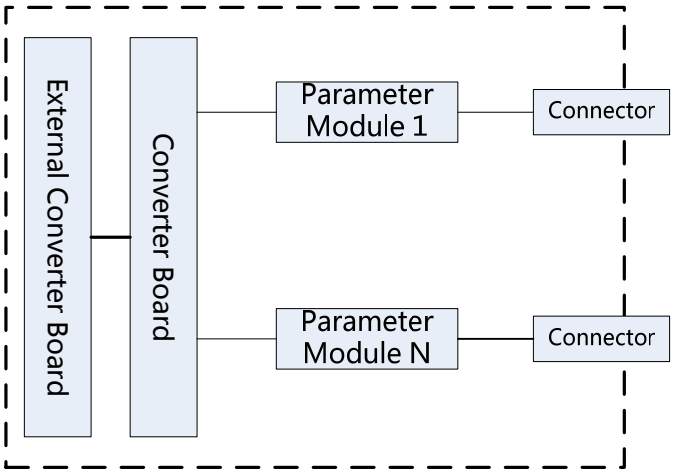
2.5.8 Parameter Connector Board

The parameter connector board transmits the ECG signal, Temp signal, SpO_2 signal, and IBP signals to the multi-parameter board.

2.6 Modules

The monitor can carry multiple parameter modules, which include IBP/C.O., CO_2, and AG modules. The detailed module configuration is listed below:

- IBP module
- CO_2 Module
- IBP + C.O. Module
- IBP + C.O. + CO_2 (Mindray Sidestream CO_2 /Microstream CO_2) module
- IBP + C.O. + AG (w O_2) module



2.6.1 Module Converter

The module converter performs signal conversion function.

2.6.2 Converter

The converter performs the following functions:

- Converting 12 V to 5 V DC power
- Converting RS232 level to TTL level
- Detecting and identifying the modules

2.6.3 IBP + C.O. Module

The IBP/C.O. module supports C.O. and 2-channel measurement of IBP. The module consists of an amplification circuit, AD converter, CPU circuit and power isolation circuit.

2.6.4 CO_2 Module

The monitor supports the following CO_2 modules:

- M02C Sidestream module
- Ordion Microstream CO_2 module

2.6.5 AG Module

The monitor supports the 2.5G Artema AG module (with O_2).

3 Unpacking and Installation

3.1 Unpacking the Equipment

Open the package and take out the packing list. Check that all the articles included in the packing list are available and the quantity and specification are correct. Make sure that:

- All the optional parts purchased by the customer shall also be checked.
- Notify the supplier if provided components are not correct as compared to the packing list.
- In case of damage during transportation, keep the packing material and notify the supplier immediately.
- Keep the packing material till new equipment is accepted.

The following pictures show the monitor and accessory packing.

Main unit packing

Accessory packing

3.2 Preparation for Installation

3.2.1 Preparation for Installation Site

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

Environmental Requirements

To avoid explosion hazard, do not use the equipment in the presence of flammable anesthetics, vapors or liquids. The environment where the monitor will be used should be reasonably free from vibration, dust and corrosive substances. If these conditions are not met, the system may not function normally.

The environmental specification is as follows:

Main Unit (Passport 8)			
Item	**Temperature (°C)**	**Relative humidity (noncondensing)**	**Altitude (kPa)**
Operating environment	0 to 40	15% to 95%	57.0 to 107.4
Storage environment	-30 to 70	10% to 95%	16.0 to 107.4

Main Unit (Passport 12)			
Item	**Temperature (°C)**	**Relative humidity (noncondensing)**	**Altitude (kPa)**
Operating environment	0 to 40	15% to 95%	57.0 to 107.4
Storage environment	-20 to 60	10% to 95%	16.0 to 107.4

Sidestream CO_2 module			
Item	**Temperature (°C)**	**Relative humidity (noncondensing)**	**Altitude (kPa)**
Operating environment	5 to 40	15% to 95%	57.3 to 105.3
Storage environment	-20 to 60	10% to 95%	57.3 to 105.3

Microstream CO_2 module			
Item	**Temperature (°C)**	**Relative humidity (noncondensing)**	**Altitude (kPa)**
Operating environment	0 to 40	15% to 95%	57.3 to 105.3
Storage environment	-20 to 60	10% to 95%	57.3 to 105.3

NOTE

- **The environmental specifications of unspecified parameters are the same as those of Passport 12 main unit.**

3.2.2 Electrical Requirements

Check cables and power cords. Make sure that:

1. Check that the system cables, power cords, and power plugs are not damaged, and pins are not loose. In case of any damage, remove it from use.
2. The insulation of patient cables and leadwires is not damaged, and connectors are not loose.

WARNING

- **Only power sockets with protective grounding can be used.**

Line voltage	100 to 240 V AC
Current	1.1 to 0.5 A
Frequency	50/60 Hz

3.2.3 Monitor Installation

Refer to ***GCX Adapter Installation Guide (PN: 046-003424-00)***, ***Ambulance Mounting Installation Guide (Passport) (PN: 046-003425-00)***, ***Passport 8 Hook Assembly Installation Guide (PN: 046-003465-00)***.

3.2.4 Preparation for Power on

To prepare for power on:

1. Before you start to make measurements, check the monitor for any mechanical damage and make sure that all external cables, plug-ins and accessories are properly connected.
2. Plug the power cord into the AC power source. If you run the monitor on battery power, ensure that the battery is sufficiently charged.
3. Press the power on/off switch on the monitor's front.

3.2.5 Wireless Network Specification

Network standard	IEEE 802.11a/b/g/n
Modulation mode	DSSS and OFDM
Operating frequency	For 2.4G frequency bands (FCC): 2.4GHz to 2.483GHz (only use Channels 1 to 11) For 5G frequency bands (FCC): 5.15GHz to 5.35GHz, 5.725GHz to5.82GHz
QoS	QoS Supported. Real time monitoring data transmission priority can be configured with a higher priority than other data transmission.
Channel spacing	IEEE 802.11a: 20MHz IEEE 802.11b/g: 5MHz IEEE 802.11n at 2.4 GHz: 5MHz IEEE 802.11n at 5 GHz: 20MHz
Wireless baud rate	IEEE 802.11a: 6 to 54 Mbps IEEE 802.11b: 1to11 Mbps IEEE 802.11g: 6 to 54 Mbps

	IEEE 802.11n (at both 2.4GHz and 5GHz): 6.5 to 72.2 Mbps
Output power	< 30 dBm (FCC requirement: detection mode – peak power) < 20 dBm (CE requirement: detection mode – RMS)
Operating mode	Infrastructure
Data security	Security standards: WPA-PSK, WPA2-PSK, WPA-Enterprise/WPA2-Enterprise EAP methods: PEAP-MsCHAPv2, PEAP-GTC, PEAP-TLS, EAP-TTLS, EAP-TLS, EAP-FAST, and EAP-LEAP Encryption modes: TKIP and AES
Roaming	Supported
System capacity	Number of Passport 8/12 monitors supported by a single AP: ≤ 16. Each Passport 8/12 monitor can communicate with the central station and connect to two other monitors at the same time, and among them, at most two Passport 8/12 monitors can transmit history data (the Panorama central station does not transfer the historical data.) when reconnection at the same time. The wireless functions of all Passport 8/12 monitors are normal at the same time.
Resistance to wireless interference	The wireless functions of the monitor are normal when the following conditions exist simultaneously: 1. The distance between interfering devices (including wireless devices at the frequency of 2.4GHz such as cellular communication devices, microwave ovens, intercoms, cordless phones and electro-surgical units, excluding Wi-Fi) and the monitor is greater than 20 cm. 2. Co-channel interference (CCI) on the Wi-Fi network should be no greater than -85dBm. 3. Adjacent–channel interference (ACI) on the Wi-Fi network should be no greater than -50dBm.
FCC approval	SQG-MSD45N

3.2.6 Network Setup Overview

In the [**Network Setup**] menu, you can set IP address, subnet mask and gateway. You should not change the patient monitor's IP address randomly. If you want to know details about IP address setup, contact Mindray Technical Support Department..

NOTE

- **The design, installation, restruction and maintenance of the wireless network's distribution shall be performed by authorized service personnel of our company.**
- **The existence of obstacles (such as wall) will exert impact on data transferring or even cause network interruption.**
- **The Central Monitoring System is capable of connecting up to 32 bedside monitors via the wireless network.**

3.2.7 Setting the Network Type

The monitor supports both wired and wireless network.

To set the network type:

1. Select [**Main Menu**]→[**Maintenance>>**]→[**User Maintenance>>**]→enter the required password→select [**Ok**].
2. Select [**Network Setup** >>].
3. Select [**Monitor Network Setup** >>].
4. Set [**Network Type**] to [**LAN**] or [**WLAN**].

3.2.8 Setting the Wireless Network

The patient monitors can be connected to a wireless network via a built-in Wi-Fi module. The Wi-Fi module used in the monitor is in compliance with IEEE 802.11a/b/g/n.

This wireless network will have the following capabilities:

- Support the 802.11a/b/g/n wireless protocol
- Have a channel bandwidth of 20 MHz
- Support WPA-PSK , WPA2-PSK , WPA-Enterprise, and WPA2-Enterprise
- Provide a signal strength at the monitor of no less than -65 dBm

To set the wireless network:

1. Select [**Main Menu**]→[**Maintenance**>>]→[**User Maintenance**>>]→enter the required password→[**Network Setup** >>]→[**Monitor Network Setup** >>].
2. Set the [Network Type] to [WLAN].
3. Set the desired [Address Type].
   - [**Manual**] : Indicates that the operator will manually enter network settings including IP Address, Subnet Mask, Gateway.
   - [**DHCP**]: Indicates that the monitor will automatically acquire network settings from a DHCP server.
4. Select [**WLAN Setup >>**] to enter the [**WLAN Setup**] menu.
5. Enter a network name (SSID).
6. Select a security mode from the [Security] drop-down list and configure the items.
   - [**WEP_OFF**], [**WPA-PSK**], [**WPA2-PSK**]: When you select one of these security modes, you need to enter a password for the wireless network.
   - [**WEP_ON**] : When you select this security mode, you need to configure [**Password**], [**Key Index**], and[**AUT. Type**].
   - [**WPA_TKIP**], [**WPA2_AES**], [**CCKM_TKIP**], [**CCKM_AES**], [**WPA_PSK_AES**], [**WPA_AES**]: These security modes are Wi-Fi Protected Access (WPA/WPA2) enterprise encryption modes. When you select one of these security modes, you need to configure additional items such as [**EAP Method**], [**AUT. Protocol**], [**Identity**], [**Anonymity**], and [**CA Certificate**]. You need to import the desired certificate to the monitor before you can select a certificate. For how to manage certificates, see ***3.2.10 Certificates Maintenance***.
7. Select [**Ok**].

To test the availability of the wireless network, follow this procedure:

1. Select [**WLAN Test >>**] in the [**Monitor Network Setup**] menu.
2. Enter the [**IP Address**] of the wireless AP in the [**WLAN Test >>**] menu.
3. Click [**Connection Test**].

   If the designated IP can be successfully connected, the reply time is displayed. If the connection fails, the reply is timeout.

3.2.9 Setting the WLAN Band and Channels

The monitor supports 2.4 G and 5G WLAN. To set WLAN band rate and channels:

1. Select [**Main Menu**]→[**Maintenance>>**]→[**User Maintenance>>**]→enter the required password→select [**Ok**].
2. Select [**Network Setup** >>].
3. Select [**WLAN Setup** >>].
4. Set [**WLAN Band**] to [**Auto**], [**5G**], or [**2.4G**] according to the band you are using. Auto is the default, indicating that the monitor can automatically identify the WLAN band.
5. Select [**AUT. Server Type**] to set the type of authentication server. The options are ACS and SBR.
6. Select [**BG Channe**l] to set the type of B and G channels. The options are All, Specified, and None. When you select [**Specified**], you need to enter the desired channel.
7. Select [**A Channel**] to set the type of A channel. The options are All, Specified, and None. When you select [**Specified**], you need to enter the desired channel.

3.2.10 Certificates Maintenance

WPA)/WPA2 Enterprise can deliver a higher level of security compared with other security encryption modes such as WPA2 PSK. You need to import the desired certificates to the monitor before implementing WPA/WPA2 Enterprise encryption on your WLAN. If you do not need to use certificates, you can also delete them from the monitor.

3.2.10.1 Importing Certificates

To import certificates to the monitor:

1. Create a folder named “cert” in the USB drive
2. .Copy the certificates to the “cert” folder.
3. Insert the USB drive into the monitor’s USB port.
4. Select [**Main Menu**]→[**Maintenance**>>]→[**User Maintenance**>>]→enter the required password.→[**Network Setup >>**]→[**Certificates Maintenance** >>]→[**Import certificates**>>].
5. Select the desired certificates and then select [**Import**].

3.2.10.2 Deleting Certificates

To delete certificates from the monitor:

1. Select [**Main Menu**]→[**Maintenance**>>]→[**User Maintenance**>>]→enter the required password.→[**Network Setup >>**]→[**Certificates Maintenance** >>]→[**Delete certificates**>>].
2. Select the certificates you want to delete. If you want to deselect certificates, select [Reset] and reselect the desired items.
3. Select [**Delete**]. The certificates selected will be deleted from the monitor and will disappear from the [**CA Certificate**] drop-down list.

3.2.11 Setting the Network Service Quality Level

To set the quality of service (QoS):

1. Select [**Main Menu**]→[**Maintenance**>>]→[**User Maintenance**>>]→enter the required password.→[**Network Setup** >>]→[**QoS Setup** >>].
2. Select the desired value for [**Realtime Monitoring**]. This sets the service quality of network connection for important realtime network transactions such as parameter measurements, waveforms, and alarms. The value ranges from 0 to 7. The greater the value, the higher priority the network transaction.
3. Select the desired value for [**Others**]. This sets the service quality of network connection for secondary non-realtime network transactions such as transferring history data from the monitor to the CMS. The value ranges from 0 to7. The greater the value, the higher priority the network transaction.

3.2.12 Setting the Multicast Parameters

Multicast parameters must be configured before use on a network.

To set the multicast parameters:

1 Select [**Main Menu**]→[**Maintenance**>>]→[**User Maintenance**>>]→enter the required password.→[**Network Setup >>**]→[**Multicast Setup** >>].

2. Set [**Multicast Addr**] and [**TTL**].
3. Select [**Ok**] to save the setting.

FOR YOUR NOTES

4 Hardware and Software Upgrade

4.1 Hardware Upgrade

Passport 12/8 patient monitors supports upgrade of the following functions:

- IBP measurement;
- C.O. measurement;
- CO_2 measurement;
- AG measurement;
- O_2 measurement;
- Analog output and Sync Defib;
- Wireless network;
- Recorder; and,
- Hook.

4.1.1 Upgrade Package

Upgrade package	Monitor config. before upgrade	Description of upgrade package	PN of upgrade package
Parameter module	/	IBP_C.O. module kit	115-030781-00
	/	IBP_C.O._Sidestream CO_2 module kit	115-030782-00
	/	IBP_C.O._Microstream CO_2 module kit	115-030783-00
	/	Sidestream CO_2 module kit	115-030779-00
	/	IBP module kit	115-030780-00
	/	IBP_C.O._AG (w O_2) module kit	115-030784-00
Wireless network	/	Passport 12 Wi-Fi module kit	115-010844-00
	/	Passport 8 Wi-Fi module kit	115-010801-00
	/	PP8/12 5G Wi-Fi upgrade kit	115-039363-00
Hook	/	Passport 12 hook assembly kit	115-012698-00
	/	Passport 8 hook assembly kit	115-012697-00

Note: measurement accessories are not included in the above upgrade packages.

4.1.2 Hardware Upgrade Method

4.1.2.1 Upgrading the Parameter Modules

The external parameter modules are ready for use once properly installed into the module slot on the back of the monitor.

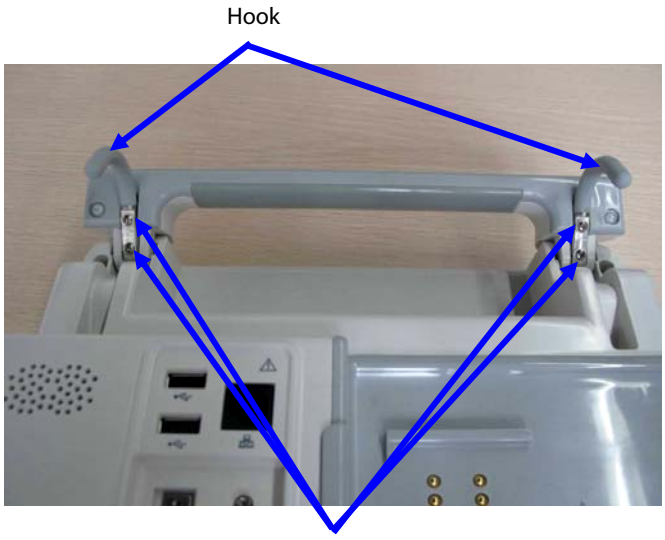
4.1.2.2 Upgrading Wireless Network Function

1. Install the Wi-Fi module onto the main board and then connect the Wi-Fi antennas as described in ***7.4.2 Removing the Wi-Fi Module***.
2. Select [**Main Menu**] → [**Maintenance >>**] → [**User Maintenance >>**] → enter the required password→ [**Network Setup >>**], and then set the [**Network Type**] to [**WLAN**]. Correctly set the monitor and connect to a nearby wireless network as described in ***Network Connection*** in ***Passport 12/Passport 8 Patient Monitor Operator's Manual*** to confirm that the Wi-Fi function is available on the monitor.

4.1.2.3 Installing Hooks

For Passport 12 Patient Monitors

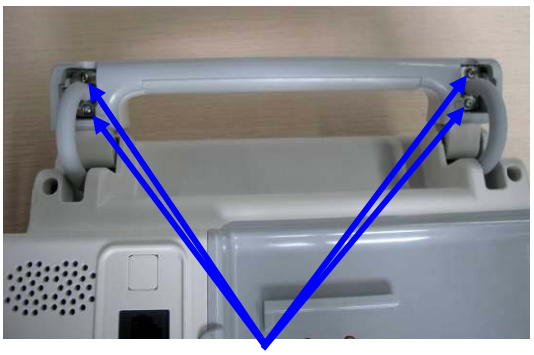
Fasten the two hooks on to the handle with four M3×10 screws with the hook facing downward, as shown below:



Screw, Pan head with washer, Phillips M3×10

For Passport 8 Patient Monitors

1. Remove the handle shield, and install the hook to the handle as shown below. Then insert the positioning pin into the corresponding hole on the hook assembly. Fasten the hook with two M3×6 screws.
2. Install and fasten the other hook onto the patient monitor as described.



Screw, Pan head w/washer, Phillips M3×6

4.2 Software Upgrade

Software upgrades must be performed by Mindray, NA authorized service provider. Call Service Dispatch 1 800 288-2121 ext: 7875.

FOR YOUR NOTES

5 Testing and Maintenance

5.1 Introduction

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

The testing procedures provided in this chapter are intended to verify that the monitor meets the performance specifications. If the monitor or a module fails to perform as specified in any test, repairs or replacements must be done to correct the problem. If you have any question, contact Mindray Technical Support Department.

CAUTION

- **All tests should be performed by qualified service personnel only.**
- **Care should be taken to change the settings in [User Maintenance] and [Factory Maintenance] menus to avoid loss of data.**
- **Service personnel should acquaint themselves with the test tools and make sure that test tools and cables are applicable.**

5.2 Preventative Maintenance

Preventative maintenance refers specifically to actions taken to prevent inaccurate results in the eqipment. The following sections provide a list of recommended preventative maintenance procedures and their recommended frequencies.

5.2.1 Preventative Maintenance Frequency

Check/Maintenance Item		Frequency
CO_2 tests and calibration	Leakage test	1. If the user suspects that the measurement is incorrect. 2. Following any repairs or replacement of relevant module. 3. Once a year.
	Performance test	
	Calibration	
AG test	Leakage test	
	Performance test	
	Calibration	

5.2.2 CO_2 Tests and Calibration

5.2.2.1 Leakage Test

1. Connect the CO_2 module with the patient module.
2. Wait until CO2 warmup is finished and then completely block the gas inlet of the module or watertrap. The sidestream and microstream CO2 modules should have as follows:
   - Sidestream: The alarm message [**CO2 FilterLine Err**] is displayed on the screen after a short time. Block the gas inlet for another 30 s. If the alarm message still displays, it indicates that the module does not leak.
   - Microstream: The alarm message [**CO2 Purging**] is displayed on the screen after a short time. Block the gas inlet for another 30 s. If alarm message [**CO2 FilterLine Err**] is shown, it indicates that the module does not leak.

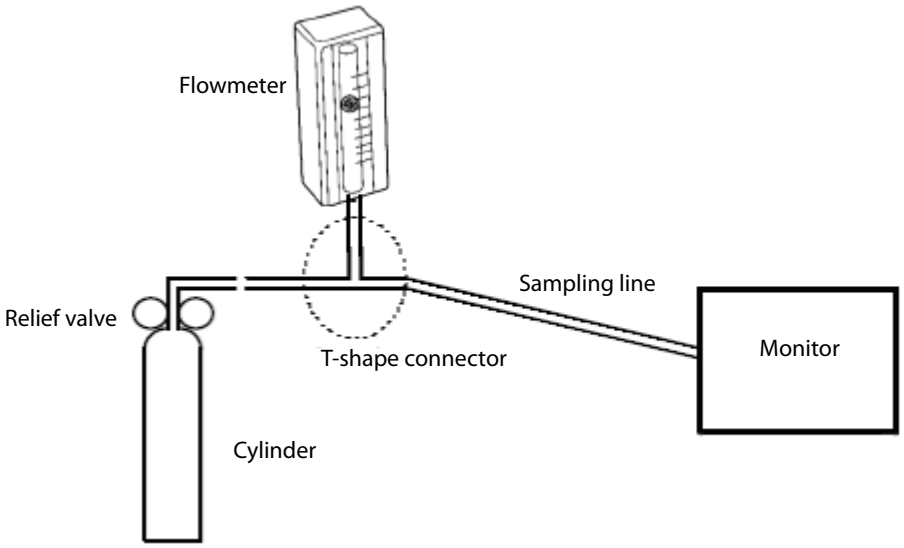
5.2.2.2 Accuracy Test

Tools required:

- A steel gas cylinder with 5±0.03% CO_2, 21.0% O_2 and balance gas N_2 (P/N 0075-00-0033-01), or a steel gas cylinder with:
  - CO_2 concentration 3% - 7%
  - a/c ≤ 0.01 (where a = absolute gas concentration accuracy, c = gas concentration)
- T-shape connector
- Tubing

To perform the test

1. Connect the CO_2 module with the patient module.
2. Wait until the CO_2 module warmup is finished. Check the airway for leak.
3. Select [**Main Menu**]→ [**Maintenance >>**]→[**User Maintenance>>**]→enter the required password→ [**Module Maintenance>>**]→ [**Maintain CO2 >>**]→[**Calibrate CO2>>**]..
4. Connect the test system as follows:



5. Open the valve to flow CO_2 and make sure that there is flow sufficient to vent to atmosphere.
6. Verify the realtime CO_2 value is within 6.0 ± 0.3% in the [**Calibrate CO2**] menu.

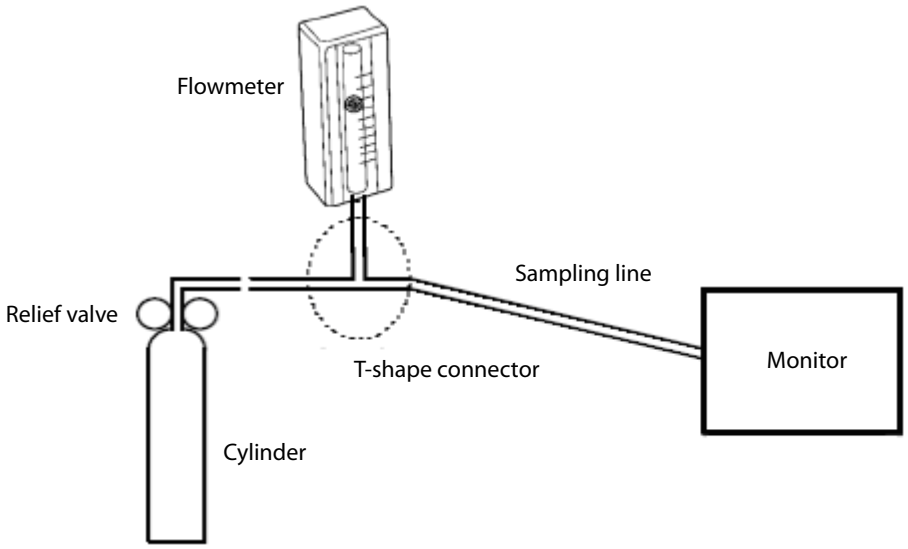
5.2.2.3 Calibration

Tools required:

- A steel gas cylinder with 5±0.03% CO_2, 21.0% O_2 and balance gas N_2 (P/N 0075-00-0033-01), or a steel gas cylinder with:
  - CO_2 concentration 3% - 7%
  - a/c ≤ 0.01 (where a = absolute gas concentration accuracy, c = gas concentration)
- balance gas N_2
- T-shape connector
- Tubing

To perform a calibration:

1. Make sure that the sidestream or microstream CO_2 module is warmed up.
2. Check the airway for leaks.
3. Select [**Main Menu**] → [**Maintenance >>**] → [**User Maintenance >>**] → enter the required password →[**Module Maintenance>>**]→[**Maintain CO2 >>**] → [**Calibrate CO2 >>**].
4. In the [**Calibrate CO2**] menu, select [**Zero**].
5. After the zero calibration is finished successfully, connect the equipment as follows:



6. Open the valve to flow CO2 and make sure that there is flow sufficient to vent to atmosphere.
7. In the [**Calibrate CO2**] menu, enter the CO2 concentration in the [**CO2**] field.
8. In the [**Calibrate CO2**], the measured CO2 concentration is displayed. After the measured CO2 concentration becomes stable, select [**Calibrate CO2**] to calibrate the CO2 module.

If the calibration is finished successfully, the message [**Calibration Completed!**] is displayed in the [**Calibrate CO2**] menu. If the calibration failed, the message [**Calibration Failed**] is displayed. In this case, perform another calibration.

5.2.3 AG Tests and Calibration

5.2.3.1 Leakage Test

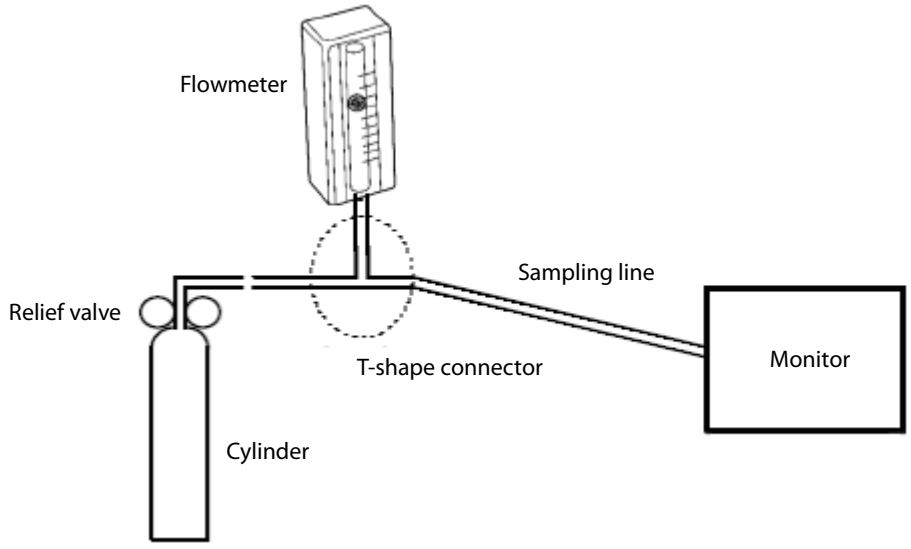
1. Plug the AG module into the module rack.
2. Wait for a minute until the AG module warmup is finished and then use your hand or other objects to completely block the gas inlet of the AG module. An alarm message [**AG Airway Occluded**] will be displayed.
3. Block the gas inlet for another 60 seconds, Then select [**User Maintenance >>**] → [**Maintain AG >>**] → [**Calibrate AG >>**] and check that the current flow rate is less than 10 ml/min. If the alarm message does not disappear, it indicates that the module does not leak.

5.2.3.2 Accuracy Test

Tools required:

- Gas cylinder with a certain standard gas (4% Desflurane, 6% CO_2, 45% N_2O, Bal O_2, P/N: 0075-00-0048-01 and flow regulator P/N: 0119-00-0235). Gas concentration should meet the following requirements : AA ≥ 1.5%, CO_2 ≥ 1.5%, N_2O ≥ 40%, O_2 ≥ 40%, of which AA represents an anesthetic agent (Des, Sev, Enf, Iso, or Hal). a/c ≤ 0.01 (a is the gas absolute concentration accuracy; c is the gas concentration)
- T-shape connector
- Appropriate tubing

1. Plug the AG module into the module rack.
2. Wait for at least 10 min and then perform a leakage test to make sure the airway has no leakage.
3. Check if the fan inside the AG module works correctly.
4. Connect the test system as follows:



5. Adjust the relief valve and make sure the flowmeter reading is stable and within 10 and 50 L/min.
6. Check that the concentration of each composition meets the specification stated in the Operator's Manual.

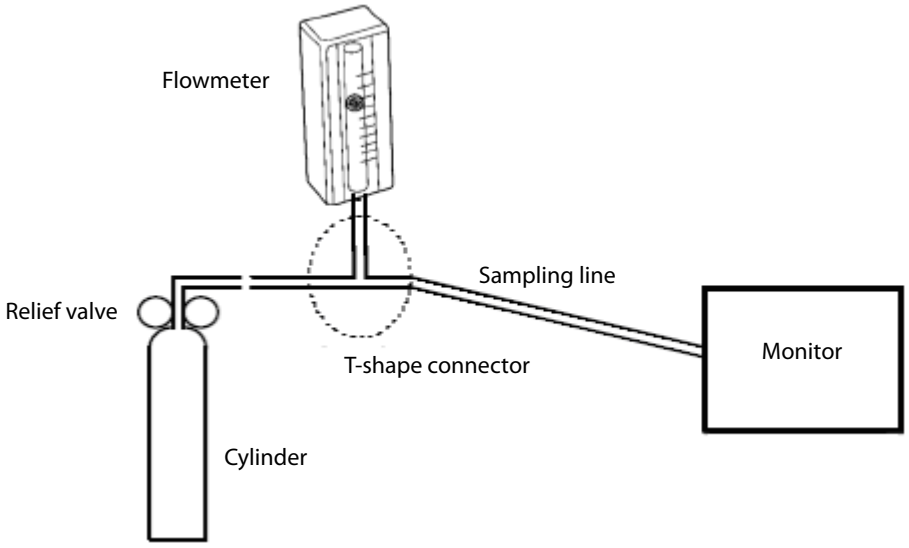
5.2.3.3 Calibration

Tools required:

- Gas cylinder with a certain standard gas (4% Desflurane, 6% CO_2, 45% N_2O, Bal O_2, P/N: 0075-00-0048-01 and flow regulator P/N: 0119-00-0235). Gas concentration should meet the following requirements: AA ≥ 1.5%, CO_2 ≥ 1.5%, N_2O ≥ 40%, O_2 ≥ 40%, of which AA represents an anesthetic agent (Des, Sev, Enf, Iso, or Hal). a/c ≤ 0.01 (a is the gas absolute concentration accuracy; c is the gas concentration)
- T-shape connector
- Appropriate tubing

Follow this procedure to perform the pressure calibration:

1. Select [**Main Menu**] → [**Maintenance >>**] → [**User Maintenance >>**] → enter the required password → [**Calibrate AG >>**] to access the [**Calibrate AG**] menu.
2. Check the airway and make sure that there are no occlusions or leaks.
   - Vent the sampling tubing to the air and check if the [**Current Flow Rate**] and [**Set Flow Rate**] are approximately the same. If the deviation is great, it indicates that there is an occlusion in the tubing. Check the tubing for an occlusion.
   - Check the airway and make sure that the airway has no leakage.
3. Connect the test system as follows:



4. Open the relief valve and vent a certain standard gas or gas mixture. Then adjust the relief valve and make sure the flowmeter reading is stable and within 10 and 50 L/min.
5. In the [**Calibrate AG**] menu, the concentration and flowrate of each measured gas are displayed.
   - If the difference between the measured gas concentration and the actual one is very small, a calibration is not needed.
   - If the difference is great, you should perform a calibration. Select [**Calibrate >>**] to enter the calibrate menu.
6. Enter the vented gas concentration. If you use only one gas for calibration, set other gases' concentration to 0.
7. Select [**Start**] to start calibration.
8. If the calibration is finished successfully, the message [**Calibration Completed!**] is displayed. If the calibration failed, the message [**Calibration Failed**] is displayed. In this case, perform another calibration.

CAUTION

- **Calibrate the O_2 module, if it has been transported for long distance.**

5.3 Performance Tests

Performance test are designed to ensure that measurement results are accurate. The following sections provide a list of performance and accuracy tests and their recommended frequencies.

5.3.1 Performance Test Frequencies

Visual Inspection		1. When first installed or reinstalled.
ECG test	Performance test	1. If the user suspects that the measurement is incorrect. 2. Following any repairs or replacement of relevant module. 3. Once a year for NIBP and CO_2 tests. 4. Once every two years for other parameter module performance tests.
	Verification	
Resp performance test		
SpO_2 test		
NIBP test	Pressure check	
	Leakage test	
Temp test		
IBP performance test		
Analog output performance test		If the user suspects that the analog output does not work.

5.3.2 Visual Inspection

Inspect the equipment for obvious signs of damage. Follow these guidelines when inspecting the equipment:

- Carefully inspect the case, display screen, buttons and knob for obvious signs of damage.
- Inspect the power cord, wall mount, and module accessories for obvious signs of damage.
- Inspect all external connections for loose connectors, bent pins or frayed cables.
- Inspect all connectors on the equipment for loose connectors or bent pins.
- Make sure that safety and information labels on the equipment are clearly legible.

5.3.3 ECG Tests

5.3.3.1 ECG Performance Test

Tool required:

- Fluke Medsim 300B patient simulator or equivalent equipment

To perform an ECG performance test:

1. Connect the patient simulator with the ECG connector using an ECG cable.
2. Set the patient simulator as follows: ECG sinus rhythm, HR = 80 bpm with the amplitude as 1 mV.
3. Check the ECG waves are displayed correctly without noise and the displayed HR value is within 80 ± 1 bpm. If the value is not within 80 +/-1 then contact Mindray Technical Support.
4. Disconnect each of the leads in turn and observe the corresponding lead off message displayed on the screen.
5. Set the simulator outputs paced signals and set [**Paced**] to [**Yes**] on the monitor. Check the pace pulse marks on the monitor screen.

5.3.3.2 ECG Verification

Tool required:

- Vernier caliper

To perform an ECG verification:

1. Select the ECG parameter window or waveform area and set [**Filter**] to [**Diagnostic**].
2. Select [**Main Menu**] → [**Maintenance >>**]→ [**User Maintenance** >>]→ enter the required password→ [**Module Maintenance>>**].
3. Select [**Calibrate ECG**]. A square wave appears on the screen and the message [**ECG calibrating**] is displayed.
4. Compare the amplitude of the square wave with the wave scale. The difference should be within 5%. If the difference is not within 5% contact Mindray Technical Support.

After completing the calibration, select [**Stop Calibrating ECG**].

5.3.4 Resp Performance Test

Tool required:

- Fluke Medsim 300B patient simulator or equivalent equipment

To perform a Resp performance test:

1. Connect the patient simulator to the module using a non ESU-proof cable and set lead II as the respiration lead.
2. Configure the simulator as follows: lead II as the respiration lead, base impedance line as 1500 Ω, data impedance as 0.5 Ω, and respiration rate as 40 rpm.
3. Verify the Resp wave is displayed without any distortion and the displayed Resp value is within 40 ± 2 rpm.

5.3.5 SpO_2 Test

Tool required:

- None

To perform an SpO_2 test:

1. Connect SpO_2 sensor to the SpO_2 connector of the monitor. Set [**Patient Cat.**] to [**Adu**] and [**PR Source**] to [**SpO2**].
2. Apply the SpO2 sensor to the ring finger of a healthy person.
3. Check the Pleth wave and PR reading on the screen and make sure that the displayed SpO2 is within 95% and 100%. If you are unable to get the SPO2 between 95% and 100%, contact Mindray Technical Support.
4. Remove the SpO2 sensor from the finger and make sure that an alarm of SpO2 Sensor Off is triggered.

NOTE

- **A functional tester cannot be used to assess the accuracy of a pulse oximeter monitor. However, it can be used to demonstrate that a particular pulse oximeter monitor reproduces a calibration curve that has been independently demonstrated to fulfill a particular accuracy specification.**

5.3.6 NIBP Tests

5.3.6.1 NIBP Leakage Test

NOTE

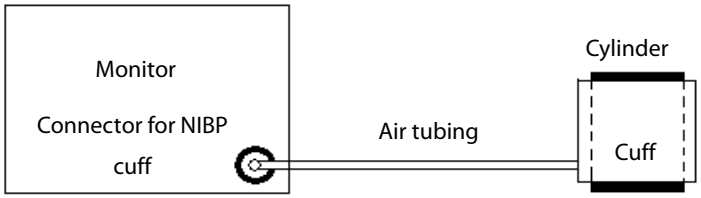
- **Perform NIBP leakage test before any other NIBP related test.**

Tools required:

- NIBP cuff for adult patient
- Tubing
- Cylinder

Follow this procedure to perform the leakage test:

1. Set [**Patient Cat.**] to [**Adu**].
2. Connect the NIBP cuff to the NIBP connector on the monitor.
3. Apply the cuff to the cylinder as shown below.



4. Select [**Main Menu**] → [**Maintenance >>**] →[**User Maintenance >>**] →enter the password→[**Module Maintenance >>**] →[**NIBP Leakage Test**]. The message [**Leakage Testing…**] is displayed in the NIBP parameter area.
5. The cuff automatically deflates after 20 s, indicating NIBP leakage test is completed.
6. 6.If no message is displayed in the NIBP parameter area, it indicates that the system has no leakage. If the message [**NIBP Pneumatic Leak**] is displayed, it indicates that the system may have a leak. In this case, check if all connections are good and the cuff and tubing have no leakage. Perform the test again after making sure all connections are sealed.

You can either perform a manual leakage test:

1. Perform steps 1 to 4 in the ***NIBP Accuracy Test*** section.
2. Raise the pressure in the rigid vessel to 250 mmHg with the Manometer bulb. Then, wait for 5 seconds to let the measured values becoming stable.
3. Record the current pressure value, and meanwhile use a time counter to count the time. Then, record the pressure value after 60 s.
4. Compare the two pressure values and make sure the difference should not be greater than 6 mmHg.

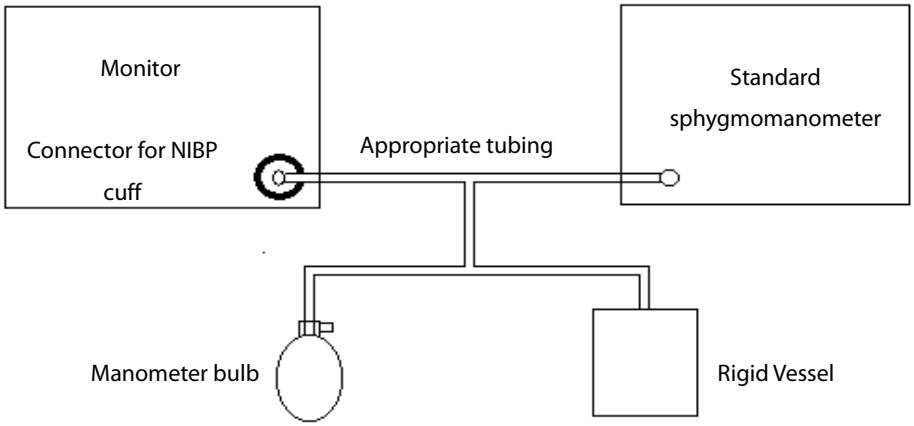
5.3.6.2 NIBP Accuracy Test

Tool required:

- T-shape connector
- Appropriate tubing
- Manometer bulb
- Rigid Vessel with volume 500 ± 25 ml
- Reference manometer (calibrated with accuracy equal to or better than 0.75 mmHg)

Follow this procedure to perform the accuracy test:

1. Connect the equipments as shown below.



2. Before inflation, check that the reading of the manometer is 0. If not, open the Manometer bulb valve to atmosphere. When pressure reads 0, close the bulb valve.
3. Select [**Main Menu**] → [**Maintenance >>**] → [**NIBP Accuracy Test**].

4. Check the manometer values and the monitor values. Both should be 0 mmHg.
5. Raise the pressure in the rigid vessel to 50 mmHg with the bulb. Then, wait for 10 seconds to let the measured values become stable.
6. Compare the manometer values with the monitor values. The difference between the manometer and displayed values should be no greater than 3 mmHg.
7. Raise the pressure in the rigid vessel to 200 mmHg with the bulb. Then, wait for 10 seconds to let the measured values become stable. Repeat step 6.

NOTE

- **You can use an NIBP simulator to replace the manometer bulb and the reference manometer to perform the test.**
- **You can use an appropriate cylinder and a cuff instead of the rigid vessel.**

5.3.7 Temp Test

Tool required:

- Resistance box (with accuracy above 0.1 Ω)

1. Connect the two pins of any Temp connector in the monitor to the two ends of the resistance box using 2 wires.
2. Set the resistance box to 1354.9 Ω (corresponding temperature is 37 ℃).
3. Verify that the displayed value is within 37 ± 0.1℃. If the temperature is not within 37 ± 0.1℃, contact Mindray Technical Support.
4. Repeat steps 1 to 3 and verify another temperature channel.

5.3.8 IBP Performance Test

Tools required:

- Medsim300B patient simulator, or MPS450, or equivalent
- IBP adapter cable for test (P/N 009-002199-00 for Medsim 300B, P/N 009-002198-00, for MPS450)

1. Connect the patient simulator to the monitor's IBP connector.
2. Verify the patient simulator outputs to the IBP channel is zero.
3. Select IBP Zero in the IBP setup Menu to perform a zero calibration.
4. Configure the patient simulator as P (static) = 200 mmHg.
5. The displayed value should be within 200 ± 4 mmHg. If the error is beyond ±4 mmHg, return the IBP module to the factory for repair.
6. Set the patient simulator output to 120/80 mmHg ART signal and 120/0 mmHg LV signal to the IBP channel and check that the IBP wave is displayed correctly.
7. Repeat the steps above to calibrate other IBP channels.

5.3.9 C.O. Test

Tools required:

- Medsim300B patient simulator, or MPS450, or equivalent equipment
- C.O. adapter box (CI-3 module/cable, P/N: 3010-0289 for 300B; P/N: 5180500 for MPS450)
- C.O. trunk cable (P/N: 0010-21-42716)

1. Connect the patient simulator to the C.O. connector on the monitor using a C.O. trunk cable and a C.O. adapter box.
2. Set the blood temperature (BT) to 37 °C on the patient simulator and check that the temperature value displayed on the monitor is within 37 ± 0.2 °C.
3. In the [**C.O. Setup**] menu on the monitor, set [**Auto TI**] to [**Off**], [**Manual TI (°C)**] to 2 °C, and [**Comp. Const.**] to 0.542. Select [**C.O. Measure**] to enter the C.O. measurement window.
4. Select [**Start**] in the C.O. measurement window to start C.O. measurement.
5. On the patient simulator, set C.O. to 5 L/min and wait for 3 to 10 seconds.
6. Verify that the C.O. value displayed on the monitor is 5 ± 0.25 L/min.

5.3.10 Nurse Call Reply Performance Test

Tool required:

- Oscilloscope

To perform a nurse call reply performance test:

1. Connect the nurse call cable to the Multifunctional Connector of the monitor.
2. Enter [**Demo**] mode. Then select [**Main Menu**] → [**Maintenance >>**] → [**User Maintenance >>**] → enter the required password → [**Others >>**].
3. In the [**Others >>**] menu, select [**Nurse Call Setup >>**] and then in the [**Nurse Call Setup**] menu, select all optional [**Alm Lev**] and [**Alm Cat.**], and set [**Contact Type**] to [**Normally Open**].
4. In [**Nurse Call Setup >>**] menu, set [**Signal Type**] to [**Pulse**]. Force the monitor to generate an alarm and check that the oscillograph displays positive pulses of 1s width when there is an alarm.
5. In [**Nurse Call Setup >>**] menu, set [**Signal Type**] to [**Continuous**]. Make the monitor to generate an alarm and check that the oscillograph outputs continuous high level when there is an alarm.

5.3.11 Analog Output Performance Test

Tools required:

- Medsim300B patient simulator, or MPS450, or equivalent equipments
- Oscilloscope

To perform an analog output performance test:

1. Connect the patient simulator to the monitor using an ECG or IBP cable.
2. Connect the oscilloscope to the monitor's multifunctional connector.
3. Verify that the waves displayed on the oscilloscope are identical with those displayed on the monitor.

5.4 Electrical Safety and Other Tests

5.4.1 Electrical Safety and Other Test Frequencies

Check/Maintenance Item		**Frequency**
Electrical safety tests		Refer to appendix ***A Electrical Safety Inspection.***
Power on test		1. When first installed or reinstalled. 2. Following any maintenance or the replacement of any main unit parts.
Touchscreen calibration/		1. When the touchscreen accuracy diminishes. 2. After the touchscreen is replaced.
Battery check	Function test	1. When first installed. 2. Whenever a battery is replaced.
	Performance test	Once a year or if the battery run time is significantly reduced.

5.4.2 Electrical Safety Test

See appendix ***A Electrical Safety Inspection*** for electrical safety tests.

5.4.3 Power-on Test

This test is to verify that the monitor powers up correctly.

1. Insert the battery in the battery compartment and connect the monitor to the AC mains. The AC mains LED and battery LED light.
2. Press the power on/off switch to switch on the monitor.

The monitor will perform a self-test at power up. During the self-test, the alarm lamp will turn yellow, red, and then off; the monitor will then give a beep. This indicates that the visual and audible alarm indicators operate properly.

5.4.4 Touchscreen Calibration

Tool required:

- None

To perform a touchscreen calibration:

1. Select [**Main Menu**] → [**Maintenance >>**] → [**Cal. Touchscreen**]. The  symbol will appear at different positions of the screen.
2. Touch, in order, the central point of the  symbol. After the calibration is completed, the message [**Screen Calibration Completed!**] is displayed.
3. Select [**Ok**] to confirm the completion of the calibration.

5.4.5 Recorder Check

Tool required:

- None

To perform a recorder check:

1. Print ECG waveforms. The recorder should print correctly and the printout should be clear.
2. Set the recorder to some problems such as out of paper, etc. the monitor should give corresponding prompt messages. After the problem is removed, the recorder should be able to work correctly.
3. Switch automatic alarm recording for each parameter ON and then set each parameter's limit outside set alarm limits. Corresponding alarm recordings should be triggered when parameter alarms occur.

5.4.6 Battery Check

Tool required:

- None

5.4.6.1 Battery Function Test

To perform a function test:

1. If the monitor is installed with a battery, remove the battery first.
2. Verify that the monitor works correctly when running powered from an AC source.
3. Insert the battery per the procedures provided in the Operator's Manual.
4. Remove the AC power cord and verify that the monitor still works correctly.

5.4.6.2 Battery Performance Test

The performance of a rechargeable battery will deteriorate over time. The battery performance test must be performed every six months, before monitor repairs, or whenever the battery performance is suspected.

To check the performance of a battery:

1. Disconnect the monitor from the patient and stop all monitoring or measuring.
2. Turn off the monitor.
3. Apply AC power to the monitor and allow the battery to charge uninterrupted for 4 hours.
4. Remove AC power and allow the monitor to run from the battery until it shuts off.
5. Record the battery operating time.

The battery operating time directly reflects its performance. If the battery operating time is noticeably shorter than that stated in the specifications, contact your Mindray service personnel.

5.4.7 Network Print Test

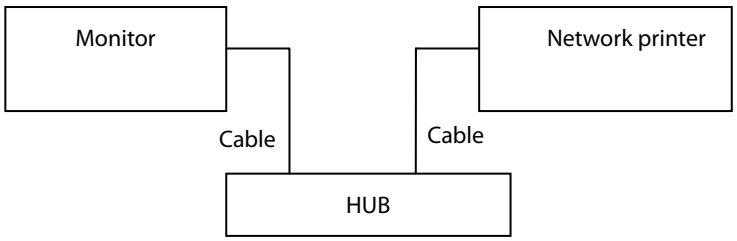
Note

- **Use the recommended printers specified in the operator's manual (PN: 046-004417-00).**

Tools required:

- Hub and network cable

1. Connect the monitor and network printer to a HUB using common network cables as follows:



2 Set IP address as follows: Select [**Main Menu**]→ [**Maintenance >>**]→ [**User Maintenance >>**]→ enter the required password→ [**Network Setup >>**]→ [**Monitor Network Setup >>**] and set the IP address of the monitor in the same network segment with that of the network printer. (See the instructions for use accompanying the printer).

3 Search for printer by selecting [**Main Menu**]→ [**Print Setup >>**]→ [**Printer Setup >>**]→ [**Search Printer**]. Momentarily, the printer's model and IP address will appear in the box beside [**Printer**].

5.4.8 Print Function Test

To perform a print function test:

1. Enter the Demo mode of the monitor.
2. Select [**Main Menu**]→ [**Print Setup >>**]→ [**Realtime Reports >>**]→ [**Normal Report**] and then select [**Print**]. The network printer should print out the report correctly.

5.5 Factory Maintenance

5.5.1 Accessing Factory Maintenance Menu

To access the [**Factory Maintenance**] menu, select [**Main Menu**] → [**Maintenance >>**] → [**Factory Maintenance >>**] → enter the required password.

5.5.2 Configuring the Central Station

The monitor can be connected to either the Panorama central station or the Hypervisor central station. In the [**Factory Maintenance>>**] menu, select [**Central Station**] to configure the central station you want to connect.

5.5.3 Drawing Waves

In the [**Factory Maintenance>>**] menu, select [**Draw Wave**] to define the method to draw waves.There are two methods to draw waves: [**Color**] and [**Mono**].

- Color: selecting Color will have smoother waveforms.
- Mono: selecting Mono will have a wider viewing angle.

5.5.4 Enabling/Disabling Recorder

To enable/disable the recorder, select [**Recorder**] and toggle between [**On**] and [**Off**].

NOTE

- **The recorder is disabled if [**Recorder**] is set to [**Off**] in the [**Factory Maintenance**] menu.**

5.5.5 Checking Software version

In the [**Factory Maintenance**] menu, select the [**Software Version >>**] to show the software version information

5.5.6 Checking Monitor information

In the [**Factory Maintenance**] menu, select [**Monitor Information >>**] to show the status of the monitor

FOR YOUR NOTES

6 Troubleshooting

6.1 Introduction

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

For more information on troubleshooting, contact Mindray Technical Support Department.

6.2 Part Replacement

Printed circuit boards (PCBs), major parts and components in the monitor are replaceable. Once you isolate a PCB you suspect defective, follow the instructions in chapter ***7 Disassembly and Repair*** to replace the PCB with a known good one. Verify proper operation and that the monitor passes all performance tests. Defective PCB can be sent to Mindray Technical Support Department for repair.

To obtain information on replacement parts or order them, refer to chapter ***8 Parts***.

6.3 Checking Monitor Status

Some troubleshooting tasks may require you to identify the hardware version and status of your monitor.
To view the information on system start time, self check, etc., select [**Main Menu**]→[**Maintenance >>**]→[**Monitor Information >>**].
You can also view the information on the monitor's current status by selecting [**Main Menu**]→[**Maintenance >>**]→[**Factory Maintenance >>**]→enter the required password→[**Monitor Information >>**].

6.4 Checking Software Version

Some troubleshooting may involve software compatibility. This requires you to know your monitor configuration and software version. For detailed information on version compatibility, please contact our Technical Support Department.

To view information on the system configuration and system software version, select [**Main Menu**] → [**Maintenance >>**] → [**Software Version >>**].

You can also view the information on system software version and module software version by selecting [**Main Menu**] →[**Maintenance >>**]→[**Factory Maintenance >>**]→enter the required password → [**Software Version>>**]..

6.5 Checking Technical Alarms

Before troubleshooting the monitor, check for technical alarm messages. If an alarm message is presented, eliminate the technical alarm first.

For detailed information on technical alarm message, possible cause and corrective action, refer to the patient monitor's Operation Manual.

6.6 Troubleshooting Guide

6.6.1 Power On/Off Failure

Symptoms	Possible Cause	Corrective Action
The monitor fails to start.	AC mains not connected or battery too low	Check that AC mains is properly connected or battery capacity is sufficient.
	Cable defective	1. Check that the cable between the keypad board and main board is correctly connected. 2. Check that the cable between the power board and power management board is correctly connected. 3. Check that the cable between the main board and power management board is correctly connected.
	Power board defective	Replace the power board.
	Power management board defective	Replace the power management board.
	The main board failed.	Replace the main board.

6.6.2 Display Failures

Symptoms	Possible Cause	Corrective Action
The display is blank or black.	Cable defective	1. Check if the cable between the display and main board and the backlight cable are correctly connected. 2. Check that the cables and connectors are not damaged.
	Main board defective	Replace the main board.
	Display defective	Replace the display.
Images overlapped or distorted	Main board error	Replace the main board, or upgrade the main board with the upgrade software.
	Cable defective	Check if the cable between the display and main board and the backlight cable are correctly connected.
Secondary display does not function or displays snows or flashing specks	Cable defective	1. Check that the cable between the secondary display and the monitor is correctly connected. 2. Check that the cable between the main board and power management board is correctly connected. 3. Check that the cable between power management board and interface board is correctly connected.
	The connector board failed.	Replace the connector board.

Symptoms	Possible Cause	Corrective Action
	Power management board defective	Replace the power management board.
	The main board failed.	Replace the main board.
Touchscreen does not respond.	Touchscreen disabled	Check if there is a  symbol displayed above the [Main Menu] quickkey. If yes, press and hold the [Main Menu] quickkey for more than 3 seconds to enable the touchscreen.
	Cable defective	1. Check that the cable between the touchscreen and touchscreen control board is correctly connected. 2. Check that the cable between the touchscreen control board and main board is correctly connected.
	Touchscreen control board defective	Replace the touchscreen control board
	Touchscreen defective	Replace the touchscreen.
	The main board failed.	Replace the main board.
Touch position invalid	Touchscreen not calibrated	Calibrate the touchscreen.

6.6.3 Alarm Lamp Failures

Symptoms	Possible Cause	Corrective Action
The alarm lamp is not light or extinguished, or the alarm lamp illuminates abnormally.	Cable defective	1. Check that the cable between the alarm lamp board and main board is correctly connected. 2. Check that the cables and connectors are not damaged.
	Alarm lamp board defective	Replace the alarm lamp board
	The main board failed.	Replace the main board.

6.6.4 Button and Knob Failures

Symptoms	Possible Cause	Corrective Action
Buttons do not work	Cable defective	Check that the cable between the keypad board and main board is correctly connected.
	Keypad board failure	Replace the keypad board.
Knob does not work	Cable defective	1. Check that the cable between the knob and keypad board is correctly connected. 2. Check that the cable between the keypad board and main board is correctly connected.
	Knob failure	Replace the knob encoder.
	Keypad board failure	Replace the keypad board.

6.6.5 Sound Failures

Symptoms	Possible Cause	Corrective Action
No hardkey or knob sound, or hardkey or knob sound abnormal	The key volume is set to zero.	Select [**Main Menu**] → [**Screen Setup >>**] → [**Key Volume >>**] and adjust the key volume to appropriate level.
	Cable defective	Check that the cable between the speaker and interface board is properly connected.
	Speaker defective	Replace the speaker.
	The main board failed.	Replace the main board.
	Power management board defective	Replace the power management board.
No alarm sound or alarm sound abnormal	The alarm sound is set to zero.	Select [**Main Menu**]→[**Maintenance >>**]→[**User Maintenance >>**]→enter the required password →[**Alarm Setup >>**] and set the [**Minimum Alarm Volume**] to appropriate level. Select [**Alarm Setup**] on the main menu to adjust the alarm volume.
	Cable defective	Check that the cable between the speaker and interface board is properly connected.
	Speaker defective	Replace the speaker.
	The main board failed.	Replace the main board.
	Power management board defective	Replace the power management board.

6.6.6 Battery Failures

Symptoms	Possible Cause	Corrective Action
Battery cannot be charged	Battery defective	Replace the battery.
	Cable defective	Check that the cable between the battery interface board and power management board is correctly connected.
	Power management board defective	Replace the power management board.
	Battery interface board defective	Replace the battery interface board.

NOTE

- **When the battery module has a failure, it may cause problems to other components, In this case, troubleshoot the battery module per the procedure described in the table above.**
- **Components of the main unit are powered by the power module. In the event that a component malfunctions, check if the operating voltage is correct.**

6.6.7 Recorder Failures

Symptoms	Possible Cause	Corrective Action
No printout	Recorder module disabled	1. Check if the recorder status indicator lights. 2. If yes, enable the module in the [**Factory Maintenance**] menu. Otherwise, check for other possible causes.
	Paper reversed	Re-install the paper roll.
	Cable defective	Check that the cable between the recorder and main board is correctly connected.
	Recorder defective	Replace the recorder.
Poor print quality or paper not feeding properly	Paper roll not properly installed	Stop the recorder and re-install the paper roll.
	Print head dirty	1. Check the thermal print head and the paper roller for foreign matter. 2. Clean the thermal print head with an appropriate clean solution.
	Recorder defective	Replace the recorder.

6.6.8 Output Interface Failure

Symptoms	Possible Cause	Corrective Action
No analog out signal	Cable defective	1. Check that the cable between the multi-parameter board and power management board is correctly connected. 2. Check that the cable between power management board and interface board is correctly connected.
	Multi-parameter board failure	Replace the multi-parameter board
	Power management board defective	Replace the power management board.
	The connector board failed.	Replace the connector board .
Unable to use the USB devices USB drive data transfer failure	Cable defective	1. Check that the cable between the power management board and main board is correctly connected. 2. Check that the cable between power management board and interface board is correctly connected.
	The connector board failed.	Replace the connector board.
	Power management board defective	Replace the power management board.
	The main board failed.	Replace the main board.
	Improper setup	Select [**Main Menu**]→[**Maintenance >>**]→[**User Maintenance >>**]→enter the required password→ [**Others >>**] and set [**Data Transfer Method**] to [**USB Device**].

6.6.9 Data Storage Failure

Symptoms	Possible Cause	Corrective Action
Fails to review archived patient data	Abnormal patient admitting	Admit the patient properly.
	SD card full; unavailable for more patient data	Delete garbage patient data, remove the related alarm, and readmit the patient.
	The main board failed.	Replace the main board.
SD card failure	SD card not formatted	Format the SD card.
	SD card failure	Replace the SD card.
	SD card is locked	Unlock the SD card.
	Main board defective	Replace the main board.

6.6.10 Wired Network Related Problems

Symptoms	Possible Cause	Corrective Action
Unable to connect the wired network	Incorrect LAN cable connection	Check LAN cable connection. LAN cable shall not be longer than 50 m.
	Incorrect IP address configuration	Check for IP address conflict. If yes, reconfigure the IP address.
	Cable defective	1. Check that the cable between the power management board and main board is correctly connected. 2. Check that the cable between power management board and interface board is correctly connected.
	The connector board failed.	Replace the connector board.
	Power management board defective	Replace the power management board.
	The main board failed.	Replace the main board.
The monitor is frequently off line or disconnects from the network.	Incorrect LAN cable connection	Check LAN cable connection. LAN cable shall not be longer than 50 m.
The monitor is connected to a LAN but cannot view other patients under the View Others mode	Incorrect LAN cable connection	Check LAN cable connection. LAN cable shall not be longer than 50 m.
	Excessive requests for viewing the monitor at the same time	A monitor can only be viewed by 4 other monitors at the same time under the View Others mode. The excessive view requests system will be ignored.
	Incorrect IP address configuration	Check for IP address conflict. If yes, reconfigure the IP address.

6.6.11 Wi-Fi Related Problems

Symptoms	Possible Cause	Corrective Action
The monitor is frequently off line or disconnects from the Wi-Fi network. The transmission delay is too long.	The Wi-Fi signal is unstable in the operating area.	1. Check if the Mindray recommended wireless AP is used. If not, verify the AP effective transmission rate meets the throughput requirements of the connected devices. 2. Verify the AP channel bandwidth is 20 MHz. 3. Verify where the monitor is located, the wireless AP signal strength is no less than -65 dBm. 4. Verify where the monitor is located, the signal strength of other Wi-Fi devices at the same channel is no greater than -85 dBm. 5. Verify where the monitor is located, the signal strength of other Wi-Fi devices of adjacent channels is no greater than -50 dBm. 6. Verify that the recommended distance between the monitor and other non-Wi-Fi wireless devices, including wireless devices at the frequency of 2.4GHz, cellular mobile communication networks, microwave ovens, intercoms, cordless phones and electro-surgical units, is no less than 20 cm. 7. Verify that no unauthorized devices are connected to the wireless AP.
	The monitor's Wi-Fi antenna is detached from or not properly connected with the Wi-Fi module.	Disassemble the monitor and properly attach the Wi-Fi antenna.
	Wi-Fi antenna defective	Replace the Wi-Fi antenna.
	Wi-Fi module defective	Replace the Wi-Fi module.

Symptoms	Possible Cause	Corrective Action
Unable to connect to the Wi-Fi network.	The Wi-Fi signal is unstable in the operating area.	1. Verify that the network is available. 2. Check if the network type is correctly set. For example, if LAN is used, set network type to LAN and connect the patient monitor to the network; if WLAN is used, set the network type to WLAN and connect the patient monitor to the network. 3. Check that the SSID and password of the monitor are consistent with those of the wireless AP. 4. Check for IP address conflicts. If any, set the IP addresses correctly. 5. Check if Mindray recommended wireless AP is used. If not, verify the AP effective transmission rate meets the throughput requirements of the connected devices. 6. Verify the AP channel bandwidth is 20 MHz. 7. Verify where the monitor is located, the wireless AP signal strength is no less than -65 dBm. 8. Verify where the monitor is located, the signal strength of other Wi-Fi devices at the same channel is no greater than -85 dBm. 9. Verify where the monitor is located, the signal strength of other Wi-Fi devices of adjacent channels is no greater than -50 dBm. 10. Verify that the recommended distance between the monitor and other non-Wi-Fi wireless devices, including wireless devices at the frequency of 2.4GHz, cellular mobile communication networks, microwave ovens, intercoms, cordless phones and electro-surgical units, is no less than 20 cm.
	The monitor's Wi-Fi antenna is detached from or not connected to the Wi-Fi module.	Properly attach the Wi-Fi antenna.
	Wi-Fi antenna defective	Replace the Wi-Fi antenna.
	Wi-Fi module defective	Replace the Wi-Fi module.
	Main board defective	Replace the main board.

6.6.12 Module Failures

Symptoms	Possible Cause	Corrective Action
Failed to connect the external parameter modules	Module defective	1. Check that the cable between the external converter board inside the module and the converter board is correctly connected, 2. Replace the converter board.
	Main unit defective	1. Check that the cable between the main board and power management board is correctly connected. 2. Replace the power management board. 3. Replace the main board.
Module can be loaded, but "XX communication stopped" is reported or some parameters cannot be used	Cable defective inside the module	Check the cables connecting the converter board and corresponding parameter module.
	Parameter module defective	Replace the corresponding module.
	Converter board defective inside the module	Replace corresponding converter board.

6.6.13 Technical Alarm Messages

Refer to the ***Passport 12/Passport 8 Patient Monitor Operator's Manual (PN: 046-004417-00)***.

FOR YOUR NOTES

7 Disassembly and Repair

7.1 Tools Required

To disassemble and replace the parts and components, the following tools may be required:

- Philips screwdrivers
- Tweezers
- Needle nose pliers
- Clamp

7.2 Preparations for Disassembly

Before disassembling the equipment, finish the following preparations:

- Stop patient monitoring, turn off the equipment, and disconnect all the accessories and peripheral devices.
- Disconnect the AC power source and remove the battery.

WARNING

- **Before disassembling the equipment, be sure to eliminate the static charges first. When disassembling the parts labeled with static-sensitive symbols, make sure you are wearing electrostatic discharge protection such as antistatic wristband or gloves to avoid damaging the equipment.**
- **Properly connect and route the cables and wires when reassembling the equipment to avoid short circuit.**
- **Select appropriate screws to assemble the equipment. If unfit screws are tightened by force, the equipment may be damaged and the screws or part may fall off during use, causing unpredictable equipment damage or human injury.**
- **Follow correct sequence to disassembly the equipment. Otherwise, the equipment may be damaged permanently.**
- **Be sure to disconnect all the cables before disassembling any parts. Be sure not to damage any cables or connectors.**
- **Be sure to place removed screws and disassembled parts properly, preventing them from being lost or contaminated.**
- **Place the screws and parts from the same module together to facilitate reassembling.**
- **To reassemble the equipment, first assemble the assemblies, and then the main unit. Carefully route the cables.**
- **Make sure that the waterproof material is properly applied during reassembling.**

7.3 Disassembling the Main Unit

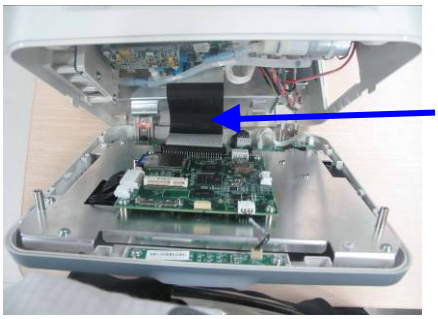
NOTE

- **The recorder can be disassembled separately.**
- **To disassemble the equipment, place the equipment on a work surface free from foreign material, avoiding damaging the antiglare screen, touchscreen and the knob. Be careful not to break the two cotter pins on the front ends of rear housing.**
- **All operations should be performed by qualified service personnel only. Make sure to put on insulating gloves during service operations.**
- **Operations relating to optional parts may not apply to your equipment.**

7.3.1 Separating the Front and Rear Half of the Monitor

1. Lay the monitor on a flat platform with the knob overhanging as shown below. Then unscrew the two M3×10 screws on the rear panel and the two M3×6 screws on the bottom of the monitor.

2. Stand the monitor and separate the front housing assembly and rear housing assembly with caution. Disconnect the cable between the main board and keypad board and then take off the front panel.

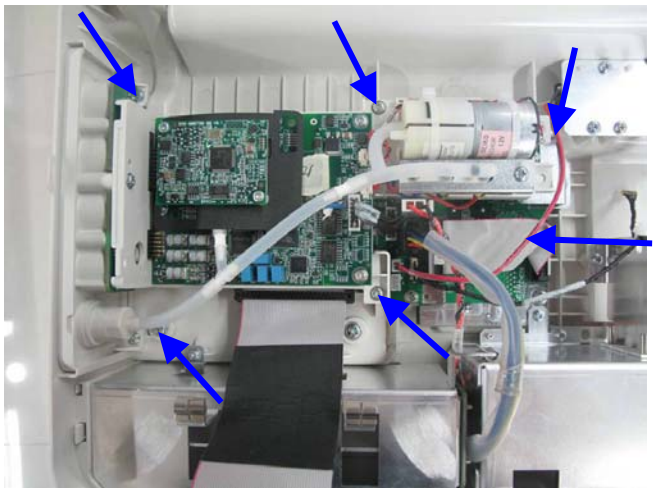


NOTE

- **When reassembling the equipment, be sure to check if the front housing waterproof strip is correctly placed.**

7.3.2 Disassembling Parameter Modules

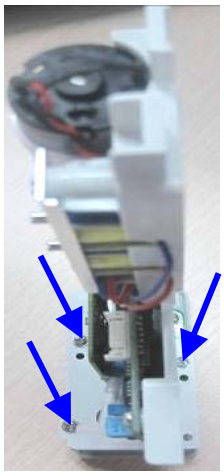
Lay the monitor on a flat platform and unscrew the five M3×5 screws as shown below. Disconnect the cable between the power management board and multi-parameter board, and then take out the parameter module.



Cable between the power management board and multi-parameter board

7.3.3 Removing the Parameter Connector Panel Assembly

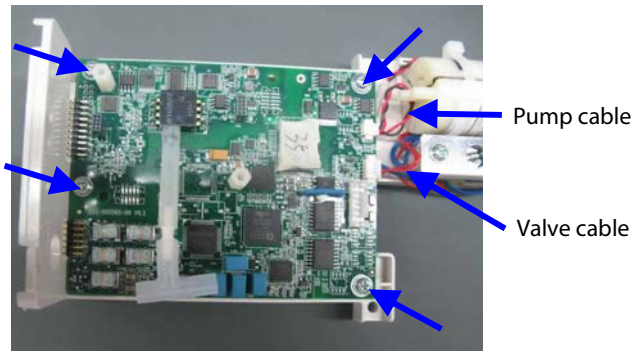
Unscrew the three M3×6 screws as shown below and separate the parameter connector panel assembly and parameter board assembly.



7.3.4 Removing the SpO_2 Board and Parameter Board

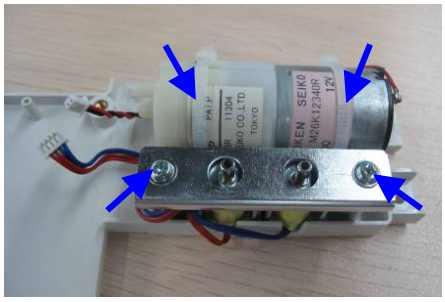
1. Unscrew the two M3×4 screws and take out the SpO_2 board and insulation plate.

2. Unscrew the four M3×6 screws, disconnect the pump cable and valve cable, and then take out the SpO_2 board.



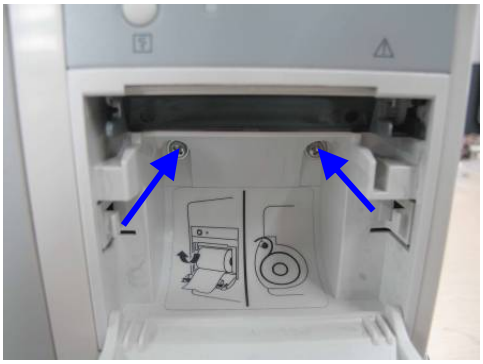
7.3.5 Removing Pump and Valve

Unscrew the two M3×6 screws and take out the valve. Then cut the two tie wraps to take out the pump.



7.3.6 Removing the Recorder (Optional)

Unscrew the two M3×6 screws, press locking tabs inward to release, and disconnect the recorder cable to remove the recorder.

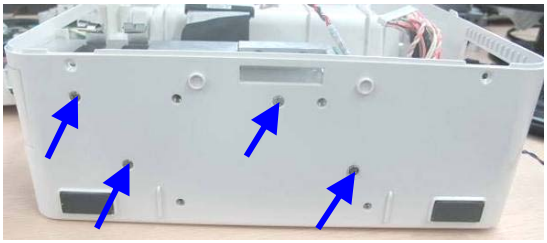


NOTE

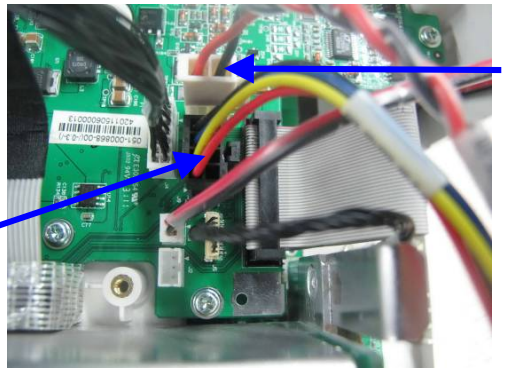
- **The recorder can be disassembled separately.**

7.3.7 Removing Battery Interface Board and Power Board (Passport 8)

1. Unscrew the three M3×6 screws inside the monitor and the four M3×6 screws on the bottom as shown below:



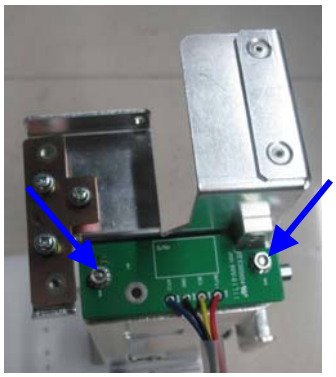
2. Disconnect the cable between battery interface board and power management board, and the cable between the power management board and AC/DC power board. Then take out the battery compartment assembly.



Cable between the power management board and AC/DC power board

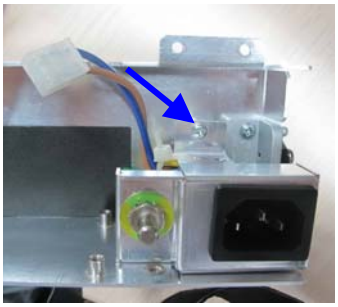
Cable between the battery interface board and power management board

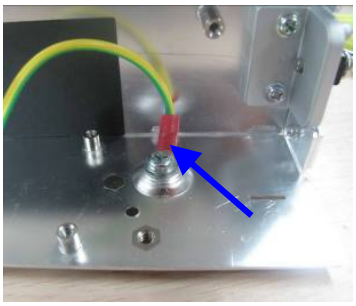
3. Unscrew the two M3 nuts to take out the battery interface board.



4. Unscrew the three M3×6 screws to remove the AC/DC power board.

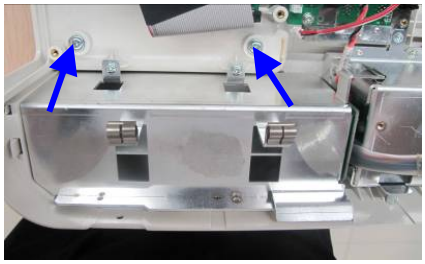
5. Unscrew the M3×6 screw and the flat head screw fastening the AC input receptacle assembly, and then loosen the screw that fastens the grounding cable to remove the AC input receptacle assembly.

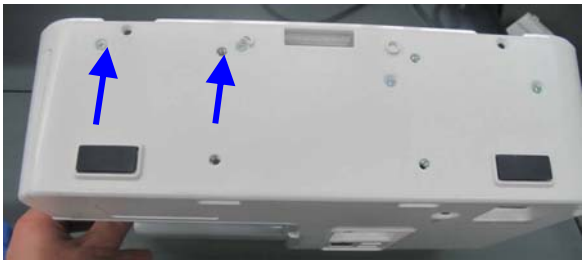




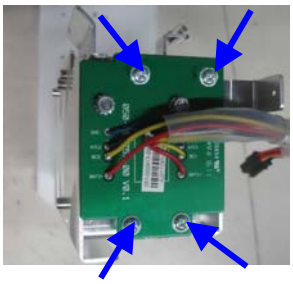
7.3.8 Removing the Battery Interface Board and Power Board (Passport 12)

1. Unscrew the two M3×6 screw inside the monitor and then the two M3×6 screws on the bottom. Then disconnect the cable between the battery interface board and power management board to remove the battery compartment assembly.

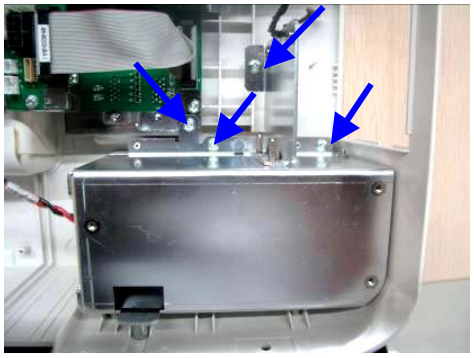




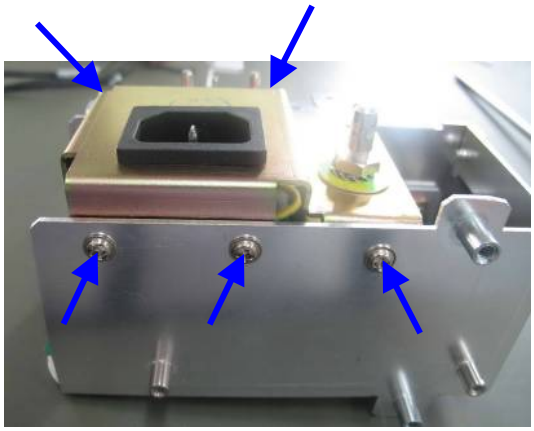
2. Unscrew the four M3×6 screws to take out the battery interface board assembly.



3. Unscrew the two M3×6 screws inside the monitor and then the two M3×6 screws on the bottom. Then disconnect the cable between the battery interface board and the power management board to remove the power board assembly.



4. Unscrew the five M3×6 screws that fasten the AC input receptacle assembly and then the screw that fastens the grounding cable. Unplug the AC input receptacle and cable from the board to remove the AC input receptacle assembly.

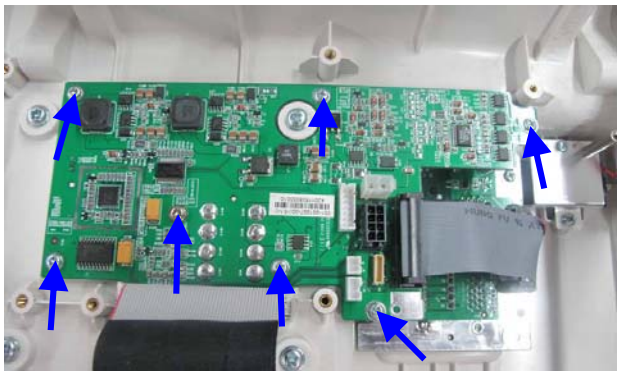


AC input receptacle and cable

5. Unscrew the three M3×6 screws to remove the AC/DC power board.

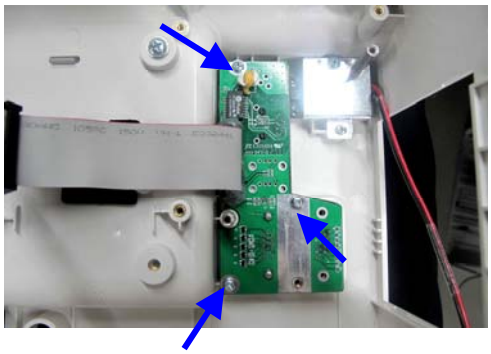
7.3.9 Removing the Power Management Board

Unscrew the seven M3×6 screws inside the monitor, disconnect all the cables, and then remove the power management board.



7.3.10 Removing the Interface Board (Passport 8)

Unscrew the three M3×6 screws inside the monitor and remove the interface board.



7.3.11 Removing the Interface Board (Passport 12)

Unscrew the three M3×6 screws inside the monitor and remove the interface board.

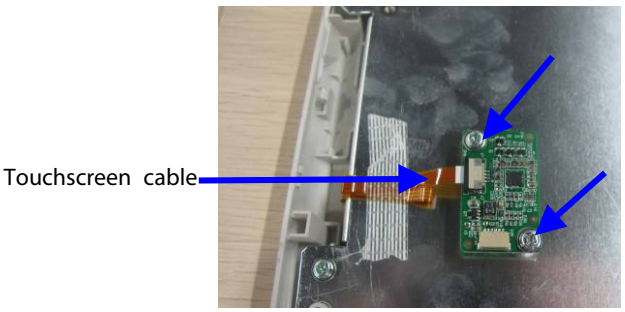
7.4 Disassembling the Front Housing Assembly

NOTE

- **To disassemble the equipment, place the equipment on a work surface free from foreign material, avoiding damaging the antiglare screen, touchscreen and the knob.**
- **Remember to install the screen support pad properly during reassembly.**
- **Operations relating to optional parts may not apply to your equipment.**
- **Position the touchscreen properly with the flexible cable facing down.**

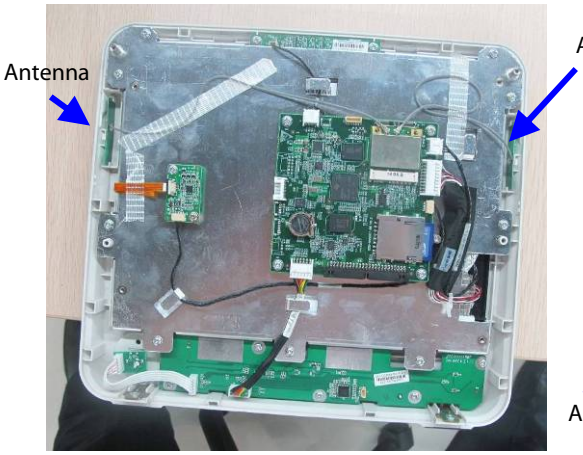
7.4.1 Removing Touchscreen Control Board

Loosen and unscrew the two M3×6 screws as shown below. Disconnect the touchscreen cable and cable for touchscreen control board, and then remove the touchscreen control board.

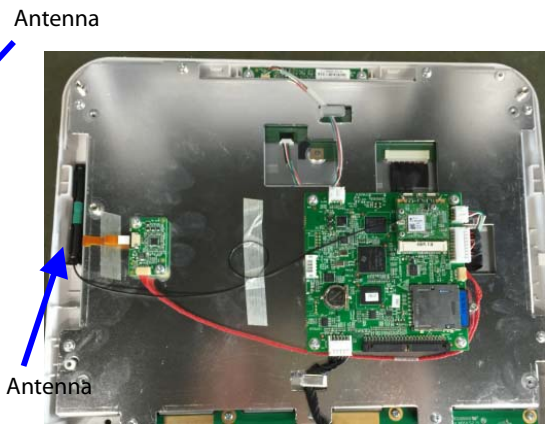


7.4.2 Removing the Wi-Fi Module

1. Take out the antennas on the front panel from the slots as shown below:

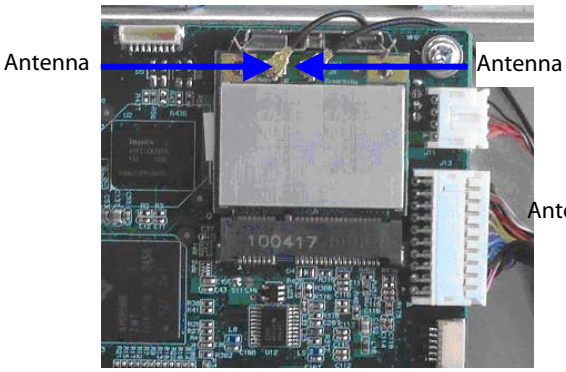


Cyber link



Laird

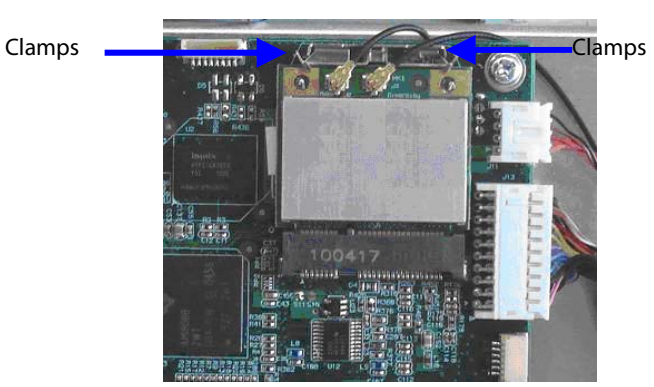
2. Remove the antennas from the Wi-Fi module PCBA.



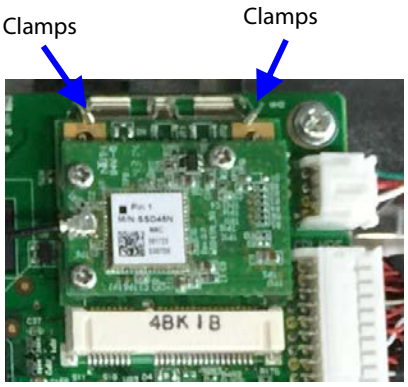
Cyber link

Laird

3. Push the clamps aside to remove the Wi-Fi module.



Cyber link



Laird

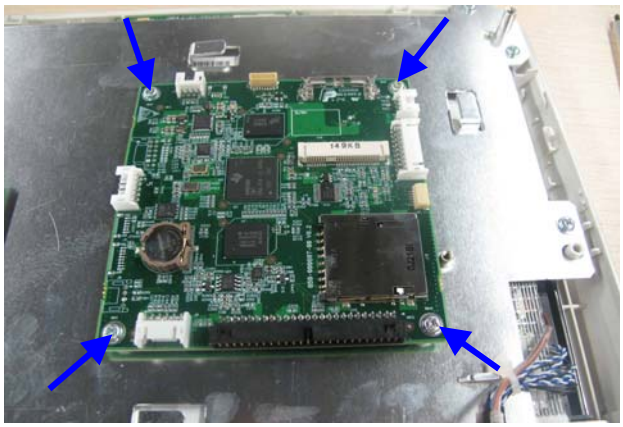
4. For Laird 2.4/5GHz Module, unscrew the three M2×4 screws and disassembly the Laird 2.4/5GHz Module and Carrier Board of Wireless Module:

7.4.3 Removing SD Card

Unscrew the M3×6 screw, and push the SD card as indicated below to take out the SD card.

7.4.4 Removing the Main Control Board

Disconnect the alarm lamp cable, cable for display backlight, display cable, and the cable between the main board and keypad board respectively. Unscrew the four M3×8 screws and take out the main board, as shown below:



7.4.5 Removing the Touchscreen

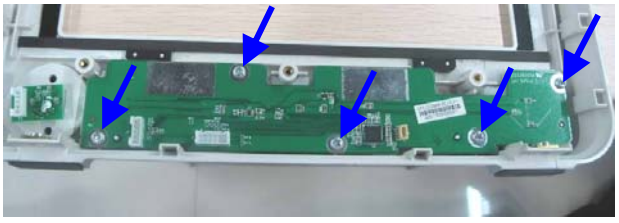
Unscrew the nine M3×6 screws as indicated below. Take out the touchscreen assembly and then the touchscreen.

7.4.6 Disassembling the Screen

Unscrew the four M3×6 screws indicated below to remove the screen.

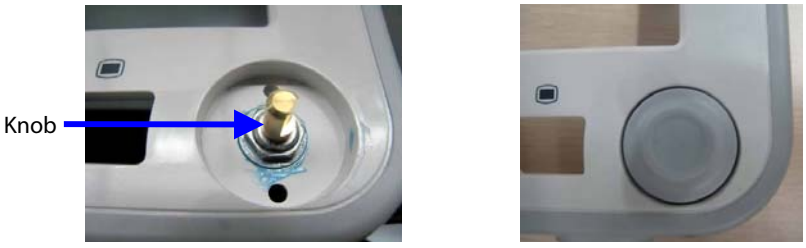
7.4.7 Removing the Keypad

Unplug the encoder cable and unscrew the five PT3×8 screws indicated below. Take out the keypad.



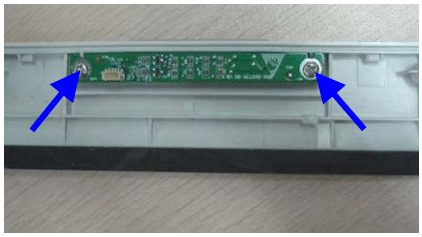
7.4.8 Removing the Encoder

Remove the encoder knob out from the slot and loosen the nut with a needle nose plier. Take out the encoder.



7.4.9 Removing the Alarm Lamp Board

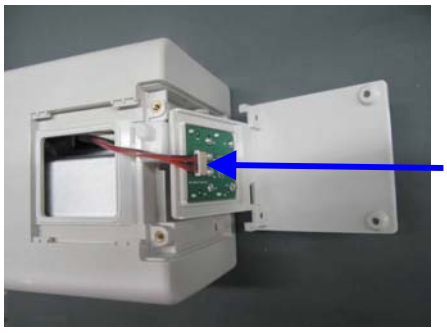
Unscrew the two M3×6 screws indicated below and take out the alarm lamp board.



7.5 Disassembling Modules

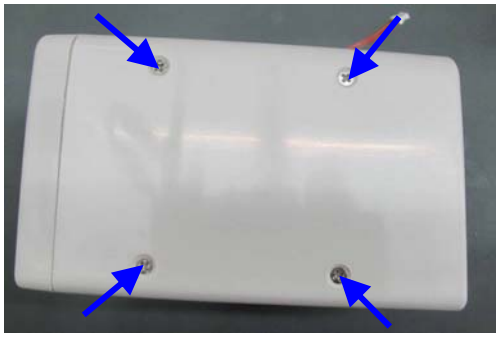
7.5.1 Removing the External Converter Board

Unscrew the four M3×8 screws and disconnect the cable between the converter board and copper board to remove the converter board.

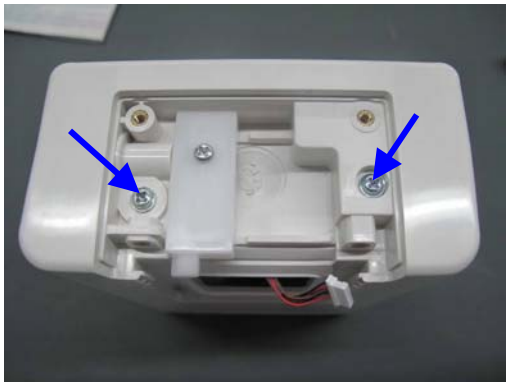


7.5.2 Separating the Front and Rear Housing of Modules

1. For AG modules, unscrew the four M3×8 screws on the bottom before separating the front and rear housing.

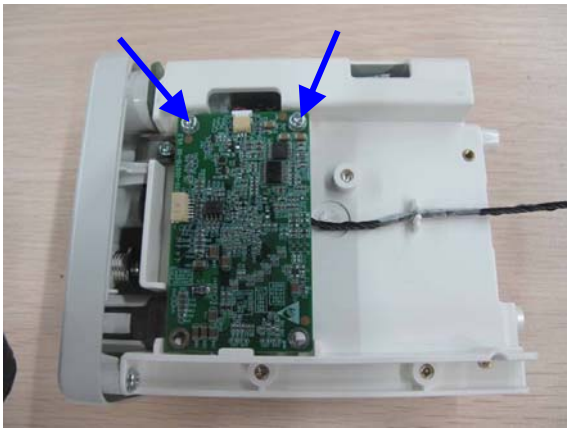


2. For other modules, unscrew the two M3×6 screws on the back to separate the front and rear housing.



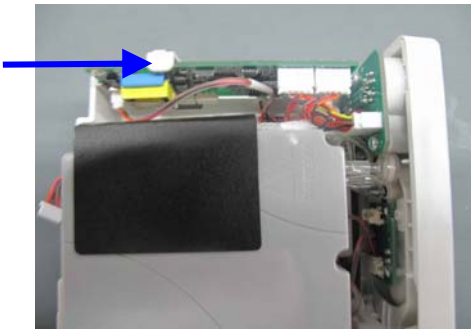
7.5.3 Removing the External Module Interface Board

Unscrew the two M3×6 screws, disconnect all the cables from the board, and then remove the module interface board.



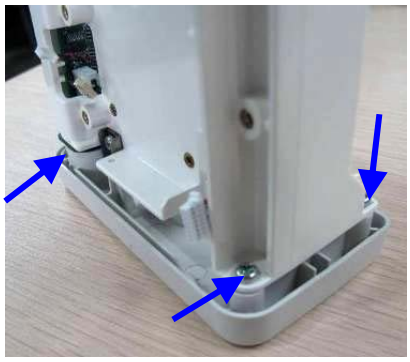
7.5.4 Removing M03B Module

Disconnect all the cables from the M03B module and push the clamp on the bracket to remove the M03B module.



7.5.5 Removing Sidestream CO_2 Module

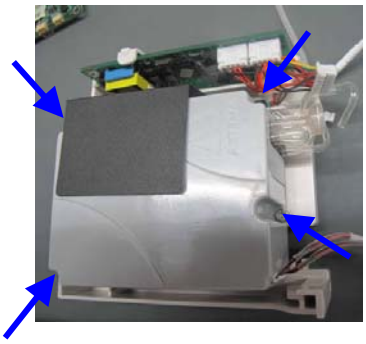
1. Unscrew the 3 screws that fasten the bracket and connector panel. Disconnect all the cables and tubing that connect the bracket and connector panel. Then separate the connector panel and bracket.



NOTE

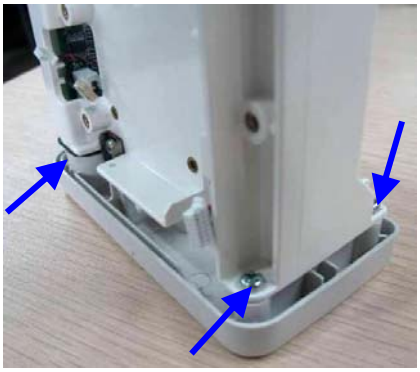
- **Manage the tubing properly during reassembly and make sure the tubing shaping smooth.**

2. Unscrew the four screws that fasten the M02C module, and then take out the M02C module.

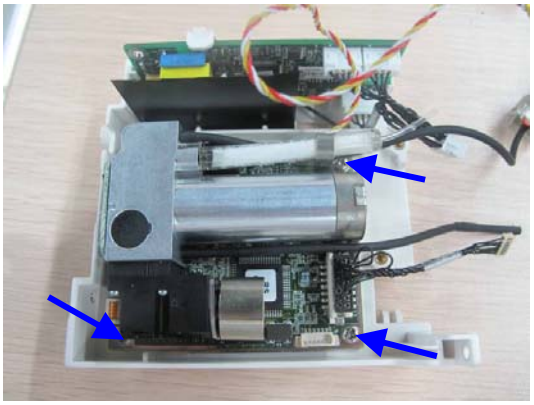


7.5.6 Removing Microstream CO_2 Module

1. Unscrew the 3 screws that fasten the bracket and connector panel. Disconnect all the cables and tubing that connect the bracket and connector panel. Then separate the connector panel and bracket.

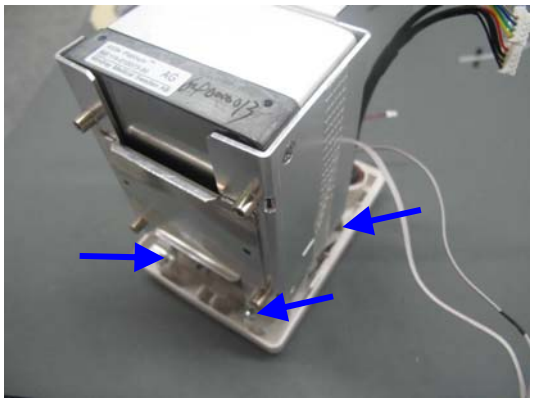


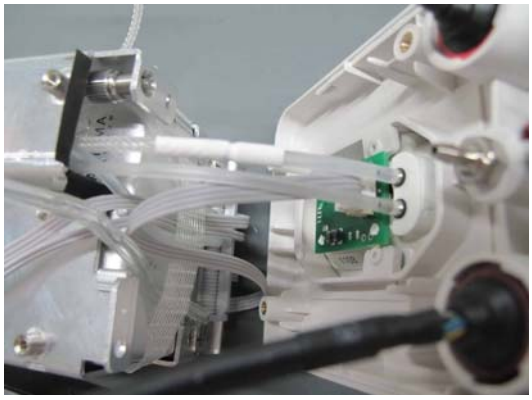
2. Unscrew the three M3×8 screws that fasten the microstream CO_2 module, and then remove the microstream CO_2 module.



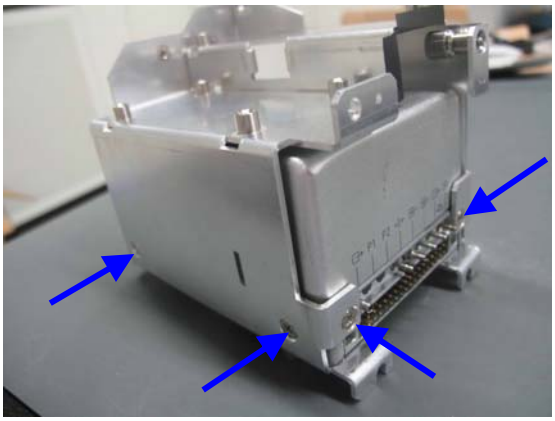
7.5.7 Removing AG Module

1. Unscrew the three M3×6 screws and the captive screw that fasten the AG module bracket and connector panel. Then disconnect all the cables and tubing connecting the connector panel and the AG module to separate the connector panel and bracket.





2. Unscrew the six M3×6 screws that fasten the AG module and remove AG module.



NOTE

- **Manage the tubing properly during reassembly and make sure no hoses are kinked or pinched.**

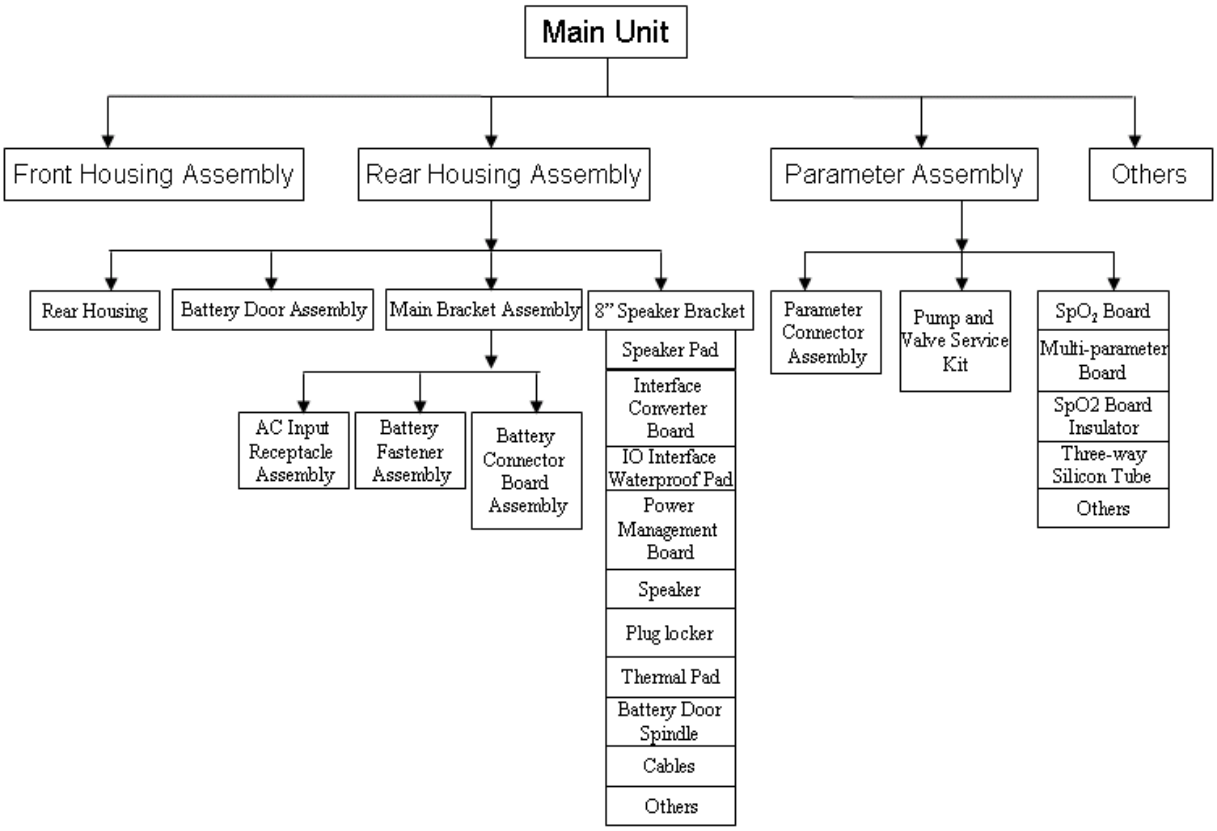
FOR YOUR NOTES

8 Parts

8.1 Introduction

This chapter contains the exploded views and parts lists of the main unit. It helps the engineer to identify the parts while disassembling the monitor and replacing the parts. This manual is based on the maximum configuration. Your equipment may not have same parts and the quantity of the screws or stacking sleeves etc. may be different with those included in the parts lists.

Hardware architecture of the main unit is shown below:



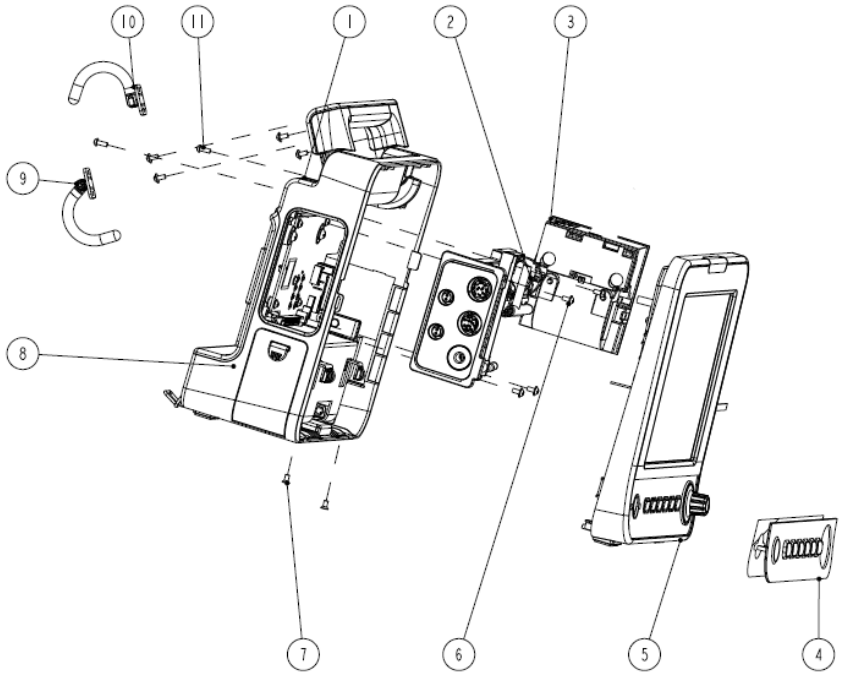
NOTE

- **The part number listed in the Parts List is only for checking the FRU part number which is also included in the Parts List. Please provide the FRU parts number when purchasing spare parts.**

8.2 Passport 8

8.2.1 Main Unit

8.2.1.1 Exploded View

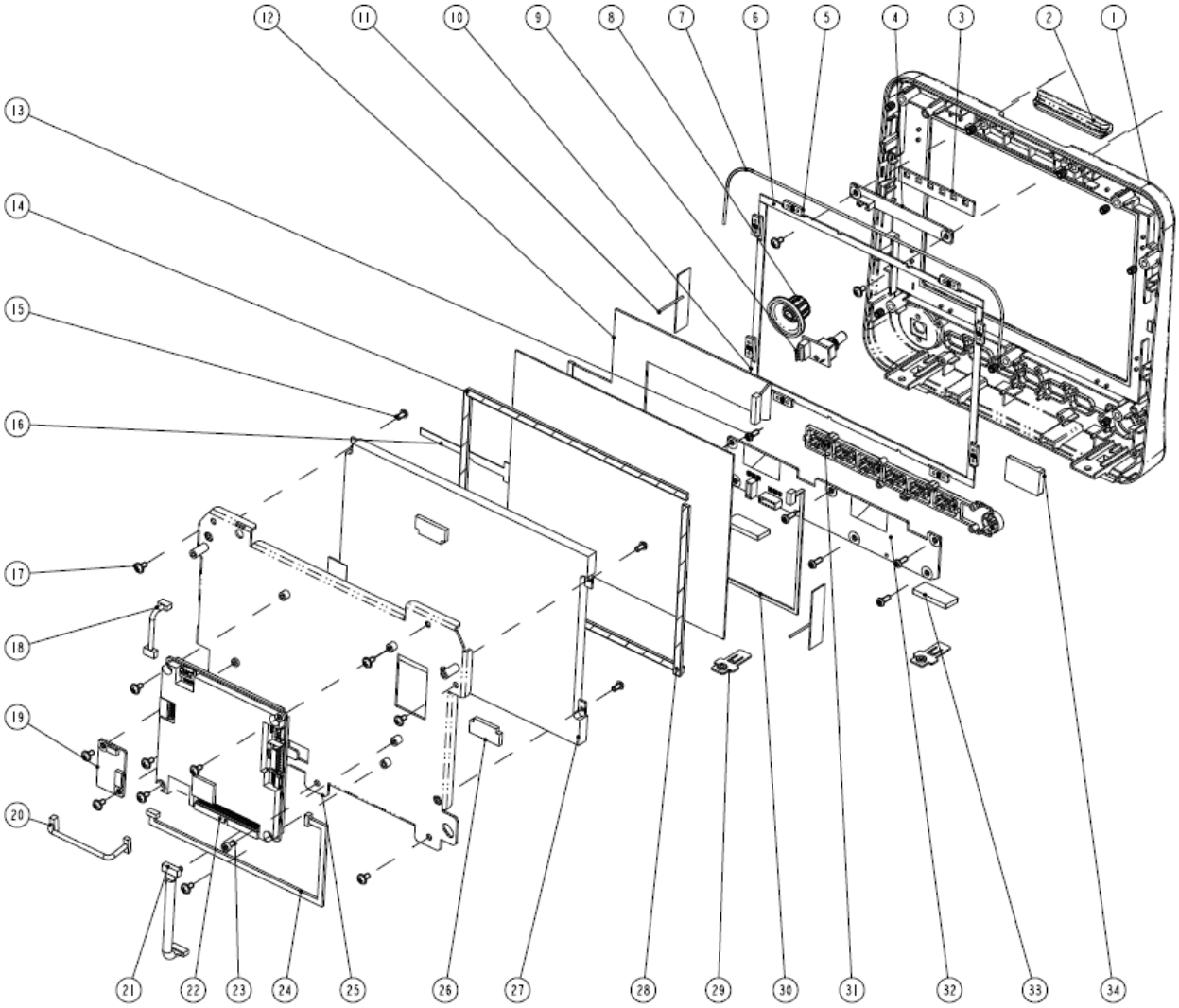


8.2.1.2 Parts List

SN	Description	FRU part number
1	Rear housing assembly (Passport 8)	/
2	Multi-parameter assembly (3-/5-lead, Nellcor SpO_2)	/
3	TR6F recorder	115-001290-00
4	Passport 8 Silica gel key	049-000628-00
5	Front cover assembly of Passport 8	115-022924-00
6	Screw, Pan Head W/Washer Phillips M3×6	/
7	Screw, Flat Head Phillips M3×6	/
8	Main unit label	/
9	Hook assembly (Passport 8, right, PN 115-011534-00)	115-010924-00
10	Hook assembly (Passport 8, left, PN 115-011533-00)	
11	Screw, Pan Head Phillips M3×8	/

8.2.2 Front Housing Subassembly

8.2.2.1 Exploded View



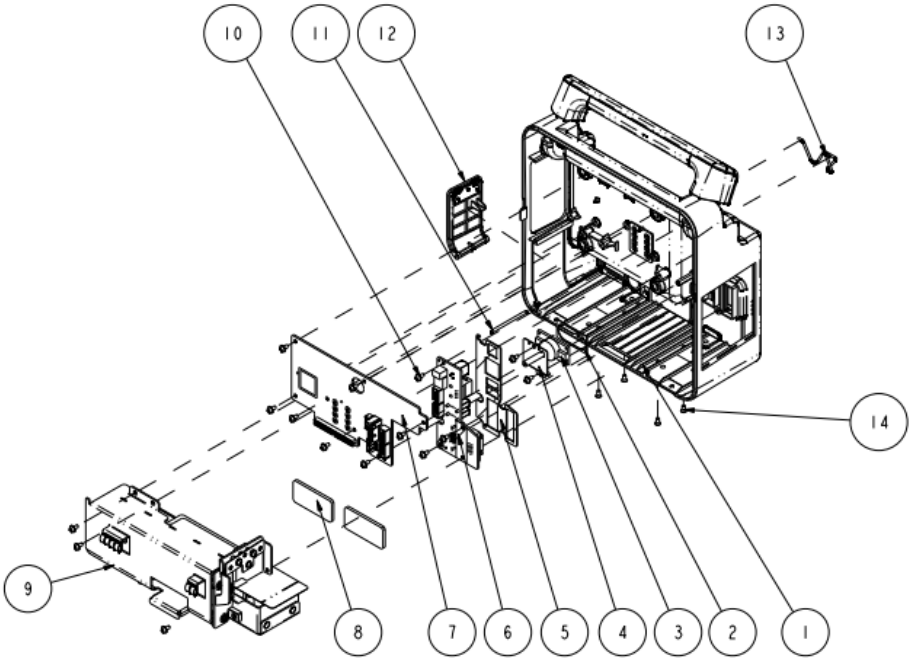
8.2.2.2 Parts List

SN	Description	FRU part number
1	Passport 8 Front cover(silk screen)	115-022923-00
2	Alarm light of Passport 8	
3	Alarm lamp gasket	
5	Touchscreen position pad (8")	
6	Long gasket, Passport 8, touchscreen	
7	Tube, white, 1.6 mm OD × 0.8 mm	
10	Short gasket, Passport 8, touchscreen	
29	Locking plate	
33	Square foot pad	
4	Alarm lamp board PCBA	051-000879-01

SN	Description	FRU part number
8	Knob of Passport 8	043-003641-00
9	Encoder board	0010-30-43089
11	Antenna TQX2400EF	024-000196-00
12	Signal cable for 8" screen	009-001983-00
13	Screw, self-tapping, PT3×8	/
14	LCD, PORON-S	/
15	Screw, Pan Head Cross Recessed M3×6	/
16	Touchscreen, resistive-type, 8.4" 4-line	021-000058-00
17	Screw, Pan head with washer, Phillips M3×6	/
18	Cable between mother board and alarm lamp	009-001980-00
19	Touchscreen control board PCBA	051-000881-00
20	Encoder cable	9200-21-10460
21	Cable between main board and keypad board	009-001982-00
22	Passport 8 main board service kit	115-023212-00
23	Inner hexagon screw, M3×6	/
24	Cable between the touchscreen control board and the main board	009-001981-00
25	Bracket for 8" screen	/
26	TM DISPLAY PAD	/
27	LCD, for Passport 8	801-9261-00042-00
28	LCD dust-proof strips	/
30	Cable between the main board and backlight board (8")	009-001986-00
31	Key Carrier of Passport 8	043-003643-00
32	Keypad board PCBA, 8.4 inch	051-000887-00
34	Industrial SD card (SLC), 1G	023-000755-00
Other parts	Cyberlink module PCBA	051-000811-00 (2.4GHz)
	Antenna cable	0012-00-1730-01 (2.4GHz)
	Radio module	024-000707-00 (5GHz)
	Carrier Board of Wireless Module	051-002330-00 (5GHz)
	Wi-Fi antenna	024-000745-00 (5GHz)
	Passport Wi-Fi module kit	115-010801-00 (2.4GHz) or 115-034776-00(5GHz)

8.2.3 Rear Housing Assembly

8.2.3.1 Exploded View

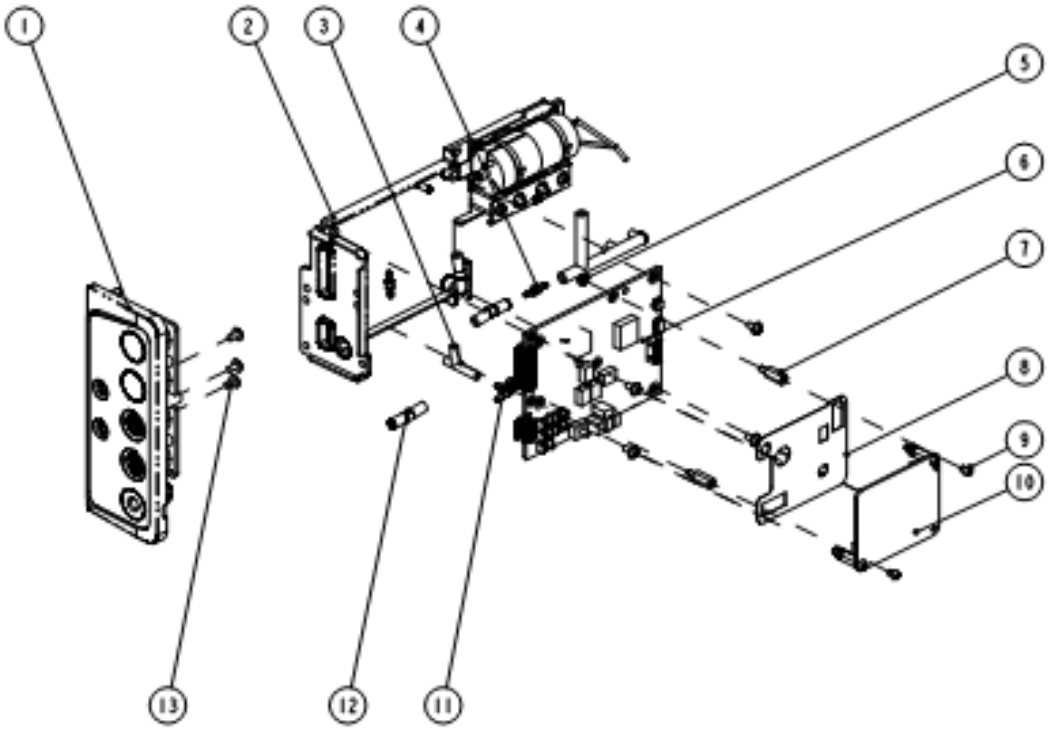


8.2.3.2 Parts List

SN	Description	FRU part number
1	Rear housing assembly (Passport 8)	115-010811-01
2	Speaker pad	801-9261-00010-00
3	Speaker, 2W, 4ohm, 500 Hz	
4	Speaker bracket (Passport 8)	/
5	I/O gasket	801-9261-00014-00
6	Interface converter kit (Passport 8, USB, no DC_IN)	
7	Power management and interface board (full config, USB)	051-001007-01
8	Thermal gel	/
9	Main bracket assembly (Passport 8)	/
10	Screw, Pan head with washer, Phillips M3×6	/
11	Door spindle (Passport 8)	115-010919-00
12	Battery door assembly (Passport 8)	
13	AC Inlet Hook	9211-20-87369
14	Screw, pan head, Phillips, M3×6	/
Other parts	Cable between the interface board and main board	9211-20-87225
	Cable between power management board and I/O interface board	009-002235-00
	Cable between the power management board and parameter board	009-001989-00
	Recorder cables	009-001969-00

8.2.4 Multi-parameter Assembly

8.2.4.1 Exploded View

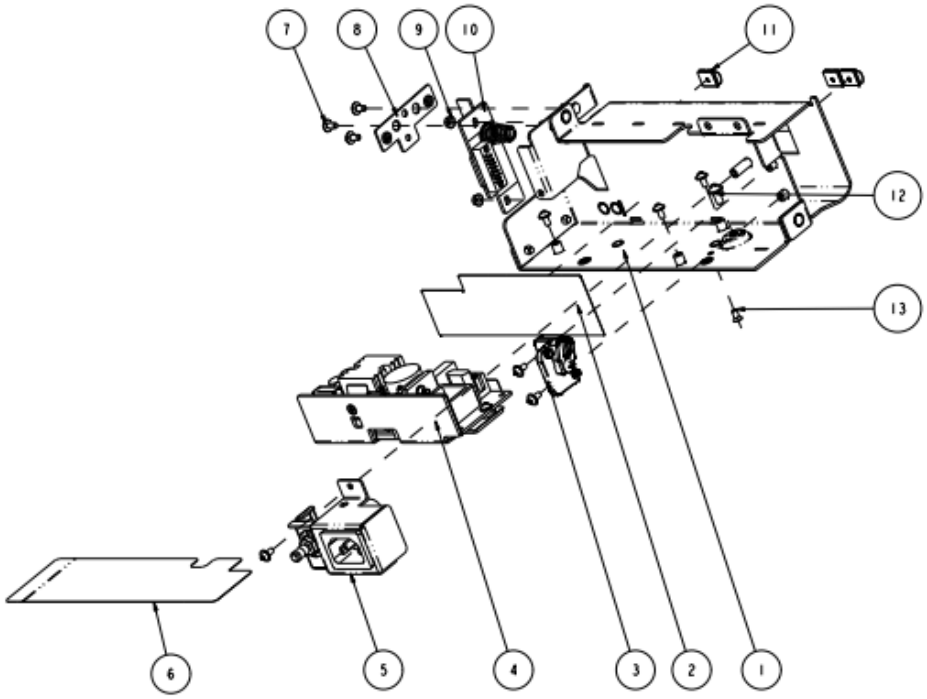


8.2.4.2 Parts List

SN	Description	FRU part number	Remarks
1	Parameter connector assembly (Nellcor SpO_2)	115-010794-00	For Passport 8
	Parameter connector assembly (Masimo SpO_2)	115-010795-00	
	Parameter connector assembly (Passport 12, Nellcor SpO_2, IBP)	115-010835-00	For Passport 12
	Parameter connector assembly (Passport 12, Masimo SpO_2, IBP)	115-010836-00	
2	NIBP gas valve	082-000864-00	/
	NIBP pump	801-9261-00040-00	/
3	3-way silicone tube	/	/
4	Plastic connector	/	/
5	Hexagon plastic nut, M3×0.5P, PC	/	/
6	Passport multi-parameter board PCBA (5-Lead, complete)	051-001063-01	/
7	Plastic hexagon bolt	/	/
8	SpO_2 board insulator	/	/
9	Screw, pan head Phillips, M3×4	/	/
10	Nellcor SpO_2 board	100-000106-00	/
	Masimo MS-2013 SpO_2 board	040-000109-01	
11	Connector	/	/
12	Silicon tube, 3/32" × 7/32" × 100 ft	/	/
13	Screw, Pan head with washer, Phillips M3×6	/	/

8.2.5 Battery Compartment Assembly

8.2.5.1 Exploded View

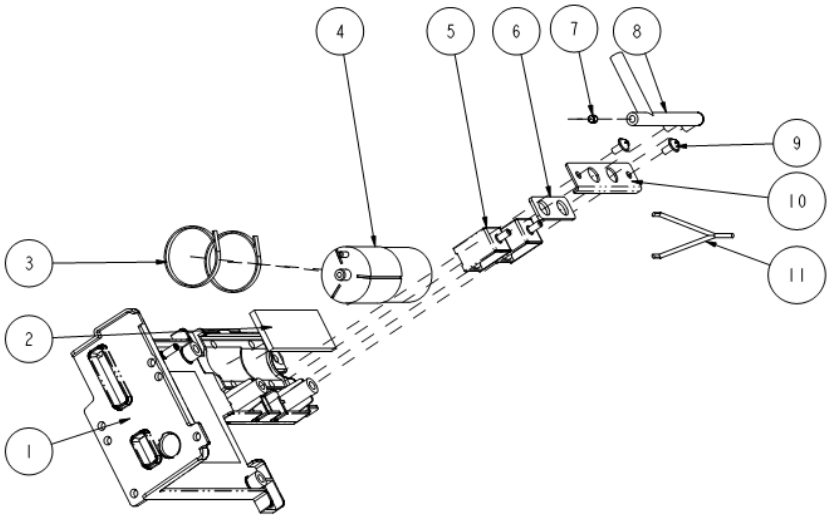


8.2.5.2 Parts List

SN	Description	FRU part number
1	Main bracket (Passport 8)	/
2	Power bracket insulator	/
3	Battery fastener	115-010921-00
4	AC/DC power board	051-001064-00
5	AC input receptacle assembly	115-010920-00
6	Power insulator (Passport 8)	/
7	Screw, Pan head with washer, Phillips M3×6	/
8	Recorder adjustment bracket	/
9	M3 nut with spring washer	/
10	Battery connector board ()	115-010799-00
11	Spring, EMI	/
12	Screw, Pan head with washer, Phillips M4×8	/
13	Screw, pan head, Phillips, M3×6	/
/	Cable between the power management board and AC/DC power board	009-001991-00

8.2.6 NIBP Pump and Valve Kit

8.2.6.1 Exploded View

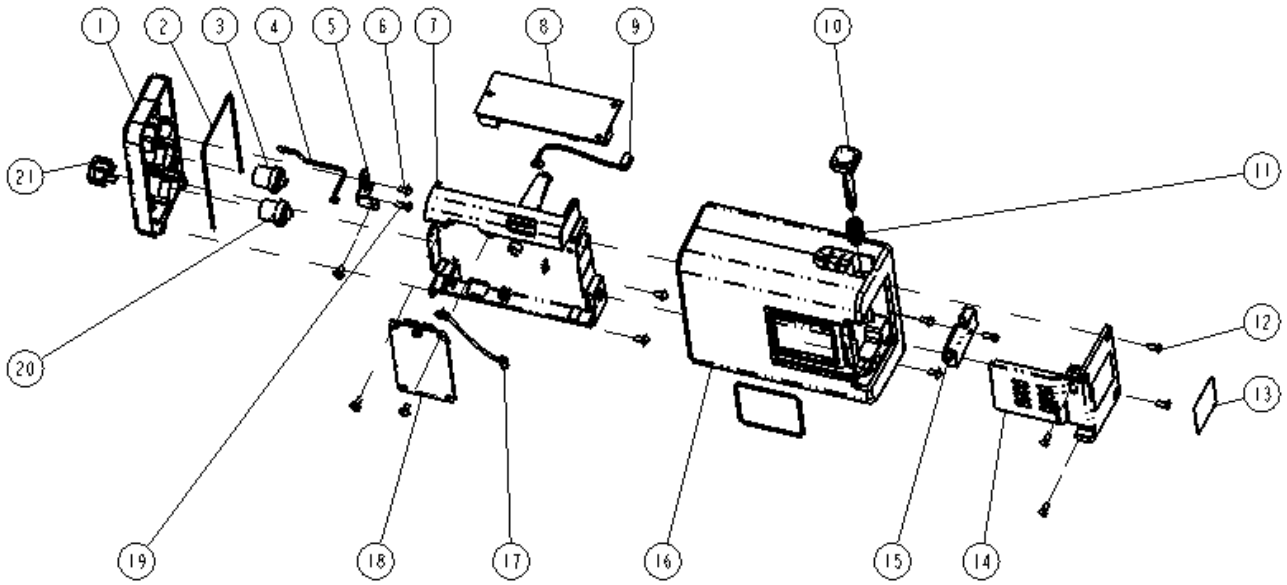


8.2.6.2 Parts List

SN	Description	FRU part number
1	Multi-parameter board bracket	/
2	Shock absorption cushion for pump	/
3	Nylon tie wrap	/
4	Pump, P54C06R	801-9261-00040-00
6	Valve cushion	
11	Cable between the pump and multi-parameter board	
5	Gas valve, CJV13-A12B2	082-000864-00
7	630F reducer	/
8	NIBP pipe	/
9	Screw, Pan head with washer, Phillips M3×6	/
10	Valve bracket	/

8.2.7 IBP_C.O. Module Assembly

8.2.7.1 Exploded View

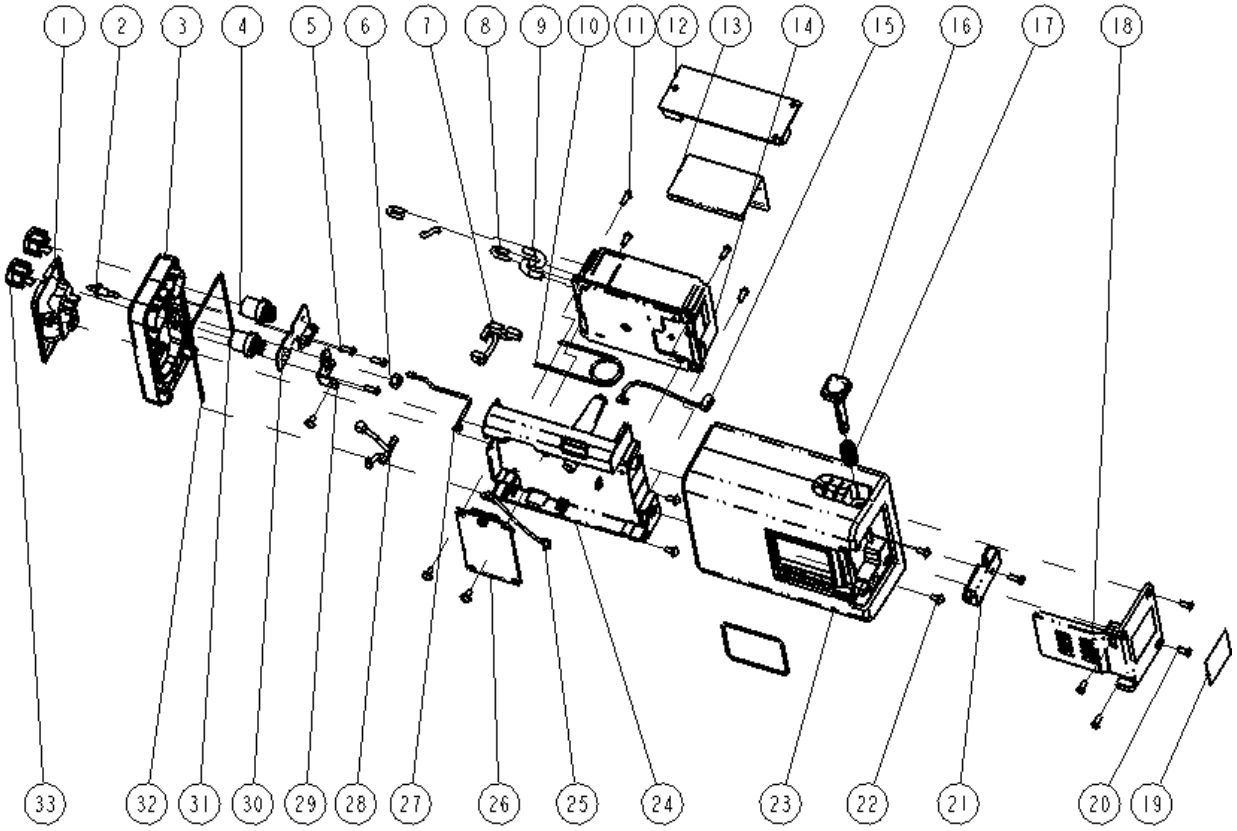


8.2.7.2 Parts List

SN	Description	FRU part number
1	Front housing of A1 module	801-9261-00025-00
4	Module indicator and cable	
2	Silicone tube	
3	IBP signal cable (3-way)	009-001972-00
5	Connecting sheet for A1 module bracket	/
6	Screw, Pan head with washer, Phillips M3×6	/
7	Bracket for A module	043-001890-01
8	CO/IBP (M03B) module	M03B-30-26064
9	Cable between the converter board and M03B module	009-001971-00
10	A module button	043-001891-01
11	Spring washer	/
12	Screw, pan head, Phillips, M3×8	/
13	Module label (no manufacturer information)	/
14	External converter board (plug-in modules)	051-000874-00
15	Lock for A module	043-001892-01
16	Rear housing of A modules	043-002103-01
17	Cable between the converter board and copper board	009-001970-00
18	External module interface board (IBP_C.O.)	801-9261-00016-00
19	Screw, self-tapping, PT3×8	/
20	C.O. signal cable	009-001973-00
21	Blank IBP socket	043-001893-01

8.2.8 IBP_C.O._Sidestream CO_2 Module Assembly

8.2.8.1 Exploded View



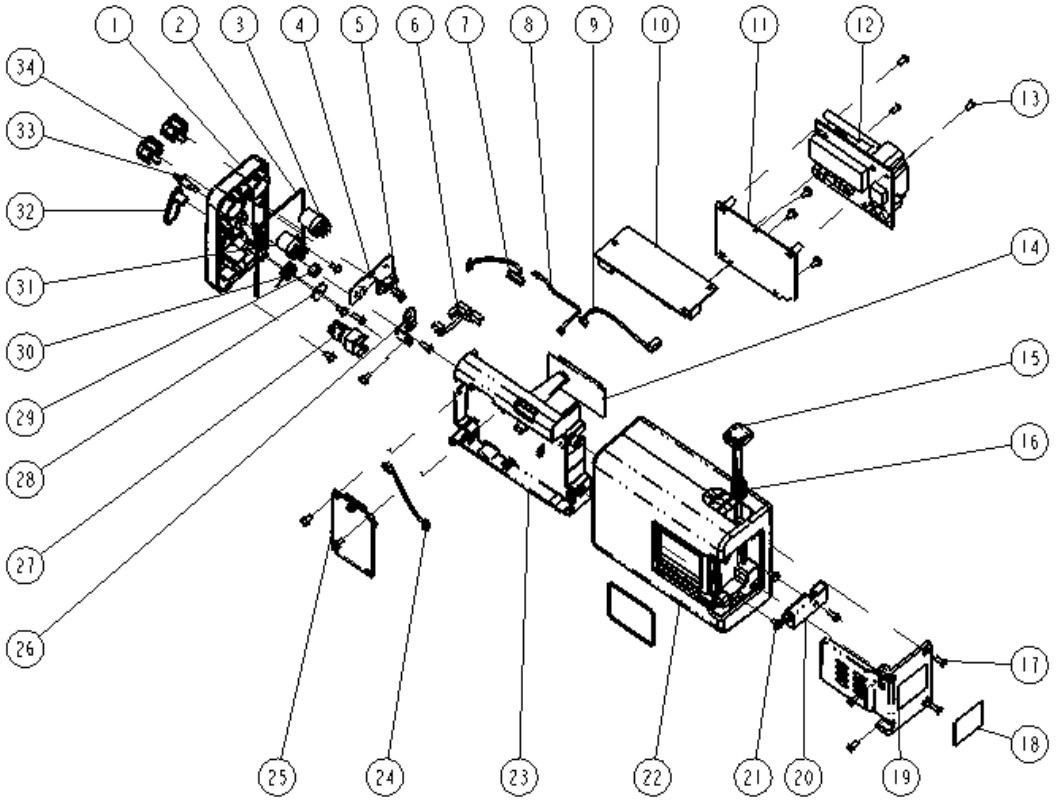
8.2.8.2 Parts List

SN	Description	FRU part number
1	Dryline receptacle, Mindray	801-9261-00026-00
2	Gas Outlet	
3	Front housing, A2 module	
4	Receptacle, 2-IBP adapter cable	
27	Module indicator and cable	
30	C.O.-IBP panel board PCBA	
31	C.O. Housing	
5	Screw, self-tapping, PT3×8	
6	Nut, Stainless Steel M5 GB6170	/
7	IBP/C.O. signal cable (4-way)	009-002214-00
8	System tubing PUR.AION,1.4/2.8mm,60-12110-00	/
9	System tubing PUR.AION, 2.2/4.4mm,60-12120-00	/
10	Moisture exchanger (Nafion Tube for Mindray CO2)	/
11	Screw, Pan Head Phillips M3×8	/
12	C.O./IBP (M03B) module	M03B-30-26064
13	Sampling tube, slice ,A module	/

SN	Description	FRU part number
14	Sidestream CO_2 main unit(FDA)	115-030767-00
15	Cable between the converter board and M03B module	009-001971-00
16	A module button	043-001891-01
17	Spring washer	/
18	External converter board (plug-in modules)	051-000874-00
19	Module label (no manufacturer information)	/
20	Screw, Flat Head Phillips M3×8	/
21	Lock for A module	043-001892-01
22	Screw, Pan head with washer, Phillips M3×6	/
23	Rear housing of A modules	043-002103-01
24	Bracket for A module	043-001890-01
25	Cable between the converter board and copper board	009-001970-00
26	External module interface board PCBA,	801-9261-00018-00
28	Cable for M02C module interface	009-002309-00
29	Holder connector 2, A module	/
32	Silicone tube(1.6 mm OD X 0.8 mm ID)	/
33	Blank IBP socket	043-001893-01

8.2.9 IBP_C.O._Microstream CO_2 Module Assembly

8.2.9.1 Exploded View



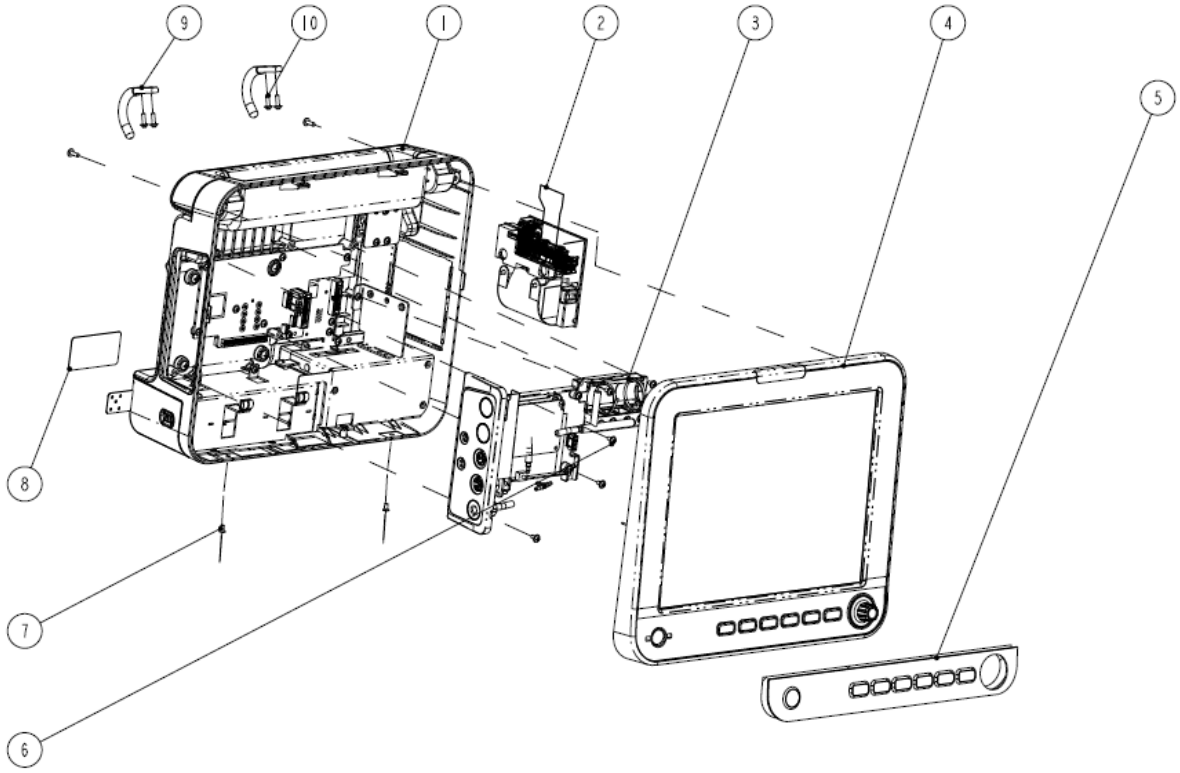
8.2.9.2 Parts List

SN	Description	FRU part number
1	Front housing of A3 module (2ch-IBP + C.O. + Microstream CO_2)	801-9261-00028-00
2	Silicone tube	
3	Double IBP receptacle (9281)	
4	C.O._IBP interface board (Passport)	
8	Module indicator and cable	
31	C.O. module, single receptacle	
5	Screw, self-tapping, PT3×8	/
6	IBP/C.O. signal cable (4-way)	009-002214-00
7	Cable between the Microstream CO_2 module and converter board	009-001992-00
9	Cable between the converter board and M03B module	009-001971-00
10	C.O./IBP (M03B) module	M03B-30-26064
11	CO_2 bracket for A module	/
12	IBP_CO_Microstream CO_2 main unit(FDA)	115-030771-00
13	Screw, pan head Phillips, M3×6	/
14	IBP insulator for A module	/
15	A module button	043-001891-01
16	Spring washer	/
17	Screw, pan head, Phillips, M3×8	/
18	Module label (no manufacturer information)	/
19	External converter board (plug-in modules)	051-000874-00
20	Lock for A module	043-001892-01
21	Screw, Pan head with washer, Phillips M3×6	/
22	Rear housing of A modules	043-002103-01
23	Bracket for A module	043-001890-01
24	Cable between the converter board and copper board	009-001970-00
25	External module interface board (IBP_C.O._Microstream CO_2)	801-9261-00020-00
	External module interface board (Microstream CO_2)	801-9261-00021-00
26	Connecting sheet for A1 module bracket	/
27	Microstream CO_2 module connector	/
28	Spring washer	/
29	Nut, Stainless Steel M5 GB6170	/
30	Microstream CO_2 connector fixing spring	/
32	Microstream CO_2 connector baffle	/
33	Gas outlet	/
34	Blank IBP socket	043-001893-01

8.3 Passport 12

8.3.1 Main Unit

8.3.1.1 Exploded View

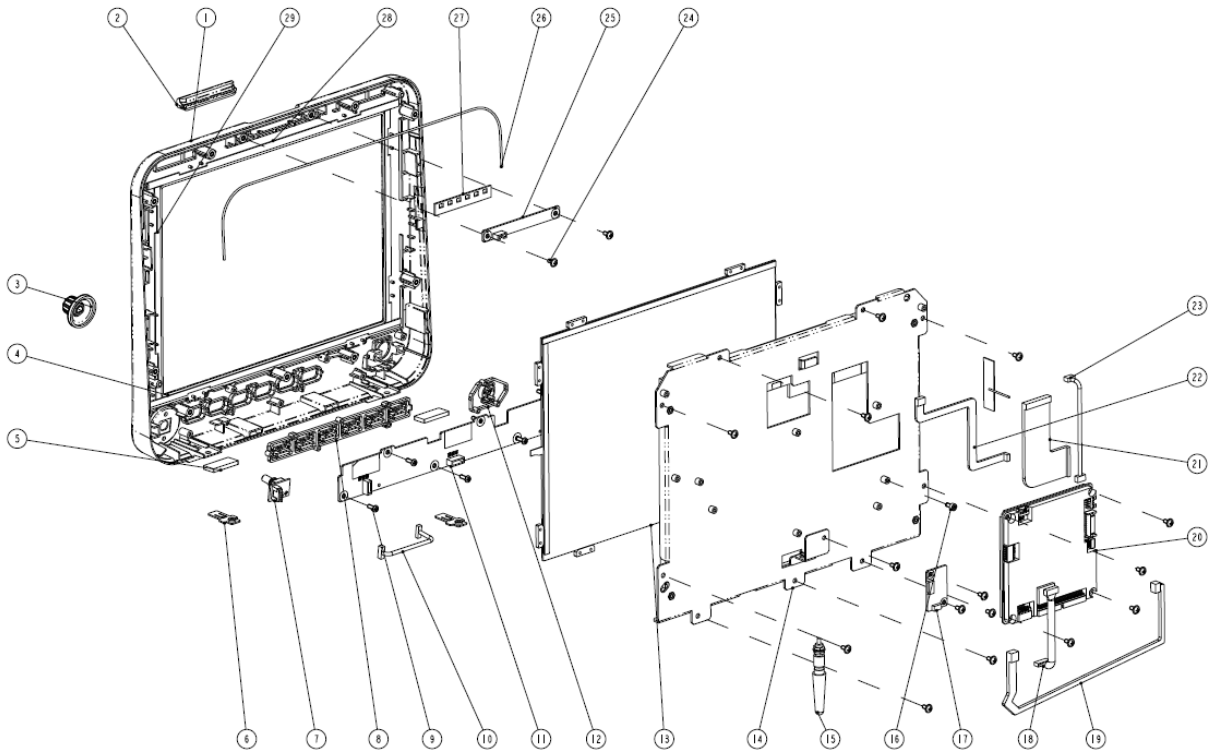


8.3.1.2 Parts List

SN	Description	FRU part number	Remarks
1	Rear housing assembly (Passport 12)	/	/
2	TR6F recorder	115-001290-00	/
	Recording cover (MR-DS193)	043-000184-00	For monitors without recorder
3	Multi-parameter assembly (Passport 12, 3-/5-lead, SpO_2)	/	/
4	Front cover assembly of Passport 12	/	/
5	Passport12 Silica gel key(silk screen EN)	049-000627-00	/
6	Screw, Pan head with washer, Phillips M3×6	/	/
7	Screw, pan head, Phillips, M3×6	/	/
8	Passport 12 rear label	/	/
9	Hook (Passport 12)	115-010922-00	/
10	Screw, Pan head with washer, Phillips M3×10	/	/

8.3.2 Front Housing Subassembly

8.3.2.1 Exploded View



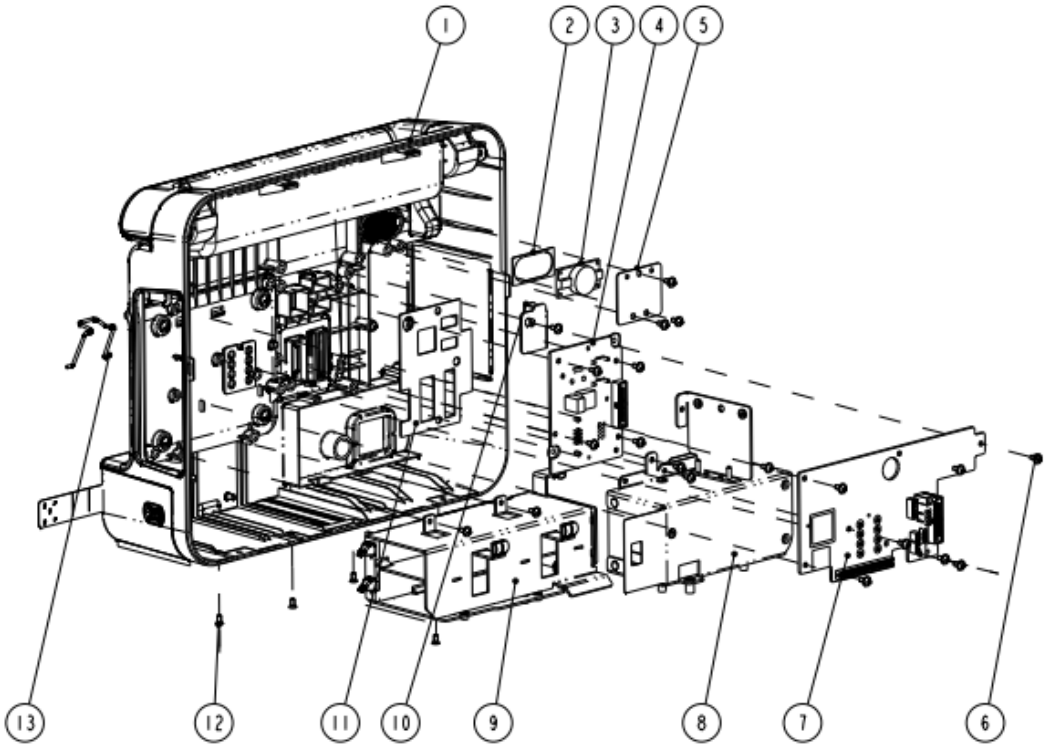
8.3.2.2 Parts List

SN	Description	FRU part number
1	PP12 Front cover(silk screen)	115-022925-00
27	Alarm lamp gasket	
2	Alarm light of Passport 8	
28	Long gasket, Passport 12, touchscreen	
29	Short gasket, Passport 12, touchscreen	
4	Long gasket, Passport 12, touchscreen	
15	Square foot pad	
6	Locking plate	
26	Tube, white, 1.6 mm OD × 0.8 mmID	
25	Alarm lamp board PCBA	051-000879-01
3	Knob of Passport 8	043-003641-00
7	Encoder board	0010-30-43089
10	Encoder cable	9200-21-10460
15	Wi-Fi module kit	115-010801-00 (2.4GHz)) or 115-034776-00 (5GHz)
	Cyberlink module PCBA	051-000811-00 (2.4GHz)
	Antenna cable	0012-00-1730-01 (2.4GHz)

SN	Description	FRU part number
	Antenna service kit (Passport 12)	801-9221-00006-00 (2.4GHz)
	Radio module	024-000707-00 (5GHz)
	Carrier Board of Wireless Module	051-002330-00 (5GHz)
	Wi-Fi antenna	024-000745-00 (5GHz)
8	Key Carrier A of PP12	043-003644-00
12	Key Carrier B of PP12	043-003655-00
17	Touchscreen control board PCBA	051-000881-00
18	Cable between main board and keypad board	009-001982-00
19	Cable between the touchscreen control board and the main board	009-001981-00
16	Inner hexagon screw, M3×6	/
20	Passport 12 main board service kit	115-033303-00
22	Cable between the main board and backlight board (12")	009-001988-00
23	Cable between main board and alarm lamp board	009-002203-00
21	Signal cable for 12" screen	009-001985-00
14	12" LCD service kit	801-9221-00008-00
13	Touch-panel, resitive-type, 12.1" 4-line	021-000059-00
9	Screw, self-tapping, PT3×8	/
11	Keypad board PCBA, 12 inch	051-000889-00
24	Screw, Pan head with washer, Phillips M3×6	/
Other parts	Industrial SD card (SLC), 1G	023-000755-00

8.3.3 Rear Housing Assembly

8.3.3.1 Exploded View

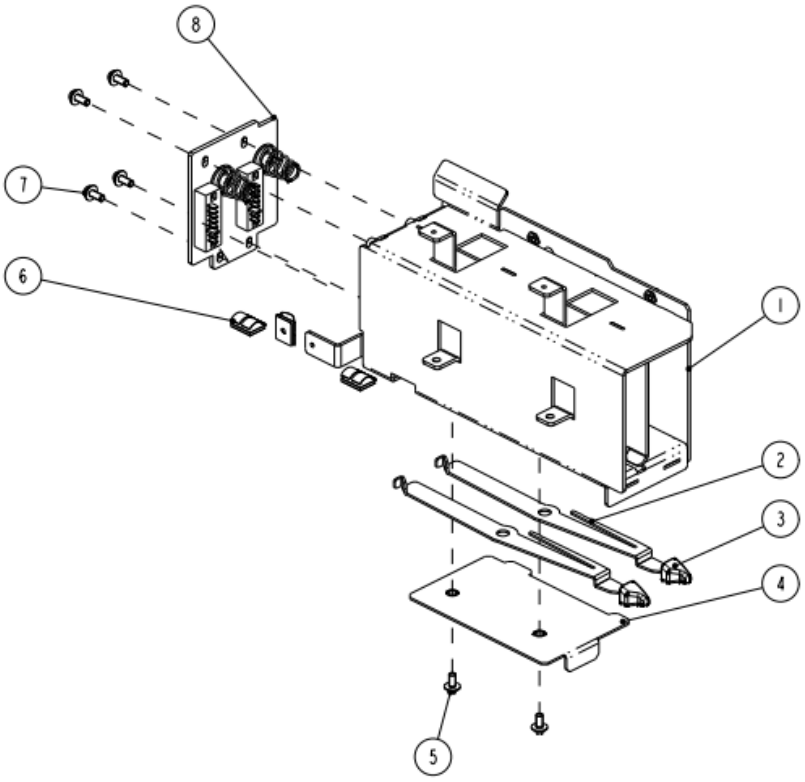


8.3.3.2 Parts List

SN	Description	FRU part number
1	Rear housing assembly (Passport 12)	115-010843-00
2	Speaker pad	801-9261-00010-00
3	Speaker, 2W, 4ohm, 500 Hz	
4	Interface converter board (Passport12, full config, USB)	115-018178-00
5	Speaker pad	/
6	Screw, Pan head with washer, Phillips M3×6	/
7	Power management and interface board (full config, USB)	051-001007-01
8	Power board PCBA (Passport 12)	051-001064-00
9	Battery compartment subassembly (12 inch)	/
10	Parameter board bracket (Passport 12)	/
11	I/O interface waterproof pad (Passport 12)	/
12	Screw, pan head, Phillips, M3×6	/
13	AC Inlet Hook	9211-20-87369
Other parts	Cable between power management board and I/O interface board	009-002235-00
	Cable between the interface board and main board	9211-20-87225
	Cable between the power management board and parameter board	009-001989-00
	Recorder cable	009-001969-00
	Battery door assembly service kit (Passport 12)	801-9221-00005-00
	AC input receptacle assembly	115-010916-00

8.3.4 Battery Compartment Assembly

8.3.4.1 Exploded View



8.3.4.2 Parts List

SN	Description	FRU part number
1	Battery compartment (Passport 12)	/
2	Battery latch (Passport 12)	/
3	Knob, Battery latch 2	0380-00-0593
4	Battery spring (Passport 12)	/
5	Screw, Pan head with washer, Phillips M3×6	/
6	Spring, EMI	/
7	M4×8 combined screw	/
8	Battery connector board assembly (Passport 12)	115-010841-00

8.3.5 Multi-parameter Assembly

For the exploded view and parts list of the multi-parameter assembly, refer to section ***8.2.4 Multi-parameter Assembly***.

8.3.6 NIBP Pump and Valve Kit

For the exploded view and parts list of the NIBP pump and valve kit, refer to section ***8.2.6 NIBP Pump and Valve Kit***.

8.3.7 IBP_C.O. Module Assembly

For the exploded view and parts list of the IBP_C.O. module assembly, refer to section ***8.2.7 IBP_C.O. Module Assembly***.

8.3.8 IBP_C.O._Sidestream CO_2 Module Assembly

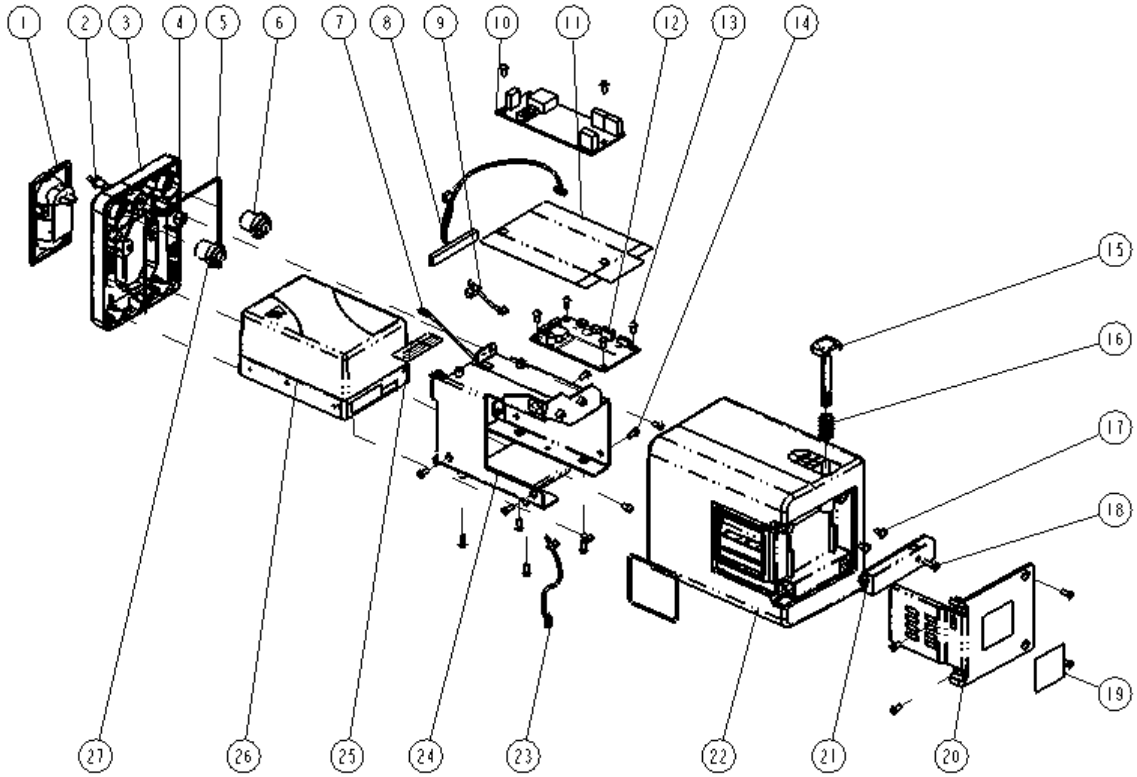
For the exploded view and parts list of the IBP_C.O._Siderstream CO_2 module assembly, refer to section ***8.2.8 IBP_C.O._Sidestream CO2 Module Assembly***.

8.3.9 IBP_C.O._Microstream CO_2 Module Assembly

For the exploded view and parts list of the IBP_C.O._Microstream CO_2 module assembly, refer to section ***8.2.9 IBP_C.O._Microstream CO2 Module Assembly***.

8.3.10 IBP_C.O._AG Module Assembly

8.3.10.1 Exploded View



8.3.10.2 Parts List

SN	Description	FRU part number
1	AG watertrap receptacle	9200-10-10560
2	Gas outlet	/
3	Front housing of B1 module	801-9261-00032-00
5	Silicone tube	
7	Module indicator and cable	
4	Nut, Stainless Steel M5 GB6170	/
6	IBP signal cable (3-way)	009-001972-00
8	Cable between the AG module and converter board	009-001976-00
9	Cable between the converter board and M03B module	009-001971-00
10	C.O./IBP (M03B) module	M03B-30-26064
11	IBP insulator for B module	/
12	External module interface board (RS232)	801-9261-00024-00
13	Screw, pan head Phillips, M3×6	/
14	Screw, pan head, Phillips, M3×8	/
15	A module button	043-001891-01
16	Spring washer	/
17	Screw, Pan head with washer, Phillips M3×6	/
18	Screw, self-tapping, PT3×10	/
19	Module label (no manufacturer information)	/
20	External converter board (B modules)	/
21	Lock for B module	043-001899-01
22	Rear housing of B modules	/
23	Cable between the converter board and copper board	009-001970-00
24	Bracket for B1 module	/
25	B module pipe shield	/
26	IBP_CO_AG main unit（with 0_2)(FDA)	115-030772-00
27	C.O. signal cable	009-001973-00

FOR YOUR NOTES

A Electrical Safety Inspection

The following electrical safety tests are recommended as part of a comprehensive preventive maintenance program. They are a proven means of detecting abnormalities that, if undetected, could prove dangerous to either the patient or the operator. Additional tests may be required according to local regulations.

All tests can be performed using commercially available safety analyzer test equipment. These procedures assume the use of a 601PROXL International Safety Analyzer or equivalent safety analyzer. Other popular testers complying with IEC 60601-1 used in Europe, such as Fluke, Metron, or Gerb, may require modifications to the procedure. Please follow the instructions of the analyzer manufacturer.

The consistent use of a safety analyzer as a routine step in closing a repair or upgrade is emphasized as a mandatory step if an approved agency status is to be maintained. The safety analyzer also proves to be an excellent troubleshooting tool to detect abnormalities of line voltage and grounding, as well as total current loads.

A.1 Power Cord Plug

Test Item		Acceptance Criteria
The power plug	The power plug pins	No broken or bent pin. No discolored pins.
	The plug body	No physical damage to the plug body.
	The strain relief	No physical damage to the strain relief. No plug warmth for device in use.
	The power plug	No loose connections.
The power cord		No physical damage to the cord. No deterioration to the cord.
		For devices with detachable power cords, inspect the connection at the device.
		For devices with non-detachable power cords, inspect the strain relief at the device.

A.2 Device Enclosure and Accessories

A.2.1 Visual Inspection

Test Item	Acceptance Criteria
The enclosure and accessories	No physical damage to the enclosure and accessories.
	No physical damage to meters, switches, connectors, etc.
	No residue of fluid spillage (e.g., water, coffee, chemicals, etc.).
	No loose or missing parts (e.g., knobs, dials, terminals, etc.).

A.2.2 Contextual Inspection

Test Item	Acceptance Criteria
The enclosure and accessories	No unusual noises (e.g., a rattle inside the case).
	No unusual odors (e.g., burning or smoky odor, particularly from ventilation holes).
	No taped notes that may suggest device deficiencies or operator concerns.

A.3 Device Labelling

Check the labels provided by the manufacturer or the healthcare facility are present and legible.

- Main unit label
- Integrated warning labels

A.4 Scheduled Electrical Safety Inspection

For scheduled electrical safety inspection, perform all the test items listed in ***A.6 ELECTRICAL SAFETY INSPECTION FORM***.

A.5 Electrical Safety Inspection after Repair

The following table specifies test items to be performed after the equipment is repaired. Refer to ***A.6 ELECTRICAL SAFETY INSPECTION FORM*** for the description of the test items.

Repair with main unit not disassembled		Test items: 1, 2, 3
Repair with main unit disassembled	When neither power supply PCBA nor patient electrically-connected PCBA is repaired or replaced	Test items: 1, 2, 3, 4
	When power supply PCBA is repaired or replaced	Test items: 1, 2, 3, 4, 5
	When patient electrically-connected PCBA is repaired or replaced	Test items: 1, 2, 3, 4, 6, 7, 8
	When both power supply PCBA and patient electrically- connected PCBA are repaired or replaced	Test items: 1, 2, 3, 4, 5, 6, 7, 8

A.6 ELECTRICAL SAFETY INSPECTION FORM

Inspection and Testing			Limit
1	Power Cord Plug		
2	Device Enclosure and Accessories		/
3	Device Labeling		/
4	Protective Earth Resistance		Max 0.2 Ω
5	Earth Leakage	Normal condition(NC)	Max: NC: 300μA(refer to UL60601-1) SFC: 1000μA
		Single Fault condition(SFC)	
6	Patient Leakage Current	Normal condition(NC)	Max: CF applied part: NC:10μA, SFC: 50μA BF applied part: NC:100μA, SFC: 500μA
		Single Fault condition(SFC)	
7	Mains on Applied Part Leakage		Max: CF applied part: 50μA BF applied part: 5000μA
8	Patient Auxiliary Current	Normal condition(NC)	Max: CF applied part: NC:10μA, SFC: 50μA BF applied part: NC:100μA, SFC: 500μA

FOR YOUR NOTES

P/N: 046-005807-00 (2.0)