- Cyclic pressure up to 10 kPa (100 cmH_2O)
- Other sources of interference, if any

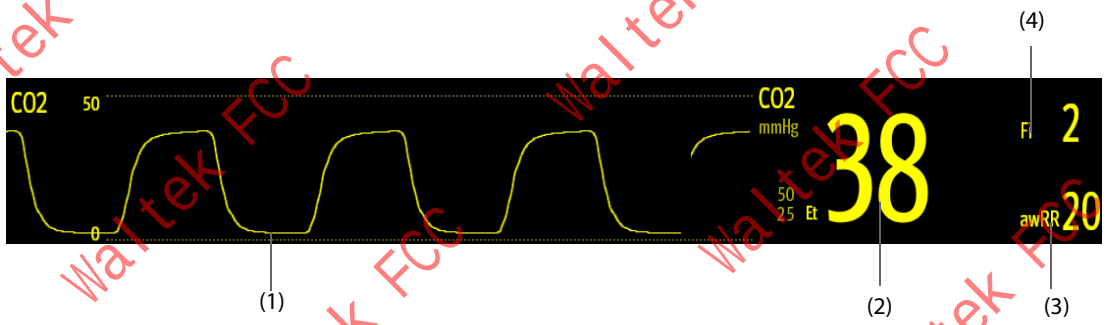
For more information, see *B.9 CO_2 Specifications*.

CAUTION

- **Measurement accuracy of the sidestream CO_2 module may be affected by the breath rate and inspiration/expiration (I/E) ratio.**
- **Measurement accuracy of the Microstream™ CO_2 module may be affected by the breath rate.**

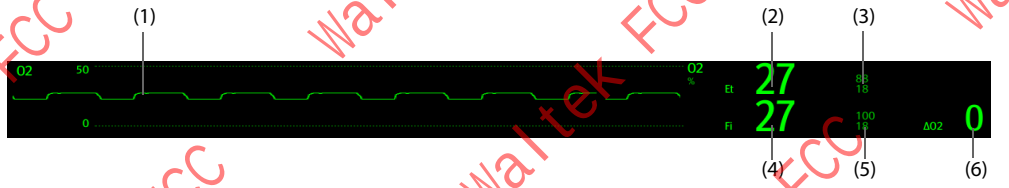
17.4 CO_2 Display

The CO_2 numeric and waveform area provide $FiCO_2$ measurement, $EtCO_2$ measurement, awRR measurement, and a CO_2 waveform.



(1) CO_2 waveform
(2) End tidal CO_2 value ($EtCO_2$)
(3) Airway respiration rate (awRR)
(4) Fraction of inspired CO_2 ($FiCO_2$)

If your sidestream CO_2 module is configured with the oxygen sensor, O_2 waveform and parameters can be displayed as follows:



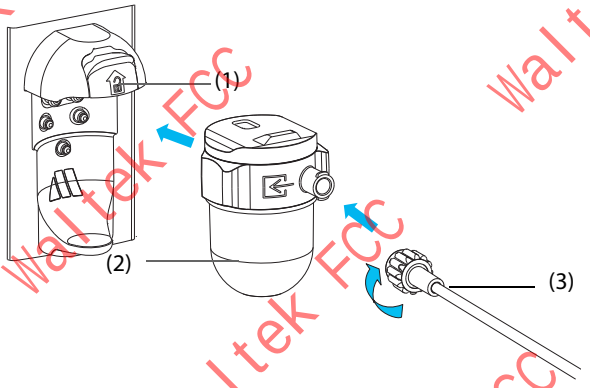
(1) O_2 waveform
(2) EtO_2 measurement
(3) EtO_2 alarm limits
(4) FiO_2 measurement
(5) FiO_2 alarm limits
(6) ΔO2: difference between FiO_2 and EtO_2

17.5 Measuring CO_2 Using Sidestream/Microstream™ CO_2 Module

17.5.1 Preparing to Measure CO_2 Using Sidestream CO_2 Module

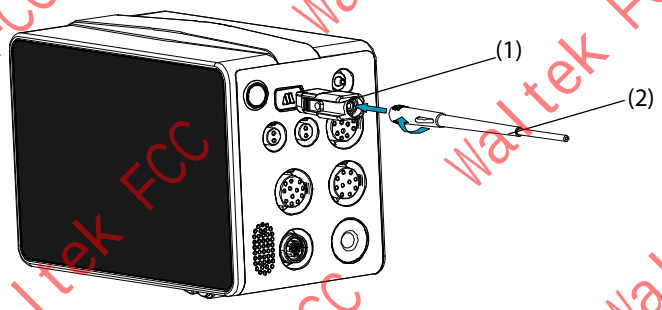
To prepare the CO_2 module for measurement, follow this procedure:

1. Select the appropriate gas sample line and watertrap according to the patient category.
2. Connect the gas sample line.
   - If you're using the sidestream CO_2 module, connect the watertrap to the CO_2 module, and connect the gas sample line to the watertrap.



(1) Watertrap receptacle (2) Watertrap (3) Gas sample line

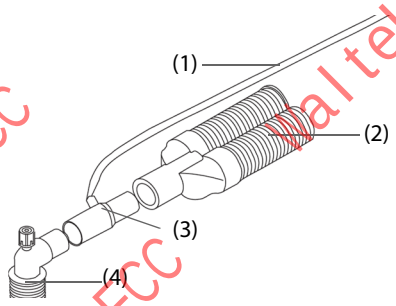
◆ If you're using the N1 monitor for CO_2 measure, connect the gas sample line to the CO_2 adapter.



(1) CO_2 adapter (2) Gas sample line

3. Connect the other end of the gas sample line to the patient.

◆ For intubated patients requiring an airway adapter, install the airway adapter between the patient circuit and the ventilator Y-piece.



(1) Sample line (2) Connect to the ventilator

(3) Airway adapter (4) Connect to the patient

◆ For non-intubated patients, place the nasal cannula onto the patient.

4. If the equipment is used in the presence of anesthetic gases, nitrous oxide or high concentrations of oxygen, connect the gas outlet to the scavenging system using an exhaust tube.

After the CO_2 module is connected, it enters measure mode by default and the monitor displays **CO2 Starting**. CO_2 can be measured after the start-up is complete.

WARNING

- **Do not apply adult or pediatric watertrap to the neonate patient. Otherwise, patient injury could result.**

CAUTION

- **Check the compatibility of the CO_2 adapter and the sampling line before use.The CO_2 adapter is intended for connecting an Oridion CO_2 sampling line.**
- **Leakage in the breathing or sampling system may cause the EtCO_2 reading significantly low. Always make sure that all the connections are tight and there is no leak in the system.**
- **Inspect the airway adapter for a tight connection and proper operation before attaching it to the patient.**
- **Squeezing or bending the sample line during the sidestream or Microstream™ CO_2 measurement may cause inaccurate CO_2 reading or no reading.**
- **If the equipment is used in the presence of anesthetic gases, nitrous oxide or high concentrations of oxygen, connect the gas outlet to the scavenging system when measuring CO_2 using the Sidestream CO_2 module.**
- **To avoid blocking the airway, empty the DRYLINE II watertrap container whenever half full. Dispose of accumulated fluids in accordance with hospital policy or your local regulations.**
- **The DRYLINE II watertrap has a filter preventing bacterium, water and secretions from entering the module. Extended use could destroy the filter in watertrap and fail to stop the bacterium, water and secretions entering the module, result in damaging the gas module and having infection risk. Replacing the DRYLINE II watertrap once a month is recommended.**

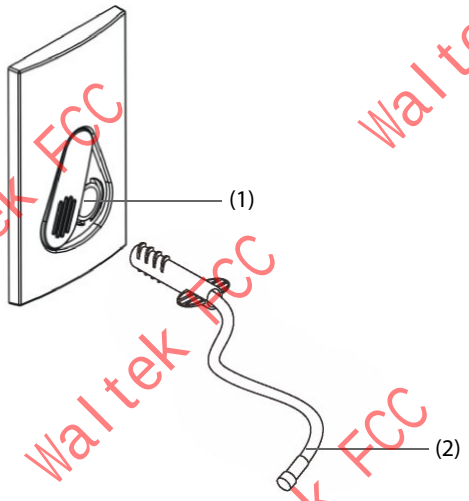
NOTE

- **It is recommended to replace the CO_2 adapter at least once a year.**
- **To extend the lifetime of the watertrap and module, disconnect the watertrap from the module and set the operating mode to Standby mode when CO_2 monitoring is not required.**
- **The sample rates are different when different types of watertraps are used.**
- **The emptying interval of the DRYLINE II adult/pediatric watertrap is 26 hours @ 120 ml/min, sample gas of 37 °C, room temperature of 23 °C, and 100% RH.**
- **The emptying interval of the DRYLINE II neonatal watertrap is 35 hours @ 90 ml/min, sample gas of 37 °C, room temperature of 23 °C, and 100% RH.**

17.5.2 Preparing to Measure CO_2 Using Microstream™ CO_2 Module

To prepare the CO_2 module for measurement, follow this procedure:

1. Connect one end of the sample line to the Microstream™ CO_2 module.



(1) Sample line connector (2) Sample line

2. Connect the other end of the sample line to the patient.
   - For intubated patient requiring an airway adapter, install the airway adapter between the patient circuit and the ventilator Y-piece.
   - For non-intubated patient, place the nasal cannula onto the patient.
   - For patient prone to mouth breathing, place the oral-nasal cannula onto the patient.
3. If the equipment is used in the presence of anesthetic gases, nitrous oxide or high concentrations of oxygen, connect the gas outlet to the a scavenging system using an exhaust tube.

After the CO_2 module is connected, it enters measure mode by default and the monitor displays **CO2 Sensor Warmup**. CO_2 can be measured after the start-up is complete.

CAUTION

- **If the equipment is used in the presence of anesthetic gases, nitrous oxide or high concentrations of oxygen, connect the gas outlet to the scavenging system when measuring CO_2 using the Microstream™ CO_2 module.**
- **When using a sampling line for intubated patients with a closed suction system, do not place the airway adapter between the suction catheter and endotracheal tube. This is to ensure that the airway adapter does not interfere with the functioning of the suction catheter.**
- **The FilterLine may ignite in the presence of O2 when directly exposed to laser, ESU devices, or high heat. When performing head and neck procedures involving laser, electrosurgical devices or high heat, use with caution to prevent flammability of the FilterLine or surrounding surgical drapes.**

NOTE

- **Sampling lines with H in their names include a moisture reduction component (Nafion® or its equivalent) for use in higher humidity environments where long duration use of CO2 sampling is required.**
- **Disconnect the sample line from the module when CO_2 monitoring is not required.**

17.5.3 Zeroing the Sidestream/Microstream™ CO_2 Module

The sidestream and Microstream™ CO_2 modules perform a zero calibration automatically when needed. Once the zero calibration is started, the CO_2 module stops measuring and "Zeroing" is displayed in the CO_2 numeric area.

After the zero calibration is completed, the CO_2 module reacquires the CO_2 readings.

The automatic zero calibration will not start under the following conditions:

- Physiological alarms related to CO_2 are active.
- An apnea alarm is active.
- No breath has been detected for over 30 seconds.

You can also perform the zero calibration manually. For more information, see *23.6.2 The CO2 Tab*.

NOTE

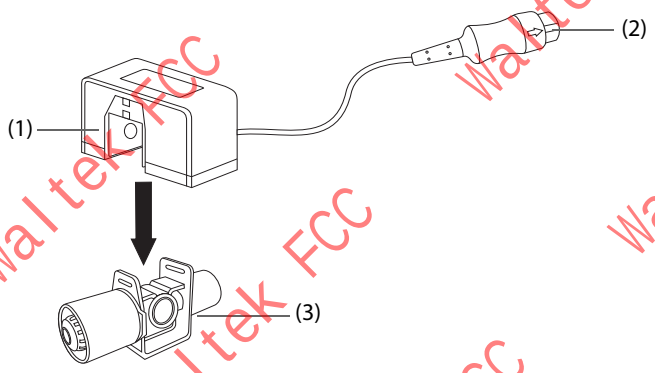
- **Periodic auto zero function compensates for drifts between components, changes in ambient temperature, and barometric conditions. This automatic process eliminates variances that might otherwise cause measurement drift.**

17.6 Measuring CO_2 Using Mainstream CO_2 Module

17.6.1 Preparing to Measure CO_2 Using Mainstream CO_2 Module

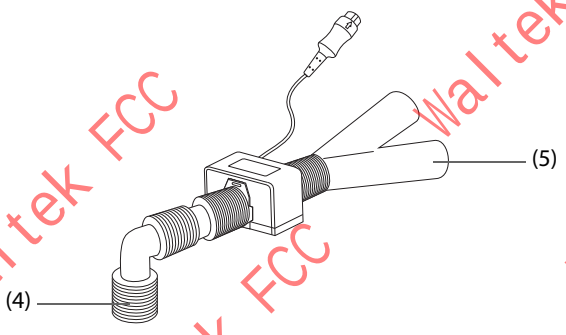
To prepare the CO_2 module for measurement, follow this procedure:

1. Connect the airway adapter to the sensor head.



(1) Sensor (2) Connect to module (3) Airway adapter

2. Attach the sensor connector to the CO_2 connector on the mainstream CO_2 module.
3. Zero the sensor after the warm-up is finished. For details, see *17.6.2 Zeroing the Mainstream CO_2 Sensor*.
4. After the zero calibration is finished, connect the airway as shown below.



(4) Connect to patient (5) Connect to ventilator

5. Make sure that no leakages are in the airway and then start a measurement.

NOTE

- **Be sure to set the barometric pressure properly before using the mainstream CO_2 module. Improper settings will result in erroneous CO_2 reading.**

- **Always position the sensor with the adapter in an upright position to avoid collection of fluids in the windows of the adapter. Large concentrations of fluids at this point will obstruct gas analysis.**
- **To avoid dead space, place the sensor as close to the patient as possible.**

17.6.2 Zeroing the Mainstream CO_2 Sensor

For mainstream CO_2 modules, the sensor should be zeroed in the following conditions:

- Before each measurement.
- A new adapter is used.
- Reconnect the sensor to the module.
- The message **CO2 Zero Required** displays. In this case, check the airway adapter for any blockage, e.g. mucus, etc. If a blockage is detected, clear or replace the adapter.

To zero the sensor, follow this procedure:

1. Connect the sensor to the module.
2. In the **CO2** menu, select **Setup** tab.
3. Set the **Operating Mode** to **Measure**. The message **CO2 Sensor Warmup** is displayed.
4. After warm-up is finished, connect the sensor to a clean, dry airway adapter. The adapter should be vented to the air and isolated from CO_2 sources, such as ventilator, the patient's breathing, your own breathing, etc.
5. Select **Zero** in the **CO2** menu. The message **Zeroing** is displayed.

It takes about 15 to 20 seconds. The message disappears when the zero calibration is completed.

WARNING

- **When perform a zero calibration during the measurement, disconnect the sensor from the patient's airway first.**
- **Do not rely on the readings during CO_2 zeroing.**

17.7 Changing CO_2 Settings

17.7.1 Changing CO_2 Alarm Settings

To change the CO_2 alarm settings, follow this procedure:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select the **Alarm** tab.
3. Enter the password if required.
4. Set alarm properties as desired.

17.7.2 Setting the CO_2 Waveform

To set the CO_2 waveform, follow this procedure:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select the **Setup** tab.
3. Set **Waveform Type**, **Speed, Scale**, or **CO2 Scale** of the CO_2 waveform.

17.7.3 Setting the RR Source

To set the respiration rate (RR) source, follow this procedure:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select the **Setup** tab.

3. Set **RR Source**.

When the current RR source does not have valid measurement, the system will automatically switch **RR Source** to **Auto**.

17.7.4 Manually Entering the Standby Mode

The default operating mode is **Measure**. If you do not use the CO_2 module, you can put the CO_2 module into the standby mode. This can prolong the service life of the CO_2 module. To enter the standby mode, follow this procedure:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select the **Setup** tab.
3. Set **Operating Mode** to **Standby**.

17.7.5 Entering the Intubation Mode

When performing intubation during general anesthesia, you can enter the intubation mode in order to reduce unnecessary alarms. To enter the intubation mode, follow this procedure:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select **Intubation Mode**.

For the details of the intubation mode, see *8.13 Intubation Mode*.

17.7.6 Setting the Time Before Auto Standby (for Sidestream and Microstream™ CO_2 Module)

You can configure the CO_2 module to automatically enter the standby mode after a designated period of time if no respiration is detected since the last detected respiration. To set the time before auto standby, follow this procedure:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select the **Setup** tab.
3. Set **Auto Standby**.

NOTE

- **For the Microstream™ CO_2 module, once the module have detected respiration, the module will not automatically stand by even if no breath is detected after the designated auto standby period. You can manually stand by the module if necessary. For more information, see *17.7.4 Manually Entering the Standby Mode*.**

17.7.7 Setting Humidity Compensation (for Sidestream and Microstream™ CO_2 Module)

The presence of humidity in breathing circuit may raise the CO_2 reading. For the sidestream and Microstream™ CO_2 module, you can switch humidity compensation on or off to correct the CO_2 reading according to actual condition.

- Body Temperature and Pressure Saturated Gas (BTPS), or wet gas
- Ambient Temperature and Pressure Dray (ATPD), or dry gas

The CO2 partial pressure is calculated as follows:

- ATPD: $P_{CO2}(mmHg)=CO_2(vol\%) \times P_{amb}/100$
- BTPS (sidestream): $P_{CO2}(mmHg)=CO_2(vol\%) \times (P_{amb}- 47)/100$
- BTPS (Microstream™): $P_{CO2}(mmHg)=CO_2(vol\%) \times (1- 0.03) \times P_{amb}/100$

Where, $P_{CO2}(mmHg)$= *partial pressure, vol%=*CO_2 *concentration,* P_{amb}*=ambient pressure, and unit is mmHg.*

To set the humidity compensation, follow this procedure:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.

2. Select the **Setup** tab.
3. Set **BTPS Compensation**.
   - Switch on for BTPS.
   - Switch off for ATPD.

17.7.8 Changing O_2 Alarm Settings (for Sidestream CO_2 Module Integrating O_2)

To change the O_2 alarm settings, follow this procedure:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select the **Alarm** tab.
3. Enter the password if required.
4. Set alarm properties as desired.

17.7.9 Setting the O_2 Waveform (for Sidestream CO_2 Module Integrating O_2)

To set the O_2 waveform, follow this procedure:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select the **Setup** tab.
3. Set **Speed** and **O2 Scale** of the O_2 waveform.

17.7.10 Setting the Gas Compensation (for Sidestream and Mainstream CO_2 Module)

The presence of interfering gas affects the CO_2 measurement. To get the best possible measuring result, it is needed to set the gas compensation. The configured concentration of the interfering gas should be in accordance with its actual proportion.

For the Microstream™ CO_2 module, gas compensations are not required.

WARNING

- **Make sure to use the appropriate compensations. Inappropriate compensations may cause inaccurate measurement values and result in misdiagnosis.**

For the sidestream CO_2 module, follow this procedure to set the gas compensation:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select the **Setup** tab.
3. Set the compensation according to the actual condition.

For the mainstream CO_2 module, follow this procedure to set the gas compensation:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select the **Setup** tab.
3. Set **Balance Gas**.
   - Select **Room Air** when air predominates in the ventilation gas mixture.
   - Select **N2O** when N_2O predominates in the ventilation gas mixture.
   - Select **He** when He predominates in the ventilation gas mixture.
4. Set **O2 Compensation.**
   - Select **Off** when the amount of O_2 is less than 30%.
   - Select an appropriate setting according to the amount of O_2 in the ventilation gas mixture.
5. Set AG compensation. This could compensate for the effect of AG on the readings.
   - For the mainstream module configured with Respironics 1036698 CO_2 sensor, select **AG Compensation** and input the concentration of anesthetic gas present in the ventilation gas mixture.

- For the mainstream module configured with Mindray GA3701 CO_2 sensor, select **Gas Type**. Then select **AG Compensation** and input the concentration of anesthetic gas present in the ventilation gas mixture.

17.7.11 Choosing a Time Interval for Peak-Picking (for Microstream™ and Mainstream CO_2 Module)

For Microstream™ and mainstream CO_2 modules, you can select a time interval for picking the highest CO_2 as the $EtCO_2$ and the lowest as the $FiCO_2$.

To set the time interval, follow this procedure:

1. Select the CO_2 numeric area or waveform area to enter the **CO2** menu.
2. Select the **Setup** tab.
3. Set **Maximum Hold**.
4. Toggle between **Single Breath**, **10 s**, **20 s** and **30 s** if Microstream™ CO_2 module is configured; toggle between **Single Breath**, **10 s** and **20 s** if mainstream CO_2 module is configured.
   - **Single Breath**: $EtCO_2$ and $FiCO_2$ are calculated for every breath.
   - **10 s**, **20 s**, or **30 s**: $EtCO_2$ and $FiCO_2$ are calculated using 10, 20 or 30 seconds of data.

17.7.12 Changing Barometric Pressure (for Mainstream CO_2 Module)

Both sidestream and Microstream™ CO_2 modules have the function of automatic barometric pressure compensation (the system automatically measures the barometric pressure to which the patient monitor is exposed). However, the mainstream CO_2 module does not have such function. For the mainstream CO_2 module, the default barometric pressure is 760 mmHg. You must modify the barometric pressure based on the actual situation.

This function is password protected. For more information, see *23.11 The Other Settings*.

WARNING

- **Be sure to set the barometric pressure properly before using the mainstream CO_2 module. Improper settings will result in erroneous CO_2 reading.**

17.8 Performing the Leakage Test

When measuring CO_2 using the internal CO_2 module or the sidestream CO_2 module, leakage test is required every time before the CO_2 measurement. To perform the CO_2 leakage test, follow this procedure:

1. Connect the measuring accessories as per section *17.5.1 Preparing to Measure CO_2 Using Sidestream CO_2 Module*.
2. Wait until the startup finishes. Completely block the gas inlet on the sidestream CO2 module or on the N1. Then the alarm message "**CO2 Airway Occluded**" will appear on the screen.
3. Block the gas inlet for another one minute.
4. Select the **Main Menu** quick key → from the **System** column select **Maintenance** → input the required password → select .
5. Select the **Module** tab → **CO2** tab.
6. Check that the current flow rate is less than 10ml/min, and the alarm message "**CO2 Airway Occluded**" does not disappear.

   This indicates that the module does not leak. If the alarm message disappears, or the flow rate is equal to 10ml/min or greater, it indicates that the module leaks. Perform the leakage test again. If the problem remains, contact your service personnel for help.

17.9 CO_2 Calibration

- For sidestream CO_2 modules, a calibration is needed every year or when the measured values have a great deviation.

- For Microstream™ CO_2 modules, initially calibrate after 1,200 operating hours, then once a year or after 4,000 operating hours, whichever comes first. The initial calibration should not occur before 720 hours of use. If the initial calibration is done before 720 hours of use, the module will reset to require its next calibration after 1200 hours, instead of after 4000 hours.
- For mainstream CO_2 module, no calibration is needed.

To calibrate the CO_2 module, contact the service personnel.

CAUTION

- **Connect the gas outlet to the scavenging system when calibrating the CO_2 module.**
- **If calibration does not take place as instructed, the monitor may be out of calibration. The monitor that is out of calibration may provide inaccurate results.**

17.10 CO_2 Troubleshooting

This section lists the problems that might occur. If you encounter the problems when using the equipment or accessories, check the table below before requesting for services. If the problem persists, contact your service personnel.

NOTE

- **For the physiological and technical alarm messages, see *E Alarm Messages*.**

17.10.1 Troubleshooting the Sidestream/Microstream™ CO_2 Module

Problem	Solution
$EtCO_2$measurements too low	1. Ventilate the room if the environmental CO_2 concentration is too high. 2. Check the sample line and connectors for leakage. 3. Check the patient status.

17.10.2 Troubleshooting the Mainstream CO_2 Module

Problem	Solution
Elevated baseline	1. Check the patient status. 2. Check the sensor.

17.11 Oridion Information

Microstream

Microstream is a trademark of a Medtronic company.

Oridion Patents

The list of relevant patents for the Microstream™ CO2 module appears on US Patents: www.covidien.com/patents.

No Implied License

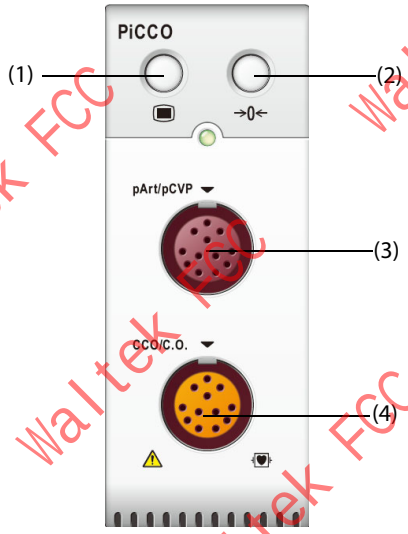
Possession or purchase of this device does not convey any express or implied license to use the device with unauthorized CO_2 sampling consumables which would, alone, or in combination with this device, fall within the scope of one or more of the patents relating to this device and/or CO_2 sampling consumable.

18 Monitoring Continuous Cardiac Output (CCO from PiCCO Module)

18.1 CCO Introduction

The PiCCO method combines transpulmonary thermodilution and pulse contour analysis on the blood pressure waveform. A cold bolus (e.g. normal saline 0.9%) with a known volume and temperature is injected into the right atrium through a central venous catheter. The cold bolus mixes with the blood in the heart and the change in blood temperature is measured with a thermistor at the distal end of the arterial thermodilution catheter placed in one of the bigger systemic arteries, for example, the femoral artery. The monitor uses the transpulmonary thermodilution method to measure C.O., Global End Diastolic Volume (GEDV) and Extra Vascular Lung Water (EVLW). With the C.O. value measured with the transpulmonary thermodilution method and the result of the pulse contour analysis, a patient-specific calibration factor is calculated. The monitor uses this value to compute CCO and the other continuous hemodynamic parameters.

PiCCO monitoring is intended for adult and pediatric patients.



(1) CCO menu hard key

(2) Zero IBP hard key

(3) IBP cable connector

(4) PiCCO cable connector

18.2 CCO Safety Information

WARNING

- **PiCCO monitoring is not intended for neonatal patients.**
- **Use only pressure transducers specified in this manual. Never reuse disposable pressure transducers.**
- **Make sure that the applied parts never contact other conductive parts.**
- **To reduce the hazard of burns during high-frequency surgical procedure, ensure that the monitor's cables and transducers never come into contact with the high-frequency surgical units.**
- **When using accessories, their operating temperature should be taken into consideration. For details, see instructions for use of accessories.**

CAUTION

- **Do not perform transpulmonary thermodilution measurement on patients undergoing IABP.**

18.3 Zeroing the IBP transducer

To avoid inaccurate pressure readings, the monitor requires a valid zero. Zero the transducer in accordance with your hospital policy. The IBP transducer should be zeroed in the following conditions:

- The IBP transducer, IBP cable or module is reconnected.
- The monitor restarts.
- You doubt the readings.
- The monitor displays the prompt message **Zero Required**.

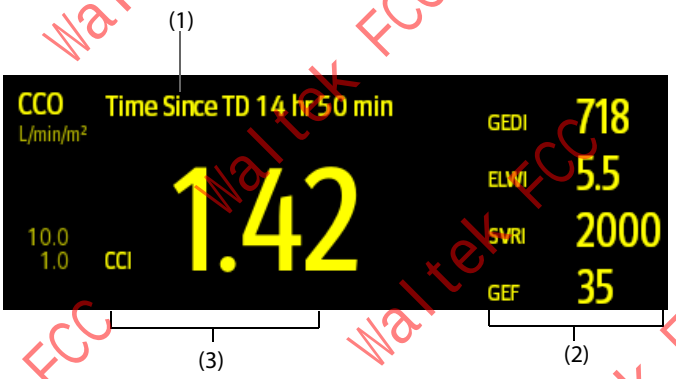
To zero the transducer, follow this procedure:

1. Connect the IBP transducer, the IBP cable and the module.
2. Turn off the three-way valve (the one close to the transducer) to the patient, in order to vent the transducer to the atmospheric pressure.
3. Zero the transducer by one of the following methods:
   - Press the **Zero** hard key on the module.
   - Select the numeric area (such as the Art numeric area), and then select **Zero**.
4. After the zero calibration is completed, close the stopcock to the air and open the stopcock to the patient.

18.4 PiCCO Display

18.4.1 CCO Display

CCO numeric area displays the CCO and other hemodynamic parameters. You can select the parameters for display on the **Parameter** page of the **CCO** menu. For more information, see *18.7.2 Setting Parameters for Display*.



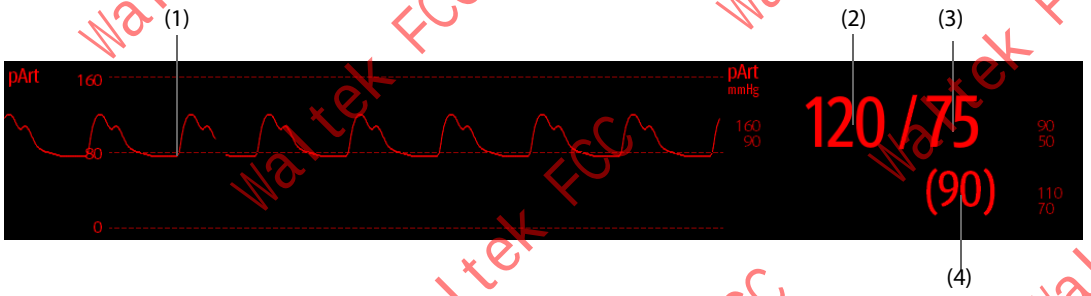
(1) Prompt message: the time since previous TD measurement

(2) Labels and values for secondary parameters

(3) Label and value for primary parameter

18.4.2 pArt Display

The artery pressure from the PiCCO module (pArt) is displayed on the monitor as a waveform and numeric pressures. The figure below shows the pArt waveform and numerics.



(1) Waveform

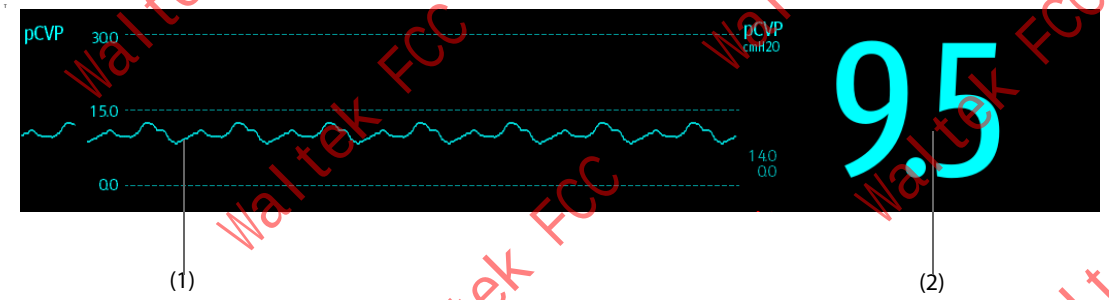
(2) Systolic pressure

(3) Diastolic pressure

(4) Mean pressure

18.4.3 pCVP Display

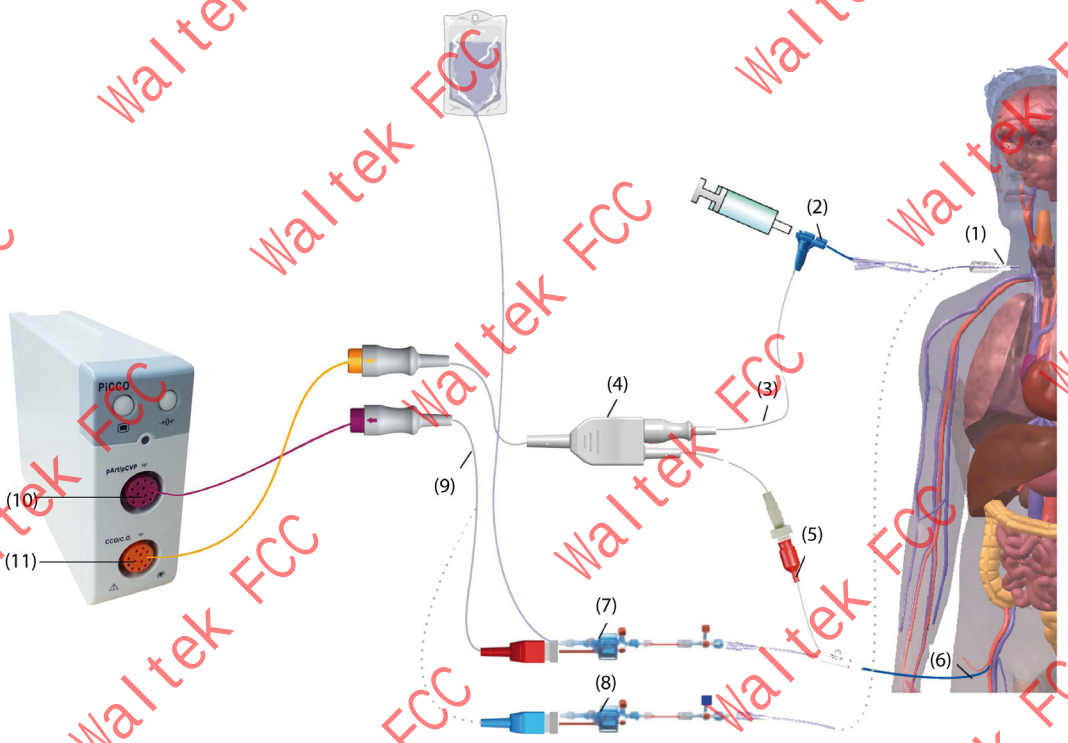
The central venous pressure from the PiCCO module (pCVP) is displayed on the monitor as a waveform and numeric pressures. The figure below shows the pCVP waveform and numerics.



(1) Waveform

(2) Central venous pressure

18.5 CCO Equipment to Patient Connection



(1) Central venous catheter
(2) Injectate temperature sensor
(3) Injectate temperature sensor cable
(4) PiCCO cable
(5) Blood temperature sensor
(6) Arterial thermodilution catheter
(7) Arterial pressure transducer
(8) CVP transducer
(9) IBP cable
(10) IBP cable connector
(11) PiCCO cable connector

18.5.1 Preparing to Monitor C.O.

To prepare to monitor C.O., follow this procedure:

1. Place the arterial thermodilution catheter.

NOTE

- **Use the specified catheters and puncture locations.**
- **The arterial thermodilution catheter must be placed in one of the bigger systemic arteries, for example, the femoral, the brachial or the auxiliary artery.**

2. Place the central venous catheter.
3. Connect the blood temperature sensor to the arterial thermodilution catheter.
4. Connect the injectate temperature sensor to the central venous catheter.
5. Plug the PiCCO cable into the CCO/C.O. connector on the PiCCO module, and connect the following devices to the PiCCO cable:
   - Injectate temperature sensor probe
   - Blood temperature sensor connector
6. Plug the IBP cable into the pArt/pCVP connector on the PiCCO module.
7. Connect one end of the arterial pressure transducer to the arterial thermodilution catheter and the other end to the IBP cable marked with pArt.

WARNING

- **Make sure there is no air bubbles in the IBP transducer systems. If air bubbles appear in the tubing system, flush the system with the infusion solution again. Air bubble may lead to wrong pressure reading.**

8. If you need to measure CVP, connect one end of the CVP transducer to the central venous catheter and the other end to the IBP cable marked with pCVP. Then plug the IBP cable to the pArt/pCVP connector on the PiCCO module.

18.5.2 Performing the CCO Settings

To perform the CCO settings, follow this procedure:

1. Select the CCO numeric area to enter the **C.O. Measure (CCO)** menu.
2. Select **Setup** to enter the **Setup** page of the **CCO** menu.
3. Set patient information.

   Correct input of height, weight, category and gender is mandatory for the accuracy of the displayed parameters as well as for the correct indexing of some parameters. The monitor automatically calculates predicted body weight (PBW), body surface area (BSA) and predicted body surface area (PBSA) according to the inputted height and weight.
4. Check that the correct arterial catheter type is displayed at **Catheter Type**.

   The monitor can recognize the arterial catheter automatically when the arterial thermodilution catheter, PiCCO cable, and PiCCO module are connected. If the catheter constant is not recognized, enter the correct value for the catheter in the **Catheter Type** edit box. The catheter constant is usually written either on the catheter or on the catheter packaging.
5. Set **Catheter Position**.

   Set the position site of the arterial thermodilution catheter according to the catheter type.
6. Set **Injectate Volume**.

   If the injectate volume is not selected, the monitor sets the volume by default during the first measurement, which is 15ml for adult and 10 ml for pediatric. Later the monitor adjusts the injectate volume according to previous measuring result. The following table displays the recommended injectate volume depending on body weight and Extravascular Lung Water Index (ELWI):

Patient Weight (kg)	ELWI < 10	ELWI > 10	ELWI < 10
	Iced Injectate	Iced Injectate	Room Temperature Injectate
<3	2ml	2ml	3ml
<10	2ml	3ml	3ml
<25	3ml	5ml	5ml
<50	5ml	10ml	10ml
<100	10ml	15ml	15ml
≥100	15ml	20ml	20ml

CAUTION

- **The selected volume should be strictly the same as actual injected volume. Otherwise, the measurement accuracy may be compromised or measurement may be failed.**

7. Set **Auto Start**.
   - If **Auto Start** is disabled, you should start each measurement manually by selecting **Start** in **C.O. Measure (CCO)** window.
   - If **Auto Start** is enabled, C.O. measurements can be performed consecutively after you start the first measurement, without the need for pressing **Start** between measurements.

8. Set **Auto pCVP**.
   - Enable **Auto pCVP** if the monitor is performing pCVP measurement. In this case, the monitor obtains the pCVP value automatically.
   - Disable **Auto pCVP** if the monitor fails to obtain the pCVP value. In this case, the pCVP value should be input manually at **pCVP**.
9. Set **TD Reminder**. The CCO parameter area displays the time to last injection. After the set time is reached, the background of the time to last injection is highlighted in yellow to remind you.

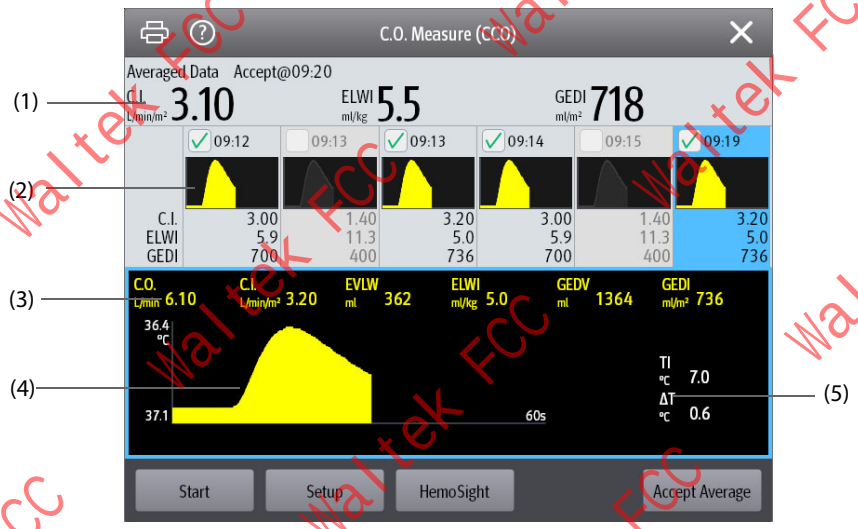
NOTE

- **Input a proper pCVP value if Auto pCVP is disabled. The system adopts 5mmHg by default if the pCVP value is not input manually.**

18.5.3 Performing C.O. Measurement

To perform the C.O. measurement, follow this procedure:

1. Select the CCO numeric area to enter the **C.O. Measure (CCO)** menu.



(1) Average values (2) History window

(3) Current measurements (4) Thermodilution curve

(5) Variation of blood temperature (ΔT)

2. Select **Start** and inject the bolus rapidly (<7sec) and smoothly as soon as the message **Inject xx ml!** displays and prompt tone sounds. As shown in the figure above, during the measurement, the currently measured thermodilution curve is displayed. At the end of the measurement, the measured values are displayed in the history window and the monitor prompts you to wait for a certain period of time before starting a new measurement. The ΔT value should be greater than 0.15°C to ensure high accuracy. A low ΔT can be caused by a very high ELWI or an extreme low CI. If ΔT is too low, you can try to increase it by the following method:
   - Inject more volume (remember to reenter the injectate volume in the **Setup** page of the **CCO** menu before injecting).
   - Inject colder bolus.
   - Inject the bolus in a shorter time.
3. Perform three to five single measurements directly after each other within a maximum of 10 minutes as described in Step 2. A new measurement is available when you see the blood temperature is steady in the **C.O. Measure (CCO)** window.
   - If **Auto Start** is disabled in the **Setup** page of the **CCO** menu, you should repeat step 2 manually.
   - If **Auto Start** is enabled in the **Setup** page of the **CCO** menu, the C.O. measurements can be performed consecutively, without the need for pressing **Start** between measurements. A new thermodilution measurement is possible as soon as **Inject xx ml** is displayed on the screen. The patient monitor automatically detects further thermodilution measurements.

4. Select the thermodilution curves you desired in the history window, and select **Accept Average** to obtain the averaged value of parameters.

   A maximum of six C.O. measurements can be stored. The monitor automatically performs calibration and calculates the CCO and CCI values according to the C.O. measurements you select.

CAUTION

- **If the monitor can not get a reliable pArt value during a C.O. measurement, the corresponding C.O. value is invalid for CCO calibration.**
- **If the option of the auto pCVP measurement is not enabled, pCVP value should be manually updated as soon as a new value is obtained to accurately calculate SVR and CCO.**
- **If the displayed continuous parameters are not plausible, they should be checked by a thermodilution measurement. The PiCCO measurement will be recalibrated automatically.**
- **Faulty measurements can be caused by incorrectly placed catheters, interfering signal transmission e.g. of arterial pressure, defective connections or sensors, or by electromagnetic interference.**
- **Aortic aneurysms may cause the displayed blood volume (GEDV/ITBV) derived by thermodiution measurement to be erroneously high if the arterial thermodilution catheter is placed in the femoral artery.**
- **The use of injectate solution with a temperature that is not at least 10°C lower than the blood temperature may cause incorrect values for the thermodilution and CCO calibration.**

NOTE

- **Three to five single thermodilution measurements within 10 minutes are recommended. For a stable patient it is recommended to perform a thermodilution measurement every eight hours. For an unstable patient it may be necessary to perform thermodilution measurements more frequently in order to determine the patient's volume status and to recalibrate the continuous determination of C.O.**
- **As the pulse contour cardiac output of children has not been sufficiently validated thus far, the C.O. should be checked by thermodilution before therapeutic interventions.**
- **A new measurement is recommended with significant changes in hemodynamic conditions, such as volume shifts or changes to medication.**

18.6 Viewing the Hemodynamic Parameters

To view the hemodynamic parameters, follow this procedure:

1. Select the CCO numeric area to enter the **C.O. Measure (CCO)** menu.
2. Select the **Hemodynamic Parameters**.

In the **Hemodynamic Parameters** menu, you can view both the measurement and referential normal range of each parameter. If a parameter value exceeds its normal range, the system will add a "↑" or "↓" to the right of the parameter.

	Abbreviation	Full Spelling	Unit	Default Normal Range
Output	CCO	Continuous Cardiac Output	L/min	/
	CCI	Continuous Cardiac Index	L/min/m^2	3.0-5.0
	SV	Stroke Volume	ml	/
	SVI	Stroke Volume Index	ml/m^2	40-60
	HR	Heart Rate	bpm	60-80

	Abbreviation	Full Spelling	Unit	Default Normal Range
Contractility	GEF	Global Ejection Fraction	%	25-35
	CFI	Cardiac Function Index	1/min	4.5-6.5
	dPmx	Left Ventricular Contractility	mmHg/s	/
Preload Volume	GEDV	Global End Diastolic Volume	ml	/
	GEDI	Global End Diastolic Volume Index	ml/m^2	680-800
	ITBV	Intrathoracic Blood Volume	ml	/
	ITBI	Intrathoracic Blood Volume Index	ml/m^2	850-1000
	SVV	Stroke Volume Variation	%	0-10
	PPV	Pulse Pressure Variation	%	0-10
Afterload Volume	SVR	Systemic Vascular Resistance	DS/cm^5 or kPa-s/l	/
	SVRI	Systemic Vascular Resistance Index	$DS•m^2/cm^5$ or kPa-s-m^2/l	1700-2400
	pArt-M	Mean Artery Pressure	mmHg, kPa or cmH_2O	70-90
	pArt-D	Diastolic Artery Pressure	mmHg, kPa or cmH_2O	60-80
	pArt-S	Systolic Artery Pressure	mmHg, kPa or cmH_2O	100-140
Organ Function	EVLW	Extravascular Lung Water	ml	/
	ELWI	Extravascular Lung Water Index	ml/kg	3.0-7.0
	CPO	Cardiac Power Output	W	/
	CPI	Cardiac Power Index	W/m^2	0.5-0.7
	PVPI	Pulmonary Vascular Permeability Index	no unit	1.0-3.0
	TB	Blood Temperature	℃	/

18.7 Changing CCO Settings

18.7.1 Changing CCO and CCI Alarm Settings

To change the CCO and CCI alarm settings, follow this procedure:

1. Select the CCO numeric area to enter the **C.O. Measure (CCO)** menu.
2. Select **Setup** to enter the **Setup** page of the **CCO** menu.
3. Select the **Alarm** tab.
4. Enter the password if required.
5. Set alarm properties as desired.

18.7.2 Setting Parameters for Display

To set the parameters for display, follow this procedure:

1. Select the CCO numeric area to enter the **C.O. Measure (CCO)** menu.
2. Select **Setup**.
3. Select the **Select Parameter** tab.
4. Select the primary and secondary parameters for display.

18.7.3 Setting the Normal Range of Hemodynamic Parameters

You can set the normal range for the hemodynamic parameters according to patient condition. The system adopts the default normal ranges for the parameters if the ranges are not set up manually. Please refer to section *18.6 Viewing the Hemodynamic Parameters* for the hemodynamic parameters to see the default normal ranges of the hemodynamic parameters. To set the normal range of the hemodynamic parameters, follow this procedure:

1. Select the CCO numeric area to enter the **C.O. Measure (CCO)** menu.
2. Select **Hemodynamic Parameters**.
3. Select **Setup**.
4. Set the normal range of parameters.
5. Select **Defaults** to restore the normal ranges of all parameters to the defaults.

NOTE

- **The normal ranges are based upon clinical experience and can vary from patient to patient. The stated values are therefore offered without guarantee. Indexed parameters are related to body surface area, predicted body weight or predicted body surface area and can also be displayed as absolute values.**
- **The values listed are not recommended for use on a specific patient. The treating physician is in any case responsible for determining and utilizing the appropriate diagnostic and therapeutic measures for each individual patient**

18.8 PiCCO Troubleshooting

This section lists the problems that might occur. If you encounter the problems when using the equipment or accessories, check the table below before requesting for services. If the problem persists, contact your service personnel.

NOTE

- **For the physiological and technical alarm messages, see *E Alarm Messages*.**

Problem	Solution
Do not see CCO numeric area on the main screen	1. Check that the CCO is set to display in the **Screen Setup** menu. For more information, see *3.11.2 Displaying Parameter Numerics and Waveforms*. 2. Check that if the CCO parameter switch is enabled. If not, enable the CCO measurement. For more information, see *3.11.1 Switching On or Off a Parameter*. 3.Check that the patient type is adult. 4. Check the connection of PiCCO cable, arterial thermodilution catheter and injectate temperature sensor.
CCO value is inaccurate	1. Check that the arterial thermodilution catheter is positioned properly. 2. Check that the catheter type is proper. 3. Inject solution rapidly and smoothly. 4. Finish injection within four to five seconds. 5. Inject more volume, or inject colder solution. 6. Check that the height and weight of patient is properly configured. 7. Check that the entered **Injectate Volume** is correct.
CCO measurement fails	1. Inject more volume, or inject colder solution. Make sure that the injectate temperature is at least 10°C colder than the patient blood temperature. 2. Finish injection within four to five seconds. 3. Check the connection of PiCCO cable, arterial thermodilution catheter and injectate temperature sensor.

Problem	Solution
Message “Unstable baseline. Please wait.” constantly appears.	1. Check if the patient’s temperature changes rapidly. Wait till the patient’s temperature is stable. 2. Check if the patient is being transfused with large volume of fluid. Wait till transfusion stops. 3. IBP cable fails or incorrectly connected. Check the cable and its connection. Replace the cable if necessary. 3. The temperature sensor of the thermodilution catheter may fail. Flush the catheter and check if TB changes. If TB does not change, replace the catheter.

19 Review

19.1 Review Overview

The monitor provides the patient's trends to help you evaluate how the patient's condition is developing.

19.2 Review Page

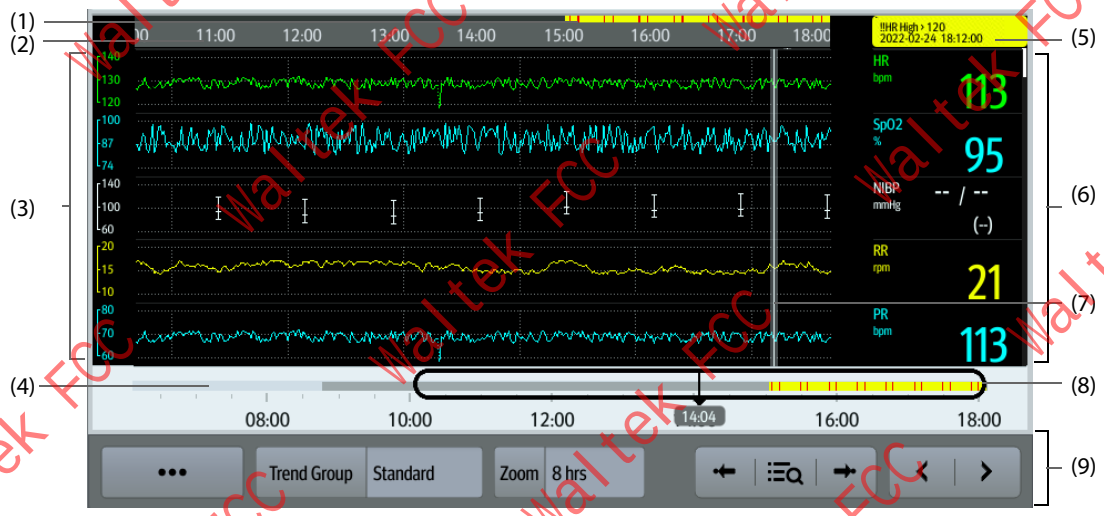
The **Review** page contains tabs to display trend data in tabular, graphic, or other forms.

19.2.1 Accessing the Review Page

To enter the review page, select the **Main Menu** quick key → from the **Review** column select the desired option. If reviewing patient data is password protected, input the monitor's clinical password (local password).

19.2.2 Example Review Page

The review pages have similar structure. We take the **Graphic Trends** review page as an example.



(1) Event type indicator: different color blocks match different types of events:

- Red: high priority alarm event
- Yellow: medium priority alarm event
- Cyan: low priority alarm event
- Green: manual event
- White: operation-related event

(2) Current window time line: indicates the time length of the current window.

(3) Waveform area: displays trend curves.

(4) Time line: indicates the entire time length that trend data can be reviewed.

(5) Event area: displays the event at the cursor time. Selecting the event accesses the event list. If there is no event at the cursor time, the cursor time is displayed.

(6) Numeric area: displays numeric values at the cursor time. The background color of numeric values matches the alarm priority.

(7) Cursor

(8) Slider: indicates the position of current window time in the entire time length. Dragging the slider left or right enables you to locate the trend data at a specific time and also refreshes trend data in current window accordingly.

(9) Button area.

19.2.3 Symbols on Review Pages

The following table lists the symbols on review pages.

Symbol	Description
	Slider: indicates the position of current window time in the entire time length. Dragging the slider left or right enables you to locate the trend data at a specific time and also refreshes data in current window accordingly.
or	Goes to the previous or next event.
	Event list: displays events in a chronological order. The most recent event is displayed at the top.The number of asterisk symbols before an event matches alarm priority.
	Print button: select it to output patient information and data through the printer.

19.2.4 Common Operations

This section describes common operations for all review pages.

19.2.4.1 Browsing Trend Data

Browse trend data in one of the following ways:

- Move the cursor.
- Move the slider
- Slide your finger on the screen.

19.2.4.2 Viewing Events

You can view the following types of events:

- Manually triggered events
- Parameter-related operation events and alarm-related events, such as starting NIBP measurement
- Operation events not related to parameters, such as system time change

View events in either of the following ways:

- Select and select the desired event.
- Select or to view the previous or next event.
- Events are displayed in a chronological order. The most recent event is displayed at the top.

19.2.5 Reviewing the Tabular Trends

The **Tabular Trends** review page displays trend data in a tabular form.

19.2.5.1 Entering the Tabular Trends Review Page

To enter the **Tabular Trends** review page, select the **Main Menu** quick key → from the **Review** column select **Tabular Trends**.

19.2.5.2 Changing the Tabular Trend Group

To change the tabular trend group, follow this procedure:

1. Enter the **Tabular Trends** review page.

2. Set **Trend Group**.

19.2.5.3 Editing the Tabular Trend Group

The setting of the **Trend Group** defines the contents of displayed and printed trends. To edit the tabular trend group, follow this procedure:

1. Enter the **Tabular Trends** review page.
2. Select **Group Setup** → select the desired tab.

NOTE

- **You cannot edit trend group labeled All or Standard.**
- **ECG parameter and waveform are always displayed in the first row on the trend page. It cannot be deleted or moved.**

19.2.5.4 Changing the Resolution of Trend Data

The resolution of tabular trends defines the interval of displaying trend data. Short interval is suit for patients, for example the neonate, whose clinical situation changes quickly. Longer interval is more appropriate for patients, for example the adult, whose status changes more gradually.

To change the interval of trend data, follow this procedure:

1. Enter the **Tabular Trends** review page.
2. Select **Interval**.
   - **5 sec or 30 sec**: select to view up to 4 hours of tabular trends at an interval of 5 seconds or 30 seconds.
   - **1 min, 5 min, 10 min, 15 min, 30 min, 1 hr, 2 hrs, or 3 hrs**: select to view up to 120 hours of tabular trends at selected interval.
   - Select parameters, such as NIBP, C.O. to view the tabular trends when parameter measurements are acquired.

19.2.5.5 Printing a Tabular Trends Report

To print a tabular trends report, follow this procedure:

1. Enter the **Tabular Trends** review page.
2. Select  at the upper left corner of the review page to enter the **Print Setup** menu.
3. Set the tabular trends report as described in *22.6.3 Setting Tabular Trends Reports*.
4. Select **Print**.

19.2.6 Reviewing the Graphics Trends

The **Graphic Trends** review page displays trend data in a graphic form.

19.2.6.1 Entering the Graphic Trends Review Page

To enter the **Graphic Trends** review page, select the **Main Menu** quick key → from the **Review** column select **Graphic Trends**.

19.2.6.2 Changing the Graphic Trend Group

To change the graphic trend group, follow this procedure:

1. Enter the **Graphic Trends** review page.
2. Select  and set **Trend Group**.

19.2.6.3 Editing the Graphic Trend Group

The setting of the **Trend Group** defines the contents of displayed and printed trends. To edit the graphic trend group, follow this procedure:

1. Enter the **Graphic Trends** review page.
2. Select ••• → select **Group Setup** → select the desired tab.

NOTE

- **You cannot edit the trend groups labeled All or Standard.**
- **ECG parameter and waveform are always displayed in the first row on the trend page. It cannot be deleted or moved.**

19.2.6.4 Changing the Resolution of Trend Data

To change the length of trend data displayed on the current screen, follow this procedure:

1. Enter the **Graphic Trends** review page.
2. Select **Zoom**.
   - **8 min:** the screen displays eight minutes of trend data. You can view the recent one hour data.
   - **30 min, 1 hr, 2 hrs, 4 hrs**: the screen displays 30 minutes, one hour, two hours, or four hours of trend data. You can view the recent four hour data.
   - **8 hrs, 12 hrs, 24 hrs, 48 hrs**: the screen displays eight hours, 12 hours, 24 hours, or 48 hours of trend data. You can view the recent 120 hours of data.

19.2.6.5 Changing the Number of Waveforms

To change the number of waveforms displayed on the trend review page, follow this procedure:

1. Enter the **Graphic Trends** review page.
2. Select ••• and set **Trends**.

19.2.6.6 Printing a Graphic Trends Report

Before print a graphic trends report, set the **Graphic Trends** report as described in *22.6.3 Setting Tabular Trends Reports*.

To print a **Graphic Trends** report, follow this procedure:

1. Enter the **Graphic Trends** review page.
2. Select at the upper left corner to enter the **Print Setup** menu.
3. Select **Print**.

19.2.7 Reviewing Events

The monitor stores events in real time, including technical alarm events, physiological alarm events, manual events, and operational events. When an event occurs, all the measurement numerics and three event-related waveforms 16 seconds before and after the event are stored.

NOTE

- **A total loss of power has no impact on the events stored.**
- **Alarms are saved as events and will be maintained if the equipment is powered down. The time of equipment power down is not recorded as an event and cannot be reviewed.**
- **Earlier events will be overwritten by later ones if the capacity is reached.**

19.2.7.1 Entering the Events Review Page

To enter the events review page, select the **Main Menu** quick key → from the **Review** column select **Events**.

The **Events** page displays event list. Events are displayed in descending chronological order. The most recent event is displayed at the top.The number of asterisk symbols before an event indicate alarm priorities.

Different color blocks are displayed on the left of each event to indicate different event types.

- Red: high priority alarm event
- Yellow: medium priority alarm event
- Cyan: low priority alarm event
- Green: manual event
- White: operation-related event

19.2.7.2 Configuring the Filter

You can filter events to facilitate event review. To configure the filter, follow this procedure:

1. Enter the **Events** page.
2. Select **Filter**. From the drop-down list, select the desired item.

You can customize two criteria. To do so, follow this procedure:

1. From the **Filter** drop-down list, select **Custom 1** or **Custom 2** to enter the **Filter Setup** menu.
2. Select the **Name** field to edit the name of the custom criterion.
3. Select desired items.

If you want to review events happened around certain time, select the  button → set the time → select **OK**. Then the cursor jumps to the event happened closest to the defined time.

19.2.7.3 Editing Events

To edit events, follow this procedure:

1. Enter the **Events** page and tick off the desired events.
2. Select  to edit the selected events.
   - **Lock**: manually lock the event. Locked events cannot be deleted.
   - **Note**: enter comments for the event.
   - Rename: allow renaming an event name. Only manual events and arrhythmia events can be renamed if enabled by the hospital's settings. For more information, see *23.7.2 The Event Tab*.

19.2.7.4 Viewing Event Details

To view waveforms and parameter values at the event time, follow this procedure:

1. Enter the **Events** review page.
2. Select **Detail**.

To display beat labels on the first ECG waveform, switch on **Beat Anno:**. The white beat labels indicate heart beats classification and may explain suspected, missed, or false arrhythmia calls. Heart beats are classified as follows:

- N = Normal
- V = Ventricular ectopic
- S = Supraventricular premature
- P = Paced
- L = Learning
- ? = Insufficient information to classify beats
- I = Inoperative (for example, Lead Off)
- M = Missed beat

19.2.7.5 Printing Event Reports

To print event reports, follow this procedure:

1. Enter the **Events** review page.
2. Select  at the upper left corner to enter the **Print Setup** menu.

3. Select the desired options.
   - **Print All Event List**: print the entire event list.
   - **Print List of Selected Events**: print the list of selected events.
   - **Print Detail of Selected Events**: print the details of selected events.
   - **Print Displayed Event Detail**: print the waveforms and parameters of the currently displayed event.
4. Select **Print**.

19.2.8 Reviewing Full Disclosure

You can review up to 48-hour waveform data on the **Full Disclosure** review page. You can view both the compressed waveforms, full waveforms and numeric values.

19.2.8.1 Entering the Full Disclosure Review Page

To enter the **Full Disclosure** review page, select the **Main Menu** quick key → from the **Review** column select **Full Disclosure**.

19.2.8.2 Selecting Waveforms

Before reviewing compressed waveforms, you must select waveforms you want to store and display. To store and display the desired waveforms, follow this procedure:

1. Enter the **Full Disclosure** review page.
2. Select ••• → **Setup** to enter the **Select Waveform** page.
3. Select the **Storage** tab and set the desired waveforms to be stored in the monitor. Select the **Display(Maximum: 3)** tab and set the desired waveforms to be displayed on the **Full Disclosure** page.

NOTE

- **The more waveforms selected in the Storage column, the shorter the waveform storage time. The waveforms may not be stored for 48 hours. Please exert caution when selecting waveforms.**

In case of alarms, the background of compressed waveform at the alarm time is highlighted as follows:

- Red: high alarm priority
- Yellow: medium alarm priority
- Cyan: low alarm priority

19.2.8.3 Setting Scale and Duration

To set the length and size of displayed compressed waveforms, follow this procedure:

1. Enter the **Full Disclosure** review page.
2. Select ••• , and then select **Scale** to set ECG waveform gain.
3. Select **Duration** to set the length of displayed waveforms.

19.2.8.4 Viewing Details of Compressed Waveforms

To view the full waveforms and numeric values, follow this procedure:

1. Enter the **Full Disclosure** review page.
2. Select **Detail**.

You can perform the following operations on the this page:

- Switch on **Beat Anno:**. For more information, see *19.2.7.4 Viewing Event Details*.
- Set **Speed** and **ECG Gain**, or **Save As Event**.
- Select ••• and set **Save As Event**.
- Select ••• and set **Speed** and **ECG Gain**, or **Save As Event**.
- Select **Overview** to switch to the compressed waveform page.

19.2.8.5 Printing the Full Disclosure Waveform Report

To print a compressed waveform report, follow this procedure:

1. Enter the **Full Disclosure** review page.
2. Select and set the time range for printing.
3. Select **Print**.

19.2.9 OxyCRG Review Page (available for the independent external display)

You can review up to 48 hours of 4-minute trend curves on the OxyCRG review page. The OxyCRG review functionality is applicable for neonatal monitoring only.

19.2.9.1 Entering the OxyCRG Review Page

Choose any of the following methods to enter the OxyCRG review page:

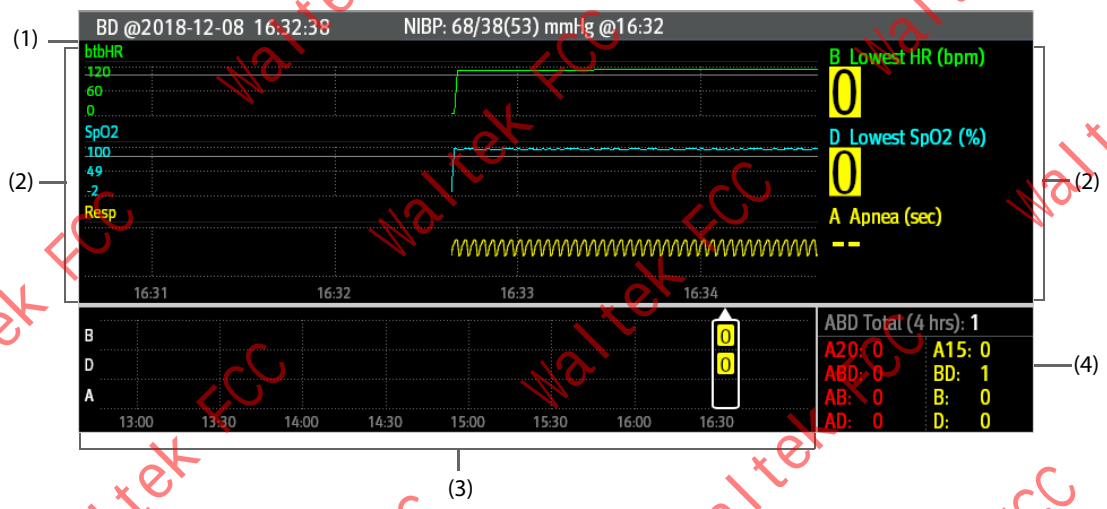
- From the OxyCRG screen, select the ABD events list area.
- Select the **Main Menu** quick key → from the **Review** column select **OxyCRG**.

NOTE

- **OxyCRG Review Page is available only when Patient Category is set to Neo.**

19.2.9.2 The Display of the OxyCRG Review Page

The following figure shows the OxyCRG screen:



(1) Event title area: displays information of the selected event, such as the event type and time.

(2) Event detail area: displays parameter trends, compressed waveform, and parameter values of selected event.

(3) Event summary area: displays ABD events within the **Zoom** period. The selected event is enclosed in a white frame.

(4) Event statistics area: displays the total number of ABD events and the numbers of each event within the **Zoom** period.

19.2.9.3 Changing the Resolution of Trend Curves

To set the resolution of trend curves, follow this procedure:

1. Enter the OxyCRG review page.
2. Set **Zoom**.

19.2.9.4 Printing an OxyCRG Review Report

To print an OxyCRG review report, follow this procedure:

1. Enter the OxyCRG review page.
2. Set the desired compressed waveform and duration.
3. Select  .

19.2.10 12-Lead ECG Review Page

When 12-lead ECG analysis is performed, you can review the most recent 20 events of 12-lead analysis. For more information, see *11 Resting 12-Lead ECG Analysis*.

19.2.10.1 Entering the 12-Lead Review Page

Choose one of the following methods to enter the 12-lead ECG review page:

- Upon completion of 12-lead ECG analysis, select **Review** from the **12-Lead Interpretation** screen. For more information, see *11 Resting 12-Lead ECG Analysis*.
- Select the **Main Menu** quick key → from the **Review** column select **12-Lead ECG**.

19.2.10.2 Switching to Median Complex (for Glasgow Algorithm Only)

The median complex template displays 12-lead ECG waveforms on one page in 4 columns, with 3 lines in each column, and one rhythm lead waveform at the bottom. Besides, a short vertical bar appears above each waveform, marking the start and end position of P-wave and QRS-wave and the end position of T-wave.

To view Median Complex, follow this procedure:

1. Enter the 12-lead review page.
2. Select **Median Complex**.

Selecting **Waveform** can return to the 12-lead ECG waveform page.

19.2.10.3 Setting 12-Lead ECG Waveforms

To set the 12-lead ECG waveforms on the review page, follow this procedure:

1. Enter the 12-lead review page.
2. Set **Speed**, **Gain**, and **Layout**.

19.2.10.4 Editing Patient Information for 12-Lead Report

On the 12-lead ECG review page, you can edit patient information if needed. To do so, follow this procedure:

1. Enter the 12-lead review page.
2. Select  in the patient information area.
3. Edit patient information as required.

19.2.10.5 Printing the 12-Lead ECG Report

To print the 12-Lead ECG report, follow this procedure:

1. Enter the 12-lead review page.
2. Select  .

19.3 Reviewing Discharged Patients

For discharged patients, you can review the trend data in the review page. You can also review the events and 12-lead ECG analysis results.

19.3.1 Checking the Details of a Discharged Patient

1. Access the **Discharged Patients** dialog box by selecting the **Main Menu** quick key → from the **Patient Management** column select **Discharged Patients**. If viewing discharged patients is password protected, input the user name and password (the user name and password saved in the MLDAP server).
2. From the patient list select the desired patient. Select **Detail**. If reviewing patient data is password protected, input the monitor's clinical password (local password).

19.3.2 Checking Patient Demographics of a Discharged Patient

1. Access the **Discharged Patients** dialog box by selecting the **Main Menu** quick key → from the **Patient Management** column select **Discharged Patients**. If viewing discharged patients is password protected, input the user name and password (the user name and password saved in the MLDAP server).
2. From the patient list select the desired patient. Select **Detail**. If reviewing patient data is password protected, input the monitor's clinical password (local password).
3. Select the  icon to enter the **Patient Management** dialog box.
4. Select **OK** to exit the **Patient Management** dialog box.

This page intentionally left blank.

20 Clinical Assistive Applications (CAA) (only available for the independent external display)

The Clinical Assistive Applications (CAA) function integrates some commonly used clinical guidelines and tools into the monitor. It puts the currently monitoring parameter measurements together and provides comprehensive analysis results.

CAA is not intended to replace the competent judgment of a clinician. It must be used in conjunction with observation of clinical signs and symptoms.

20.1 Glasgow Coma Scale (GCS)

The Glasgow Coma Scale (GCS) function is based on 1974_Lancet_Teasdale Assessment of Coma and Impaired Consciousness-A Practical Scale. Three aspects of behavior are independently measured: eye opening, verbal response, and motor response. The scores are added together to indicate that patient's level of consciousness.

GCS is intended for adults and pediatric patients.

CAUTION

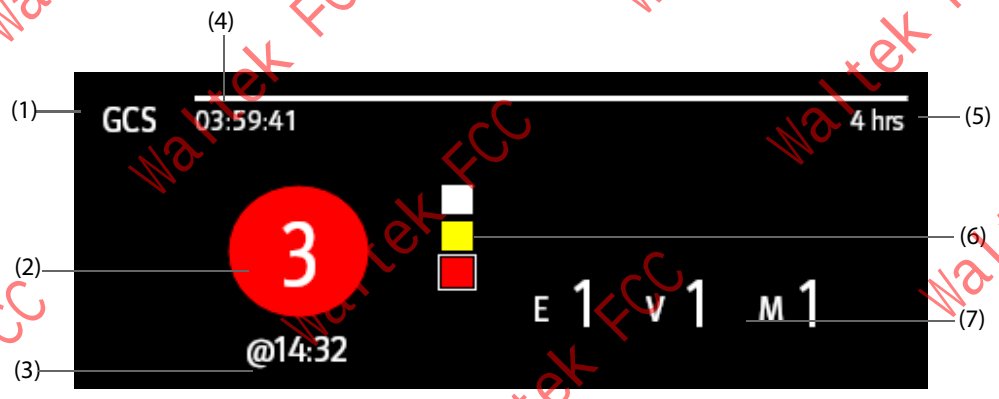
- **GCS is intended as an adjunct in patient assessment and must be used in conjunction with observation of clinical signs and symptoms.**
- **GCS is not applied to patients that are sedated, muscularly relaxed, with artificial airway, drunk, or in status epilepsies.**
- **GCS is not applied to deaf people and patients having language barrier or with mental disorder.**
- **When applied to children younger than five years old or elder people who are slow, the GCS score might be low.**

20.1.1 Displaying the GCS Parameter Area

To Display the GCS parameter area, follow this procedure:

1. Access **Tile Layout** in either of the following ways:
   - Select the **Screen Setup** quick key → select the **Tile Layout** tab.
   - Select the **Main Menu** quick key → from the **Display** column select **Tile Layout**.
2. Select the parameter area where you want to display the GCS score, and then from the popup list select **GCS**.

The following figure shows the GCS parameter area:



(1) GCS label

(2) Total score and level of consciousness. The color of the circle indicates the level of risk.

(3) Scoring time

(4) Scoring countdown: time to the next scoring.

(5) Scoring interval

(6) Risk level indicator. The level of risk increases from top down. The current level is enclosed by a white square frame.

(7) Subscores
- E: eye opening
- V: verbal response
- M: motor response

20.1.2 Accessing the GCS Menu

Enter the GCS menu in any of the following ways:

- Select the GCS parameter area
- Select the **GCS** quick key.
- Select the **Main Menu** quick key → from the **CAA** column select **GCS**.

(1) Subscore (2) Total score

20.1.3 Performing GCS Scoring

To perform scoring, follow this procedure:

1. From the **Eye Opening** area, **Verbal Response** area, and **Motor Response** area, respectively select an item that represents the patient's status.
2. Select **OK** to accept the total score.

   The following table lists the default score range and color of relevant consciousness level.

Level	Range	Color	Description
Mild	13-15	White	The brain function is normal or mildly damaged.
Moderate	9 - 12	Yellow	The brain function is suffered from moderate to severe damage.
Severe	3 - 8	Red	Can be brain death or remain vegetative.

20.1.4 Setting GCS Scoring Interval

From the **GCS** menu, select **Interval** to set GCS scoring interval. When the scoring interval is reached and you do not perform another scoring, the score will be invalid and displayed as outline fonts.

20.1.5 Reviewing GCS Trend Data

From the **GCS** menu, select **Review** to enter the **Review** menu and view the GCS trend data from the **Tabular Trends**.

20.2 SepsisSight™

The SepsisSight™ function is based on Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3) and Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016 (SSC Guidelines 2012 and 2016).

The monitor provides SSC screening and recommendations, as well the patient's parameter trends to help you recognize the early signs and symptoms of sepsis.

SepsisSight™ is intended for adult patients suffering from sepsis or suspicious of sepsis.

CAUTION

- **SepsisSight is not a tool for Sepsis diagnosis and treatment. It cannot replace the physician's judgment.**

NOTE

- **The recommendations may not be as detailed as the SSC guidelines due to limited screen size.**
- **A License is required for the SepsisSight function.**

20.2.1 Accessing the SepsisSight Menu

Enter the SepsisSight menu in any of the following ways:

- Select the **SepsisSight** quick key.
- Select the **Main Menu** quick key → from the **CAA** column select **SepsisSight**.

20.2.2 Screening

As per Sepsis-3, SepsisSight supports quick Sepsis-Related Organ Failure Assessment (qSOFA, or quick SOFA) and Sepsis-Related Organ Failure Assessment (SOFA). qSOFA is intended for quickly screening, while SOFA is intended for further screening patients suspicious of sepsis. SOFA is the default assessment tool for ICU, while qSOFA is the default for other departments.

20.2.2.1 Performing qSOFA

qSOFA evaluate the patient's respiration rate, systolic blood pressure and altered mental status.

RR and BP-S being monitored are automatically obtained. You can also manually enter these values by selecting the symbol. Select whether the patient's mental status is altered. Then qSOFA score is calculated. Select **Confirm** to record the calculation time.

If the qSOFA score is greater than or equal to 2, or sepsis is suspected, select **SOFA >>** to perform SOFA.

NOTE

- **The keyboard symbol indicates that the parameter value is manually entered.**
- **The question mark (?) in the score circle indicates that more parameter values are required.**

20.2.2.2 Performing SOFA

SOFA score is used to identify sepsis-related organ failure.

To perform SOFA, enter the value or select a range for each item, SOFA score will be automatically calculated. Select **Confirm** to record the calculation time.

If Sepsis criteria is met, make a comprehensive judgement on the clinical features.

20.2.2.3 Clearing the Current Score

To clear the current qSOFA score or SOFA score, select **Reset**.

20.2.2.4 Changing Screening Settings

From the **Screening** page select **Setup**. You can change the following settings:

- In the **Screening** area, set **RR (rpm)** high limit and **BP-S (mmHg)** low limit for qSOFA scoring.
- In the **Unit** area, set the unit of **Bilirubin** and **Creatinine**.

20.2.3 Recommendations

The **SSC Bundles** page lists goals and treatments to be completed in the defined time. Pages **Treatment I** and **Treatment II** list graded recommendations as per the SSC Guidelines 2016.

You can define the time and goals for initial resuscitation, as well as treatments to be completed in one hour, 3 hours, and 6 hours. For more information, see *23.5.3 The SepsisSight Tab*.

20.2.3.1 Viewing Detailed Recommendations

On the Pages **Treatment I** and **Treatment II** select the arrow symbol ▶ at the right side of each item to view detailed recommendations of SSC Guideline 2016. The star symbol ★ indicates the grade of recommendation:

- ★★: strong recommendation
- ★: weak recommendation
- No star symbol: best practice statement

To hide the detailed recommendations, select the arrow symbol ▼.

20.2.3.2 Marking Implemented Items

Select the implemented items to mark it as completed. Then the time and date are automatically recorded and displayed.

- You can select the  symbol to change the date and time.
- Select **Reset** to clear the current results.

20.2.4 Reviewing SepsisSight Trend Data

Select the **Graphic Trends** tab to view the trend of parameters of resuscitation.

When a recommended treatment is checked off on pages **Treatment I** and **Treatment II**, relevant event is marked in the tabular trend. Vertical lines of different colors indicate the event type:

- White: inspection performed
- Blue: medication
- Green: goal achieved
- Purple: other treatment

20.3 BoA Dashboard

The Balance of Anesthesia (BoA) Dashboard provides a view of the patient's anesthesia status, brain function status, and trends of related parameters. It helps understanding the patient's status during surgical procedure.

NOTE

- **BoA Dashboard is only available when Department is set to OR.**
- **A License is required for the BoA Dashboard function.**

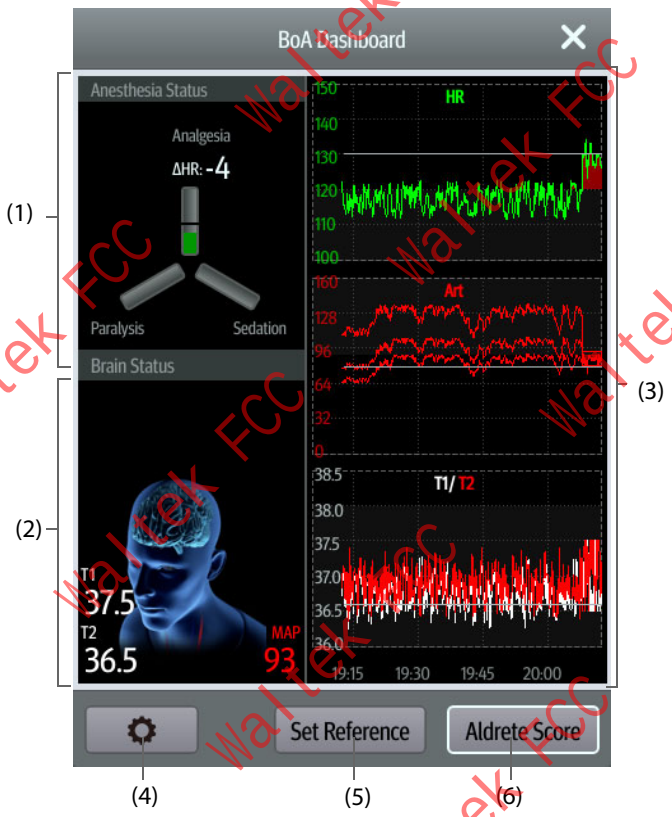
20.3.1 Opening the BoA Dashboard window

To open the BoA Dashboard window, choose any of the following ways:

- Select the **BoA Dashboard** quick key.
- Select the **Screen Setup** quick key → select the **Choose Screen** tab → select **BoA Dashboard**.
- Select the **Main Menu** quick key → from the **CAA** column select **BoA Dashboard**.

20.3.2 BoA Dashboard Dispaly

The following figure is an example of the BoA Dashboard window.



(1) Anesthesia status area:

The three arms of the anesthesia status indicator respectively indicate the patient's status of pain (Analgesia), consciousness (Sedation), and neuromuscular blockage (Paralysis).

The black line or lines on each parameter arm indicate the normal range of corresponding parameter.

The filling length of each parameter indicates the value of corresponding parameter.

The color of the arm indicates parameter status: green indicates that the parameter value is within normal range. Red or yellow indicates that the parameter value is beyond normal range. Gray indicates that the parameter value is unavailable or invalid.

(2) Brain status area: displays brain status related parameters.

(3) Minitrends area: displays the trends of related parameters.

(4) The setup button: selecting this button enters the BoA Dashboard menu.

(5) The Set Reference button: for more information, see *20.3.4 Setting Parameter References*.

(6) The Aldrete Score button: for more information, see *20.3.3 Aldrete Score*.

20.3.3 Aldrete Score

Select **Aldrete Score** to view the latest Aldrete score and scoring time. You can also change desired subscores according to the patient's current status, and then select **OK** to get a new Aldrete score.

To exit the **Aldrete Score** menu, select **Cancel** or the exit button ✕.

NOTE

- **Aldrete scores should not be used as the sole basis for diagnosis or therapy decisions. It is not intended to replace the competent judgment of a clinician.The Aldrete scores and recommended actions must be used in conjunction with observation of clinical signs and symptoms.**

20.3.4 Setting Parameter References

In the minitrends area, the recently set parameter references are displayed as white lines. To change parameter references, follow this procedure:

1. Select **Set Reference**.
2. To set the current measurements as references, select **OK**. Or input new references, and then select **OK** to save new references.

20.3.5 Selecting Parameters for Anesthesia Status Indicator

The three arms of the anesthesia status indicator respectively indicate the patient's status of pain (Analgesia), consciousness (Sedation), and neuromuscular blockage (Paralysis). The pain status can be evaluated by the changes of heart rate and systolic pressure.

To select parameters for the anesthesia status indicator, follow this procedure:

1. Select the setup button to enter the **BoA Dashboard** menu.
2. Set **Analgesia**.
3. Set parameter thresholds. **ΔHR** and **ΔBP-S** respectively refer to the changes of heart rate and systolic pressure as compared with reference values.

20.3.6 Setting BoA Dashboard Parameter Trends

You can view the minitrends of related parameters through the **BoA Dashboard** window. The displayed parameters and trend time are configurable. To do so, follow this procedure:

1. Select the setup button to enter the **BoA Dashboard** menu.
2. Select the **Minitrends** tab.
3. Select parameters for display.
4. Set **Minitrend Length**.

20.3.7 Restoring Default BoA Dashboard Settings

To restore default BoA Dashboard settings, follow this procedure:

1. Select the setup button to enter the **BoA Dashboard** menu.
2. Select the desired tab.
3. Select **Defaults**. Then all the settings in the corresponding menu are restored to default values.

20.4 Early Warning Score (EWS)

The Early Warning Scores (EWS) can help you recognize the early sign of deterioration in patients based on vital signs and clinical observations. Recommendations are provided according to the score.

The monitor supports the following scores:

- MEWS (Modified Early Warning Score)
- NEWS (National Early Warning Score)
- NEWS2 (National Early Warning Score 2)
- Custom Score, such as PEWS (Pediatric Early Warning Score)

There are two types of scoring tools:

- Total score: A sum of subscores. A subscore is given for each parameter based on the measured or input value. When all the required parameters are measured or input, the subscores are added together to

calculate the total score. Each subscore has a color coding to indicate associated level of risk, When the total score is outside of the thresholds, actions are recommended. MEWS, NEWS and NEWS2 can give total scores.

- IPS (individual parameter score): A color-coded score is given for each parameter based on the measured or entered value. Each parameter has upper and lower thresholds. When an individual parameter measured or entered is outside of the thresholds, actions are recommended.

Custom Score is based on user-defined parameters. It can be a total score or an IPS, depending on the configuation.

MEWS, NEWS and NEWS2 are intended for adult patients only. The patient category applied to the Custom Score is defined by Mindray Clinical Score Configuration Tool. For more information, see *Mindray Clinical Scoring Config Tool Instruction for Use (P/N: 046-007126-00)*.

WARNING

- **EWS should not be used as the sole basis for diagnosis or therapy decisions. It is not intended to replace the competent judgment of a clinician.The EWS scores and recommended actions must be used in conjunction with observation of clinical signs and symptoms.**
- **MEWS and NEWS are not applicable to pregnant woman, COPD (Chronic Obstructive Pulmonary Disease) patients and patients under 16 years old. NEWS2 is not applicable to pregnant woman and patients under 16 years old.**

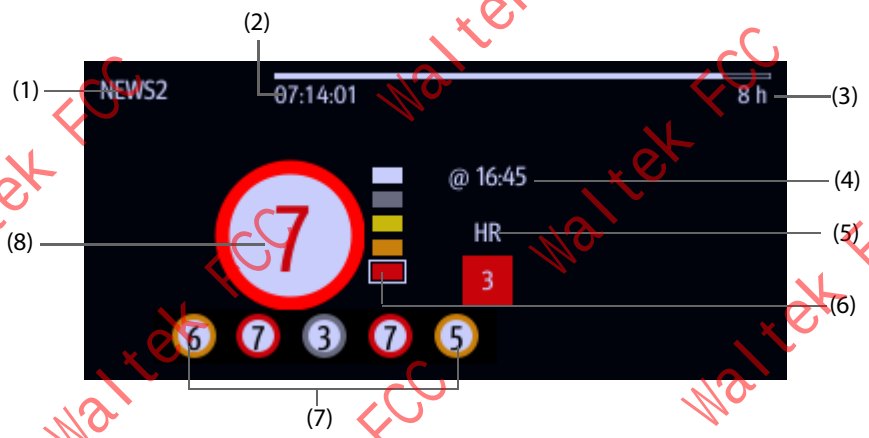
NOTE

- **A License is required for the EWS function.**

20.4.1 Displaying the EWS Numerics Area

To display the EWS numerics area, follow this procedure:

1. Access **Tile Layout** in either of the following ways:
   - Select the **Screen Setup** quick key → select the **Tile Layout** tab.
   - Select the **Main Menu** quick key → from the **Display** column select **Tile Layout**.
2. Select the parameter area where you want to display the EWS score, and then from the popup list select **EWS**.



(1) EWS protocol label

(2) Scoring countdown: time to the next scoring.

(3) Scoring interval

(4) The current scoring time

(5) Single parameter whose score reaches 3

(6) Risk level indicator. The level of risk increases from top down. The current level is enclosed by a white square frame. For IPS, this indicator does not display.

(7) History total score. The rightmost one is the latest history score.

(8) Total score. The color of the circle indicates the level of risk. For IPS, no score is displayed. Only level of risk is shown: white means normal and red indicates alert.

20.4.2 Accessing the EWS Screen

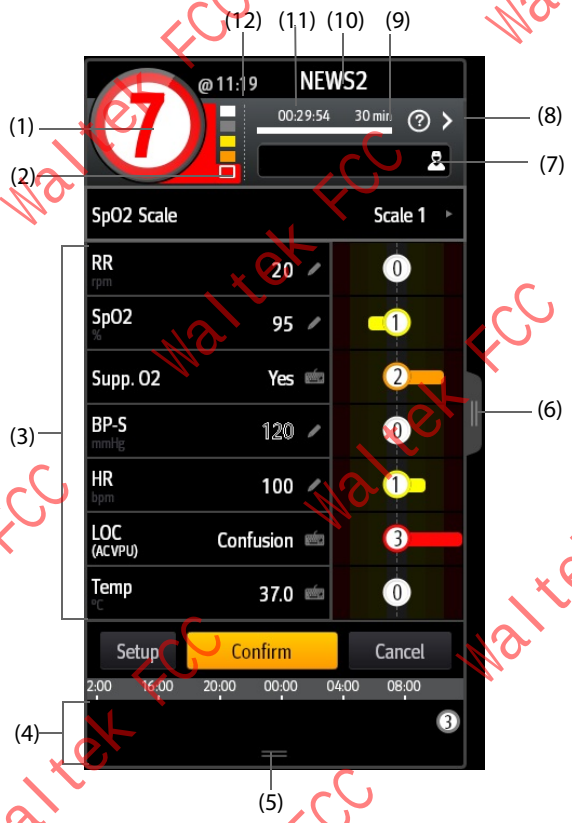
Access the EWS window in any of the following ways:

- Select the EWS parameter area
- Select the **EWS** quick key.
- Select the **Screen Setup** quick key → select the **Choose Screen** tab → select **EWS**.
- Select the **Main Menu** quick key → from the **CAA** column select **EWS**.

If the EWS screen is hidden as , you can also choose one of the following methods to quickly enter the EWS screen.

- Swipe left or right across the touchscreen with two fingers until you switch to the EWS screen.
- Swipe right across the touchscreen with a single finger,
- Select the button.

The following figure shows the EWS screen when the NEWS2 score is used. Your screen may be slightly different due to the configuration.



(1) Total score. The color of the circle indicates the level of risk. For IPS, no numeric score is displayed. Only level of risk is shown: white means normal and red indicates alert by default.

(2) Risk level indicator. The level of risk increases from top down. The current level is enclosed by a white frame. For IPS, this indicator does not display.

(3) Parameter area: display the subscore and parameter value of each parameter. The keyboard symbol indicates that the parameter value is manually entered.

(4) History total scores area: selecting this area or swiping up with a finger can review the trends of total score and each subscore.

(5) Selecting this button can review the trends of the total score and each subscore.

(6) Selecting this button or swiping right on the screen with a finger can review the trends of total score and parameter values for scoring.

(7) Clinician ID (displays only when the Clinician ID is enabled): allows inputting the Clinician ID to associate with the EWS score.

(8) Select this button to see the clinical response to the current score

(9) Scoring interval

(10) EWS protocol label

(11) Scoring countdown: time to the next scoring.

(12) The scoring time

20.4.3 Performing EWS Scoring

To perform scoring, follow this procedure:

1. Select **Reset** to clear the previous score and update values of currently monitored parameters and relevant subscores.
2. For NEWS2, set the **SpO2 Scale**.
   - **Scale 1**: for patient without hypercapnic respiratory failure.
   - **Scale 2**: for patients with a prescribed oxygen saturation requirement of 88–92% (for example, in patients with hypercapnic respiratory failure).
3. Measure or manually enter other required parameters and observations.
4. If the clinician ID is enabled, input the clinician information by selecting [redacted] and then manually entering the information, or by scanning the clinician's barcode.
5. Select **Calculate** to get the total score.
6. If **Score Confirmation** is enabled, select **Confirm** to save current scoring, or select **Cancel** to give up current scoring. Refer to section *20.4.5.2 Setting the Scoring Confirmation Switch* for more information.

CAUTION

- **The decision to use Scale 2 of the SpO2 Scale should be made by a competent clinical decision maker and should be recorded in the patient's clinical notes.**

NOTE

- **Before calculating the score, select Reset to clear the previous score.**
- **The keyboard symbol at the right of the parameter value indicates that the value is manually entered.**
- **You can get the score only when all required parameters have been measured or entered.**
- **When a patient is discharged or the monitor is turned off, the clinician ID is cleared.**

20.4.4 EWS Alarm

If enabled, the monitor can automatically give alarms and refreshes the score.

20.4.4.1 Setting the EWS Alarm

If enabled, the monitor can automatically give alarms in the following cases:

- The total score exceeds the configured threshold
- The score of auto obtained parameter is 3.

To configure the EWS alarm, follow this procedure:

1. From the EWS page select **Setup**.
2. Select the **Alarm** tab.

3. Turn on the **Alarm** switch.
4. Set the alarm switches for the single parameters listed in the **3 in single parameter** area.
5. Set the alarm switch and threshold of the total score in the **EWS Score** area.

20.4.4.2 Auto Refreshing Scores

If enabled, the monitor can automatically refresh the score in the following cases:

- The total score reaches the configured threshold, or falls from the configured threshold to a lower score.
- The score of auto obtained parameter reaches 3, or falls from 3 to a lower score.

To enable the auto refreshing score function, follow this procedure:

1. From the EWS screen select **Setup**.
2. Select the **Alarm** tab.
3. Turn on the **Auto Refresh Scores** switch.

20.4.5 Changing EWS Settings

20.4.5.1 Changing the Scoring Protocol

The monitor is configured with a default scoring protocol. To change the scoring protocol, follow this procedure:

1. From the EWS page select **Setup**.
2. Set **Score**.

20.4.5.2 Setting the Scoring Confirmation Switch

To select if confirmation is required before saving score, follow this procedure:

1. From the EWS page select **Setup**.
2. Set **Score Confirmation** switch.
   - Off: the monitor automatically saves the scoring result after the scoring is completed.
   - On: you need to confirm that whether the scoring result is saved or not after the scoring is completed.

20.4.5.3 Setting the Manual Data Timeout

The manually input parameter data becomes invalid after a preset time. To set the timeout period for the input data, follow this procedure:

1. From the EWS screen select **Setup**.
2. From the **Manual Data Timeout** area, select a desired parameter and set its timeout period.

NOTE

- **If the data is expired and not updated, the monitor displays the corresponding parameter score in outline font, and gives a timeout alarm.**

20.4.5.4 Setting Auto Scoring

The monitor automatically starts scoring at the preset interval. To set auto scoring, follow this procedure:

1. From the EWS screen select **Setup**.
2. Set **Auto Scoring**:
   - **Interval**: the monitor automatically starts scoring at the preset interval.
   - **NIBP**: the monitor automatically starts scoring at the completion of each NIBP measurement.
   - **Alarm**: the monitor automatically starts scoring when an alarm occurs to the parameter for scoring.
   - If no option is selected, the monitor does not initiate auto scoring.

20.4.5.5 Setting Auto Scoring Interval

To set the interval for automatically initiating scoring, follow this procedure:

1. From the EWS screen select **Setup**.
2. Set **Interval**:
   - **By Score**: the monitor automatically starts scoring as per the interval selected for corresponding total score.
   - **5 min** - **24 h**: If **Auto Scoring** is set to **Interval**, the monitor automatically starts scoring as per the selected interval. If **Auto Scoring** is not set to **Interval**, the countdown timer of manual scoring is selected.

20.4.6 Viewing History Scores

From the EWS screen, you can view the total score or subscores of the recent 24 hours. To do so, choose either of the following ways:

- Select the history total score area.
- From the history total score area, swipe up with one finger.

Refer to *20.4.2 Accessing the EWS Screen* for the position of the history total score area.

20.4.7 Viewing Parameter Trends

From the EWS screen, you can view the 24-hour graphic trends of each parameter used for scoring. To do so, choose either of the following ways:

- Select the  button.
- Swipe right across the EWS screen with one finger.

Refer to *20.4.2 Accessing the EWS Screen* for the position of the  button.

20.5 NeuroSight

The NeuroSight provides a view of the patient's brain function. It displays parameters and trends related to the patient's cerebral blood flow, regional oxygen saturation, and cerebral function. It helps understanding the patient's brain status.

NOTE

- **A License is required for the NeuroSight function.**

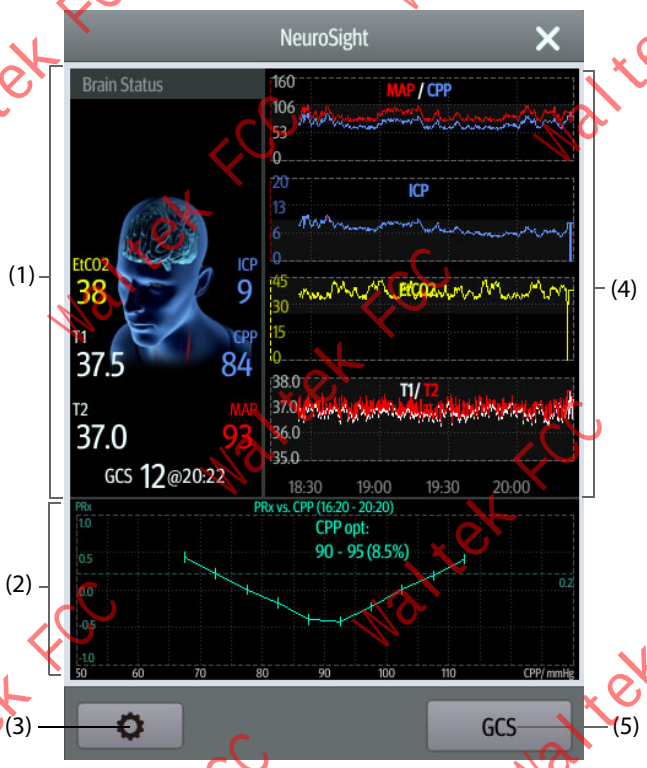
20.5.1 Opening the NeuroSight Window

To open the **NeuroSight** window, choose any of the following ways:

- Select the **NeuroSight** quick key.
- Select the **Screen Setup** quick key → select the **Choose Screen** tab → select **NeuroSight**.
- Select the **Main Menu** quick key → from the **CAA** column select **NeuroSight**.

20.5.2 NeuroSight Display

The following figure is an example of the NeuroSight window:



(1) Brain status area

(2) PRx area: displays the PRx trend or the PRx vs CPP relationship curve.

(3) The setup button: selecting this button enters the NeuroSight menu.

(4) Minitrends area: displays the trends of related parameters.

(5) The GCS button: selecting this button enters the **GCS** window. For more information, see *20.1 Glasgow Coma Scale (GCS)*.

20.5.3 PRx

The pressure reactivity index (PRx) reflects the real-time change in the auto adjustment ability of cerebral vessels. If Art and ICP are being monitored, you can view the PRx trend and the PRx vs CPP relationship curve from the NeuroSight window. With the PRx vs CPP relationship curve, you can continuously and dynamically monitor the patient's cerebrovascular reactivity. This helps finding the optimal CPP value.

The PRx area displays the PRx trend by default. Selecting this area switches between the PRx trend and the PRx vs CPP relationship curve.

NOTE

- **The PRx vs CPP curve is not available if the patient is monitored for less than four hours.**

20.5.4 Setting NeuroSight Parameter Trends

You can view the minitrends of related parameters through the **NeuroSight** window. The displayed parameters and trend time are configurable. To do so, follow this procedure:

1. Select the setup button to enter the **NeuroSight** menu.
2. Select parameters for display.
3. Set **Zoom**.

20.5.5 Setting PRx

To set PRx, follow this procedure:

1. Select the setup button to enter the **NeuroSight** menu.

2. Set **Relationship Curve Duration** and **PRx Threshold**.

20.5.6 Restoring Default NeuroSight Settings

To restore default NeuroSight settings, follow this procedure:

1. Select the setup button to enter the **NeuroSight** menu.
2. Select **Defaults**.

20.6 Resus Mode

You can put the monitor into the Resus mode when rescuing a patient. The Resus mode has the following features:

- Displaying resuscitation-related parameter values and waveforms.
- Monitoring CPR quality (available for N1 equipped with Mindary SpO_2).
- Recording drugs and treatments through the CPR Record.

The Resus mode is intended for adult, pediatric, and neonatal patients.

NOTE

- **In the Resus mode, all physiological alarms and some of technical alarms are disabled.**
- **Exit the Resus mode as soon as the resuscitation ends to resume normal patient monitoring.**

20.6.1 Entering the Resus Mode

To enter the Resus mode, choose either of the following ways:

- Select the **Resus Mode** quick key → select **OK**.
- Select the **Main Menu** quick key → from the **Alarm** column select **Resus Mode** → select **OK**.

20.6.2 CPR Record

The CPR Record helps you record the process of patient resuscitation. You can record the following items through the CPR Record:

- The time resuscitation starts and ends.
- Drug names and doses.
- Resuscitation treatments.

NOTE

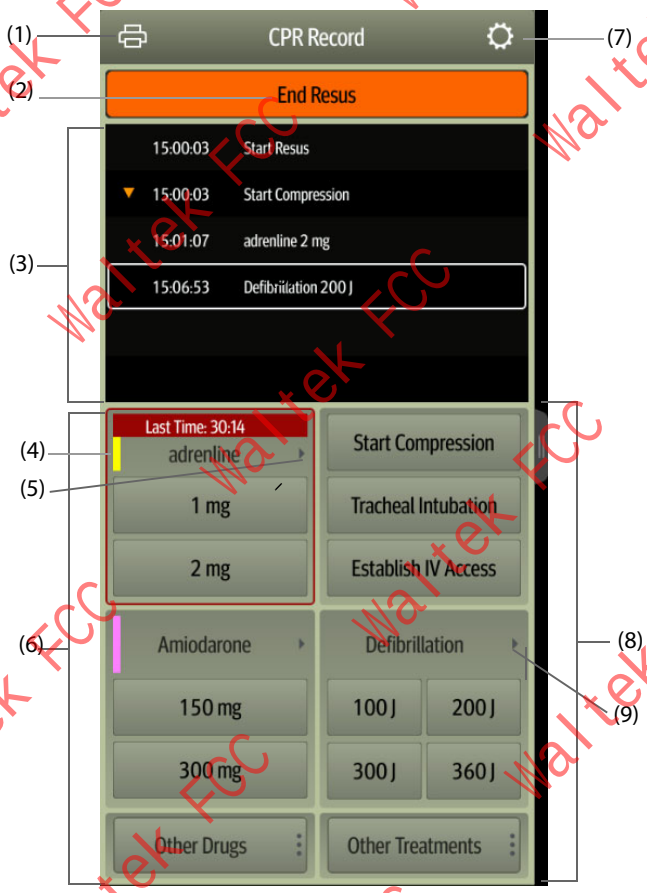
- **A license is required for the CPR Record function.**

20.6.2.1 Accessing the CPR Record

The CPR Record automatically displays when you enter the Resus mode. If the CPR Record is closed, choose either of the following ways to open it:

- Select the **Main Menu** quick key → from the **CAA** column select **CPR Record**.
- Select the button at the left of the screen and swipe right.

The following figure shows the CPR Record:



(1) Press this key to output the resuscitation report through the printer.

(2) Press this key to record the resuscitation start time/end time and result. The monitor automatically records the resuscitation start time when you enters the Resus mode.

(3) Event area: lists drugs and treatments. Select any event to add an event, edit or delete this event. The resuscitation record saves automatically.

(4) Drug color mark: is used to distinguish the type of drugs.

(5) Press this key to select other doses. If adrenalin is used, you can define the injection interval. If the injection time is approaching, the time to the last injection will be highlighted in red, reminding that injection is required.

(6) Drug record area: quickly records the names and doses of drugs used for patient resuscitation. Select **Other Drugs** to record other drugs or temporary drugs not included. You can edit these drugs later.

(7) Press this key to enter the **Setup** menu. You can customize drugs and treatments.

(8) Treatment record area: quickly records the treatments. Select **Other Treatments** to record other treatments. If an undefined treatment is selected, you can edit it later.

(9) Press this key to select other defibrillation energy and the type of defibrallation waveform.

20.6.2.2 Customizing Drugs

You can customize drugs frequently used for resuscitation. To do so, follow this procedure:

1. From the **CPR Record** screen, select the button to enter the **Setup** menu.
2. Define the name, unit, dose, and color of each drug as needed.

The CPR Record can list up to six frequently used drugs. The first two drugs directly shown on the **CPR Record** screen are the most frequently used. The other four drugs are displayed by selecting **Other Drugs**.

20.6.2.3 Customizing Treatment

Besides **Start Compression**, **Tracheal Intubation**, **Establish IV Access**, **Defibrillation**, **Mechanical Ventilation**, **Place Urinary Catheter**, you can customize defibrillation energy and two additional treatments. To do so, follow this procedure:

1. From the **CPR Record** screen, select the button to enter the **Setup** menu.
2. Select the **Customized Treatment** tab to define the defibrillation energy and the names of two additional treatments.

20.6.2.4 Recording the Resuscitation Result

After the resuscitation is completed, select **End Resus** to record the resuscitation end time and result.

20.6.2.5 Outputting the Current Resuscitation Report

The resuscitation report automatically saves. You can output the report through the recorder or printer.

You can also export the resuscitation report using a USB drive. To do so, follow this procedure:

1. Connect the N1 to the Dock.
2. Connect the USB drive to the Dock's USB connector.
3. From the top of the **CPR Record** screen, select the button to enter the **Print Setup** menu.
4. Select **Print Preview** → **Export to USB**.

20.6.2.6 Closing the CPR Record

The **CPR Record** automatically closes when you exit the Resus mode. You can select the button at the right of the **CPR Record** screen and swipe left to close the **CPR Record**.

20.6.3 Monitoring CPR Quality (CQI®)

I f the monitor is configured with Mindray SpO2, the CQI monitoring function is available. The CQI function is on the basis of SpO_2 monitoring. The CQI monitoring unit obtains the pulsation signal of the patient's peripheral vessel through the SpO_2 sensor, generates the pleth waveform, and calculates CQI through further analysis. The monitor also provides CQI trend.

The CQI function is intended for evaluating the CPR effect for adult patients. CQI should be used in conjunction with the patient's medical history, the cause of heart attack, as well as the clinical judgment.

CQI monitoring is intended for adult patient suffering from heart attack and requiring CPR.

CQI monitoring is contraindicated for the patients not suitable for SpO_2 monitoring.

For the patients suffering from the following condition, CQI monitoring should be used with caution.

- Fingertip defect
- Dyes in the measurement site, such as methylene blue, indigo carmine, nail polish, and etc
- Arterial blood flow too low to be measured due to vasoconstriction drug or Raynaud's phenomenon, and etc
- Severe anemia
- High carboxyhemoglobin (COHb) and methemoglobin (MetHb) level

The clinician should make a judgment in conjunction with the patient's clinical signs and symptoms.

WARNING

- **The CQI monitoring function is not intended for pediatric and neonatal patients.**

CAUTION

- **Use recommended SpO2 sensor and apply it to a proper site.**
- **Avoid moving the measurement site.**

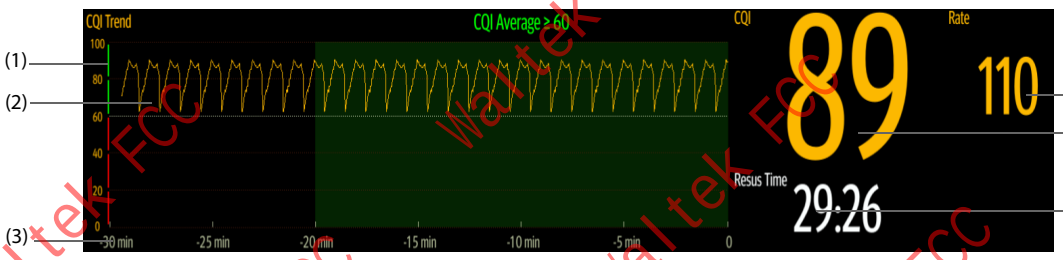
- **Apply the SpO_2 sensor properly. If the SpO_2 sensor is improperly applied or a wrong SpO2 sensor is used, erroneous CQI could result. For more information, refer to *13.3 SpO_2 Measurement Limitations*.**

NOTE

- **A license is required for the CQI function.**

20.6.3.1 CQI Display

CQI monitoring displays the compression rate, CQI value, and trend as follows:



(1) CQI scale: CQI scale lower than 60 indicates that the patient 's peripheral circulation and CPR quality are not good; while CQI scale higher than 60 indicates that the patient 's peripheral circulation and CPR quality are good.

(2) CQI trend: indicates the change of CQI value.

(3) CQI tend length: indicates the period of time to the current time. The monitor displays up to 30 minutes of CQI trend.

(4) Rate value: times of chest compression per minute.

(5) CQI value: CPR quality index. It indicates the compression quality. The greater the CQI value, the better the patient's peripheral circulation and compression quality.

(6) Resuscitation timer: indicates the total time from resuscitation start to resuscitation end.

20.6.4 Exiting the Resus Mode

To exit the Resus mode, choose either of the following ways:

■ Select the **Exit Resus Mode** quick key.

■ Select the **Main Menu** quick key → from the **Alarm** column select **Exit Resus Mode**.

Exit the Resus mode as soon as resuscitation ends to return to normal patient monitoring.

20.6.5 Reviewing the Resuscitation Events

You can review the details of resuscitation events after exiting the Resus mode. To do so, follow this procedure:

1. Enter the **Events** page by choosing either of the following ways:
   - ◆ Select the **Review** quick key → select the **Event** tab.
   - ◆ Select the **Main Menu** quick key → from the **Review** column select the **Event** tab.
2. From the events list select the desired resuscitation event, and then select **Detail**.

20.6.5.1 Editing an Resuscitation Event

You can edit the history resuscitation event and result. To do so, follow this procedure.

1. Enter the **Events** page.
2. From the events list select the desired resuscitation event, and then select **Detail**.
3. Select any event to add an event, edit or delete this event.

20.6.5.2 Outputting History Resuscitation Record

You can print or export the history resuscitation record through event review. To do so, follow this procedure:

1. Enter the **Events** page.
2. From the events list select the desired resuscitation event, and then select **Detail**.
3. Select the  button to enter the **Print Setup** menu.
4. Print or export the resuscitation report:
   - Select **Print Preview** → **Print** to print this report.
   - Select **Print Preview** → **Export to USB** to export this report.

20.7 AF Summary

The AF Summary provides statistics of AF events that last more than 30 seconds as well as trends of vital signs.

The AF Summary function is intended for adult patients only.

NOTE

- **A License is required for the AF Summary function.**
- **The AF Summary function is intended for the current patient. It is not intended for discharged patients.**
- **Data displayed in the AF Summary is not recalculated.**

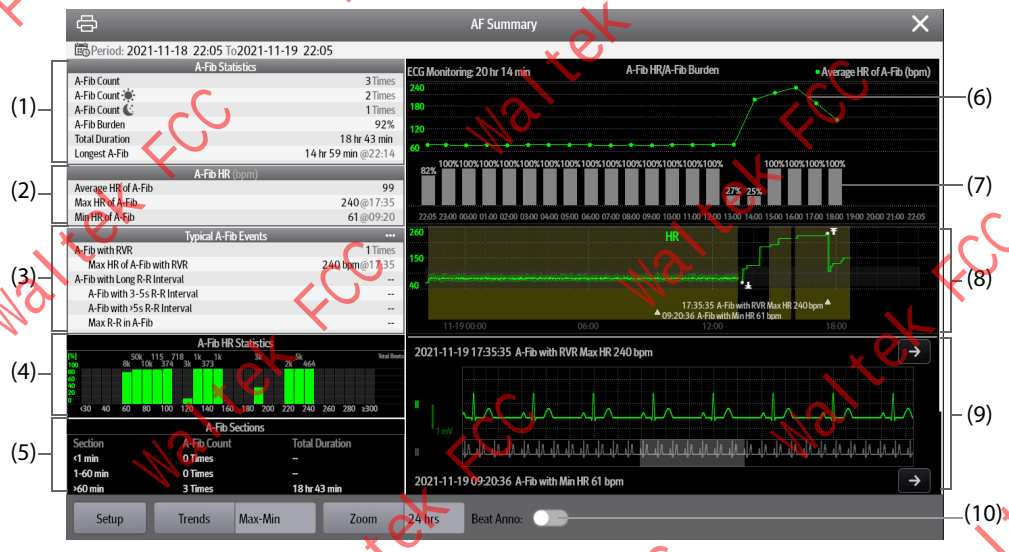
20.7.1 Opening the AF Summary Window

To open the AF Summary window, choose either of the following ways:

- Select the **AF Summary** quick key.
- Select the **Main Menu** quick key → from the **Summary** column select **AF Summary.**

20.7.2 AF Summary Display

The following figure is an example of the AF Summary window:



(1) A-Fib statistics

(2) A-Fib HR statistics: shows statistics of heart rates when A-Fib events occur.

(3) Statistics of typical A-Fib events: selecting this area goes to statistics review.

(4) A-Fib HR distribution: shows the distribution of A-Fib heart rates over the statistical period.
Horizontal axis: heart rate
Vertical axis: percentage
Total beats: the total beats in corresponding HR range
Green bar: A-Fib HR as a percentage of total beats in corresponding HR range

(5) Statistics of A-Fib sections: shows A-Fib counts in different A-Fib duration sections.

(6) Average A-Fib HR: shows hourly average A-Fib HR.

(7) Hourly AF burden. The AF burden is the cumulative duration of AF events over the statistical period as the percentage of effective monitoring time.

(8) Graphic trends: shows the trends of mean parameter value or maximum/minimum parameter value. The shaded part indicates that there is an A-Fib event. The triangular symbol ? indicates the occurrence time of the typical AF event or the maximum/minimum AF heart rate.

(9) A-Fib waveform: shows ECG waveforms corresponding to the typical AF event or the maximum/minimum AF heart rate. Selecting the arrow on the upper right corner can review full disclosure ECG waveforms.

(10) The Beat Anno: switch. To display beat labels on the first ECG waveform, switch on Beat Anno:. For more information, see *19.2.7.4 Viewing Event Details*.

20.7.3 Setting A-Fib Statistical Duration

You can view up to 24 hours of A-Fib statistics from the AF Summary window. Select Zoom to set statistical duration.

20.7.4 Setting Trend Parameters for the AF Summary

Select **Setup** to set parameters to be displayed in the AF Summary.

20.7.5 Setting the Type of Trend for the AF Summary

Select **Trends** to set whether the trend of maximum/minimum values or the trend of average values is displayed.

20.7.6 Printing the AF Summary Report

Select the printer symbol  to print the AF Summary report.

20.8 ECG 24h Summary

The ECG 24h Summary provides ECG statistics of the current patient over the latest 24 hours. It also displays the patient's typical ECG strips.

NOTE

- **The ECG 24h Summary function is intended for the current patient. It is not intended for discharged patients.**
- **Pacer statistics is intended for paced patients. Pacer statistics is available only when the Paced setting is Yes.**
- **ST statistics is available only when ST analysis is switched on.**
- **QT statistics is available only when QT analysis is switched on.**
- **Data displayed in the ECG 24h Summary is not recalculated.**
- **A License is required for the ECG 24h Summary function.**

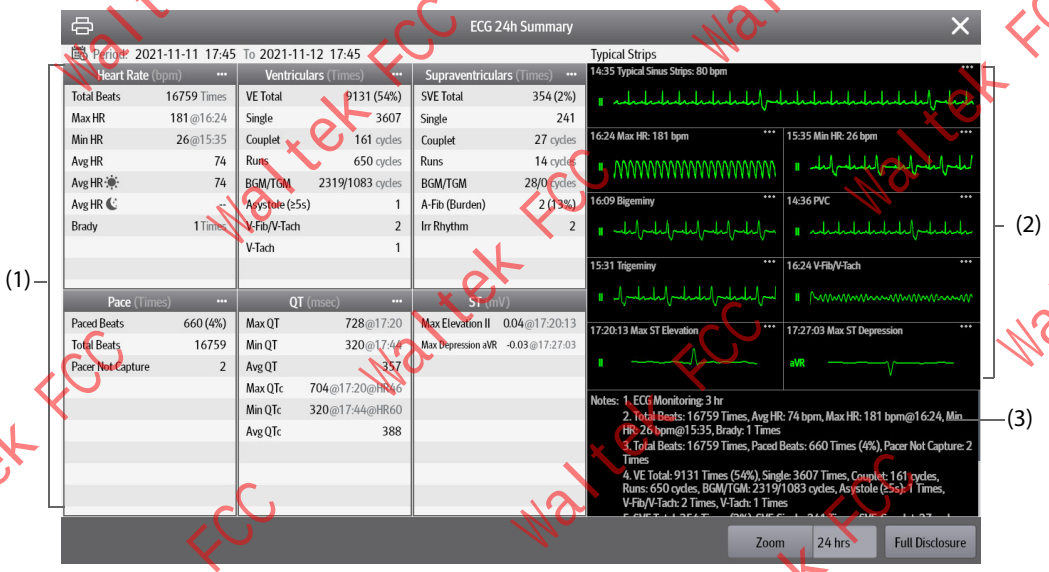
20.8.1 Opening the ECG 24h Summary Window

To open the ECG 24h Summary window, choose either of the following ways:

- Select the **ECG 24h Sum** quick key.
- Select the **Main Menu** quick key → from the **Summary** column select **ECG 24h Summary**.

20.8.2 The Display of ECG 24h Summary

The following figure is an example of the ECG 24h Summary window:



(1) ECG statistics, including the following items:

- Statistics of heart rates
- Statistics of ventricular beats and ventricular events
- Statistics of supraventricular beats and supraventricular events
- Statistics of QT/QTc measurements
- Statistics of maximum ST elevations and depressions
- Statistics of pace

(2) Typical ECG strips

(3) Notes: includes additional information on the ECG 24h Summary

20.8.3 Selecting Typical ECG Strips

Taking V-Tach as an example, to select typical V-Tach waveform, select the currently displayed V-Tach waveform, from the popup list select the desired waveform as typical V-Tach waveform.

If no V-Tach occurs to the patient within 24 hours, an add symbol ➕ is displayed in the V-Tach area. You can select the add symbol to display a typical ECG waveform of other event in this area.

20.8.4 Setting the Statistical Duration of the ECG 24h Summary

You can view a maximum of 24 hours of ECG statistics through the ECG 24h Summary. To select the statistical duration, select **Zoom**.

20.8.5 Reviewing the ECG Summary

Selecting any of the statistic area can access corresponding trends and events review. Selecting **Full Disclosure** can review ECG full disclosure waveforms. For more information, see *19 Review*.

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21 Calculation (only available for the independent external display)

21.1 Calculation Overview

The monitor provides calculation functions. The calculated values, which are not directly measured, are computed based on the values you provide. The calculation feature is independent of other monitoring functions and can be therefore used for patients being monitored by other monitors. Any operation in a calculation window does not affect the patient monitored by the current monitor.

You can perform the following calculations:

- Drug calculations
- Hemodynamic calculations
- Oxygenation calculations
- Ventilation calculations
- Renal calculations

21.2 Calculation Safety Information

WARNING

- **Drug calculations are basing on input values. Always check the correctness of input parameters and the appropriateness of the calculations. Choice and dosage of drugs administered to patients must be decided by the physician in charge.**

NOTE

- **Check that the entered values are correct and the calculated values are appropriate. We assume no responsibility for any consequences caused by wrong entries and improper operations.**

21.3 Drug Calculations

The monitor provides the drug calculation function.

21.3.1 Performing Drug Calculations

To perform drug calculations, follow this procedure:

1. Access drug calculator by either of the following ways:
   - Select the **Calculations** quick key.
   - Select the **Main Menu** quick key → from the **Calculations** column select **Drug**.
2. Set **Drug Name** and **Patient Category.** If the dose of drug is weight dependent, you must input the patient's weight. The dose calculation program has a library of commonly used drugs, of which Drug A through Drug E are user defined.
3. Enter the known values, for example **Drug Amount** and **Solution Volume.**
4. Select **Calculate**. The calculated values are indicated by red arrows.

NOTE

- **If available, the patient category and weight from the Patient Management menu are automatically entered when you first access drug calculation. You can change the patient category and weight.**

This will not change the patient category and weight stored in the patient demographic information.

21.3.2 Checking the Titration Table

The titration table shows information on the currently used drugs. Use the titration table to see what dose of a drug your patient will receive at different infusion rates. To access the titration table, follow this procedure:

1. Access drug calculator by either of the following ways:
   - ◆ Select the **Calculations** quick key.
   - ◆ Select the **Main Menu** quick key → from the **Calculations** column select **Drug**.
2. Select the **Titration Table** tab.
3. Select **Dose Type** to set the type of dose unit in the titration table.
4. Select **Interval** to set the interval between two adjacent titration table items.

You can select how to display the titration table:

- ■ **Dose**: the titration table is listed in the sequence of increased drug dose.
- ■ **Infusion Rate**: the titration table is listed in the sequence of increased infusion rate. Normally the resolution of the infusion rate is one (1). By selecting **Exact Rate** the resolution of the infusion rate can reach 0.01 so that you can display the infusion rate more accurately.

21.3.3 Drug Calculation Formula

Description	Unit	Formula
Dose	Dose/hr Dose/min	Dose = Infusion Rate × Concentration
Dose (weight based)	Dose/kg/hr Dose/kg/min	Dose (weight based) = Infusion Rate × Concentration/Weight
Drug Amount	g series: mcg, mg, g unit series: Unit, KU, MU mEq series: mEq	Drug Amount =Dose × Duration
Drug Amount (weight based)	g series: mcg, mg, g unit series: Unit, KU, MU mEq series: mEq	Drug Amount (weight based) = Dose × Duration × Weight
Duration	hr	Duration = Amount/Dose
Duration (weight based)	hr	Duration (weight based) = Amount/(Dose × Weight)
Concentration	mcg/ml, mg/ml, g/ml, Unit/ml, KU/ml, MU/ml, mEq/ml	Concentration = Drug Amount/Solution Volume
Solution volume	ml	Volume = Infusion Rate × Duration
Infusion rate	ml/hr	Infusion Rate = Dose/Concentration
Infusion rate (weight based)	g•ml/hr	Infusion Rate = Dose × Weigh/Concentration

21.3.4 Titration Table Calculation Formula

Description	Unit	Formula
Infusion Rate	ml/hr	Infusion Rate = Dose/Concentration
Infusion Rate (weight based)	ml/hr	Infusion Rate = Weight × Dose/Concentration

Description	Unit	Formula
Dose	Dose/hr Dose/min	Dose = Infusion Rate × Concentration
Dose (weight based)	Dose/kg/hr Dose/kg/min	Dose (weight based) = INF Rate × Concentration/ Weight

21.4 Hemodynamic Calculations

The monitor provides the hemodynamic calculation function. The monitor can save the results of up to 10 calculations, which are displayed in groups.

21.4.1 Performing Hemodynamic Calculations

To perform hemodynamic calculation, follow this procedure:

1. Access hemodynamic calculation by either of the following ways:
   - Select the **Calculations** quick key → **Hemodynamics** tab.
   - Select the **Main Menu** quick key → from the **Calculations** column select **Hemodynamics**.
2. Enter the known values. For a patient who is being monitored, the currently measured values are automatically taken.
3. Select **Calculate**.

   The calculated value greater than the normal upper limit is indicated by an up arrow "↑". The calculated value lower than the normal lower limit is indicated by a down arrow "↓".

You can select **Range** to show the normal range of each parameter.

21.4.2 Input Parameters for Hemodynamic Calculations

Input Parameter	Label	Unit
cardiac output	C.O.	L/min
heart rate	HR	bpm
pulmonary artery wedge pressure	PAWP	mmHg
artery mean pressure	PMAP	mmHg
pulmonary artery mean pressure	PA Mean	mmHg
central venous pressure	CVP	mmHg
end-diastolic volume	EDV	ml
height	Height	cm
weight	Weight	kg

NOTE

- **If you enable Use PA-D as PAWP, PA-D value will be used to replace PAWP value for hemodynamic calculation. For more information, refer to *16.7.5 Setting the Use PA-D as PAWP Switch*.**

21.4.3 Calculated Parameters and Formulas for Hemodynamic Calculations

Calculated Parameters	Label	Unit	Formula
cardiac index	C.I.	L/min/m^2	C.I. (L/min/m^2) = C.O. (L/min)/BSA (m^2)

Calculated Parameters	Label	Unit	Formula
body surface area	BSA	m^2	BSA (m^2) = $Wt^{0.425}$ (kg) × $Ht^{0.725}$ (cm) × 0.007184
stroke volume	SV	ml	SV (ml) = 1000× C.O. (L/min)/HR (bpm)
stroke index	SVI	ml/m^2	SVI (ml/m^2) = SV (ml)/BSA (m^2)
systemic vascular resistance	SVR	DS/cm^5	SVR (DS/cm^5) = 79.96 × [PAMAP (mmHg) - CVP (mmHg)]/C.O. (L/min)
systemic vascular resistance index	SVRI	$DS•m^2/cm^5$	SVRI ($DS•m^2/cm^5$) = SVR (DS/cm^5) × BSA (m^2)
pulmonary vascular resistance	PVR	DS/cm^5	P VR (DS/cm^5) = 79.96 × [PAMAP (mmHg) - PAWP (mmHg)]/C.O. (L/min)
pulmonary vascular resistance index	PVRI	$DS•m^2/cm^5$	PVRI ($DS•m^2/cm^5$) = PVR (DS/cm^5)× BSA (m^2)
left cardiac work	LCW	kg•m	LCW (kg•m) = 0.0136 × PAMAP (mmHg) × C.O. (L/min)
left cardiac work index	LCWI	$kg•m/m^2$	LCWI ($kg•m/m^2$) = LCW (kg•m)/BSA (m^2)
left ventricular stroke work	LVSW	g•m	LVSW (g•m) = 0.0136 × PAMAP (mmHg) × SV (ml)
left ventricular stroke work index	LVSWI	$g•m/m^2$	LVSWI ($g•m/m^2$) = LVSW (g.m)/BSA (m^2)
right cardiac work	RCW	kg•m	R CW (kg•m) = 0.0136 × PAMAP (mmHg) × C.O. (L/min)
right cardiac work index	RCWI	$kg•m/m^2$	R CWI ($kg•m/m^2$) = RCW (kg.m)/BSA (m^2)
right ventricular stroke work	RVSW	g•m	R VSW (g•m) = 0.0136 × PAMAP (mmHg) × SV (ml)
right ventricular stroke work index	RVSWI	$g•m/m^2$	R VSWI ($g•m/m^2$) = RVSW (g•m)/BSA (m^2)
ejection fraction	EF	%	EF (%) = 100 × SV (ml)/EDV (ml)
End-diastolic volume index	EDVI	ml/m2	EDVI (ml/m^2) = EDV (ml)/BSA (m^2)
End-systolic Volume	ESV	ml	ESV (ml) = EDV (ml) –SV (ml)
End-systolic Volume index	ESVI	ml/m^2	ESVI (ml/m^2) = ESV (ml)/BSA (m^2)

21.5 Oxygenation Calculations

The monitor provides the oxygenation calculation function. The monitor can save the results of up to 10 calculations, which are displayed in groups.

21.5.1 Performing Oxygenation Calculations

To perform oxygenation calculations, follow this procedure:

1. Access oxygenation calculation by either of the following ways:
   - Select the **Calculations** quick key → **Oxygenation** tab.
   - Select the **Main Menu** quick key → from the **Calculations** column select **Oxygenation**.
2. Enter the known values. For a patient who is being monitored, the currently measured values are automatically taken.
3. Select **Calculate**.

The calculated value greater than the normal upper limit is indicated by an up arrow "↑". The calculated value lower than the normal lower limit is indicated by a down arrow "↓".

In the **Oxygenation** page, you can also perform the following operations:

- Select **OxyCont Unit**, **Hb Unit**, and **Pressure Unit**. Then corresponding parameter values will be automatically converted and updated accordingly.
- Select **Range** to show the normal range of each parameter.

21.5.2 Input Parameters for Oxygenation Calculations

Input Parameter	Label	Unit
cardiac output	C.O.	L/min
percentage fraction of inspired oxygen	FiO_2	%
partial pressure of oxygen in the arteries	PaO_2	mmHg, kPa
partial pressure of carbon dioxide in the arteries	$PaCO_2$	mmHg, kPa
arterial oxygen saturation	SaO_2	%
partial pressure of oxygen in venous blood	PvO_2	mmHg, kPa
venous oxygen saturation	SvO_2	%
hemoglobin	Hb	g/L, g/dl, mmol/L
respiratory quotient	RQ	None
atmospheric pressure	ATMP	mmHg, kPa
height	Height	cm, inch
weight	Weight	kg, lb

21.5.3 Calculated Parameters and Formulas for Oxygenation Calculations

Calculated Parameters	Label	Unit	Formula
body surface area	BSA	m^2	BSA (m^2) = $Wt^{0.425}$ (kg) × $Ht^{0.725}$ (cm) × 0.007184
oxygen consumption	VO_2	ml/min	VO_2 (ml/min) = C(a-v)O_2 (ml/L)× C.O. (L/min))
arterial oxygen content	CaO_2	ml/L, ml/dL	CaO_2 (ml/L) = 10× (0.0134 × Hb (g/dl) × SaO_2 (%)) +0.031× PaO_2 (mmHg)
venous oxygen content	CvO_2	ml/L, ml/dL	CvO_2 (ml/L) = 10× (0.0134 × Hb (g/dl) × SvO_2 (%)) +0.031 × PvO_2 (mmHg)
arteriovenous oxygen content difference	C(a-v)O_2	ml/L, ml/dl	C(a-v)O_2 (ml/L) = CaO_2 (ml/L) - CvO_2 (ml/L)
oxygen extraction ratio	O_2ER	%	O_2ER (%) = 100×C(a-v)O_2 (ml/L)/CaO_2 (ml/L)
oxygen transport	DO_2	ml/min	DO_2(ml/min) = C.O. (L/min) × CaO_2(ml/L)
partial pressure of oxygen in the alveoli	PAO_2	mmHg, kPa	PAO_2 (mmHg) = [ATMP (mmHg) - 47 mmHg] × FiO_2 (%)/100 - $PaCO_2$ (mmHg) × [FiO_2 (%)/100 + (1 - FiO_2 (%)/100)/RQ]
alveolar-arterial oxygen difference	$AaDO_2$	mmHg, kPa	$AaDO_2$ (mmHg) = PAO_2 (mmHg) - PaO_2 (mmHg)
capillary oxygen content	CcO_2	ml/L, ml/dl	CcO_2 (ml/L) = Hb (g/L) × 1.34 + 0.031 × PAO_2 (mmHg)

Calculated Parameters	Label	Unit	Formula
venous admixture	QS/QT	%	QS/QT (%) = 100× [1.34 × Hb (g/L) × (1 - SaO2 (%)/100) + 0.031 × (PAO2 (mmHg) - PaO2 (mmHg))]/[1.34 × Hb (g/L) × (1 - SvO2 (%)/100) + 0.031× (PAO2 (mmHg) - PvO2 (mmHg))]
oxygen transport index	DO_2I	ml/min/m^2	DO2I (ml/min/m^2) = CaO2 (ml/L) × (C.O. (L/min)/BSA (m^2))
oxygen consumption	VO_2I	ml/min/m^2	VO2I (ml/min/m^2) = C (a-v) O2 (ml/L) ×(C.O. (L/min)/BSA (m^2))

21.6 Ventilation Calculations

The monitor provides the ventilation calculation function. The monitor can save the results of up to 10 calculations, which are displayed in groups.

21.6.1 Performing Ventilation Calculations

To perform ventilation calculations, follow this procedure:

1. Access ventilation calculation by either of the following ways:
   - Select the **Calculations** quick key → **Ventilation** tab.
   - Select the **Main Menu** quick key → from the **Calculations** column select **Ventilation**.
2. Enter the known values. For a patient who is being monitored, the currently measured values are automatically taken. If the anesthesia machine or ventilator is connected, measured values for ventilation calculation are also automatically taken.
3. Select **Calculate**.

   The calculated value greater than the normal upper limit is indicated by an up arrow "↑". The calculated value lower than the normal lower limit is indicated by a down arrow "↓".

On the **Ventilation** page, you can also perform the following operations:

- Select **Pressure Unit**. Then corresponding parameter values will be automatically converted and updated accordingly.
- Select **Range** to show the normal range of each parameter.

21.6.2 Input Parameters for Ventilation Calculations

Input Parameter	Label	Unit
percentage fraction of inspired oxygen	FiO_2	%
respiration rate	RR	rpm
partial pressure of mixed expiratory CO2	$PeCO_2$	mmHg, kPa
partial pressure of carbon dioxide in the arteries	$PaCO_2$	mmHg, kPa
partial pressure of oxygen in the arteries	PaO_2	mmHg, kPa
tidal volume	TV	ml
respiratory quotient	RQ	None
atmospheric pressure	ATMP	mmHg, kPa

21.6.3 Calculated Parameters and Formulas for Ventilation Calculations

Calculated Parameters	Label	Unit	Formula
partial pressure of oxygen in the alveoli	PAO_2	mmHg, kPa	PAO_2 (mmHg) = [ATMP (mmHg) - 47 mmHg] × FiO_2 (%)/100 - $PaCO_2$ (mmHg) × [FiO_2(%)/100 + (1 - FiO_2 (%)/100)/RQ]
alveolar-arterial oxygen difference	$AaDO_2$	mmHg, kPa	$AaDO_2$ (mmHg) = PAO_2 (mmHg) - PaO_2 (mmHg)
oxygenation ratio	Pa/FiO_2	mmHg, kPa	Pa/FiO_2(mmHg) = 100 × PaO_2 (mmHg)/FiO_2 (%)
arterial to alveolar oxygen ratio	a/AO_2	%	a/AO_2 (%) = 100 × PaO_2 (mmHg)/PAO_2 (mmHg)
minute volume	MV	L/min	MV (L/min) = [TV (ml) × RR (rpm)]/1000
volume of physiological dead space	Vd	ml	Vd (ml) = TV (ml) × [1 - $PeCO_2$ (mmHg)/$PaCO_2$ (mmHg)]
physiologic dead space in percent of tidal volume	Vd/Vt	%	Vd/Vt (%) = 100 × Vd (ml)/TV (ml)
alveolar volume	VA	L/min	VA (L/min) =[TV (ml) - Vd (ml)] × RR (rpm)/ 1000

21.7 Renal Calculations

The monitor provides the renal calculation function. The monitor can save the results of up to 10 calculations, which are displayed in groups.

21.7.1 Performing Renal Calculations

To perform renal calculations, follow this procedure:

1. Access renal calculation by either of the following ways:
   - Select the **Calculations** quick key → select the **Renal** tab.
   - Select the **Main Menu** quick key → from the **Calculations** column select **Renal**.
2. Enter the known values. .
3. Select **Calculate**.

   The calculated value greater than the normal upper limit is indicated by an up arrow "↑". The calculated value lower than the normal lower limit is indicated by a down arrow "↓". You can select **Range** to show the normal range of each parameter.

21.7.2 Calculated Parameters and Formulas for Renal Calculations

Input Parameter	Label	Unit
urine pstassium	URK	mmol/L
urinary sodium	URNa	mmol/L
urine	Urine	ml/24 hrs
plasm osmolality	Posm	mOsm/kgH_2O
urine osmolality	Uosm	mOsm/kgH_2O
serum sodium	SerNa	mmol/L
creatinine	Cr	μmol/L
urine creatinine	UCr	μmol/L

Input Parameter	Label	Unit
blood urea nitrogen	BUN	mmol/L
height	Height	cm
weight	Weight	kg

21.7.3 Calculated Parameters and Formulas for Renal Calculations

Calculated Parameters	Label	Unit	Formula
urine sodium excretion	URNaEx	mmol/24 hrs	URNaEx (mmol/24 hrs) = Urine (ml/24 hrs) × URNa (mmol/L)/1000
urine potassium excretion	URKEx	mmol/24 hrs	URKEx (mmol/24 hrs) = Urine (ml/24 hrs) × URK (mmol/L)/1000
sodium potassium ratio	Na/K	%	Na/K (%) = 100 × URNa (mmol/L)/URK (mmol/L)
clearance of sodium	CNa	ml/24 hrs	CNa (ml/24 hrs) = URNa (mmol/L) × Urine (ml/24 hrs)/SerNa (mmol/L)
creatinine clearance rate	Clcr	ml/min	Clcr (ml/min) = Ucr (μmol/L) × Urine (ml/24 hrs)/[Cr (μmol/L) × (BSA (m^2)/1.73) × 1440]
fractional excretion of sodium	FENa	%	FENa (%) = 100 × URNa (mmol/L) × Cr (μmol/L)/[SerNa (mmol/L) × Ucr (μmol/L)]
osmolar clearance	Cosm	ml/min	Cosm (ml/min) = Uosm (mOsm/kgH_2O) × Urine (ml/24 hrs)/(Posm (mOsm/kgH_2O) × 1440)
free water clearance	CH2O	ml/hr	CH2O (ml/hr) = Urine (ml/24 hrs) × [1 - Uosm (mOsm/kgH_2O)/Posm (mOsm/kgH_2O)]/24
urine to plasma osmolality ratio	U/P osm	None	U/P osm = Uosm (mOsm/kgH_2O)/Posm (mOsm/kgH_2O)
blood urea nitrogen creatinine ratio	BUN/Cr*	Mmol/L	BUN/Cr = 1000 × BUN (mmol/L)/Cr (μmol/L)
urine-serum creatinine ratio	U/Cr	None	U/Cr (mmol/L) = Ucr (μmol/L)/Cr (μmol/L)

*: BUN/Cr is a ratio at mol unit system.

22 Printing

The monitor can output patient reports via network printer or print server.

22.1 Supported Printer

The monitor supports the following printer:

- HP LaserJet Pro M202dw
- HP LaserJet Enterprise M605
- HP LaserJet P4015n
- HP LaserJet Pro 400 M401n
- HP LaserJet 600 M602
- HP LaserJet M507dn

NOTE

- **For more details about the printer, see the document accompanying the printer. With product upgrades, the monitor may support more printers and no prior notice will be given. If you have any doubt about the printer you have purchased, contact Mindray.**

22.2 End Case Reports

22.2.1 Printing the End Case Report

To print the end case report, choose one of the following ways:

- Select **Print** from the **End Case Report** menu.
- Select **Print End Case Report** when you discharge a patient
- Select the **End Case Report** quick key (only available for the independent external display)

22.2.2 Setting a Report as An End Case Report

The following reports can be set as end case reports:

- Tabular Trends Report
- Graphic Trend Report
- Event Report
- 12-lead Interpretation
- Alarm Limits Report
- Realtime Report
- ECG Report

To set a report as an end case report, follow this procedure:

1. Select the **Main Menu** quick key → from the **Report** column select **End Case Report**.
2. From the **Select Reports** page, select the checkbox before the desired report, for example **ECG Report**.

22.2.3 Setting the End Case Report

To set the end case report, follow this procedure:

1. Select the **Main Menu** quick key → from the **Report** column select **End Case Report**.

2. From the **Report Setup** page, set the following end case reports:
   - Select the **Tabular Trends Report**, **Graphic Trends Report**, **Realtime Report**, and **ECG Report** tab, and set these end case report by referring to section *22.6 Setting Reports*.
   - Select the **Event Report** tab, and select the event that needs to be printed.
   - Select the **12-Lead Interpretation** tab, and set the switch of **Median Complex**, **Measurements**, **Interpretation**, or **Interpretation Summary**. For other settings, refer to section *22.6 Setting Reports*.

22.2.4 Setting the End Case Report Period

To set the end case report print period, follow this procedure:

1. Select the **Main Menu** quick key → from the **Report** column select **End Case Report**.
2. From the **Select Reports** page, set the **Period**.

NOTE

- **End case report print period is calculated from the patient discharged time to the configured period.**
- **Period setting is applicable to all the end case report.**

22.3 Manually Starting a Printing Task

You can start a printing task manually.

22.3.1 Starting Printing from the Current Page

From the current page, select the  button, if available, to start printing.

22.3.2 Printing Realtime Reports

Select  to print a realtime report. You can also print a realtime report from the **Report Setup** page. For more information, see *22.3.3 Printing Common Reports*.

22.3.3 Printing Common Reports

You can print the following common reports:

- ECG Report
- Realtime Report
- Tabular Trends Report
- Graphic Trend Report

To print the reports, follow this procedure:

1. Select the **Main Menu** quick key →from the **Report** column select **Report Setup**.
2. Select the desired report tab.
3. Check the settings.
4. Select **Print**.

22.4 Automatically Printing Reports

When a parameter alarm switch is set to on and an alarm is triggered for this parameter, you can set a printer to start alarm printing automatically.

To do so, follow this procedure:

1. Access alarm related tabs such as the **Alarm** tab for a parameter in one of the following ways:
   - Select the parameter or waveform area of the desired parameter → select the **Alarm** tab.
   - Select the **Main Menu** quick key → from the **Parameters** column select **Setup** → select the desired parameter → select the **Alarm** tab.

2. Switch on **Alarm Outputs** for desired parameters.

22.5 Stopping a Printing Task

To stop a printing task, follow this procedure:

1. Select the **Main Menu** quick key → from the **Report** column select **Print Queue**.
2. Select desired printing tasks and then select **Delete**. Selecting **Delete All** to stop all the printing tasks.

22.6 Setting Reports

This section focuses on how to set ECG reports, realtime reports, tabular trends reports, and graphic trends reports.

22.6.1 Setting ECG Reports

To set ECG reports, follow this procedure:

1. Select the **Main Menu** quick key → from the **Report** column select **Report Setup**.
2. Select **ECG Report**.
3. Set the desired options. The following table only lists some of the options.

Menu item	Function	Description
Speed	Set the print speed of ECG waveforms	25 mm/sec: prints 25 mm of ECG waveform per second. 50 mm/sec: prints 50 mm of ECG waveform per second.
Auto Interval	Defines the spacing between the ECG waveforms on a printout	**On:** automatically adjusts the space between waveforms to avoid overlapping. **Off**: each waveform area has the same size on a printout.
	Note: This setting is only relevant when **12×1** is selected for **12-Lead Format**.	
12-Lead Format	Select the format of 12-lead ECG waveforms on a printout.	**12×1:** displays 12-lead ECG waveforms on one page in one column. **6×2**: displays 12-lead ECG waveforms on one page in two columns, with 6 lines in each column. **6×2+1**: displays 12-lead ECG waveforms on one page in two columns, with 6 lines in each column, and one rhythm lead waveform at the bottom. **3×4+1**: displays 12-lead ECG waveforms on one page in 4 columns, with 3 lines in each column, and one rhythm lead waveform at the bottom. **3×4+3**: displays 12-lead ECG waveforms on one page in 4 columns, with 3 lines in each column, and three rhythm lead waveforms at the bottom.
Rhythm Lead 1 Rhythm Lead 2 Rhythm Lead 3	Select the lead that will be used as Rhythm Lead 1, 2, or 3.	I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6
	Note: This setting is only relevant when **6×2+1**,**3×4+1**, or **3×4+3** is selected for **12-Lead Format**.	
Format Sequence	Select the recording method of ECG report generated by auto measurement	**Sequential**: 12-lead ECG data are recorded sequentially and displayed in 3 lines and 4 columns with 2.5 seconds of ECG data for each column. **Simultaneous**: Record simultaneous 12-lead ECG data.

NOTE

- **When ECG Lead Set is set to 3-Lead, ECG report cannot be printed.**

22.6.2 Setting Realtime Reports

To set tabular realtime reports, follow this procedure:

1. Select the **Main Menu** quick key → from the **Report** column select **Report Setup**.
2. Select **Realtime Report**.
3. Set the desired options. The following table only lists some of the options.

Menu item	Function	Description
Select Waveform	Select the desired waveform to print	**Current Waveforms**: prints the realtime report for current waveforms. **Selected Waveforms**: prints the realtime report for the selected waveforms.

22.6.3 Setting Tabular Trends Reports

To set tabular trends reports, follow this procedure:

1. Select the **Main Menu** quick key → from the **Report** column select **Report Setup**.
2. Select **Tabular Trends Report**.
3. Set the desired options. The following table only lists some of the options.

Menu Item	Function	Description
Period	Select the period during which a tabular trends report will be printed.	**Auto**: one page of a tabular trends before the current time will be printed at the selected **Interval**. **All**: all stored tabular rends will be printed at the selected **Interval**. **30 min** to **96 hrs**: 30 min to 96 hrs of tabular trends before the selected **Time** will be printed at the selected **Interval**.
Interval	Select the resolution of the tabular trends printed on a report.	**NIBP, EWS, GCS**: at an interval of acquiring the values of selected parameter. **Auto**: using the **Interval** setting of the **Tabular Trends** review page. **5 sec** to **3 hrs**: the tabular trends will be printed at the selected **Interval**.
Report Format	Select the printing principle.	**Parameter Oriented**: parameter values are listed vertically and trend time is listed horizontally.. **Time Oriented**: trend time is listed vertically and parameter values are listed horizontally.

22.6.4 Setting Graphic Trends Reports

To set graphic trends reports, follow this procedure:

1. Select the **Main Menu** quick key → from the **Report** column select Report Setup.
2. Select the **Graphic Trends Report** tab.
3. Set the desired options.

Menu Item	Function	Description
Period	Select the period during which a graphic trends report will be printed.	**Auto**: one page of a graphic trends before the current time will be printed. **All**: all stored graphic rends will be printed.. **30 min** to **96 hrs**: 30 min to 96 hrs of graphic trends before the selected **Time** will be printed.

22.7 Viewing Printer Status

You can view the status of the recent ten printing tasks in the **Print Queue** window. To view the status of printing tasks, select the **Main Menu** quick key, from the **Report** column select **Print Queue**.

Each printing task includes the following information:

- Print time
- Report title
- Printer name (when using the print server) or IP address (when using the network printer)
- Printing status, for example, printing, failed, retrying, and waiting.

22.8 Printer Out of Paper

When the printer runs out of paper, the print request will not be responded. If there are too many print jobs that are not responded, a printer error may occur. In these cases, you need to install paper and then re-send the print request. Restart the printer if necessary.

Therefore, you'd better ensure that there is enough paper in the printer before sending a print request.

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23 User Maintenance Settings

User maintenance enables you to customize your equipment to best meet your needs. Accessing the **Maintenance** menu is password protected.

This chapter describes the settings and functions in the **Maintenance** menu. The monitor provides different maintenance menus for different user types. The following table lists the access authorization of different users.

User Type	Menu
Clinical professional	Device Location, Patient Management, Alarm, CAA, Module, Review, Print, Unit, Time, Other,
Biotechnical personnel	Device Location, Patient Management, Alarm, CAA, Module, Review, Print, Unit, Time, Other, Authorization Setup, Version, Battery Information, Scanner, Network Setup,
Service personnel	Device Location, Patient Management, Alarm, CAA, Module, Review, Print, Unit, Time, Other, Authorization Setup, Version, Battery Information, Scanner, Network Setup, Factory Maintenance.

CAUTION

- **The maintenance settings can only be changed by authorized personnel. Contact your department manager or biomedical engineering department for the passwords used at your facility.**

23.1 Accessing the Maintenance Menu

To perform user maintenance, follow this procedure:

1. Select the **Main Menu** quick key → from the **System** column select **Maintenance** → input the required password → select ↵.
2. Select desired tab.

23.2 The Device Location Settings

Menu Item	Default Setting	Description
Monitor Name	/	/
Facility		
Department		
Location	Fixed	• **Fixed**: the **Patient Management** menu displays Bed No. and Room No., but you cannot change them. • **Unfixed**: you can change Bed No. and Room No. from the **Patient Management** menu. Bed No. and Room No. are cleared each time you discharge a patient.
Room No.	/	/
Bed No.		

23.3 The Patient Management Settings

23.3.1 The Field Tab

Menu Item	Default Setting	Description
Room No	Unselected	Selects which items can be displayed and edited from the **Patient Management** menu.
Visit Number	Unselected	
Patient ID	Selected	
Middle Name	Unselected	
Race	Unselected	
Age (Gestational Age: Neo)	Selected	
Custom Field 1- Custom Field 4	Unselected	

NOTE

- **If the monitor is connected with the CMS, the patient information items and customized fields are loaded from the CMS.**

23.3.2 The Find Patient Tab

Menu Item		Default Setting	Description
Find Patient		All Patients	Selects which patient can be found in the CMS or the ADT server. **All Patients**: searches from all patients in the CMS or ADT server. **Current Department Patients**: searches from the current department in the CMS or ADT server.
ADT Query	Facility	Unselected	Selects which criteria are used to search patients in the ADT server. If **Find Patient** is set to **All Patients**, you can search from all patients in the ADT server. If **Find Patient** is set to **Current Department Patients**, you can only search from the current department in the ADT server.
	Department		
	Room No		
	Bed No		
	Visit Number		
	Patient ID	Selected	
	Patient Name		

23.3.3 The Discharge Tab

Menu Item	Default Setting	Function
Auto Discharge When Power Off	Never	Automatically discharges the patient when the monitor is turned off for the designated period of time. **Never**: not discharge a patient no matter for how long the monitor has been switched off.
Auto delete discharged patients when storage space is full	On	/
Prompt on patient auto deleted	On	**On:** an alarm is issued when the monitor automatically deletes earlier discharged patients.

Menu Item	Default Setting	Function
Prompt Alarm When Storage Is Nearly Full	Med	Selects whether an alarm is issued when the monitor memory is very low and the priority of this alarm.
Include Patient Demographics When Exporting Patient Data	Off	Selects whether patient demographics is included when exporting the patient data.
Auto Delete Patient Data if Discharged	Auto	Selects whether patient data is deleted when the patient is discharged. • **Auto**: not delete patient data when the patient is discharged. Discharged patient will be deleted when the storage space of the monitor is full. • **Right Now**: deletes patient data as soon as the patient is discharged. • **7 days**: deletes patient data seven days after the patient is discharged. • **1 Month**: deletes patient data one month after the patient is discharged
Clear All Patient Data	/	Deletes all patient information and data. Clearing patient data will discharge the current patient.

23.3.4 The Location Tab

Menu Item	Default Setting	Description
Location 1 - Location 10	/	Selects where the patient goes after patient monitoring stops.

23.3.5 The Display Tab

Menu Item	Default Setting	Description
Primary Screen Display Full Name	On	Selects whether patient name is displayed in the patient information area on the primary display.
Secondary Screen Display Full Name	On	Selects whether patient name is displayed in the patient information area on the secondary display, if configured.
Remote View Display Full Name	On	Selects whether patient name is displayed in the patient information area on the remote monitors when this monitor is viewed by other monitors.
Remote View Bedlist Display Full Name	On	Defines whether patient name is displayed in beds list on the remote monitors when this monitor is viewed by other monitors.
Primary Screen Display Full Patient ID	Off	Selects whether patient ID is displayed in the patient information area on the primary display.
Secondary Screen Display Full Patient ID	Off	Selects whether patient ID is displayed in the patient information area on the secondary display, if configured.

23.4 The Alarm Settings

23.4.1 The Audio Tab

Menu Item	Default Setting	Description
Minimum Alarm Volume	2	/
Alarm Sound	ISO2	Defines the alarm tone pattern. When ISO2 is selected, the monitor can generate special alarm sound.
High Alarm Interval	3 sec	Defines the interval between alarm tones for the ISO mode and ISO2 mode.
Med Alarm Intervalf	8 sec	
Low Alarm Interval	20 sec	
Auto Increase Volume	2 Steps	• **2 Steps**: if an alarm is not reset within the designated delay time after the alarm occurs, the alarm volume automatically increases by two levels. • **1 Step**: if an alarm is not reset within the designated delay time after the alarm occurs, the alarm volume automatically increases by one level. • **Off**: if an alarm is not reset within the designated delay time after the alarm occurs, the volume of the alarm tone does not change.
Increase Volume Delay	20 sec	Defines the delay time of alarm volume escalation
Special Advanced Alarm Sound (Asystole, V-Fib/V-Tach, V-Tach, Vent Brady, Extreme Tachy, Extreme Brady, SpO2 Desat, Apnea)	Unselected	If ISO2 alarm sound mode is selected, the monitor gives special alarm sound to indicate that the patient may be in a critical condition when an selected alarm is triggered.

NOTE

- **The alarm volume escalation function is not applied to the latched alarms.**
- **The monitor provides the same alarm tone pattern for the remote device alarms as those for your monitor alarms.**

23.4.2 The Pause/Reset Tab

Section	Menu Item	Default Setting	Description
Pauses	Pause	Alarm Pause	Selects the pause function. • **Alarm Pause**: pauses alarms. • **Audio Pause**: pauses alarm tones.
	Pause Time	2 min	Selects the alarm pause time. The alarm pause time can be set to **1 min**, **2 min**, **3 min**, or **Permanent**.
	Pause Priority	All	Selects alarms of what priority can be paused. • **All**: pressing the **Alarm Pause** quick key pauses all alarms. • **Med & Low**: pressing the **Alarm Pause** quick key pauses alarms of medium and low priority. The high priority alarms will not be paused. • **Disabled**: the **Alarm Pause** quick key is disabled.
	Pause 5 min	Off	Selects how long the alarm can be paused if switched on..
	Pause 10 min	Off	
	Pause 15 min	Off	
Alarm Reset	Alarm Light	On When Reset	• **On When Reset**: when the alarm system is reset, the alarm tones of the current alarms are switched off, but the alarm lamp remains flashing. • **Off When Reset**: when the alarm system is reset, both the alarm tone and alarm lamp of the current alarms are switched off.
Reminder Tone	Alarm Reset Reminder	On	Selects the reminder tone rule when the alarm volume is set to zero, or the alarm is reset or switched off. • **On**: the monitor issues reminder tones at a designated interval. • **Re-alarm**: if the alarm condition persists, the alarms marked with "√" will be regenerated after the designated reminder tone interval. • **Off**: the monitor does not issue reminder tones at a designated interval. The alarms marked with "√" will be silenced.
	Alarm Off Reminder	On	/
	Reminder Interval	5 min	• **10 min**: the monitor issues reminder tones every 10 minutes. • **5 min**: the monitor issues reminder tones every five minutes. • **3 min**: the monitor issues reminder tones every three minutes. • **2 min**: the monitor issues reminder tones every two minutes. • **1 min**: the monitor issues reminder tones every one minute.

23.4.3 The Latching Tab

Menu Item		Default Setting	Description
Lethal	Visible	Unselected	Selects alarm latching rules: • If **Visible** is selected, you can separately latch visual alarm signal. • Latching audible alarm signal simultaneously latches visual signal. Selecting alarms of lower priority simultaneously latches higher priority alarms.
	Audible		
High	Visible		
	Audible		
Med	Visible		
	Audible		
Low	Visible		
	Audible		

23.4.4 The Guard Limits Tab

Menu Item	Default Setting	Description
Disable Off	Lethal Arrhy, SpO2 Desat, Apnea: On Others: Off	**On**: the alarm cannot be switched off. **Off**: the alarm can be switched off from the iAlarm menu.
Highest	/	The alarm high limit cannot be set higher than this setting.
Lowest	/	The alarm low limit cannot be set lower than this setting.
Priority	RR, Temp: ≥Low Others: ≥Med	The alarm priority setting cannot be lower than this setting.
Clear	/	Selecting **Clear** can resume default guard limits
Patient Category	Adult	Sets patient category.

23.4.5 The Combined Alarm Tab

Menu Item	Description
Check box	Selects combined alarms that can be displayed and modified from the Combined Alarm setup of the iAlarm menu.
Name	Selects the alarm name to change the default name of corresponding alarm.
Icon Type	In the Patient Status window, the selected icon is used to indicate the alarmed system or organ. You can only select icon type of a custom combined alarm.
Notification	• **Only Alarm**: when a combined alarm occurs, alarm message is displayed in the physiological alarm area. • **Only Popup**: when a combined alarm occurs, the Patient Status window pops up. • **Alarm+Popup**: when a combined alarm occurs, alarm message is displayed in the physiological alarm area and the Patient Status window pops up.
Delay	Sets the default delay of the combined alarm.
Combined Alarm Refractory Period	Sets the refractory period of combined alarms. In the refractory period, the alarm will not be presented even if the alarm condition occurs again.
Add	Adds custom combined alarms and sets alarm properties. To delete an custom alarm, select the editing symbol to enter the **Custom Combined Alarm** menu and select **Delete**.

The following table lists the predefined combined alarms and their default settings:

Name	Icon Type	Default Notification Type	Default Delay Time
HR>100 with IBP-S<90 and RR>22 over 1 min	Circulatory	Alarm+Popup	1 min
qSOFA score ≥2 over 1 min	Infection	Only Popup	1 min
ICP-M > 20 over 5 min	Neuro	Alarm+Popup	5 min
CPP > 95 over 5 min	Neuro	Alarm+Popup	5 min
CPP < 60 over 5 min>	Neuro	Alarm+Popup	5 min
EtCO2 ≤ 15 over 3 min, or EtCO2 ≥ 60 over 3 min, or RR ≤ 5 over 3 min, or SpO2 ≤ 85 over 3 min	Respiratory	Only Popup	3 min
Sys ↓ 20% within 30 min, or Sys ↑ 20% within 30 min	Circulatory	Only Popup	30 min
HR/PR ↓ 20% within 30 min, or HR/PR ↑ 20% within 30 min	Circulatory	Only Popup	30 min
A-Fib with RVR over 1 min	Heart	Alarm+Popup	1 min
A-Fib with Long R-R Interval	Heart	Alarm+Popup	/
R on T with QT Prolonged	Heart	Alarm+Popup	/
Freq. PVCs with QT Prolonged	Heart	Alarm+Popup	/

23.4.6 The Remote View Tab (Only available for the independent external display)

Menu Item	Default Setting	Description
Reset Remote Bed Alarms	Off	Selects whether you can reset alarms occurring to the remote devices from your monitor. **On**: the **Alarm Reset** button appears on the bottom left of the **Remote View** screen.
Alarm Reset By Other Bed	On	**On**: alarms on your monitor can be reset by remote devices.
Alarm Reminder	Visible+Audible	Selects what alarm indicators are necessary for the remote devices. • **Visible+Audible**: the monitor provides visual alarm indication, and continuous audible alarm indication if the alarm persists at the remote device. • **Visible+Single Tone**: the monitor provides visual alarm indication, and a single tone when the alarm occurs at the remote device. • **Visible Only**: the monitor only provides visual alarm indication.
Alarm Priority	All	Selects what priority of remote device alarms are presented for audible notification • **All**: the monitor sounds if an alarm occurs. • **High & Med**: the monitor sounds if a high or medium priority alarm occurs. • **High Only**: the monitor sounds only if a high priority alarm occurs.
Alarm Sound	ISO	Selects the alarm tone pattern for the remote device alarms.
Remote Disconnected Alarm	On	Selects whether an alarm is issued if a remote device is disconnected.

23.4.7 The Other Tab

Section	Menu Item	Default Setting	Description
Alarm Priority	ECG Lead Off	Low	Selects the priority of the ECG lead off alarm.
	SpO2 Sensor Off	Low	Selects the priority of the SpO_2 sensor off alarm.
	IBP No Sensor	Med	Selects the priority of the IBP No Sensor alarm.
	CMS/eGW Disconnected	Low	Selects the priority of the CMS and eGateway disconnection alarm.
Alarm Delay	Alarm Delay	12 sec	**1sec** - **15 sec**: for continuously measured parameters, the monitor does not present the alarm if the alarm condition is resolved within the delay time. **Off**: an alarm is always presented. The setting of **Alarm Delay** is not applied to the pArt alarms, apnea alarms, and the ST alarms.
	ST Alarm Delay	30 sec	The monitor does not present the ST alarm if the alarm condition is resolved within the delay time.
Other	Arrhy Shield Time	2 min	Alarm light and alarm tone will be disabled for designated period of time when certain arrhythmia alarms are detected. **0**: disables this function.
	Intubation Mode Period	2 min	Selects the time for intubation.
	Battery Off Alarm	On	/
	CMS/eGW Disconnected Alarm	Off	Selects whether an alarm is issued when the monitor is not connected or disconnected from the CMS/eGateway. **Off**: the "Offline" alarm is not presented when the monitor is not connected or disconnected from the CMS/eGateway.
	Alarm Escalation	On	Select whether the alarm escalation function is available.
	Disable Night Mode	Off	Select whether the night mode function is available. **On**: the night mode function is not available. **Off**: the night mode function is available.
	Notify Alarm Setting Change	Off	Select whether the monitor gives an prompt when alarm settings, including alarm limits, priorities, and switches, are changed from the CMS.

23.5 The CAA Settings

23.5.1 The EWS Tab

Menu Item	Default Setting	Description
Clinician ID	Off	Selects whether to allow inputting the clinician ID to associate with the EWS score.
Clinician ID Timeout	10 min	Selects how long the clinician ID will remain valid
Default Adult Score	NEWS	Selects the default scoring tool for different patient categories.
Default Ped Score	/	
Default Neo Score	/	

Menu Item		Default Setting	Description
Manage Score	Local	/	**Delete**: deletes the selected scoring tools. The monitor provide MEWS and NEWS by default. You cannot delete them.
	USB Drive	/	**Import**: imports the desired scoring tools to the monitor.

23.5.2 The GCS Tab

Menu Item		Default Setting	Description
Mild	High limit	15	Selects the threshold and color of each consciousness level.
	Low limit	13	
	Color	White	
Moderate	High limit	12	
	Low limit	9	
	Color	Yellow	
Severe	High limit	8	
	Low limit	3	
	Color	Red	

23.5.3 The SepsisSight Tab

Menu Item	Default Setting	Description
The first of resuscitation	1 hr	Select desired period of initial resuscitation. Select and edit the goals for initial resuscitation.
Bundles	1hr	Select and edit treatments to be completed in 1 hour, 3 hour, and 6 hours.

23.6 The Module Settings

23.6.1 The ECG Tab

Menu Item	Default Setting	Description
ECG Standard	AHA	Selects the ECG standard according to the leadwires you are using.
QTc Formula	Hodges	Selects the QTc formula used to correct the QT interval for heart rate. • **Hodges**: $QTc = QT + (1.75) \times (HeartRate - 60)$ • **Bazett**: $QTc = QT \times \left(\frac{HeartRate}{60}\right)^{\frac{1}{2}}$ • **Fridericia**: $QTc = QT \times \left(\frac{HeartRate}{60}\right)^{\frac{1}{3}}$ • **Framingham**: $QTc = QT + 154 \times \left(1 - \frac{60}{HeartRate}\right)$

Menu Item	Default Setting	Description
12-Lead Order	No	Selects whether to send the order of 12-lead interpretation report to the hospital information system while saving the report.
CrozFusion Sync Time	Off	Sets whether to enable arrhythmia suppress when CrozFusion is on. If enabled, suspicious arrhythmia alarms will not be reported.
Arrhy Suppress Event	Off	Sets whether to save an event when an arrhythmia alarm is suppressed. If saved, this event can be reviewed when needed.
Calibration	/	Select this button to calibrate the ECG module.

23.6.2 The CO2 Tab

Menu Item	Default Setting	Description
Zero	/	Select this button to start zeroing the CO_2 module.

23.6.3 The Other Tab

Menu Item	Default Setting	Description
IBP Filter	12.5 Hz	/
PAWP Timeout (only available for the independent external display)	15 min	The measurements become outline fonts after a preset time. This avoids older values being misinterpreted as current measurements.
NIBP Timeout	15 min	
CO2 Flow Rate For Neo (For Sidestream CO_2 Module Without O_2)	90 ml/min	Selects flow rate when using the sidestream CO_2 without the O_2 monitoring function to monitor a neonatal patient.
Outline Font for Suspected Values	On	Selects whether unreliable HR and SpO_2 measurements are displayed in outline font. This prevents unreliable measurements from being misinterpreted as normal measurements,
IBP Interference Refractory Period	60 sec	Within the designated period of time, when interferences occur to the arterial pressure (except for PA) from a certain IBP channel, the monitor only displays the mean pressure value of this arterial pressure. Physiological alarms related to this IBP channel and technical alarms, including "XX No Pulse" and "XX Searching Pulse", are inactivated. XX represents corresponding IBP label.

23.7 The Review Settings

23.7.1 The Tabs Tab

Menu Item	Default Setting	Description
Tabular Trends	Selected	Hides the trends you do not need to review if deselected.
Graphic Trends		
Events		
Full Disclosure		
OxyCRG (only available for the independent external display)		
12-Lead ECG		

23.7.2 The Event Tab

Menu Item		Default Setting	Description
Lethal	Lock	Selected	Selects what kind of events will be locked. Locked events will not be deleted.
High		Unselected	
Med			
Low			
Rename Event		On	Selects whether arrhythmia events can be renamed.

23.7.3 The Arrhy Mark Tab

From the **Arrhy Mark** page, you can define whether the compressed ECG waveform segments for arrhythmia events are marked with a specific background color.

23.7.4 The Export Tab

From the **Export** page, select **Export Patient Data**, and then select desired patients from the patient list to export data of selected patients via a USB drive.

23.8 The Print Settings

23.8.1 The Printer Tab

Menu Item	Default Setting	Description
Connection Type	Printer	Selects you want to output patient reports via the print server or a network printer.
Printer IP Address	0.0.0.0	For printer only.
Paper Size	A4	
Printer Resolution	300 dpi	

Menu Item		Default Setting	Description
Print Server Address		/	For print server only. If the CMS is used as the printer server, set the **Port** to 6603.
Print Server IP Address		/	
Port		6603	
General Report (For print server only)	Print Action	Paper	Selects the media of the reports.
	Printer	/	Selects the default printer (for paper report only).
	Printer Resolution	/	Selects the resolution for the default printer (for paper report only).
	PDF Resolution	600 dpi	Selects the resolution for the default printer (for PDF report only).
End Case Report (For print server only)	Print Action	Paper	Selects the media of the reports.
	Printer	/	Selects the default printer (for paper report only).
	Printer Resolution	/	Selects the resolution for the default printer (for paper report only).
	PDF Resolution	600 dpi	Selects the resolution for the default printer (for PDF report only).
Print on Alarm Report (For print server only)	Print Action	Paper	Selects the media of the reports.
	Printer	/	Selects the default printer (for paper report only).
	Printer Resolution	/	Selects the resolution for the default printer (for paper report only).
	PDF Resolution	600 dpi	Selects the resolution for the default printer (for PDF report only).
Print Test Page		/	Tests whether the printer works properly.

NOTE

- **General reports refer to the reports other than the end case report and realtime alarm report.**

23.8.2 The Report Layout Tab

Menu Item	Default Setting	Description
Report Layout	/	Selects the contents and location of the patient information included in non-ECG reports. **N/A**: refers to no information. Patient information configured in the Report Layout page is not applied to ECG reports.

23.8.3 The ECG Report Tab

Menu Item	Default Setting	Description
Patient Name/Age (Gestational Age: Neo)/Gender	/	Selects the patient information you want to display on ECG reports.
Patient ID	Selected	
Visit Number/DOB/Race/Medication/Class/Physician/Technician/Department/Room No/Bed No/12-Lead Order	Unselected	

23.8.4 The PDF File Name Tab

Menu Item	Default Setting	Description
PDF File Name	/	Selects the name of PDF files. **N/A**: refers to no information.

23.8.5 The Other Tab

Menu Item	Default Setting	Description
Second Mark (Printer)	On	Selects whether to show second marks on the report output by the printer.

23.9 The Unit Settings

Menu Item	Default Setting	Description
Height Unit	cm	Selects measurement unit for each parameter.
Weight Unit	kg	
ST Unit	mV	
CVP Unit	cmH2O	
ICP Unit	mmHg	
CO2 Unit	mmHg	
O2 Unit	%	
Temp Unit	°C	
Pressure Unit	mmHg	
SVR Unit	DS/cm^5	

23.10 The Time Settings

23.10.1 The Time Synchronization Tab

Section	Menu Item	Default Setting	Description
Nighttime	From	22:00	Defines the night time period.
	To	06:00	
/	Start NTP Time Sync	Off	**On**: enables synchronizing the monitor time with the NTP server time.
/	Interval	1 hr	Select the time interval for synchronizing the monitor time with the NTP server time.
/	Time Server Address	/	The domain name of the time server.
/	Time Server	/	The IP address of the time server.
/	Network Test	/	Tests whether the NTP server is properly connected.

23.10.2 The Daylight Savings Time Tab

Section	Default Setting	Description
Auto Daylight Savings Time	Off	**On**: auto starts the daylight saving time.

23.11 The Other Settings

Menu Item	Default Setting	Description
Barometric Pressure	760 mmHg	For the mainstream CO2 module, enter the value of barometric pressure to which the patient monitor is exposed to. Be sure to set the barometric pressure properly. Improper settings will result in erroneous measurements.
Notch Frequency	50 Hz	Selects notch filter frequency according to the power line frequency of your country.
Mouse Sensitivity	5	/
Enter Outdoor Mode	Manual	Configure the way to enter the outdoor mode: • **Manual**: Select the **Main Menu** quick key, then from the **Display** column select **Enter Outdoor Mode** to enter the outdoor mode. • **Auto**: The monitor enters the outdoor mode automatically if the strength of ambient light is greater than the threshold.
Clear CMS IP at startup	On	/
Manual Event Edit	OR: Off Other departments: On	Selects whether selecting and editing the name of a manual event is allowed.
Screenshot (only available when the N1 is used with the independent external display)	Off	**On**: the screen capture function is available. **Off**: the screen capture function is not available.
SpO2 Tone	Mode 1	Selects the SpO_2 tone mode. The monitor adjusts the QRS tone (pitch tone) according to the SpO2 values. The same SpO2 tone mode shall be used for the same monitors in a single area.
Language	/	/
Parameters On/Off Config Influenced	On	Selects whether the settings of parameter switches are influenced by configuration
Parameters On/Off Protected	Off	Selects whether setting parameter switches is password protected.
Parameters On/Off	/	Selects what parameters can be monitored.
Browse System Log		Selects this button to enter the **System Log** page, and then select the log classifications you want to view. Selecting **Search** to view the selected logs. To view logs of certain date and time, select **Jump To** and define the date and time. System log can store 15,000 events. Earlier events will be overwritten by later ones if the capacity is reached. A total loss of power has no impact on system log.
Export System Log		Selects this button to export the system log to the USB drive.

23.12 The Authorization Setup Settings

Section	Menu Item	Default Setting	Description
/	Automatic Logout Time	20 sec	Selects timeout period of the MLDAP password for accessing the Maintenance menu, alarm settings and arrhythmia settings. If there is no operation after the specified timeout period is reached, you need to re-enter the password.
Maintenance	User Maintenance	Local Password	Selects the password for accessing the monitor's **Maintenance** menu. • **Local Password**: the monitor's password for accessing the **Maintenance** menu is required. • **User Password:** the user name and password saved in the MLDAP server are required.
	Modify Local Password	/	Changes the monitor's password for accessing the **Maintenance** menu.
Clinic	Alarm Setup	No Password	Selects the password for changing alarm settings. • **No Password**: changing alarm settings is not password protected. • **Local Password**: changing alarm switch, alarm limit, and alarm priority is password protected. The monitor's clinic password is required. • **User Password**: changing alarm switch, alarm limit, and alarm priority is password protected. The user name and password saved in the MLDAP server are required.
	Arrhythmia	No Password	Selects the password for changing arrhythmia settings. • **No Password**: changing arrhythmia settings is not password protected. • **Local Password**: changing arrhythmia switch, alarm priority, and arrhythmia threshold is password protected. The monitor's clinic password is required. • **User Password**: changing arrhythmia switch, alarm priority, and arrhythmia threshold is password protected. The user name and password saved in the MLDAP server are required.
	View Discharged Patients	No Password	Selects the password for viewing discharged patients. • **No Password**: viewing discharged patients is not password protected. • **User Password**: viewing discharged patients is password protected. The user name and password saved in the MLDAP server are required.
	Viewing Patient Review Data	No Password	Selects the password for reviewing patient data. • **No Password**: reviewing patient data is not password protected. • **Local Password**: reviewing patient data is password protected. The monitor's clinic password is required.
	Modify Local Password	/	Changes the monitor's clinic password.

Section	Menu Item	Default Setting	Description
Remote Screen	Remote Screen	Enable	Selects the password for starting remote screens. • **Disable**: you cannot start remote screens for this monitor. • **Enable**: starting remote screens is not password protected. • **Local Password**: starting remote screens is password protected. The monitor's password for remote screens is required. • **User Password**: starting remote screens is password protected. The user name and password saved in the MLDAP server are required.
	Modify Local Password	/	Changes the monitor's password for starting remote screens.

23.13 The Version Settings

Tab	Default Setting	Description
Version	/	Displays system software version, module hardware and software version, and firmware version.

23.14 The Battery Information Settings

Tab	Default Setting	Description
Battery1	/	Displays battery information.
Battery2	/	

23.15 The Scanner Settings

23.15.1 The 2D Barcode Tab (for the Mindray Custom 2D Barcode Reader)

Tab	Default Setting	Description
2D Barcode	/	Establishes the relationship between the monitor data and barcode data for selectable patient demographics. For example, the monitor has an option of **Ped** for patient category. In your hospital barcode, the text may read as **Pediatric**. You need to input **Pediatric** for the field **Ped** to establish their relationship.

23.15.2 The 1D Barcode Tab

Menu Item	Default Setting	Description
Content Fill to	Patient ID	/

23.15.3 The Scanner Information Tab

Menu Item	Default Setting	Description
Scanner Type	2D Scanner	• **1D Scanner**: select this option when you are using a 1D scanner or a 2D scanner other than the Mindray custom 2D scanner. • **2D Scanner**: select this option when you are using the Mindray custom scanner.
Data Encoding Type	UTF8	When you set **Scanner Type** to **2D Scanner**, default settings are applied to **Data Encoding Type** and **Data Parse Mode**. You do not need to change these settings.
Data Parse Mode	Local	

23.15.4 The Identify Scanner Tab (for the non-Mindray Custom 2D Barcode Reader)

Tab	Default Setting	Description
Identify Scanner	/	When you are using barcode readers other than HS-1R or HS-1M, you should select the barcode reader from the USB device list, so that the monitor can identify the barcode reader. From the USB device list, select the barcode reader you are using.

23.15.5 The Field Tab (for the Mindray Custom 2D Barcode Reader)

Menu Item	Default Setting	Description
Patient ID/First Name/Last Name/Patient Category/Gender/DOB	Selected	Selects desired patient information to be output by the barcode reader.
Visit Number/Room No/Bed No/Age (Gestational Age: Neo)/Department/Custom Field 1 - 4	Unselected	

23.16 The Network Setup Settings

23.16.1 The WLAN Tab

Menu Item		Default Setting	Description
WLAN IP		/	Add wireless network and set the network in the pop-up menu.
WLAN	Name	/	Input the name of the wireless network.
	SSID	/	/
	Security	WEP OFF	Selects the security method.
	Password	/	Input the password for entering the wireless network.

Menu Item		Default Setting	Description
WLAN IP	Obtain IP Address Automatically	On	Selects whether to enable the function of automatically getting the IP address.
	Use the Following Address	Off	Selects whether inputting the **IP Address**, **Subnet Mask**, and **Gateway** is required.
	IP Address	0.0.0.0	
	Subnet Mask	0.0.0.0	
	Gateway	0.0.0.0	
	Obtain DNS address automatically	On	Selects whether to enable the function of automatically getting the DNS address.
	Using the Following DNS Address	Off	Selects whether inputting the IP address of **Preferred DNS Server** and **Alternate DNS Server** is required.
	Preferred DNS Server	0.0.0.0	
	Alternate DNS Server	0.0.0.0	
WLAN Setup	WLAN Band	Auto	**Auto**: automatically identifies the WLAN band.
	2.4G Channel	All	Selects the 2.4 GHz channels.
	5G Channel	All	Selects the 5 GHz channels.
Network Test		/	Tests whether the wireless network is properly connected.
Certificate Management	Local	/	**Delete**: delete the selected certifications.
	USB Drive	/	Select certifications you want to import from the USB memory, and then select **Import**: import the desired certifications from the USB memory.

23.16.2 The Central Station Setup Tab

Menu Item	Default Setting	Function
Select CMS	On	Selects whether to enable the CMS selection function for your monitor.
Add Central Station	/	Inputs the name, department, and server address of the CMS. You can add up to 30 CMSs for the monitor.

23.16.3 The Device Discover Tab

Multicast helps device discovery between monitors and between monitors and CMS. Devices in the same multicast group can be mutually discovered.

Menu Item	Default Setting	Description
Multicast TTL	1	/
Multicast Address	225.0.0.8	
Master Server Address	/	/
Master Server IP Address	0.0.0.0	
Connected Status	Disconnected	
Network Test	/	Tests whether the master server is properly connected.

23.16.4 The QoS Tab

Menu Item	Default Setting	Description
QoS Level For Realtime Monitoring	0	Selects the service quality of network connection for realtime monitoring, for example parameter measurements and waveforms, alarms, and so on
QoS Level For Others	0	Selects the service quality of network connection for non-realtime monitoring, for example history data, printing, and as on.

23.16.5 The ADT Tab

The ADT (admit-discharge-transfer) gateway is normally deployed in the eGateway. You can obtain patient information from the hospital ADT server through the ADT gateway.

Menu Item	Default Setting	Description
Server Address	192.168.0.100	Input the host name or IP address of the ADT gateway.
IP Address	192.168.0.100	
Port	3502	Input the port of the ADT gateway.
ADT Query	Off	Selects whether patient information can be loaded to the monitor from the ADT server.
Network Test	/	Tests whether the ADT server is properly connected.

23.16.6 The HL7 Configuration Tab

You can send the realtime data, waveforms, and alarms from the monitor to the hospital servers via HL7 protocol. This page also display the server connection status. Licenses are required for sending data, waveforms, and alarms via HL7.

Section	Menu Item	Default Setting	Description
Data + Waveforms	Server Address	/	Inputs the name or IP address for the server receiving the realtime data and waveform.
	Destination IP	0.0.0.0	
	Port	0	/
	Send Data	Off	
	Data Interval	30 sec	
	Send Waveforms	Off	
	Connection Status	Disconnected	
Alarms	Server Address	/	Inputs the name or IP address for the server receiving the alarm data.
	Destination IP	0.0.0.0	
	Port	0	/
	Send Alarms	Off	
	Connection Status	Disconnected	
Compatibility	HL7 Protocol Version	HL7 Protocol Version 1.0	Selecting the version of the HL7 protocol.

23.16.7 The Information Security Tab

Menu Item	Default Setting	Description
Encryption Connection Type	Only Private Encryption	• **Only Private Encryption**: Mindray private encryption is used to encrypt the transmitted data. You cannot connect devices supporting SSL (secure sockets layer) encryption. • **SSL Encryption Priority**: for devices supporting SSL encryption, SSL encryption is used when connecting the devices. For devices not supporting SSL encryption, private encryption is used when connecting the devices.
Broadcast Patient Demographics	On	• **On:** when viewing other patients, device location and patient information of remote devices are displayed in the remote device list. • **Off**: patient information does not display in the remote device list.
TLS Certificate Management	/	Selects this button to access the **TLS Certificate Management** menu. You can check or delete local CA certificates or user certificates. You can also import certificates from a USB drive.

23.16.8 The MLDAP Tab

Menu Item	Default Setting	Description
Server Address	/	Inputs the name or IP address for the MLDAP server.
IP Address	0.0.0.0	
Port	0	/
Network Test	/	Tests whether the monitor is properly connected with the MLDAP server.

23.17 The Dock Setup Settings

After the N1 is transferred to the target location, connecting the N1 to a Dock enables N1 to use the settings of the Dock. All the settings in this section are stored in the Dock. When the N1 is disconnected from the Dock, the N1 uses its own settings and network.

23.17.1 The Setup Tab

Menu Item	Default Setting	Function
Work Mode	Dock Mode	• **Dock Mode**: the patient location settings (facility, department, room number, and bed number), printer settings, and authorization settings are from the N1. You can change these settings on **Device Location**, **Print**, or **Authorization Setup** page from the Independent menu. • **Host Mode**: the patient location settings (facility, department, room number, and bed number), printer settings, and authorization settings are from the Dock. You can change these settings on **Device Location**, **Print**, or **Authorization Setup** page from the **Dock Setup** page.

Menu Item	Default Setting	Function
Net Setting Type	Use current N1 net setting	• **Use current N1 net setting**: the IP and WLAN settings are from the N1. You can change these settings on **Network Setup** page from the **Maintenance** menu. • **Use current N1 net setting**: the IP and WLAN settings are from the Dock. You can change these settings on **IP**, or **WLAN** tab from the **Dock Setup** page.
External Screen Contents	Independent	• **Mirrored**: the contents of the external display is exactly the same with the monitor. • **Independent**: you can separately configure the contents and layout of the monitor and external display.

23.17.2 The Location Tab

Menu Item	Default Setting	Function
Facility	/	/
Department		
Location	Fixed	• **Fixed**: the **Patient Management** dialog displays Bed No. and Room No., but you cannot change them. • **Unfixed**: you can change Bed No. and Room No. from the **Patient Management** dialog.
Room No	/	/
Bed No		

23.17.3 The IP Tab

Menu Item	Default Setting	Function
Network Type	LAN1 IP	/
Obtain IP Address Automatically	Unelected	Automatically gets the IP address.
Use the Following Address	Selected	**IP Address**, **Subnet Mask**, and **Subnet Mask** are required.
IP Address	0.0.0.0	
Subnet Mask	0.0.0.0	
Gateway	0.0.0.0	
Obtain DNS address automatically	Unelected	Automatically gets the DNS address.
Using the Following DNS Address	Selected	IP addresses of **Preferred DNS Server** and **Alternate DNS Server** are required.
Preferred DNS Server	0.0.0.0	
Alternate DNS Server	0.0.0.0	

23.17.4 The WLAN Tab

Menu Item	Menu Item	Default Setting	Function
SSID		/	/
Security		WEP OFF	Select the security method.
Password		/	/

Menu Item	Menu Item	Default Setting	Function
WLAN Setup	WLAN Band	Auto	**Auto**: automatically identifies the WLAN band.
	2.4G Channel	All	Selects the 2.4G channels.
	5G Channel	All	Selects the 5G channels.
Network Test		/	Tests whether the wireless network is properly connected.

23.17.5 The Printer Tab

Menu Item	Default Setting	Function
Connection Type	Printer	Selects you want to output patient reports via the print server or a network printer.
Printer IP Address	0.0.0.0	For printer only.
Paper Size	A4	
Printer Resolution	300 dpi	

23.17.6 The Authorization Setup Tab

Section	Menu Item	Default Setting	Function
Maintenance	Maintenance	/	Selects the password for accessing the monitor's **Maintenance** menu. • **Local Password**: the monitor's password for accessing the **Maintenance** menu is required. • **User Password:** the user name and password saved in the MLDAP server are required.
Others	Alarm Setup	No Password	Selects the password for changing alarm settings. • **No Password**: changing alarm settings is not password protected. • **Local Password**: changing alarm switch, alarm limit, and alarm priority is password protected. The monitor's password for changing alarm settings is required. • **User Password**: changing alarm switch, alarm limit, and alarm priority is password protected. The user name and password saved in the MLDAP server are required.
	Arrhythmia	No Password	selects the password for changing arrhythmia settings. • **No Password**: changing arrhythmia settings is not password protected. • **Local Password**: changing arrhythmia switch, alarm priority, and arrhythmia threshold is password protected. The monitor's password for changing arrhythmia settings is required. • **User Password**: changing arrhythmia switch, alarm priority, and arrhythmia threshold is password protected. The user name and password saved in the MLDAP server are required.
	Modify Local Password	/	Changes the monitor's password for accessing alarm settings and arrhythmia settings.

24 Battery

24.1 Battery Introduction

This monitor is designed to run on rechargeable Lithium-ion battery power when the external power is not available. The monitor can switch between battery power and the external power without interrupting patient monitoring. If both the external power and the battery power are available, the monitor uses the external power in preference to the battery power.

24.2 Battery Safety Information

WARNING

- **Keep batteries out of children's reach.**
- **Use only specified battery. Use of a different battery may present a risk of fire or explosion.**
- **Keep the batteries in their original package until you are ready to use them.**
- **Do not expose batteries to liquid.**
- **Do not crush, drop or puncture the battery. Mechanical abuse can lead to internal damage and internal short circuits. If a battery has been dropped or banged against a hard surface, whether damage is externally visible or not, remove the battery from use and dispose of it properly.**
- **If the battery shows signs of damage or signs of leakage, replace it immediately.**
- **The battery should be charged only in this monitor.**
- **Extremely high ambient temperature may cause battery overheat protection, resulting in monitor shutdown.**
- **The lithium-ion battery has a service life. Replace your battery when it reaches the end of its service life. Failure to replace the battery may cause serious damage to your equipment from battery overheating.**
- **The lithium-ion battery of MRV Pod has a service life of 5 years. Please contact your service personnel to replace the battery when it reaches the end of its service life. Failure to replace the battery may cause serious damage to your equipment from battery overheating.**
- **Do not open batteries, heat batteries above 60 °C, incinerate batteries, or short battery terminals. They may ignite, explode, leak or heat up, causing personal injury.**

CAUTION

- **Remove the battery if it will not be used for an extended period of time.**

24.3 Installing the Battery

The battery must only be installed by service personnel trained and authorized by Mindray. To install the battery, contact your service personnel. The battery is installed when the monitor leaves the factory.

WARNING

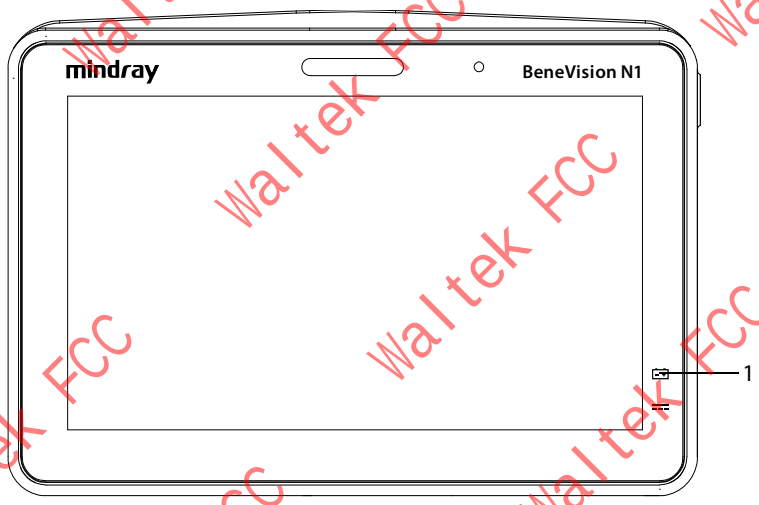
- **Lithium batteries replaced by inadequately trained personnel could result in a HAZARD (such as excessive temperatures, fire or explosion).**

24.4 Battery Indications

The battery LED, on-screen battery symbol, battery power indicator, and related alarm messages indicate the battery status.

24.4.1 Battery LED

The battery LED lies on the lower right corner of the monitor front panel.



(1) Battery LED

The battery LED indications are as follows:

- Green: the battery is fully charged.
- Yellow: the battery is being charged.
- Flashing green: the monitor runs on battery power.
- Flashing yellow: the battery is malfunctioning.
- Off: no battery is installed, or the monitor is powered off and no external power is connected.

24.4.2 Battery Symbols

The on-screen battery symbols indicate the battery status as follows:

-  indicates that the battery works correctly. The green portion represents the remaining charge.
-  indicates that the battery power is low and needs to be charged.
-  indicates that the battery is almost depleted and needs to be charged immediately. Otherwise, the monitor will soon automatically shut down.
-  indicates that the battery is being charged.
-
-  indicates that no battery is installed.
-  indicates the battery fault, battery communication fault, or battery charging fault. Contact service personnel for help.

24.4.3 Battery Power Indicator

Battery power indicator displays the remaining battery power.

24.4.4 Battery-related Alarms

The capacity of the battery is limited. When the battery is low, the monitor presents the **Low Battery** alarm, the alarm lamp flashes, and the monitor produces an alarm sound.

If the battery is almost depleted, the monitor presents the **Critically Low Battery** alarm. In this case, immediately connect the external power to run the monitor and charge the battery. Otherwise, the monitor will automatically shut down soon.

If the battery has been used for a prolonged period of time, the battery will be aged and its runtime may be significantly less than the specification. If the battery is aged, the **Battery aged, replace the battery.** alarm is presented each time the monitor is turned on, indicating that the battery reaches its lifetime.

For more information on battery-related alarms, see *E Alarm Messages*.

24.5 Charging the Battery

To optimize performance, a fully (or nearly fully) discharged battery should be charged as soon as possible. The battery can be charged in any of the following methods:

- Method 1: the monitor is connected to the AC adapter or Dock.
- Method 2: the monitor is in use with the host monitor or the defibrillator/monitor.

Method 3: the monitor is in use with the Transport Dock.For method 1 and method 3, the battery is charged in regardless of whether or not the monitor is currently turned on.

When the MRV Pod is connected to the power-on monitor through the multifunctional cable, and the monitor is connected to the external power supply, the battery of the MRV Pod will be recharged automatically.

24.6 Maintaining the Battery

24.6.1 Conditioning the Battery

The performance of batteries deteriorates over time. You should condition the batteries every three months.

If the battery is not conditioned for a prolonged time, its charge indication may not be accurate and you may wrongly evaluate the remaining battery runtime.

To condition a battery, follow this procedure:

1. Disconnect the monitor from the patient and stop all monitoring and measuring procedures.
2. Turn off the monitor, and connect the monitor to the external power source.
3. Allow the battery to be charged uninterruptedly till it is fully charged.
4. Disconnect the monitor from the external power source, and turn on the monitor.
5. Allow the monitor to run on the battery until the battery is completely depleted and the monitor automatically shuts down.
6. Fully charge the battery again for use or charge it to 40 – 60% for storage.

To condition a battery of the MRV Pod, follow this procedure:

1. Disconnect the MRV Pod from the patient and stop all monitoring and measuring procedures.
2. Connect the MRV Pod to the power-on monitor with cable, then connect the monitor to the external power source
3. Allow the battery to be charged uninterruptedly till it is fully charged.
4. Disconnect the wired connection between the MRV Pod and the monitor, use the battery to supply until the battery of the MRV Pod is depleted, and the MRV Pod automatically shuts down.
5. Fully charge the battery again for use.

NOTE

- **Do not use the monitor to monitor the patient during battery conditioning.**
- **Do not interrupt battery conditioning.**

24.6.2 Checking Battery Performance

Life expectancy of a battery depends on how frequent and how long it is used. When properly used, the lithium-ion battery has a useful life of approximately two years. If improperly used, its life expectancy can be shorten. We recommend replacing lithium-ion battery every two years.

The performance of a rechargeable battery deteriorates over time. You should check the battery performance every three months or if you doubt that the battery may fail.

See steps 1 to 5 of *24.6.1 Conditioning the Battery* to check battery performance. The operating time of the battery reflects their performance directly. If the operating time of a battery is noticeably shorter than that stated in the specifications, the battery may reach its service life or malfunction.If the battery performance meets the requirement, fully charge the battery again for use or charge it to 40 – 60% for storage.

NOTE

- **Battery operating time depends on equipment configuration and operation. For example, high display brightness or measuring NIBP repeatedly will shorten the battery operating time.**

24.7 Storing Batteries

When storing batteries, make sure that the battery terminals do not come into contact with metallic objects. If batteries are stored for an extended period of time, place the batteries in a cool place with a partial charge of 40% to 60% capacity.

Condition the stored batteries every three months. For more information, see *24.6.1 Conditioning the Battery*.

NOTE

- **Remove the battery from the equipment if the equipment is not used for a prolonged time (for example, several weeks). Otherwise the battery may overdischarge.**
- **Storing batteries at high temperature for an extended period of time will significantly shorten their life expectancy.**
- **Storing batteries in a cool place can slow the aging process. Ideally the batteries should be stored at 15 °C.**

24.8 Recycling Batteries

Discard a battery in the following situations:

- The battery has visual signs of damage.
- The battery fails.
- The battery is aged and its runtime significantly less than the specification.
- The battery has been used for more than it service time.

Properly dispose of batteries according to local regulations.

WARNING

- **Do not open batteries, heat batteries above 60 °C, incinerate batteries, or short the battery terminals. They may ignite, explode, leak or heat up, causing personal injury.**

25 Care and Cleaning

25.1 Care and Cleaning Introduction

In this chapter we only describe cleaning and disinfection of the monitor, parameter modules, Modular Rack, Dock, folding hook, monitor handle, bedrail hook and certain accessories. For the cleaning and disinfection of the Transport Dock and other reusable parameter accessories, refer to their instructions for use.

25.2 Care and Cleaning Safety Information

WARNING

- **Use only cleaners, disinfectants and methods specified in this chapter. Using unapproved substances or methods may damage the equipment and void the warranty.**
- **Do not mix disinfecting solutions, as hazardous gases may result.**
- **Mindray is not liable for the efficacy of the specified cleaners, disinfectants, or methods as a means for controlling infection. Refer to your hospital for infection controlling.**
- **Be sure to turn off the system and disconnect all power cables from the outlets before cleaning the equipment.**
- **The responsible hospital or institution shall carry out all cleaning and disinfection procedures specified in this chapter.**

CAUTION

- **Never immerse any part of the equipment or accessories in liquids or allow liquid to enter the interior.**
- **Any contact of cleaners or disinfectants with connectors or metal parts may cause corrosion.**
- **Do not pour or spray any liquid directly on the equipment or accessories or permit fluid to seep into connections or openings.**
- **If you spill liquid on the equipment or accessories, disconnect the power supply, dry the equipment, and contact your service personnel.**
- **Never use abrasive materials (such as steel wool or silver polish), or erosive cleaners (such as acetone or acetone-based cleaners).**
- **Dilute and use the cleaners or disinfectants according to the manufacturer's instructions.**
- **Check the equipment after cleaning and disinfecting. If there is any sign of damage, remove it from use.**

25.3 Cleaning the Equipment and Mounting Kits

Clean the monitor, parameter modules, Modular Rack, Dock, MRV Pod, MRV Pod Components, folding hook, monitor handle, and bedrail hook on a regular basis. Before cleaning, consult your hospital's regulations.

To clean these equipment and mounting kits, follow this procedure:

1. Dampen a soft lint-free cloth with water or ethanol (70%).
2. Wring excess liquid from the cloth.
3. Wipe the display screen.
4. Wipe the external surface of the equipment or mounting kits with the damp cloth, avoiding the connectors and metal parts.
5. Dry the surface with a clean cloth. Allow the equipment and mounting kits air dry in a ventilated and cool place.

CAUTION

- **During the cleaning procedure, disable the touch operation by switching off the monitor or locking the touchscreen.**
- **Any contact of cleaners or disinfectants with connectors or metal parts may cause corrosion.**

25.4 Disinfecting the Equipment and Mounting Kits

Disinfect the monitor, parameter modules, Modular Rack, Dock, MRV Pod, MRV Pod Components, folding hook, monitor handle, and bedrail hook as required in your hospital's servicing schedule. Cleaning the equipment and mounting kits before disinfecting is recommended. Always dilute and use disinfectants according to the manufacturer's instructions. The following table lists approved disinfectants:

Product Name	Product Type	Manufacturer
Alpet® D2 Surface Sanitizing Wipes	Wipes	BEST SANITIZERS INC™.
CIDEX® OPA	Liquid	Gilag GmbH International Advanced Sterilization products
Clorox Dispatch® Hospital Cleaner Disinfectant Towels with Bleach	Wipes	Clorox professional products company
Clorox Healthcare® Bleach Germicidal Wipes	Wipes	Clorox professional products company
Clorox Healthcare® Hydrogen Peroxide Cleaner Disinfectant Wipes	Wipes	Clorox professional products company
Diversey Oxivir® TB Wipes	Wipes	Diversey Inc
Metrex CaviCide1™	Liquid, spray	METERX® RESEARCH
Metrex CaviWipes™	Wipes	METERX® RESEARCH
PDI Sani-Cloth® AF3 Germicidal Disposable Wipe	Wipes	PDI Inc.
PDI Sani-Cloth® Bleach Germicidal Disposable Wipe	Wipes	PDI Inc.
PDI Sani-Cloth® HB Germicidal Disposable Wipe	Wipes	PDI Inc.
PDI Sani-Cloth® Plus Germicidal Disposable Cloth	Wipes	PDI Inc.
PDI Super Sani-Cloth® Germicidal Disposable Wipe	Wipes	PDI Inc.
VIRAGUARD® Hospital Surface Disinfectant Towelettle	Wipes	VERIDIEN corporation
Virex® II 256 (1:256)	Liquid	Diversey Inc
Virex® TB	Liquid, spray	Diversey Inc
JIAN ZHI SU Disinfectant Tablets	Tablet	Beijing ChangJiangMai Medical Science Technology Co. Ltd
JIAN ZHI SU Surface Disinfectant Spray	Liquid, spray	Beijing ChangJiangMai Medical Science Technology Co. Ltd

Product Name	Product Type	Manufacturer
JIAN ZHI SU Disinfectant, Double-chain Quaternary Ammonium	Liquid	Beijing ChangJiangMai Medical Science Technology Co. Ltd
DIAN'ERKANG Surface Wipes	Wipes	Shanghai Likang Disinfectant Hi-Tech Co., Ltd
DIAN'ERKANG Surface Disinfectant	Liquid	Shanghai Likang Disinfectant Hi-Tech Co., Ltd
DIAN'ERKANG Disinfectant Spray	Liquid, spray	Shanghai Likang Disinfectant Hi-Tech Co., Ltd
Clinell® Universal Wipes	Wipes	GAMA Healthcare Ltd
Clinell ® Sporicidal Wipes	Wipes	GAMA Healthcare Ltd
Tristel Duo™	Liquid, foam	Tristel solutions Limited
Tristel Jet	Liquid, spray	Tristel solutions Limited
Tristel Fuse For Surfaces, 196ppm	Liquid	Tristel solutions Limited
Surfanios Premium, 0.25%	Liquid	ANIOS LABORATORIES
Surfa 'safe	Liquid, spray	ANIOS LABORATORIES
Wip' Anios premium	Wipes	ANIOS LABORATORIES
Aniosurf ND premium, 0.25%	Liquid	ANIOS LABORATORIES
Mikrobac® Tissues	Wipes	BODE Chemie GmbH
Cleanisept® Wipes	Wipes	Dr. Schumacher GmbH
mikrozid® PAA Wipes	Wipes	Schülke & Mayr GmbH
mikrozid® Sensentive Wipes	Wipes	Schülke & Mayr GmbH
Ecolab Incidin® OxyWipe S	Wipes	Ecolab Deutschland GmbH
Glutaraldehyde, 2%	Liquid	/
*Ethanol, 70%	Liquid	/
*Isopropanol, 70%	Liquid	/
*Sodium hypochlorite bleach, 0.5%	Liquid	/
*Hydrogen peroxide, 3%	Liquid	/
*Rely+On™ Virkon® High Level surface Disinfectant, 1%	Powder	Antec International Ltd
*1-Propanol, 50%	Liquid	/
*Descosept® forte	Liquid	Dr. Schumacher GmbH
*Descosept® AF	Liquid	Dr. Schumacher GmbH
*Dismozon® plus, 0.4%	Powder	BODE Chemie GmbH
*mikrozid® AF Wipes	Wipes	Schülke & Mayr GmbH

Product Name	Product Type	Manufacturer
*Terralin® Liquid	Liquid	Schülke & Mayr GmbH
*Perform® Classic Concentrate OXY, 0.5%	Powder	Schülke & Mayr GmbH

NOTE

- **For equipment with the symbol , all the listed cleaners and disinfectants are available for use. For equipment without this symbol, only the cleaners and disinfectants marked with "*" are available for use.**

25.5 Cleaning and Disinfecting the Accessories

To clean and disinfect the following accessories, using cleansers, disinfectants, and methods described in this manual:

- NIBP air hose
- Mindray SpO_2 cable
- Masimo SpO_2 cable
- Nellcor SpO_2 cable

For other accessories, consult instructions for use delivered with the accessories.

CAUTION

- **Fluids entering the NIBP air hose can damage the equipment. When cleaning or disinfecting the NIBP air hose, prevent liquid from entering the hose.**
- **Periodically inspect the NIBP air hose and connector for signs of wear or deterioration after cleaning or disinfecting the NIBP air hose. Replace the NIBP air hose if you detect a leak. Dispose of damaged NIBP air hose according to local laws for disposal of hospital waste.**
- **Never immerse or soak the accessories in any liquid.**
- **Never clean or disinfect the connectors and metal parts.**
- **Use only Mindray approved cleaners and disinfectants and methods listed in this section to clean or disinfect the accessories. Warranty does not cover damage caused by unapproved substances or methods.**
- **To avoid long term damage, the accessories should be disinfected only when necessary as determined by your hospital's policy.**

25.5.1 Cleaning the Accessories

You should clean the accessories on a regular basis. Before cleaning the accessories, consult your hospital's regulations for cleaning the accessories.

To clean the accessories, follow this procedure:

1. Clean the accessories with a soft cloth moistened with water or ethanol (70%).
2. Wipe off all the cleaner residue with a dry cloth.
3. Allow the accessories to air dry.

25.5.2 Disinfecting the Accessories

We recommend that the accessories should be disinfected only when necessary as determined by your hospital's policy. Cleaning the accessories before disinfecting is recommended.

25.5.2.1 Disinfectants for the NIBP Air Hose (CM1903 and CM1911)

The following table lists approved disinfectants for the NIBP air hoses (CM1903 and CM1911):

Product Name	Product Type	Manufacturer
Alpet® D2 Surface Sanitizing Wipes	Wipes	BEST SANITIZERS INC™.
CIDEX® OPA	Liquid	Gilag GmbH International Advanced Sterilization products
Clorox Dispatch® Hospital Cleaner Disinfectant Towels with Bleach	Wipes	Clorox professional products company
Metrex CaviCide1™	Liquid, spray	METERX® RESEARCH
Metrex CaviWipes™	Wipes	METERX® RESEARCH
PDI Sani-Cloth® AF3 Germicidal Disposable Wipe	Wipes	PDI Inc.
PDI Sani-Cloth® Plus Germicidal Disposable Wipe	Wipes	PDI Inc.
PDI Super Sani-Cloth® Germicidal Disposable Wipe	Wipes	PDI Inc.
VIRAGUARD® Hospital Surface Disinfectant Towelettle	Wipes	VERIDIEN corporation
Virex® TB	Liquid, spray	Diversey Inc
Clinell® Universal Wipes	Wipes	GAMA Healthcare Ltd
Surfa 'safe	Liquid, spray	ANIOS LABORATORIES
Aniosurf ND premium, 0.25%	Liquid	ANIOS LABORATORIES
mikrozid® Tissues	Wipes	Schülke & Mayr GmbH
Glutaraldehyde, 2%	Liquid	/
Ethanol, 70%	Liquid	/
Isopropanol, 70%	Liquid	/
Rely+On™ Virkon® High Level surface Disinfectant, 1%	Powder	Antec International Ltd
1-Propanol, 50%	Liquid	/

25.5.2.2 Disinfectants for the SpO_2 Cable

The following table lists approved disinfectants for the Mindray and Nellcor SpO_2 cables:

Product Name	Product Type	Manufacturer
CIDEX® OPA	Liquid	Gilag GmbH International Advanced Sterilization products
Clorox Dispatch® Hospital Cleaner Disinfectant Towels with Bleach	Wipes	Clorox professional products company
Clorox Healthcare® Bleach Germicidal Wipes	Wipes	Clorox professional products company
Clorox Healthcare® Hydrogen Peroxide Cleaner Disinfectant Wipes	Wipes	Clorox professional products company
Diversey Oxivir® TB Wipes	Wipes	Diversey Inc

Product Name	Product Type	Manufacturer
PDI Super Sani-Cloth® Germicidal Disposable Wipe	Wipes	PDI Inc.
VIRAGUARD® Hospital Surface Disinfectant Towelettle	Wipes	VERIDIEN corporation
Virex® TB	Liquid, spray	Diversey Inc
Glutaraldehyde, 2%	Liquid	/
Ethanol, 70%	Liquid	/
Isopropanol, 70%	Liquid	/
Sodium hypochlorite bleach, 0.5%	Liquid	/
Hydrogen peroxide, 3%	Liquid	/
Rely+On™ Virkon® High Level surface Disinfectant, 1%	Powder	Antec International Ltd
1-Propanol, 50%	Liquid	/

The following table lists approved Masimo SpO_2 cable cleaning and disinfecting agents:

Product Name	Product Type	Active Ingredients
Isopropanol	Liquid	Isopropanol 70%

25.5.2.3 Disinfectants for the MRV Pod parameter accessories

For the Temp probe(MR403BS) and NIBP cuff(CM1203A and CM1203B), consult instructions for use delivered with the accessories.

Approved disinfectants for the other parameter accessories are same with the MRV Pod, except the Nellcor SpO_2 and Masimo SpO_2 Cable connector.

Approved disinfectants for the Nellcor SpO_2 Cable connector are same with the Nellcor SpO_2 cable 572A.
Approved cleaning and disinfecting agents for the Masimo SpO_2 Cable connector are as follows:

Product Name	Product Type	Active Ingredients
Isopropanol	Liquid	Isopropanol 70%

25.6 Sterilization

Do not sterilize the monitor, MRV Pod, MRV Pod components, accessories, or supplies unless otherwise specified in the instructions for use delivered with the accessories and supplies.

25.7 Impact of Improper Cleaning

Using cleaners other than those recommended may have the following impact:

- Product discoloration
- Metal part corrosion
- Brittle and breaking wires, connectors, and equipment housing
- Reduced cable and leadwire life
- Overall system performance degradation
- Equipment malfunction or failure

26 Maintenance

26.1 Maintenance Introduction

Regular maintenance is essential to ensure that the equipment functions properly. This chapter contains information on periodic testing and maintenance.

26.2 Maintenance Safety Information

WARNING

- **To avoid electric shock, stop using N1 if you find the housing of N1 has signs of broken. Contact the service personnel for help in that case.**
- **Follow the maintenance and testing schedule or local regulations to perform testing and maintenance.Not implementing the maintenance schedule may cause equipment failure and possible health hazards.**
- **No modification of this equipment is allowed.**
- **This equipment contains no user serviceable parts.**
- **The safety checks or maintenance involving any disassembly of the equipment should be performed by professional service personnel. Otherwise, undue equipment failure and possible health hazards could result.**
- **Do not open batteries, heat batteries to above 60 °C, incinerate batteries, or short the battery terminals. Batteries may ignite, explode, leak or heat up, causing personal injury.**
- **The service personnel must be properly qualified and thoroughly familiar with the operation of the equipment.**

CAUTION

- **The equipment and accessories shall not be served or maintained while in use with a patient.**
- **If a problem occurs to the equipment, contact the service personnel.**
- **Use and store the equipment within the specified temperature, humidity, and altitude ranges.**
- **When disposing of the packaging material, be sure to observe the applicable waste control regulations and keep it out of children's reach.**
- **At the end of its service life, the equipment, as well as its accessories, must be disposed of in compliance with the guidelines regulating the disposal of such products. If you have any questions concerning disposal of the equipment, please contact Mindray.**

NOTE

- **If needed, contact the manufacture for circuit diagrams, component part lists, descriptions, calibration instructions, or other information concerning the repair of the equipment.**

26.3 Maintenance and Testing Schedule

Follow the maintenance and testing schedule or local regulations to perform testing and maintenance. Make sure to clean and disinfect the equipment before taking any tests and maintenance.

The following table lists the maintenance and testing schedule:

Test/Maintenance Item		Recommended Frequency
Performance Tests		
Visual inspection		Every day, before first use.
Measurement module performance test and calibration		1. If you suspect that the measurement values are incorrect. 2. Follow any repairs or replacement of relevant module. 3. Once a year for the Sidestream CO_2 tests. 4. For Microstream™ CO_2 modules, initially calibrate after 1,200 operating hours, then once a year or after 4,000 operating hours, whichever comes first.5. Once every two years for other parameter module performance tests.
Analog output test		If you suspect that the analog output function does not work properly.
Defibrillation synchronization test		If you suspect that the defibrillation synchronization function does not work properly.
Electrical Safety Tests		
Electrical safety tests		Once every two years.
Other Tests		
Power-on test		Before use.
Network printer tests		1. When first installed. 2.Followany repair or replacement of the printer.
Battery check	Functionality test	1. When first installed. 2. When battery is replaced.
	Performance test	Every three months or if the battery runtime reduced significantly.

26.4 Checking Version Information

You may be asked for information on monitor and module version.

To view system software version information, select the **Main Menu** quick key →from the **System** column select **Version**.

You can check system software version, module hardware and software version, and firmware version. For more information, see*23.13 The Version Settings*.

26.5 Testing Methods and Procedures

Except the following maintenance tasks, all other test and maintenance tasks should be performed by Mindray-qualified service personnel only.

- Regular check, including visual inspection and power-on test
- Printer tests
- Battery check

If your monitor needs a safety test and performance test, contact the service personnel.

26.5.1 Performing Visual Inspection

Visually inspect the equipment before its first used every day. If you find any signs of damage, remove your monitor from use and contact the service personnel.

Verify that the equipment meets the following requirements:

- Environment and power supply specifications are met.
- The monitor housing and display screen are free from cracks or other damage.
- The power cord is not damaged and the insulation is in good condition.
- Connectors, plugs, and cables are not damaged and kinked.
- Power cord and patient cables are securely connected with the equipment and modules.

26.5.2 Performing Power-on Test

The monitor automatically performs a selftest at startup. Check the following items for the power-on test:

- The equipment powers on properly.
- The alarm system works properly.
- The monitor displays properly.

26.5.3 Testing the Network Printer

To check the printer, follow this procedure:

1. Start a printing task to print waveforms and reports.
2. Check that the printer is properly connected and functions correctly.
3. Check that the printout is clear without missing dots.

26.5.4 Checking the Battery

For information on battery check, see *24.6.2 Checking Battery Performance*.

26.6 Disposing of the Monitor

Dispose of the monitor and its accessories when its service life is reached. Follow local regulations regarding the disposal of such products.

WARNING

- **Unless otherwise specified, dispose of parts and accessories in accordance with local regulations regarding disposal of hospital waste.**

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27 Accessories

The accessories listed in this chapter comply with the requirements of IEC 60601-1-2 when in use with the patient monitor. The accessory material that contacts the patients has undertaken the bio-compatibility test and is verified to be in compliance with ISO 10993-1. For details about the accessories, refer to the instructions for use provided with the accessory.

WARNING

- **Use accessories specified in this chapter. Using other accessories may cause damage to the monitor or not meet the claimed specifications.**
- **Single use accessories are not designed to be reused. Reuse may cause a risk of contamination and affect the measurement accuracy.**

CAUTION

- **The accessories may not meet the performance specifications if stored or used outside the specified temperature and humidity ranges. If accessory performance is degraded due to aging or environmental conditions, contact your service personnel.**
- **Check the accessories and their packages for any sign of damage. Do not use them if any damage is detected.**
- **Use the accessories before the expiry date if their expiry date is indicated.**
- **The disposable accessories shall be disposed of according to hospital's regulations.**

27.1 ECG Accessories

27.1.1 ECG Electrodes

Model	PN	Description	Applicable patient
31499224	0010-10-12304	Electrode, Kendall, 10 pcs/package	Adult
2245-50	9000-10-07469	Electrode 3M, 50 pcs/package	Pediatric
1050NPSMKittycat	0681-00-0098-01	NEO Pre-wired Electrode radio Opaque	Neonate
1051NPSMKittycat	0681-00-0098-02	NEO Pre-wired Electrode radio Translucent	Neonate
SF06	040-002711-00	Electrode, 5 pcs/package	Adult
SF07	040-002833-00	Electrode, Intco	Pediatric, neonate
31.1245.21	900E-10-04880	Electrode, Kendall, 50 pcs/package	Neonate
EMG-SN10-20×20	040-003254-00	NEO Pre-wired Electrode radio Translucent, AHA, disposable	Neonate

27.1.2 12-Pin Trunk Cables

Model	PN	Description	Applicable patient
EV6201	0010-30-42719 009-004728-00	ECG cable,12-pin, 3/5-lead, defibrillation-proof AHA/IEC	Adult, pediatric
EV6202	0010-30-42720	ECG cable,12-pin, 3-lead, defibrillation-proof, AHA/IEC	Neonate, infant

Model	PN	Description	Applicable patient
EV6203	0010-30-42721	ECG cable, 12-lead, defibrillation-proof, AHA	Adult
EV6204	0010-30-42722	ECG cable, 12-lead, defibrillation-proof, IEC	Adult
EV6211	0010-30-42723	ECG cable, 12-pin, 3/5-lead, ESU-proof, AHA/IEC	Adult, pediatric
EV6212	0010-30-42724	ECG cable, 12-pin, 3-lead, ESU-proof, AHA/IEC	Neonate, infant
EV6222	040-000754-00	ECG cable, 12-pin, 3-lead, defibrillation-proof, DIN connector	Neonate
EV6206	009-005266-00	ECG cable, defibrillation-proof, 3.1 m, T/N series	Adult, pediatric
EV6216	009-005268-00	ECG cable, ESU-proof, 3.1 m, T/N series	Adult, pediatric
EV6205	040-001416-00	ECG cable, 12-pin, 3/5-lead, defibrillation-proof (DS)	Adult, pediatric
EV6213	009-003652-00	ECG cable, 12-pin, 3/5-lead, ESU-proof, (DS)	Adult, pediatric

27.1.3 3-lead ECG Leadwires

Model	PN	Description	Length	Applicable patient
EL6305A	0010-30-42896	ECG leadwires, 3-lead, AHA, clip, long	1 m	Neonate, infant
EL6306A	0010-30-42897	ECG leadwires, 3-lead, IEC, clip, long	1 m	Neonate, infant
EL6303A	0010-30-42731	ECG leadwires, 3-lead, AHA, clip, long	1 m	Adult, pediatric
EL6304A	0010-30-42732	ECG leadwires, 3-lead, IEC, clip, long	1 m	Adult, pediatric
EL6301B	0010-30-42734	ECG leadwires, 3-lead, AHA, snap, long	1 m	Adult, pediatric
EL6302B	0010-30-42733	ECG leadwires, 3-lead, IEC, snap, long	1 m	Adult, pediatric
EL6311B	040-000146-00	ECG leadwires, 3-lead, AHA, snap, long, disposable	1 m	Neonate, infant
EL6312B	040-000147-00	ECG leadwires, 3-lead, IEC, snap, long, disposable	1 m	Neonate, infant
EL6311A	040-000148-00	ECG leadwires, 3-lead, AHA, snap, long, disposable	1 m	Neonate, infant
EL6312A	040-000149-00	ECG leadwires, 3-lead, IEC, snap, long, disposable	1 m	Neonate, infant

27.1.4 5-lead ECG Leadwires

Model	PN	Description	Length	Applicable patient
EL6503A	0010-30-42729	ECG leadwires, 5-lead, AHA, clip, long	1 to 1.4 m	Adult, pediatric
EL6504A	0010-30-42730	ECG leadwires, 5-lead, IEC, clip, long	1 to 1.4 m	Adult, pediatric
EL6501B	0010-30-42735 009-004729-00	ECG leadwires, 5-lead, AHA, snap	1 to 1.4 m	Adult, pediatric
EL6502B	0010-30-42736 009-004730-00	ECG leadwires, 5-lead, IEC, snap	1 to 1.4 m	Adult, pediatric

27.1.5 6-lead ECG Leadwires

Model	PN	Description	Length	Applicable patient
EY6601B	009-004794-00	ECG leadwires, 6-lead, AHA, snap, 24 inches	24 inches	Adult, pediatric
EY6602B	009-004795-00	ECG leadwires, 6-lead, AHA, snap, 36 inches	36 inches	Adult, pediatric
EY6603B	009-004796-00	ECG leadwires, 6-lead, IEC, snap, 24 inches	24 inches	Adult, pediatric
EY6604B	009-004797-00	ECG leadwires, 6-lead, IEC, snap, 36 inches	36 inches	Adult, pediatric
EY6601A	009-004798-00	ECG leadwires, 6-lead, AHA, clip, 24 inches	24 inches	Adult, pediatric
EY6602A	009-004799-00	ECG leadwires, 6-lead, AHA, clip, 36 inches	36 inches	Adult, pediatric
EY6603A	009-004800-00	ECG leadwires, 6-lead, IEC, clip, 24 inches	24 inches	Adult, pediatric
EY6604A	009-004801-00	ECG leadwires, 6-lead, IEC, clip, 36 inches	36 inches	Adult, pediatric

27.1.6 12-lead ECG Leadwires

Model	PN	Description	Length	Applicable patient
EL6801A	0010-30-42902	ECG leadwires, 12-lead, limb lead, AHA, clip	0.8 m	Adult
EL6803A	0010-30-42904	ECG leadwires, 12-lead, chest lead, AHA, clip	0.6 m	Adult
EL6802A	0010-30-42903	ECG leadwires, 12-lead, limb lead, IEC, clip	0.8 m	Adult
EL6804A	0010-30-42905	ECG leadwires, 12-lead, chest lead, IEC, clip	0.6 m	Adult
EL6801B	0010-30-42906	ECG leadwires, 12-lead, limb lead, AHA, snap	0.8 m	Adult
EL6803B	0010-30-42908	ECG leadwires, 12-lead, chest lead, AHA, snap	0.6 m	Adult
EL6802B	0010-30-42907	ECG leadwires, 12-lead, limb lead, IEC, snap	0.8 m	Adult
EL6804B	0010-30-42909	ECG leadwires, 12-lead, chest lead, IEC, snap	0.6 m	Adult

27.2 SpO_2 Accessories

Wavelength emitted by the sensors is between 600 nm and 1000 nm. The maximum photic output consumption of the sensor is less than 18 mW.

The information about the wavelength range and maximum photic output consumption can be especially useful to clinicians, for example, when photodynamic therapy is performed.

27.2.1 Extension Cables

Model	Part No.	Description	Applicable patient
562A	0010-20-42710 009-004600-00	7-pin, Mindray	All
572A	0010-20-42712	8-pin, Nellcor	All
582A	040-000332-00	8-pin, Masimo	All

Model	Part No.	Description	Applicable patient
583A	040-005973-00	8-pin, Masimo (RD SET)	All

Note: If you need to purchase Masimo sensors, please contact Masimo.

27.2.2 Mindray SpO_2 Sensors

Model	PN	Description	Applicable patient	Application site
512F	512F-30-28263	Reusable SpO_2 sensor	Adult	Finger
512H	512H-30-79061	Reusable SpO_2 sensor	Pediatric	Finger
512E	512E-30-90390	Reusable SpO_2 sensor	Adult	Finger
512G	512G-30-90607	Reusable SpO_2 sensor	Pediatric	Finger
518B	518B-30-72107	Reusable SpO_2 sensor	Neonate	Foot
520A	009-005087-00	Disposable SpO_2 sensor	Adult	Finger
520P	009-005088-00	Disposable SpO_2 sensor	Pediatric	Finger
520I	009-005089-00	Disposable SpO_2 sensor	Infant	Toe
520N	009-005090-00	Disposable SpO_2 sensor	Adult, Neonate	Finger, foot
521A	009-005091-00	Disposable SpO_2 sensor	Adult	Finger
521P	009-005092-00	Disposable SpO_2 sensor	Pediatric	Finger
521I	009-005093-00	Disposable SpO_2 sensor	Infant	Toe
521N	009-005094-00	Disposable SpO_2 sensor	Neonate	Foot
518C	040-000330-00	Reusable SpO_2 sensor	Neonate	Foot
518C	115-004895-00	Disposable bandage, for 518C SpO_2 sensor	Neonate	/
513A	115-033848-00	Reusable SpO_2 sensor	Adult, pediatric	Ear
518BLH	115-050154-00	Reusable SpO_2 sensor	Neonate	Foot
512K	115-056388-00	Reusable SpO_2 sensor	Pediatric	Finger, toe

27.2.3 Nellcor SpO_2 Sensors

Model	PN	Description	Applicable patient	Application site
DS100A	9000-10-05161	Reusable SpO_2 sensor	Adult	Finger
OXI-P/I	9000-10-07308	Reusable SpO_2 sensor	Pediatric, infant	Finger
OXI-A/N	9000-10-07336	Reusable SpO_2 sensor	Adult, neonate	Finger, foot
MAXAI	0010-10-12202	Disposable SpO_2 sensor	Adult (>30 kg)	Finger
MAXPI	0010-10-12203	Disposable SpO_2 sensor	Pediatric (10 - 50Kg)	Finger
MAXII	0010-10-12204	Disposable SpO_2 sensor	Infant (3 - 20Kg)	Toe
MAXNI	0010-10-12205	Disposable SpO_2 sensor	Neonate (<3 kg), adult (>40 kg)	Foot Finger

27.3 Temp Accessories

27.3.1 Temp Cable

Model	Part No.	Description	Applicable patient
MR420B	040-001235-00	2-pin extension cable	All

27.3.2 Temp Probes

Model	Part No.	Description	Applicable patient
MR401B	0011-30-37392	Reusable temperature probe, esophageal	Adult
MR402B	0011-30-37394	Reusable temperature probe, esophageal	Pediatric, infant
MR403B	0011-30-37393	Reusable temperature probe, skin	Adult
MR404B	0011-30-37395	Reusable temperature probe, skin	Pediatric, infant
MR411	040-003294-00	Disposable temperature probe, esophageal/rectal, general	All
MR412	040-003295-00	Disposable temperature probe, skin	All

27.3.3 Compatible Temp Accessories

The follow accessories are compatible with the monitor. To purchase these accessories, contact the manufacturer.

Model/PN	Description	Manufacture
F45160	Disposable silicone Foley catheter with temperature sensor, 14Fr, 10 ml, 12pcs/box	Well Lead Medical Co. Ltd.

27.4 NIBP Accessories

27.4.1 NIBP Hoses

Model	Part No.	Description	Applicable patient
CM1903	6200-30-09688	Reusable NIBP hose	Adult, pediatric

27.4.2 NIBP Cuffs

Model	Part No.	Description	Limb Circumference (cm)	Bladder Width (cm)	Applicable patient
CM1200	115-002480-00	Reusable cuff	7 - 13	3.8	Small infant
CM1201	0010-30-12157	Reusable cuff	10 - 19	7.2	Infant
CM1202	0010-30-12158	Reusable cuff	18 - 26	9.8	Pediatric
CM1203	0010-30-12159	Reusable cuff	24 - 35	13.1	Adult
CM1204	0010-30-12160	Reusable cuff	33 - 47	16.5	Large adult
CM1205	0010-30-12161	Reusable cuff	46 - 66	20.5	Adult thigh

Model	Part No.	Description	Limb Circumference (cm)	Bladder Width (cm)	Applicable patient
CM1300	040-000968-00	Reusable cuff, bladderless	7 - 13	3.8	Small infant
CM1301	040-000973-00	Reusable cuff, bladderless	10 - 19	7.2	Infant
CM1302	040-000978-00	Reusable cuff, bladderless	18 - 26	9.8	Pediatric
CM1303	040-000983-00	Reusable cuff, bladderless	25 - 35	13.1	Adult
CM1304	040-000988-00	Reusable cuff, bladderless	33 - 47	16.5	Large adult
CM1305	040-000993-00	Reusable cuff, bladderless	46 - 66	20.5	Adult thigh
CM1306	115-015930-00	Reusable cuff, bladderless	24 - 35	13.1	Adult
CM1307	115-015931-00	Reusable cuff, bladderless	33 - 47	16.5	Large adult
CM1501	001B-30-70697	NIBP cuff, single patient use, 10 pcs/box	10 to 19	7.2	Infant
CM1502	001B-30-70698	NIBP cuff, single patient use, 10 pcs/box	18 to 26	9.8	Pediatric
CM1503	001B-30-70699	NIBP cuff, single patient use, 10 pcs/box	25 to 35	13.1	Adult
CM1504	001B-30-70700	NIBP cuff, single patient use, 10 pcs/box	33 to 47	16.5	Adult
CM1505	001B-30-70701	NIBP cuff, single patient use, 10 pcs/box	46 to 66	20.5	Adult thigh
CM1506	115-016969-00	NIBP cuff, single patient use, 10 pcs/box	25 to 35	13.1	Adult
CM1507	115-016970-00	NIBP cuff, single patient use, 10 pcs/box	33 to 47	16.5	Adult
CM1500A	001B-30-70692* 125-000051-00	NIBP cuff, single patient use, size 1, 20 pcs/box	3.1 to 5.7	2.2	Neonate
CM1500B	001B-30-70693* 125-000052-00	NIBP cuff, single patient use, size 2, 20 pcs/box	4.3 to 8.0	2.9	Neonate
CM1500C	001B-30-70694* 125-000053-00	NIBP cuff, single patient use, size 3, 20 pcs/box	5.8 to 10.9	3.8	Neonate
CM1500D	001B-30-70695* 125-000054-00	NIBP cuff, single patient use, size 4, 20 pcs/box	7.1 to 13.1	4.8	Neonate
CM1500E	001B-30-70696* 125-000055-00	NIBP cuff, single patient use, size 5, 20 pcs/box	8 to 15	5.4	Neonate

***Use with the CM1901 NIBP hose (PN: 6200-30-11560).**

27.5 IBP Accessories

27.5.1 IBP Accessories

Model	Part No.	Description	Applicable patient
IM2202	001C-30-70757	12-pin IBP cable, Argon	All
DT-4812	6000-10-02107	IBP transducer, disposable, Argon	All
682275	0010-10-12156	Transducer/Manifold Mount, Argon	All
IM2201	001C-30-70759	12 Pin IBP cable, ICU Medical	All
42584	0010-10-42638	IBP transducer, disposable, ICU Medical	All
42602	M90-000133---	Steady Rest for IBP Transducer and Clamp, ICU Medical	All
42394	M90-000134---	Steady Rest for IBP Transducer and Clamp, ICU Medical	All
IM2211	0010-21-12179	12 Pin IBP cable, for Edwards, reusable	All
IM2206	115-017849-00	12 Pin IBP cable, for Utah, reusable	All
IM2207	0010-21-43082	12 Pin IBP Cable, for Memscap,SP844 82031 transducer, reusable	All
IM2213	0010-30-43055	IBP adapter cable (12-pin to 6-pin), reusable	All

27.5.2 ICP Accessories

Model	Part No.	Description	Applicable patient
82-6653	040-002336-00	ICP sensor kit, disposable	/
CP12601	009-005460-00	12-pin ICP cable	/

27.6 PiCCO Accessories

Model	Part No.	Description	Applicable patient
CO7701	040-000816-00	12-pin PiCCO cable	/
PC80105	040-000817-00	2Pin TI sensor cable	/
PV2015L20N	040-000921-00	Arterial thermodilution catheter, disposable	Adult
PV2013L07N	040-000922-00	Arterial thermodilution catheter, disposable	Pediatric
IM2203	040-000815-00	12-pin IBP Y cable, reusable	/
IM2212	040-002827-00	12-pin AP&CVP cable, reusable	/
IM2211	0010-21-12179	Edward: IBP Truwave Reusable Cable	/
IM2201	001C-30-70759	12 Pin IBP cable (for ICU Medical)	/
IM2202	001C-30-70757	12 Pin IBP cable (for BD)	/
PMK-37	040-002903-00	PiCCO monitoring plate	/
PV8215	040-002899-00	PiCCO monitoring kits, disposable	/
PV8115	040-000918-00	PiCCO monitoring kits, disposable	/

27.7 CO_2 Accessories

27.7.1 Sidestream CO_2 Accessories

Model	Part No.	Description	Applicable patient
4000	M02A-10-25937	Nasal CO_2 sample cannula, disposable	Adult
4100	M02A-10-25938	Nasal CO_2 sample cannula, disposable	Pediatric
4200	M02B-10-64509	Nasal CO_2 sample cannula, disposable	Neonate
60-15200-00	9200-10-10533	Airway sampling line, disposable	Adult, pediatric
60-15300-00	9200-10-10555	Airway sampling line, disposable	Neonate
60-14100-00	9000-10-07486	Airway adapter, straight, disposable	/
040-001187-00	040-001187-00	Airway adapter, disposable	Neonate
60-14200-00	9000-10-07487	Airway adapter, elbow, disposable	/
100-000080-00	100-000080-00	Watertrap, DRYLINE II, reusable	Adult, pediatric
100-000081-00	100-000081-00	Watertrap, DRYLINE II, reusable	Neonate
/	045-003134-00	CO_2 adapter	/

27.7.2 Microstream™ CO_2 Accessories

Model	Part No.	Description	Usage	Applicable patient
MVAI	0010-10-42560	Adult-Pediatric Intubated CO2 FilterLine	Disposable	Adult, pediatric
MVAIH	0010-10-42561	Adult-Pediatric Intubated CO2 FilterLine	Disposable	Adult, pediatric
MVIIH	0010-10-42562	Neonatal-Infant Intubated CO2 FilterLine	Disposable	Neonate
MVAIL	0010-10-42563	Adult-Pediatric Intubated CO2 FilterLine	Disposable	Adult, pediatric
MVAIHL	0010-10-42564	Adult-Pediatric Intubated CO2 FilterLine	Disposable	Adult, pediatric
MVIIHL	0010-10-42565	Neonatal-Infant Intubated CO2 FilterLine	Disposable	Neonate
MVA	0010-10-42566	Adt Oral-Nasal CO2 FilterLine	Disposable	Adult
MVP	0010-10-42567	Ped Oral-Nasal CO2 FilterLine	Disposable	Pediatric
MVAO	0010-10-42568	Adt Oral-Nasal CO2 FilterLine w/O2	Disposable	Adult
MVPO	0010-10-42569	Ped Oral-Nasal CO2 FilterLine w/O2	Disposable	Pediatric
MVAOL	0010-10-42570	Adt Oral-Nasal CO2 FilterLine w/O2 L	Disposable	Adult
MVPOL	0010-10-42571	Ped Oral-Nasal CO2 FilterLine w/O2 L	Disposable	Pediatric
MVANH	0010-10-42572	Adult Nasal CO2 FilterLine	Disposable	Adult
MVINH	0010-10-42574	Neo-Inf Nasal CO2 FilterLine H	Disposable	Neonate
MVANOH	0010-10-42575	Adt Nasal CO2 FilterLine w/O2 H	Disposable	Adult
MVPNOH	0010-10-42576	Ped Nasal CO2 FilterLine w/O2 H	Disposable	Pediatric
MVAN	0010-10-42577	Adult Nasal CO2 FilterLine	Disposable	Adult
MVPN	0010-10-42578	Pediatric Nasal CO2 FilterLine	Disposable	Pediatric

27.7.3 Mainstream CO_2 Accessories (Respironics)

Model	Part No.	Description	Applicable patient
6063	0010-10-42662	Airway adapter, disposable	Adult, pediatric
6421	0010-10-42663	Airway adapter, disposable, with mouthpiece	Adult, pediatric
6312	0010-10-42664	Airway adapter, disposable	Pediatric, neonate
7007	0010-10-42665	Airway adapter, reusable	Adult, pediatric
7053	0010-10-42666	Airway adapter, reusable	Neonate
9960LGE	0010-10-42669	Mask, large	Adult
9960STD	0010-10-42670	Mask, standard	Adult
9960PED	0010-10-42671	Mask	Pediatric
6934	0010-10-42667	Cable management straps	/
8751	0010-10-42668	Sensor holding clips	/
1036698	6800-30-50760	CO_2 sensor	/

27.7.4 Mainstream CO_2 Accessories (Mindray)

Model	Part No.	Description	Applicable patient
GA3701	125-000278-00	CO_2 sensor	/
GA3201	040-006828-00	Airway adapter, disposable	Adult, pediatric
GA3202	040-006829-00	Airway adapter, disposable	Pediatric, neonate
GA3211	040-006830-00	Airway adapter, reusable	Adult, pediatric
GA3212	040-006831-00	Airway adapter, reusable	Neonate
GA3801	040-006897-00	Cable management straps, 22 mm, 5 pcs/pack	/
GA3802	040-006898-00	Cable management straps, 10 mm, 5 pcs/pack	/

27.7.5 Compatible Sidestream CO_2 Accessories

The follow accessories are compatible with the monitor. To purchase these accessories, contact the manufacturer.

Model	Description	Applicable patient	Manufacture
4707	Nasal CO_2 sample cannula, with O2, 25 pcs	Adult	Salter Labs
4703	Nasal CO_2 sample cannula, with O2, 25 pcs	Pediatric	Salter Labs
4700	Nasal CO_2 sample cannula, with O2, 25 pcs	Neonate	Salter Labs

27.8 MRV Pod Accessory

Parameter	Model	PN	Description	Applicable patient
ECG and Mindray SpO_2	EA6531BMR	125-000637-00	MRV Pod Cable,3L leadwire (AHA), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EA6532BMR	125-000639-00	MRV Pod Cable,3L leadwire (IEC), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EA6551BMR	125-000640-00	MRV Pod Cable,5L leadwire (AHA), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EA6552BMR	125-000641-00	MRV Pod Cable,5L leadwire (IEC), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EV6201MR	125-000642-00	MRV Pod Cable,3/5L trunk cable, SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EV6202MR	125-000643-00	MRV Pod Cable,3L trunk cable, SpO_2, Reusable	ECG: Neonate SpO_2:All
	EV6203MR	125-000644-00	MRV Pod Cable,12L trunk cable (AHA), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EV6204MR	125-000645-00	MRV Pod Cable,12L trunk cable (IEC), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
ECG and Nellcor SpO_2	EA6531BNC	125-000646-00	MRV Pod Cable,3L leadwire (AHA), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EA6532BNC	125-000647-00	MRV Pod Cable,3L leadwire (IEC), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EA6551BNC	125-000648-00	MRV Pod Cable,5L leadwire (AHA), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EA6552BNC	125-000649-00	MRV Pod Cable,5L leadwire (IEC), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EV6201NC	125-000650-00	MRV Pod Cable,3/5L trunk cable, SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EV6202NC	125-000651-00	MRV Pod Cable,3L trunk cable, SpO_2, Reusable	ECG: Neonate SpO_2:All
	EV6203NC	125-000652-00	MRV Pod Cable,12L trunk cable (AHA), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EV6204NC	125-000653-00	MRV Pod Cable,12L trunk cable (IEC), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All

Parameter	Model	PN	Description	Applicable patient
ECG and Masimo SpO_2	EA6531BMS	125-000654-00	MRV Pod Cable,3L leadwire (AHA), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EA6532BMS	125-000655-00	MRV Pod Cable,3L leadwire (IEC), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EA6551BMS	125-000656-00	MRV Pod Cable,5L leadwire (AHA), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EA6552BMS	125-000657-00	MRV Pod Cable,5L leadwire (IEC), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EV6201MS	125-000658-00	MRV Pod Cable,3/5L trunk cable, SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EV6202MS	125-000659-00	MRV Pod Cable,3L trunk cable, SpO_2, Reusable	ECG: Neonate SpO_2:All
	EV6203MS	125-000660-00	MRV Pod Cable,12L trunk cable (AHA), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
	EV6204MS	125-000661-00	MRV Pod Cable,12L trunk cable (IEC), SpO_2, Reusable	ECG: Adult/pediatric SpO_2:All
IBP and Temp	IM2604T	125-000665-00	MRV Pod extension cable(2Ch IBP+2Ch TEMP)	All
Temp	MR403BS	125-000764-00	Temp probe, Skin(1.5m)	All
IBP	IM2504	125-000664-00	MRV Pod extension cable for 2-Ch IBP	All
	IM2703	125-000759-00	MRV Pod IBP cable (for Edwards)	All
	IM2702	125-000760-00	MRV Pod IBP cable (for BD)	All
	IM2701	125-000761-00	MRV Pod IBP cable (for ICU)	All
	IM2704	125-000762-00	MRV Pod IBP adapter, 4PIN/ 12PIN	All
	IM2706	125-000849-00	MRV Pod IBP cable (for Utah)	All
	IM2705	125-000850-00	MRV Pod IBP cable (for B.Braun)	All
NIBP	CM1203B	125-000629-00	MRV Pod NIBP Cuff, Bag,25-35cm	Adult
	CM1911	040-008263-00	Pneumatic connector(1.8m)	All

Parameter	Model	PN	Description	Applicable patient
Miscellaneous Accessories	/	115-107997-00	MRV Pod Connection cable kit(std)	/
	/	115-107998-00	MRV Pod Connection cable kit(analog output)	/
	VPM01	009-016201-00	V Pod multifunctional cable	/
	VPC01	009-016200-00	V Pod power & communicate cable	
	BH01	044-002759-00	Bedrail hook(MRV Pod)	/
	ORC01	044-002760-00	Operating table clamp(MRV Pod)	/
	IPC01	044-003152-00	Infusion pole clamp (MRV Pod)	/
	/	045-006287-00	MRV Pod Pocket	/
	/	045-006288-00	MRV Pod Rack	/
	/	048-014568-00	MRV Pod Reusable Carry Pouch	/
	/	043-023167-00	Rubber stopper for MRV Pod (IBP and NIBP)	/

MRV Pod Accessory kits

PN	Description
115-108060-00	MRV Pod Sgl-wire Kit(3L Adu/Ped AHA+MR 512E
115-108061-00	MRV Pod Sgl-wire Kit(3L Adu/Ped IEC+MR 512E
115-108062-00	MRV Pod Sgl-wire Kit(5L Adu/Ped AHA+MR 512E
115-108063-00	MRV Pod Sgl-wire Kit(5L Adu/Ped IEC+MR 512E
115-108064-00	MRV Pod Sgl-wire Kit(3L Adu/Ped AHA+NCSpO2)
115-108065-00	MRV Pod Sgl-wire Kit(3L Adu/Ped IEC+NCSpO2)
115-108066-00	MRV Pod Sgl-wire Kit(5L Adu/Ped AHA+NCSpO2)
115-108067-00	MRV Pod Sgl-wire Kit(5L Adu/Ped IEC+NCSpO2)
115-108068-00	MRV Pod Sgl-wire Kit(3L Adu/Ped AHA+MSSpO2)
115-108069-00	MRV Pod Sgl-wire Kit(3L Adu/Ped IEC+MSSpO2)
115-108070-00	MRV Pod Sgl-wire Kit(5L Adu/Ped AHA+MSSpO2)
115-108071-00	MRV Pod Sgl-wire Kit(5L Adu/Ped IEC+MSSpO2)
115-108072-00	MRV Pod MLT-w Kit(3/5L A/P AHA Clip+MR 512E
115-108073-00	MRV Pod MLT-w Kit(3/5L A/P AHA Snap+MR 512E
115-108074-00	MRV Pod MLT-w Kit(3/5L A/P IEC Clip+MR 512E
115-108075-00	MRV Pod MLT-w Kit(3/5L A/P IEC Snap+MR 512E
115-108076-00	MRV Pod MLT-w Kit(12L A/P AHA Clip+MR 512E
115-108077-00	MRV Pod MLT-w Kit(12L A/P AHA Snap+MR 512E
115-108078-00	MRV Pod MLT-w Kit(12L A/P IEC Clip+MR 512E
115-108079-00	MRV Pod MLT-w Kit(12L A/P IEC Snap+MR 512E

PN	Description
115-108080-00	MRV Pod MLT-w Kit(3/5L A/P AHA Clip+NCSpO2)
115-108081-00	MRV Pod MLT-w Kit(3/5L A/P AHA Snap+NCSpO2)
115-108082-00	MRV Pod MLT-w Kit(3/5L A/P IEC Clip+NCSpO2)
115-108083-00	MRV Pod MLT-w Kit(3/5L A/P IEC Snap+NCSpO2)
115-108084-00	MRV Pod MLT-w Kit(12L A/P AHA Clip+NCSpO2)
115-108085-00	MRV Pod MLT-w Kit(12L A/P AHA Snap+NCSpO2)
115-108086-00	MRV Pod MLT-w Kit(12L A/P IEC Clip+NCSpO2)
115-108087-00	MRV Pod MLT-w Kit(12L A/P IEC Snap+NCSpO2)
115-108088-00	MRV Pod MLT-w Kit(3/5L A/P AHA Clip+MSSpO2)
115-108089-00	MRV Pod MLT-w Kit(3/5L A/P AHA Snap+MSSpO2)
115-108090-00	MRV Pod MLT-w Kit(3/5L A/P IEC Clip+MSSpO2)
115-108091-00	MRV Pod MLT-w Kit(3/5L A/P IEC Snap+MSSpO2)
115-108092-00	MRV Pod MLT-w Kit(12L A/P AHA Clip+MSSpO2)
115-108093-00	MRV Pod MLT-w Kit(12L A/P AHA Snap+MSSpO2)
115-108094-00	MRV Pod MLT-w Kit(12L A/P IEC Clip+MSSpO2)
115-108095-00	MRV Pod MLT-w Kit(12L A/P IEC Snap+MSSpO2)
115-114944-00	VPod MLT-w Kit(3L Neo AHA Clip+MR 518BLH
115-114945-00	VPod MLT-w Kit(3L Neo IEC Clip+MR 518BLH
115-108096-00	MRV Pod NIBP kit(1.8m tubing+CM1203 Adu cuf
115-108097-00	MRV Pod NIBP kit(1.8m tubing+CM1303 Adu cuf
115-108098-00	MRV Pod NIBP kit(1.8m tubing+CM1202 Ped cuf
115-108099-00	MRV Pod NIBP kit(1.8m tubing+CM1302 Ped cuf
115-108100-00	MRV Pod NIBP kit(1.8m tubing+CM1203B cuff)
115-108101-00	MRV Pod IBP accessory kit (BD)
115-108102-00	MRV Pod IBP accessory kit (ICU)

27.9 Mount and Mounting Accessories

Model	Part No.	Description
/	045-000924-00	Rolling stand
/	045-000934-00	Keyboard wall mount bracket
/	045-001228-00	Dock wall mount (fix screen/beneview)
/	045-002198-00	Dock install to bracket package (BD)
/	045-000931-00	Wall mount bracket
/	045-001229-00	Screen wall mount bracket
/	045-001230-00	Cross lock
/	115-050757-00	Folding hook

Model	Part No.	Description
/	115-050756-00	Monitor handle
/	115-050759-00	Bedrail hook
Dock-T	115-049411-00	Transport Dock package (Brazilian standard power cord)
Dock-T	115-049404-00	Transport Dock (Brazilian standard power cord)
Dock-T	115-049407-00	Transport Dock package (British standard power cord)
Dock-T	115-049400-00	Transport Dock (British standard, power cord)
Dock-T	115-049408-00	Transport Dock package (European standard power cord)
Dock-T	115-048806-00	Transport Dock (European standard power cord)
Dock-T	115-049409-00	Transport Dock package (South African standard power cord)
Dock-T	115-049402-00	Transport Dock (South African standard power cord)
Dock-T	115-049410-00	Transport Dock package (Swiss standard power cord)
Dock-T	115-049403-00	Transport Dock (Swiss standard power cord)
Dock-T	115-049412-00	Transport Dock package (Chinese standard power cord)
Dock-T	115-049405-00	Transport Dock (Chinese standard power cord)
Dock-T	115-049413-00	Transport Dock package (Australian standard power cord)
Dock-T	115-049406-00	Transport Dock (Australian standard, power cord)
Dock-T	115-049422-00	Transport Dock package (American standard power cord)
Dock-T	115-049423-00	Transport Dock (American standard power cord)
Dock-T	115-049503-00	Transport Dock package (Indian standard power cord)
Dock-T	115-049502-00	Transport Dock (Indian standard power cord)
Dock-T	115-066621-00	Transport Dock package (with DC input)
Dock-T	115-066700-00	Transport Dock (with DC input)
/	115-048417-00	N1 Accessories Storage Box
/	042-020780-00	N1 Accessories Storage Box

27.10 Miscellaneous Accessories

Model	Part No.	Description
/	009-003648-00	Cable protecting tube
/	0010-10-42667	Cable management strap, 5 pcs/pack
/	009-003903-00	Accessory management tape
FSP030-RCAM-G	022-000327-00	AC adapter, 100 - 240 VAC, 50/60 Hz
/	009-001075-00	Power cord, 250 V, 10 A, 3m,Brazilian standard
/	509B-10-05996	Power cord,250V, 10A, 1.6m, Chinese standard
/	DA8K-10-14454	Power cord, European standard
/	DA8K-10-14453	Power cord, British standard
/	DA8K-10-14452	Power cord, American standard
/	0000-10-10903	Power cord, 1.8m, Indian standard
/	009-001791-00	Power cord, 250 V, 16 A, 3m,South African standard

Model	Part No.	Description
/	009-002636-00	Power cord, 10 A, 1.5 m, Australian standard
/	009-007190-00	Power cord, 3m, Indian standard
/	009-007191-00	Power cord, 1.8m, Swiss standard
LI4278	115-033885-00	1D barcode scanner kit, RFID
LI4278	023-001158-00	1D barcode scanner,RFID
HS-1M	115-039575-00	2D barcode scanner kit
HS-1M	023-001286-00	2D barcode scanner
HS-1R	115-039635-00	2D barcode scanner kit, RFID
HS-1R	023-001288-00	2D barcode scanner, RFID
/	023-000248-00	USB Mouse
/	023-000247-00	USB Keyboard
/	023-000525-00	Wired keyboard and mouse
/	023-000524-00	Wireless keyboard and mouse
M202DW	023-001076-00	HP LaserJet Printer (M202dw)
LaserJet Enterprise M605	023-001139-00	HP LaserJet Printer (M605)
LASERJET PRO M203DN, LASERJET PRO M203DW	023-001523-00	HP LaserJet Printer (M203dn)
M608N	023-001566-00	HP LaserJet Printer (M608n)
/	009-005391-00	Analog output cable
/	009-006593-00	Dock cable (2m, for connecting the N series monitor)
/	009-005123-00	Dock cable (4m,for connecting the N series monitor)
/	009-006594-00	Dock cable (10m, for connecting the N series monitor)
/	009-009766-00	Dock cable (20m, for connecting the N series monitor)
/	009-003591-00	Dock cable (1m, for connecting the T series monitor)
/	009-003592-00	Dock cable (4m, for connecting the T series monitor
/	009-005894-00	Dock cable (10m, for connecting the T series monitor)
/	023-001788-00	ELO LCD Display (21.5")
/	023-001129-00	ELO LCD Display (19", 5:4)
/	023-002465-00	ELO LCD Display (15.6")
LI12I003A	115-049427-00	Lithium battery kit (2500mAh, 7.2 V)
LI12I003A	022-000338-00	Lithium battery (2500mAh, 7.2 V)
Rack	115-048150-00	Modular Rack package
Rack	115-048135-00	Modular Rack
Dock	115-048168-00	Dock (with packaging)
Dock	115-048136-00	Dock
Dock	115-048159-00	Dock (with VGA, with packaging)
Dock	115-048137-00	Dock (with VGA)
/	009-010491-00	Adapting cable connecting the BeneVision N1 and BeneView T1 analog out cable

27.11 External Parameter Modules

Model	Part No.	Description
CO2-3	115-037385-00	Sidestream CO_2 module (with packaging)
CO2-3	115-027545-00	Sidestream CO_2 module
CO2-4	115-034095-00	Sidestream CO_2 module (with O_2 sensor, with packaging)
CO2-4	115-027544-00	Sidestream CO_2 module (with O_2 sensor)
CO2-2	115-013200-00	Mainstream CO_2 module (with packaging)
CO2-2	6800-30-50487	Mainstream CO_2 module
CO2-1	115-013201-00	Microstream CO_2 module (with packaging)
CO2-1	6800-30-50558	Microstream CO_2 module
PiCCO	115-013198-00	PiCCO module (with packaging)
PiCCO	115-007270-00	PiCCO module
IBP	6800-30-50850	IBP module (with packaging)
IBP	6800-30-50485	IBP module
BeneVision VP10	115-112333-00	VP10(12L/MR SPO2/NIBP/IBP/TEMP/COM)
BeneVision VP10	115-112335-00	VP10(12L/NC SPO2/NIBP/IBP/TEMP/COM)
BeneVision VP10	115-112336-00	VP10(12L/MS SPO2/NIBP/IBP/TEMP/COM)
BeneVision VP10	115-112337-00	VP10(12L/MR SPO2/NIBP/IBP/TEMP/WIFI)
BeneVision VP10	115-112338-00	VP10(12L/NC SPO2/NIBP/IBP/TEMP/WIFI)
BeneVision VP10	115-112339-00	VP10(12L/NC SPO2/NIBP/IBP/TEMP/WIFI)
BeneVision VP10	115-112340-00	VP10(3/5L/MR SPO2/NIBP/IBP/TEMP/COM)
BeneVision VP10	115-112341-00	VP10(3/5L/NC SPO2/NIBP/IBP/TEMP/COM)
BeneVision VP10	115-112342-00	VP10(3/5L/MS SPO2/NIBP/IBP/TEMP/COM)
BeneVision VP10	115-112344-00	VP10(3/5L/MRSPO2/NIBP/IBP/TEMP/WIFI)
BeneVision VP10	115-112346-00	VP10(3/5L/NCSPO2/NIBP/IBP/TEMP/WIFI)
BeneVision VP10	115-112347-00	VP10(3/5L/MSSPO2/NIBP/IBP/TEMP/WIFI)

A Product Specifications

A.1 Monitor Safety Specifications

The monitor is classified, according to IEC 60601-1: 2020

Degree of protection against electrical shock	Type CF defibrillation proof for ECG, TEMP, IBP, SpO_2, PiCCO, and NIBP Type BF defibrillation proof for CO_2
Type of protection against electrical shock	Class I
Degree of protection against harmful ingress of water	N1 monitor: IP44 (protected against ingress of foreign objects no less than 1.0 mm, and against access to hazardous parts with wire; protect against harmful effects of splashing water) Dock/Modular Rack/AC Adapter: IPX1 (protected against harmful effects of vertically falling water drops) Transport Dock: IP22 (protected against ingress of foreign objects no less than 12.5 mm and against access to hazardous parts with finger; protected against harmful effects of vertically falling water drops with the device tilted at any angle up to 15°) MRV Pod: IP22(connecting accessories)
Degree of protection against hazard of dropping	MRV Pod: No damage by dropping from a height of 1.5 m (six faces)
Degree of safety of application in the presence of flammable anesthetic mixture with air or with oxygen or nitrous oxide	The equipment is not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide
Mode of operation	Continuous

A.2 Physical Specifications

Item	Maximum Weight (kg)	W × H × D (mm)	Comments
N1 main unit	0.95	148.5 × 103 × 81	without internal CO_2 module
N1 main unit	1.17	148.5 × 103 × 81	with internal CO_2 module
Modular Rack	1.55	165 ×130×168	with N1 not configuring the internal CO_2 module
Modular Rack	1.78	165 ×130×168	with N1 configuring the internal CO_2 module
Dock	0.97	190×125×155	/
Transport Dock (with AC input)	2.51	195.5×165×253	with cable box
Transport Dock (with AC input)	1.80	195.5×165×113	without cable box
Transport Dock (with DC input)	1.35	176×165×113	without cable box
BeneVision VP10 (MRV Pod)	0.295	147 × 70 × 28.5	/
V Pocket	0.18	110 × 85 × 55	/
V Rack	0.13	135 × 85 × 55	/
PiCCO module	0.28	136.5 × 40 × 102	/
Mainstream CO_2 module	0.26	136.5 × 40 × 102	/

Item	Maximum Weight (kg)	W × H × D (mm)	Comments
Microstream™ CO_2 module	0.38	136.5 × 40 × 102	/
Sidestream CO_2 module	0.63	136.5 × 40 × 102	with O_2
Sidestream CO_2 module	0.54	136.5 × 40 × 102	without O_2
IBP module	0.26	136.5 × 40 × 102	/

A.3 Environmental Specifications

WARNING

- **The monitor may not meet the performance specifications if stored or used outside the specified temperature and humidity ranges. If the performance of the equipment is degraded due to aging or environmental conditions, contact your service personnel.**
- **When the monitor and related products have differing environmental specifications, the effective range for the combined products is that range which is common to the specifications for all products.**

CAUTION

- **The monitor cannot be transported in the temperature lower than -30°C.**

NOTE

- **The environmental specification of unspecified parameter modules are the same as those of the main unit.**

Components	Item	Operating Condition	Storage Condition
Main Unit/ Transport Dock/AC Adapter	Temperature	0 to 40°C	-30 to 70°C
	Relative humidity (noncondensing)	5% to 95%	5% to 95%
	Barometric	427.5 to 805.5 mmHg (57.0 to 107.4 kPa)	375 to 805.5 mmHg (50 to 107.4 kPa) (with CO_2) 120 to 805.5 mmHg (16.0 to 107.4 kPa) (without CO_2)
Modular Rack/ Dock/MRV Pod	Temperature	0 to 40°C	-20 to 60°C
	Relative humidity (noncondensing)	15% to 95%	10% to 95%
	Barometric	427.5 to 805.5 mmHg (57.0 to 107.4 kPa)	120 to 805.5 mmHg (16.0 to 107.4 kPa)
Microstream™ CO_2 module	Temperature	0 to 40°C	-20 to 60°C
	Relative humidity (noncondensing)	15% to 95%	10% to 95%
	Barometric	430 to 790 mmHg (57.3 to 105.3 kPa)	430 to 790 mmHg (57.3 to 105.3 kPa)
Sidestream CO_2 module	Temperature	5 to 40°C	-20 to 60°C
	Relative humidity (noncondensing)	15% to 95%	10% to 95%
	Barometric	430 to 790 mmHg (57.3 to 105.3 kPa)	375 to 805.5 mmHg (50 to 107.4 kPa)

Components	Item	Operating Condition	Storage Condition
Mainstream CO_2 module	Temperature	0 to 40°C	-20 to 60°C
	Relative humidity (noncondensing)	10% to 90%	10% to 90%
	Barometric	427.5 to 805.5 mmHg (57.0 to 107.4 kPa)	400 to 805.5 mmHg (53.3 to 107.4 kPa)
PiCCO module	Temperature	10 to 40°C	-20 to 60°C
	Relative humidity (noncondensing)	15% to 75%	10% to 90%
	Barometric	427.5 to 805.5 mmHg (57.0 to 107.4 kPa)	120 to 805.5 mmHg (16.0 to 107.4 kPa)
MRV Pod accessories	Temperature	0 to 50°C	-30 to 70°C
	Relative humidity (noncondensing)	15% to 95%	10% to 95%
	Barometric	427.5 to 805.5 mmHg (57.0 to 107.4 kPa)	120 to 805.5 mmHg (16.0 to 107.4 kPa)

Transient operating conditions

The monitor is operated in normal use for a period not less than 20 minutes when moved from room temperature (20°C ± 2°C) to an environment of a temperature range from - 20 °C to 50 °C, and relative humidity range from 15% to 95% (non-condensing).

The monitor is operated in normal use for a period not less than 20 minutes when moved from storage temperature (range from - 30 °C to 70 °C) to room temperature (20°C ± 2°C), and started up within 10 minutes after the movement.

A.4 Power Supply Specifications

A.4.1 External Power Supply Specifications

N1 main unit	
Input voltage	12VDC (±10%)
Input current	2 A
AC Adapter	
Input	100 to 240 VAC (-15%, +10%), 50/60 Hz (±3 Hz), 1.0A to 0.6A
Output	12VDC (±10%), 2.5A
Dock	
Input voltage	100 to 240VAC (±10%)
Input current	0.65A to 0.35A
Frequency	50/60Hz (±3Hz)
Transport Dock (with AC input)	
Input	100 to 240 VAC (-15%, +10%), 50/60 Hz (±3 Hz), 1.0A to 0.6A AC waveform: sine
Output	12VDC (±10%), 2.5A
Transport Dock (with DC input)	
Input	12 VDC (-15%, +25%)/24 VDC (-15%, +25%), 3A

N1 main unit	
Input voltage	12VDC (±10%)
Output	12V(±10%), 2A
MRV Pod input voltage	12 VDC (range: 8 to 13 VDC)

A.4.2 N1 Battery Specifications

Battery type	Rechargeable lithium-Ion battery
Voltage	7.56 VDC, 7.2 VDC (alternative)
Capacity	2500 mAh
Run time	At least 8 hours when the monitor without internal CO_2 module is powered by two new fully-charged batteries at 25°C ± 5°C with factory default screen brightness, Wi-Fi disabled, ECG and SpO_2 cable connected, and auto NIBP measurements at an interval of 15 minutes. At least 3 hours when the monitor with internal CO_2 module is powered by one new fully-charged battery at 25°C ± 5°C with factory default screen brightness, Wi-Fi enabled, CO_2 sampling line connected, Temp, IBP, ECG and SpO_2 cable connected, and auto NIBP measurements at an interval of 15 minutes. Shutdown delay: at least 15 minutes after the low battery alarm first occurs.
Charge time	For the monitor without internal CO_2 module: no more than 6 hours to 90% when the monitor is off. no more than 10 hours to 90% when the monitor is on. For the monitor with internal CO_2 module: no more than 3 hours to 90% when the monitor is off. no more than 5 hours to 90% when the monitor is on.

A.4.3 MRV Pod Battery Specifications

Battery type	Rechargeable lithium-Ion battery
Voltage	3.8 VDC
Capacity	1900 mAh
Run time	At least 4 hour when the monitor is powered by a new fully-charged battery at 25 °C±5 °C and works continuously at the following conditions: • MRV Pod is configured with a 5-lead ECG, SpO_2, 2-channel IBP • NIBP set at an interval of 15 minutes. • MRV Pod is communicated with the monitor.
Charge time	For a new battery: 8 hours to 100%. 6 hours to 90%.
Shutdown delay	At least 15 minutes after the low battery alarm (from the monitor) first occurs.

A.5 Display Specifications

N1 main unit	
Screen type	Color TFT LCD
Screen Size (diagonal)	5.5 inches

Resolution	1280 x 720 pixels
Pixel per inch (PPI)	269

External display			
Screen type	Medical-grade color TFT LCD		
Screen Size (diagonal)	15.6”	19”	21.5”
Resolution	1920 x1080 pixels	1280 x 720 pixels	1920 x1080 pixels

A.6 Touchscreen Specifications

Screen type	Capacitive, multi-point touch

A.7 LEDs

A.7.1 Main Unit

Alarm lamp	1 (three color-coded: red, yellow, and cyan)
Power-on LED	1 (green)
External power LED	1 (green)
Battery LED	1 (two color-coded: yellow and green)

A.7.2 Dock

Connection status LED	1 (green)
External power supply LED	1 (green)

A.7.3 Transport Dock

Power-on LED	1 (green)

A.7.4 AC Adapter

Power-on LED	1 (green)

A.8 Audio Indicator

Speaker	Give alarm tones (45 to 85 dB), reminder tones, key tones, QRS tones; support PITCH TONE and multi-level tone modulation; alarm tones comply with IEC 60601-1-8: 2020.
Frequencies of audio signals	Alarm tone (ISO2 mode/ISO mode): 600 Hz Alarm tone (ISO3 mode): 260 Hz, 440 Hz, 350 Hz Special alarm sound: 900 Hz QRS tone: 500 Hz Screen-tapping tone: 1000 Hz Pulse tone: 687 - 164 Hz (beep-beep-beep. The frequency of pulse tone decreases as the patient’s SpO_2 decreases.) NIBP end tone: 520 Hz Timer countdown tone: 620 Hz

A.9 Monitor Interface Specifications

A.9.1 Interface Specifications of the Main Unit

DC power input connector	1
Multifunctional connector	1
Multi-pin connector	1
Communication interface	4
Infrared filter	1
Contact	2
Power switch	1
Sample line connector of the Sidestream CO_2	1
Gas outlet	1
ECG cable connector	1
SpO_2 sensor connector	1
NIBP cuff connector	1
IBP cable connector	1
Temperature probe connector	2

A.9.2 Interface Specifications of the Modular Rack

Multi-pin connector	2
Infrared filter	1
Pogo pin	3
Contact	2

A.9.3 Interface Specifications of the Dock

Network connector	1
Equipotential grounding terminal	1
AC power input connector	1
VGA connector	1
Host monitor connector	1 for standard configuration, 1 optional
USB connector	2
Multi-pin connector	1

A.10 Signal Outputs Specifications

ECG Analog Output	
Bandwidth (-3dB; reference frequency: 10 Hz)	Diagnostic mode: 0.05 to 150 Hz Monitor mode: 0.5 to 40 Hz Surgical mode: 1 to 20 Hz ST mode: 0.05 to 40 Hz
Maximum QRS delay	25 ms (in diagnostic mode, and non-paced)

Gain (reference frequency 10 Hz)	1V/mV (±5%)
Pace enhancement	Signal amplitude: V_{oh}≥2.5V Pulse width: 10ms±5% Signal rising and falling time: ≤100 μs
IBP Analog Output	
Bandwidth (-3dB; reference frequency:1Hz)	0 to 40 Hz
Maximum transmission delay	30 ms
Gain (reference frequency 1 Hz)	1 V/100 mmHg, ±5%
Defib Sync Pulse	
Output impedance	≤100 ohm
Maximum time delay	35 ms (R-wave peak to leading edge of pulse)
Amplitude	High level: 3.5 to 5 V, ±5%, providing a maximum of 10 mA output current; Low level: < 0.5 V, receiving a maximum of 5 mA input current.
Pulse width	100 ms ±10%
maximum rising and falling time	1 ms
Alarm output	
Alarm delay time from the monitor to remote equipment	The alarm delay time from the monitor to remote equipment is ≤2 seconds, measured at the monitor signal output connector.
Alarm signal sound pressure level range	45 db(A) to 85 db(A) within a range of one meter

A.11 Data Storage

Trends	A minimum of 120 hours' trend data with the resolution no less than 1 minute.
Events	1000 events, including parameter alarms, arrhythmia events, technical alarms, and so on
NIBP measurements	1000 sets
Interpretation of resting 12-lead ECG results	20 sets
Full-disclosure waveforms	48 hours at maximum. The specific storage time depends on the waveforms stored and the number of stored waveforms.
OxyCRG view	A maximum of 48 hours of oxyCRG events

A.12 Out-Of-Hospital Transport - Standards Compliance

- **Shock Tests** according to IEC TR 60721-4-7, Class 7M3. Test procedure according to IEC/EN60068-2-27 (peak acceleration up to 100g).
- **Random Vibration** according to IEC TR 60721-4-7, Class 7M3. Test procedure according to IEC/EN 60068-2-64 (RMS acceleration 5g).
- **Sinusoidal Vibration** according to IEC TR 60721-4-7, Class 7M3. Test procedure according to IEC/EN 60068-2-6 (acceleration up to amplitude 2g).
- **Bump Test** according to IEC/EN60068-2-29 (peak acceleration 15 g, 1000 bumps).
- **Free Fall Test** according to EN 60068-2-32 (height 1.2 m).
- EN 1789:2007+A2:2014 Medical vehicles and their equipment - Road ambulances.
- EN 13718-1:2008 Medical vehicles and their equipment-Air ambulances-Part 1: Requirements for medical devices used in air ambulances.
- IEC 60601-1-12:2014 Medical electrical equipment -Part 1-12: General requirements for basic safety and essential performance -Collateral Standard: Requirements for medical electrical equipment and medical electrical systems intended for use in the emergency medical services environment.

- **RTCA DO-160G** Environmental Conditions and Test Procedures for Airborne Equipment.
  - Section 7 Operational Shocks and Crash Safety
  - Section 8 Vibration (Category S for fixed wing and Category U2 for rotary wing)
- **MIL-STD-810G** Environmental engineering considerations and laboratory tests
  - Method 514.6 Category 13 - Fixed Wing Propeller Aircraft
  - Method 514.6 Category 14 Category 14 Helicopter, General, UH-60
  - Method 514.6 Category 20 - Ground vehicles - ground mobile
  - Method 514.6 Category 24 - Helicopter minimum integrity test
- **Radiated susceptibility** 20 V/m according to IEC 80601-2-30: 2018 (NIBP), ISO 80601-2-55: 2018 (CO_2), ISO 80601-2-56: 2018 (TEMP), ISO 80601-2-61: 2017 (SpO_2).
- **Extended radiated susceptibility tests**
  - TETRA 400: 27V/m
  - GMRS 460; FRS 460; GSM 800/900; TETRA 800; iDEN 820; CDMA 850; LTE Band 5; GSM 1800; CDMA 1900; GSM 1900; DECT; LTE Band 1, 3,4, 25; UMTS; Bluetooth; WLAN; 802.11 b/g/n; RFID 2450; LTE Band 7: 28V/m
  - LTE Band 13, 17; WLAN 802.11 a/n: 9V/m
- **Magnetic Field emission** according to MIL STD 461F, Chapter RE101: Radiated emissions, magnetic field, 30Hz to 100KHz. Limit class: Army.
- **Magnetic Field susceptibility**: Radiated susceptibility, magnetic field, 50 and 60 Hz, 30 A/m.

A.13 Wi-Fi Specifications

A.13.1 Wi-Fi Technical Specifications(Larid)

Protocol	IEEE 802.11a/b/g/n
Modulation mode	BPSK, QPSK, 16QAM, 64QAM
Operating frequency	2.4 GHz to 2.495 GHz. 5.15 GHz to 5.25 GHz, 5.725 GHz to 5.85 GHz
Wireless baud rate	IEEE 802.11b: 1 Mbps to 11 Mbps IEEE 802.11g: 6 Mbps to 54 Mbps IEEE 802.11n: 6.5 Mbps to 72.2 Mbps (MCS0-MCS7) IEEE 802.11a: 6 Mbps to 54 Mbps
Output power	<20dBm (CE requirement, detection mode: RMS) <30dBm (FCC requirement: detection mode: peak power)
Operating mode	As station, access AP for data transmission
Data security	Standards: WPA-PSK, WPA2-PSK, WPA-Enterprise,WPA2-Enterprise EAP method: EAP-FAST, EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP- MSCHAPv2, PEAP-TLS, LEAP Encryption: TKIP, AES

A.13.2 Wi-Fi Technical Specifications(Silex)

Protocol	IEEE 802.11a/b/g/n/ac
Modulation mode	BPSK, QPSK, 16QAM, 64QAM, 256QAM
Operating frequency	2412MHz to 2472MHz 5180MHz to 5320MHz, 5500MHz to 5700MHz, 5745MHz to 5820MHz

Wireless baud rate	IEEE 802.11a: 6 to 54 Mbps IEEE 802.11b: 1 to 11 Mbps IEEE 802.11g: 6 to 54 Mbps IEEE 802.11n: MCS0 to MCS7 IEEE 802.11ac: MCS0 to MCS9 **Note:** If radar channels are used, it is recommended to use only channels 52, 56, 60 and 64. The probability of radar interference in these channels is relatively low. Try not to use channel 120,124 and 128, as these channels are most affected by radar.
Output power	<20dBm (CE requirement, detection mode: RMS) <30dBm (FCC requirement: detection mode: peak power)
Operating mode	As station, access AP for data transmission
Data security	Standards: WPA-PSK, WPA2-PSK, WPA-Enterprise,WPA2-Enterprise EAP method: EAP-FAST, EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP- MSCHAPv2, PEAP-TLS, LEAP Encryption: TKIP, AES

A.13.3 Wi-Fi Performance Specifications(Larid)

WARNING

- **Do perform all network functions of data communication within an enclosed network.**

A.13.3.1 System capacity and resistance to wireless interference

Meets the following requirements:

- All the monitors do not encounter communication loss.
- The total delay of data transmission from the monitor to the CMS: ≤ 2 seconds.
- The delay for monitor-related settings configured at the CMS to be effective: ≤ 2 seconds.
- The total delay of data transmission from one monitor to the other: ≤ 2 seconds.
- The delay for the monitor to reset alarms of another to be effective: ≤ 2 seconds.

Testing conditions are as follows:

- Number of the monitors supported by a single AP: ≤ 16.
- Each monitor can communicate with the CMS.
- Two monitors are used to view other monitors.
- Only one monitor can transmit history data.
- The weakest strength of the AP signal where the monitor is located is not less than -65 dBm.
- The distance between the interfering devices and the monitor is greater than 20 cm. A Wi-Fi interference (no greater than -85 dBm) in the same channel and a Wi-Fi interference (no greater than -50 dBm) in an adjacent-channel are presented synchronously. The interfering devices include, but are not limited to, 2.4 GHz wireless devices, cellular mobile networks, microwave ovens, interphones, cordless phones, and ESU equipment. The interfering devices do not include Wi-Fi devices.

A.13.3.2 Wi-Fi network stability

The ratio of the communication data lost on CMS from the N1 does not exceed 0.1% in 24 hours..

Testing conditions are as follows:

- Number of the monitors supported by a single AP: ≤ 16.
- Each monitor can communicate with the CMS.
- Two monitors are used to view other monitors.
- Only one monitor can transmit history data.
- The weakest strength of the AP signal where the monitor is located cannot be less than -65 dBm.

A.13.3.3 Distinct vision distance

The distinct vision distance between the monitor and the AP is no less than to 50 meters.

A.13.4 Wi-Fi Performance Specifications(Silex)

Distinct vision distance	no less than 50m, between the monitor and the AP
Roaming	When the monitor is moved from the coverage area of AP1 to that of AP2, network switchover can be automatically completed
Stability of dynamic network	When the monitor moves at a speed not higher than 3.75 m/s within a 15 m straight line without obstacles, no communication loss occurs to the monitor
Network interruption alarm	Within ≤14 s after the network interruption, the disconnection icon is displayed on the monitor screen, and the system starts the related alarm. After the network is reconnected, the wireless connection is automatically restored.
System capacity	The number of monitors supported by a single AP is: ≤ 16 Each monitor communicates with the CMS. Up to 1 monitor can transmit historical data. 2 monitors are used for remote view. 2 monitors are connected to MRV Pod.
Network delay	Total delay of the monitor transmitting data to the CMS: ≤ 2s Delay of the CMS setting the monitor: ≤ 2s Total delay of the monitor transmitting data to other monitors: ≤ 2s Delay of the monitor performs Alarm Reset setting for other wireless monitors: ≤ 2s Total delay of MRV Pod transmitting data to the monitor: ≤ 1s
Network stability	Within 24 h, any 12 of the 16 monitors roam (2 monitors carrying MRV Pod) for 30times, the data loss probability of each monitor communicating with the CMS is ≤0.1%. The data loss probability of MRV Pod communicating with the monitor is ≤0.1%.
Test condition	The weakest strength of the AP signal where the monitor is located is not less than -65 dBm. The distance between the interfering devices and the monitor is greater than 20 cm. A Wi-Fi interference (no greater than -85 dBm) in the same channel and a Wi-Fi interference (no greater than -50 dBm) in an adjacent-channel are presented synchronously. The interfering devices include 2.4 GHz wireless devices, cellular mobile networks, microwave ovens, intercoms, cordless phones, and ESU equipment. The interfering devices do not include Wi-Fi devices.

A.14 Bluetooth Specifications

A.14.1 Bluetooth Technical Specifications

Protocol	Bluetooth 5.0
Modulation mode	GFSK
Operating frequency	2402 to 2480 MHz
Channel spacing	2MHz
Wireless baud rate	2 Mbps
Output power	≤20 dBm
Data security	AES

A.14.2 Bluetooth Performance Specifications

WARNING

- **Keep the monitor away from interference sources.**

Distinct vision distance	no less than 10 m
Network interruption alarm	Within ≤14 s after the network interruption, the monitor displays alarm or prompt information. After the network is reconnected, the wireless connection is automatically restored.
System capacity	Up to 16 monitors can be used simultaneously within a space of 200 m^2. Each monitor is connected to 1 MRV Pod (the distance is ≤ 5m).
Network delay	Total delay of MRV Pod transmitting data to the monitor: ≤ 1s.
Network stability	Within 24 h, the data loss probability of MRV Pod communicating with the monitor is ≤0.1%.
Test condition	The distance between the interfering devices and the monitor is greater than 20 cm. The interfering devices include 2.4 GHz Wi-Fi devices, bluetooth communication devices, remote controls, microwave ovens, intercoms, cellular mobile networks, cordless phone and ESU equipment.

A.15 Wi-Fi with Bluetooth Performance Specifications

Network interruption alarm	Within ≤14 s after the network interruption, the disconnection icon is displayed on the monitor screen, and the system starts the related alarm. After the network is reconnected, the wireless connection is automatically restored.
System capacity	Up to 16 monitors (supported by a single AP) can be used simultaneously within a space of 200 m^2. Each monitor communicates with the CMS. Up to 1 monitor can transmit historical data, 2 monitors are used for remote view, and 2 monitors are connected to MRV Pod (the distance is ≤ 5m).
Network delay	Total delay of MRV Pod transmitting data to the monitor: ≤ 1s
Network stability	Within 24 h, 2 monitors carrying MRV Pod roam for 30 times, the data loss probability of MRV Pod communicating with the monitor is ≤0.01%.
Test condition	The weakest strength of the AP signal where the monitor is located is not less than -65 dBm. The distance between the interfering devices and the monitor is greater than 20 cm. A Wi-Fi interference (no greater than -85 dBm) in the same channel and a Wi-Fi interference (no greater than -50 dBm) in an adjacent-channel are presented synchronously. The interfering devices include 2.4 GHz wireless devices, cellular mobile networks, microwave ovens, intercoms and cordless phones.

A.16 NFC Specifications

Protocol	ISO/IEC 14443 A
Working mode	CARD
Operating frequency	13.56 MHz
Modulation mode	ASK
Data security	Encryption: Private
Pairing information transmission time	≤ 2s
Pairing success rate	≥95%

A.17 Operating Environment

Host CPU	ARM Cortex-A8
Primary programming language	C++
Operating system	Linux 3.2.0

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B Measurement Specifications

The adjustable range of alarm limits is the same with the measurement range of signals unless otherwise specified.

B.1 ECG Specifications

ECG		
Standards	Meet standards of IEC 60601-2-27:2011 and IEC 60601-2-25: 2011	
Lead set	3-lead: I, II, III 5-lead: I, II, III, aVR, aVL, aVF, V 6-lead: I, II, III, aVR, aVL, aVF, Va, Vb 12-lead: I, II, III, aVR, aVL, aVF, V1 to V6	
ECG standard	AHA, IEC	
Display sensitivity	1.25 mm/mV (×0.125), 2.5 mm/mV (×0.25), 5 mm/mV (×0.5), 10 mm/mV (×1), 20 mm/mV (×2), 40 mm/mV (×4), Auto, less than 5% error	
Sweep speed	6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s, less than 5% error	
Bandwidth (-3dB)	Diagnostic mode: Monitor mode: Surgical mode: ST mode: High Freq Cut-off (for 12-lead ECG analysis)	0.05 to 150 Hz 0.5 to 40 Hz 1 to 20 Hz 0.05 to 40 Hz 350 Hz (0.05 to 350 Hz), 150 Hz (0.05 to 150 Hz), 35 Hz (0.05 to 35 Hz), or 20 Hz (0.05 to 20 Hz), selectable
Common mode rejection ratio	Diagnostic mode: Monitor mode/Surgical mode/ ST mode: High Freq Cut-off mode:	>100 dB (with notch filter off) >110 dB (with notch filter on) >100 dB (with notch filter off) >100 dB (with notch filter off)
Notch filter	50/60 Hz Monitor, surgical, and ST mode: notch filter turns on automatically Diagnostic mode and High Freq Cut-off: notch filter is turned on/off manually	
Differential input impedance	≥5 MΩ	
Input signal range	±10 mV (peak-to-peak value)	
Accuracy of signal reproduction	Use A and D methods based on IEC 60601-2-25: 2011 to determine frequency response.	
Electrode offset potential tolerance	±850 mV	
Lead-off detection current	Measuring electrode: <0.1 μA Drive electrode: <1 μA	
Input offset current	≤0.1 μA, (drive lead≤1μA)	
Defibrillation protection	Enduring 5000V (360 J) charge without data loss or corruption Baseline recovery time: <5 s (after defibrillation) Polarization recovery time: <10 s Defibrillation energy absorption: ≤10% (100Ω load)	
Patient leakage current	<10 uA	
Calibration signal	1mV (peak-to-peak value) ±5%	

ESU protection	Cut mode: 300 W Coagulate mode: 100 W Recovery time: ≤10 s In compliance with the requirements in clause 202.6.2.101 of IEC 60601-2-27: 2011
Pace Pulse	
Pace pulse markers	Pace pulses meeting the following conditions are labelled with a PACE marker: Amplitude: ±2 to ±700 mV Width: 0.1 to 2 ms Rise time: 10 to 100 µs (no greater than 10% of pulse width) No overshoot
Pace pulse rejection	When tested in accordance with the IEC 60601-2-27: 2011: 201.12.1.101.13, the heart rate meter rejects all pulses meeting the following conditions. Amplitude: ±2 to ±700 mV Width: 0.1 to 2 ms Rise time: 10 to 100 µs (no greater than 10% of pulse width) No overshoot

HR	
Measurement range	Neonate: 15 to 350 bpm Pediatric: 15 to 350 bpm Adult: 15 to 300 bpm
Resolution	1 bpm
Accuracy	±1 bpm or ±1%, whichever is greater.
Sensitivity	200 µV (lead II)
HR averaging method	In compliance with the requirements in Clause 201.7.9.2.9.101 b) 3) of IEC 60601-2-27: 2011, the following method is used: If the last 3 consecutive RR intervals are greater than 1200 ms, the 4 most recent RR intervals are averaged to compute the HR. Otherwise, heart rate is computed by subtracting the maximum and minimum ones from the most recent 12 RR intervals and then averaging them. The HR value displayed on the monitor screen is updated no more than one second.
Response to irregular rhythm	In compliance with the requirements in Clause 201.7.9.2.9.101 b) 4) of IEC 60601-2-27: 2011, the heart rate after 20 seconds of stabilization is displayed as follows: Ventricular bigeminy (waveform A1): 80±1 bpm Slow alternating ventricular bigeminy (waveform A2): 60±1 bpm Rapid alternating ventricular bigeminy (waveform A3): 120±1 bpm Bidirectional systoles (waveform A4): 90±2 bpm
Response time to heart rate change	Meets the requirements of IEC 60601-2-27: 2011: Clause 201.7.9.2.9.101 b) 5). From 80 to 120 bpm: less than 11 s From 80 to 40 bpm: less than 11 s
Time to alarm for tachycardia	Meets the requirements in Clause 201.7.9.2.9.101 b) 6) of IEC 60601-2-27: 2011. Waveform B1h-range: <9 s B1-range: <9 s B1d-range: <9 s B2h-range: <9 s B2-range: <9 s B2d-range: <9 s

Tall T-wave rejection capability	When the test is performed based on Clause 201.12.1.101.17 of IEC 60601-2-27: 2011, the heart rate calculation is not affected for QRS of 1 mV amplitude and 100 ms duration, T-wave duration of 180 ms and amplitude lower than 4.5 mV, and QT interval of 350 ms.
Arrhythmia Analysis Classifications	Asystole, V-Fib/V-Tach, V-Tach, Vent Brady, Extreme Tachy, Extreme Brady, Vent Rhythm, PVCs/min, Pauses/min, Couplet, Bigeminy, Trigeminy, R on T, Run PVCs, PVC, Tachy, Brady, Missed Beat, Pacer Not Pacing, Pacer Not Capture, Multiform PVC, Nonsus V-Tach, Pause, Irr Rhythm, A-Fib, SVT, SVCs/min
ST Segment Analysis	
Measurement range	-2.0 to 2.0 mV RTI
Accuracy	-0.8 to 0.8 mV: ±0.02 mV or ±10%, whichever is greater. Beyond this range: Not specified.
Resolution	0.01mV
QT/QTc Analysis	
Measurement range	QT: 200 to 800 ms QTc: 200 to800 ms QT-HR: 15 to 150 bpm for adult, 15 to 180 bpm for pediatric and neonate
Accuracy	QT: ±30 ms
Resolution	QT: 4 ms QTc: 1 ms
12-lead ECG Interpretation	
Sampling rate	1000 samples/s (A/D) 500 samples/s (ECG algorithm)
Amplitude quantisation	24 bits

Alarm limit	**Range**	**Step**
HR High	HR≤40bpm: (low limit + 2 bpm) to 40 bpm HR > 40 bpm: (low limit + 5 bpm) to 295 bpm	HR≤40bpm: 1 bpm HR > 40 bpm: 5 bpm
HR Low	HR≤40bpm: 16 bpm to (high limit - 2 bpm) HR > 40 bpm: 40 bpm to (high limit - 5 bpm)	
ST High	(low limit + 0.2 mV) to 2.0 mV (ST alarm mode: Absolute) 0 mV to 2.0 mV (ST alarm mode: Relative)	0.05 mV
ST Low	-2.0 mV to (high limit - 0.2 mV) (ST alarm mode: Absolute) -2.0 mV to 0 mV (ST alarm mode: Relative)	
QTc High	200 to 800 ms	10 ms
ΔQTc High	30 to 200 ms	

B.2 Resp Specifications

Technique	Trans-thoracic impedance
Lead	Options are lead I, II and Auto
Respiration excitation waveform	<300 μA RMS, 62.8 kHz (±10%)
Minimum respiration impedance threshold	0.3Ω
Baseline impedance range	200 to 2500Ω (Main unit: using an ECG cable with 1kΩ resistance; MRV Pod: using an ECG cable with 3.92kΩ resistance)
Bandwidth	0.2 to 2.5 Hz (-3 dB)

Sweep speed	3mm/s, 6.25 mm/s, 12.5 mm/s, 25 mm/s or 50 mm/s, less than 10% error
Respiration Rate	
Measurement range	0 to 200 rpm
Resolution	1 rpm
Accuracy	0 to 120 rpm: ±1 rpm 121 to 200 rpm: ±2 rpm
Apnea alarm time	10 s, 15 s, 20 s, 25 s, 30 s, 35 s, 40 s

Alarm limit	Range (rpm)	Step (rpm)
RR High	Adult, pediatric: RR≤20: (low limit + 2) to 20 RR>20: (low limit + 5) to 100 Neonate: RR≤20: (low limit + 2) to 20 RR>20: (low limit + 5) to 150	RR≤20: 1 RR>20: 5
RR Low	RR≤20: 0 to (high limit - 2) RR>20: 20 to (high limit - 5)	

B.3 SpO_2 Specifications

Alarm limit	Range (%)	Step (%)
SpO_2 High	(low limit + 2) to 100	1
SpO_2 Low	Mindray/Masimo: (Desat+1) to (high limit - 2) Nellcor: (Desat+1) or 20 (whichever is greater) to (high limit - 2)	
SpO_2 Desat Low	0 to (low limit - 1)	

Mindray SpO_2 Module

Standards	Meet standards of ISO 80601-2-61: 2017
Measurement range	0 to 100%
Resolution	1%
Response time	< 30 s (normal perfusion, no disturbance, SpO_2 value sudden changes from 70% to 100%)
Accuracy	70 to 100%: ±2%ABS (adult/pediatric) 70 to 100%: ±3%ABS (neonate) 0% to 69%: Not specified.

* One percent was added to the accuracies for neonatal sensors to account for accuracy variation due to properties of fetal hemoglobin. Studies were performed to validate the accuracy of Pulse Oximeter with neonatal SpO_2 sensors by contrast with a CO-Oximeter. Some neonates aged from 1 day to 30 days with a gestation age of 22 weeks to full term were involved in this study. The statistical analysis of data of this study shows the accuracy (Arms) is within the stated accuracy specification. Please see the following table.

Sensor type	Totally neonates	Data	Arms
518B	97 (51 male & 46 female)	200 pairs	2.38%
520N	122 (65 male & 57 female)	200 pairs	2.88%

The Pulse Oximeter with neonatal SpO_2 sensors was also validated on adult subjects.

Refreshing rate	≤1 s

PI	
Measurement range	0.05 to 20%
Resolution	PI<10.0: 0.01 PI≥10.0: 0.1

Nellcor SpO_2 Module

Standard	Meet standards of ISO 80601-2-61: 2017
Measurement range	0 to 100%
Resolution	1%
Refreshing rate	≤1 s
Response time	≤30 s (normal perfusion, no disturbance, SpO_2 value sudden change from 70% to 100%)
Accuracy	70 to 100%: ±2%ABS (adult/pediatric) 70 to 100%: ±3%ABS (neonate) 0% to 69%: Not specified.
When the SpO_2 sensor is applied for neonatal patients as indicated, the specified accuracy range is increased by ±1%, to compensate for the theoretical effect on oximeter measurements of fetal hemoglobin in neonatal blood.	

Masimo SpO_2 Module

Standards	meets the requirements of ISO 80601-2-61: 2017
Measurement range	1 to 100%
Resolution	1%
Response time	≤20 s (normal perfusion, no disturbance, SpO2 value sudden changes from 70% to 100%)
Accuracy[1]	70 to 100%: ±2%ABS (measured without motion in adult/pediatric mode) 70 to 100%: ±3%ABS (measured without motion in neonate mode) 70 to 100%: ±3%ABS (measured with motion) 1% to 69%: Not specified.
Refresh rate	≤ 1 s
SpO2 averaging time	2-4 s, 4-6 s, 8 s, 10 s, 12 s, 14 s, 16 s
Low perfusion conditions	Pulse amplitude: >0.02% Light penetration: >5%
Low perfusion SpO2 accuracy[2]	±2%
PI measurement range	0.02 to 20%

[1] The Masimo pulse oximeter with sensors have been validated for no motion accuracy in human blood studies on healthy adult volunteers in induced hypoxia studies in the range of 70% to 100% SpO2 against a laboratory co-oximeter and ECG monitor. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population. One percent was added to the accuracies for neonatal sensors to account for accuracy variation due to properties of fetal hemoglobin.

The Masimo pulse oximeter with sensors has been validated for motion accuracy in human blood studies on healthy adult volunteers in induced hypoxia studies while performing rubbing and tapping motions at 2 to 4 Hz. At an amplitude of 1 to 2 cm and non-repetitive motion between 1 to 5 Hz. At an amplitude of 2 to 3 cm in induced hypoxia studies in the range of 70% to 100% SpO2 against a laboratory co-oximeter and ECG monitor. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population.

[2] The Masimo pulse oximeter has been validated for low perfusion accuracy in bench top testing against a Biotek Index 2 simulator and Masimo's simulator with signal strengths of greater than 0.02% and a% transmission of greater than 5% for saturations ranging from 70 to 100%. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population.

B.4 PR Specifications

Alarm limit	Range	Step
PR High	PR≤40 bpm: (low limit + 2 bpm) to 40 bpm PR > 40 bpm: (low limit + 5 bpm) to 295 bpm	PR≤40: 1 PR>40: 5
PR Low	PR≤40 bpm: 16 bpm to (high limit - 2 bpm) PR > 40 bpm: 40 bpm to (high limit - 5 bpm)	

PR from Mindray SpO_2 Module

Measurement range	20 to 300 bpm
Resolution	1 bpm
Response time	<30 s (normal perfusion, no disturbance, PR value sudden changes from 25 to 220bpm)
Accuracy	±2 bpm
Refreshing rate	≤1 s

PR from Masimo SpO_2

Measurement range	25 to 240 bpm
Resolution	1 bpm
Response time	≤20 s (with normal perfusion, no disturbance, and a PR value transition from 25 to 220 bpm)
Accuracy	±3 bpm (measured without motion) ±5 bpm (measured with motion)
Refresh rate	≤1 s

PR from Nellcor SpO_2 Module

Measurement range	20 to 300 bpm
Resolution	1 bpm
Response time	≤30 s (normal perfusion, no disturbance, PR value sudden change from 25 to 250 bpm)
Accuracy	20 to 250 bpm: ±3 bpm 251 to 300 bpm, not specified
Refreshing rate	≤1 s

PR from NIBP Module

Measurement range	30 to 300 bpm
Resolution	1 bpm
Accuracy	±3 bpm or ±3%, whichever is greater

PR from IBP Module

Measurement range	25 to 350 bpm
Resolution	1 bpm
Accuracy	±1 bpm or ±1%, whichever is greater

B.5 Temp Specifications

Standard	Meet the standard of ISO 80601-2-56: 2018
Technique	Thermal resistance
Operating mode	Direct mode
Measurement range	0 to 50 °C (32 to 122 °F)
Resolution	0.1°C
Accuracy	±0.1 °C or ±0.2 °F (excluding probe error)
Refreshing rate	≤1 s
Minimum time for accurate measurement	Body surface: <100 s Body cavity: <80 s

Alarm limit	**Range**	**Step**
Txx High (xx refers to temperature site)	(low limit +1.0) to 50.0 °C (low limit +2.0) to 122.0 °F	0.1 °C 0.1 °F
Txx Low (xx refers to temperature site)	0.1 to (high limit - 1.0) °C 32.2 to (high limit - 2.0) °F	
ΔT High	0.1 to 50.0 °C 0.2 to 90.0 °F	

B.6 NIBP Specifications

Standard	Meet standard of IEC 80601-2-30: 2018			
Technique	Oscillometry			
Mode of operation	Manual, Auto (Interval), Auto (Clock), STAT, Sequence			
Auto mode repetition intervals	1min, 2min, 2.5min, 3min, 5min, 10min, 15min, 20min, 30min, 1h, 1.5h, 2h, 3h, 4h, 8h, 12h (optional), 24h (optional)			
STAT mode cycle time	5 min			
Max measurement time	Adult, pediatric: 180 s Neonate: 90 s			
Typical measurement time (Inflation measurement)	≤15 s (Adult: use CM1203/CM1303/CM1503 cuff, PR:60 to 200 bpm, systolic:80 to 120 mmHg Pediatric: use CM1202/CM1302/CM1502 cuff, PR:60 to 200 bpm, systolic:80 to 120 mmHg)			
Heart rate range	30 to 300 bpm			
Measurement ranges (mmHg)		Adult	Pediatric	Neonate
	Systolic:	25 to 290	25 to 240	25 to 140
	Diastolic:	10 to 250	10 to 200	10 to 115
	Mean:	15 to 260	15 to 215	15 to 125
Accuracy	Max mean error: ±5 mmHg Max standard deviation: 8 mmHg			
Resolution	1mmHg			

Initial cuff inflation pressure range (mmHg)	Adult: 80 to 280 Pediatric: 80 to 210 Neonate: 60 to 140
Default initial cuff inflation pressure (mmHg)	Adult: 160 Pediatric: 140 Neonate: 90
Software overpressure protection	Adult: 297±3 mmHg Pediatric: 297±3 mmHg Neonate: 147±3 mmHg
Hardware overpressure protection	Adult: ≤330 mmHg Pediatric: ≤330 mmHg Neonate: ≤165 mmHg
Static pressure measurement range	0 mmHg to 300 mmHg
Static pressure measurement accuracy	±3 mmHg

Alarm limit	Range (mmHg)	Step (mmHg)
NIBP-S High	Adult: (low limit + 5) to 285 Pediatric: (low limit + 5) to 235 Neonate: (low limit + 5) to 135	NIBP ≤ 50: 1 NIBP > 50: 5
NIBP-S Low	26 to (high limit - 5)	
NIBP-M High	Adult: (low limit + 5) to 255 Pediatric: (low limit + 5) to 210 Neonate: (low limit + 5) to 120	
NIBP-M Low	16 to (high limit - 5)	
NIBP-D High	Adult: (low limit + 5) to 245 Pediatric: (low limit + 5) to 195 Neonate: (low limit + 5) to 110	
NIBP-D Low	11 to (high limit - 5)	
NIBP-S Extreme High	Adult: (NIBP-S high limit + 5) to 290 Pediatric: (NIBP-S high limit +5) to 240 Neonate: (NIBP-S high limit +5) to 140	NIBP ≤ 50: 1 NIBP > 50: 5
NIBP-S Extreme Low	25 to (NIBP-S low limit - 5)	
NIBP-M Extreme High	Adult: (NIBP-M high limit + 5) to 260 Pediatric: (NIBP-M high limit + 5) to 215 Neonate: (NIBP-M high limit + 5) to 125	
NIBP-M Extreme Low	15 to (NIBP-M low limit - 5)	
NIBP-D Extreme High	Adult: (NIBP-D high limit + 5) to 250 Pediatric: (NIBP-D high limit + 5) to 200 Neonate: (NIBP-D high limit + 5) to 115	
NIBP-D Extreme Low	10 to (NIBP-D low limit - 5)	

*Measurement accuracy verification: In adult and pediatric modes, the blood pressure measurements measured with this device are in compliance with the Standard for Non-invasive sphygmomanometers (ISO 81060-2) in terms of mean error and standard deviation by comparing with intra-arterial or auscultatory measurements (depending on the configuration) in a typical patient population. For auscultatory reference, the 5th Korotkoff sound was used to determine the diastolic pressure.

In neonatal mode, the blood pressure measurements measured with this device are in compliance with the American National Standard for Non-invasive sphygmomanometers (ISO 81060-2) in terms of mean error and standard deviation by comparing with intra-arterial measurements (depending on the configuration) in a typical patient population.

B.7 IBP Specifications

Standard	Meet the standard of IEC 60601-2-34: 2011.	
Technique	Direct invasive measurement	
IBP		
Measurement range	-50 to 360 mmHg	
Resolution	1 mmHg	
Accuracy	±2% or ±1 mmHg, whichever is greater (excluding sensor error)	
Refreshing rate	≤1 s	
PPV		
Measurement range	0% to 50%	
Pressure transducer		
Excitement voltage	5 VDC, ±2%	
Sensitivity	5 μV/V/mmHg	
Zero adjustment range	±200 mmHg	
Impedance range	300 to 3000Ω	
Volume displacement	<0.04 mm^3 /100 mmHg	
Alarm limit	**Range (mmHg)**	**Step (mmHg)**
Sys High Mean High Dia High	IBP ≤ 50: (low limit + 2) to 50 IBP > 50: (low limit + 5) to 355	IBP ≤ 50: 1 IBP > 50: 5
Sys Low Mean Low Dia Low	IBP ≤ 50: -49 to (high limit - 2) IBP > 50: 50 to (high limit - 5)	
Art-S Extreme High Art-M Extreme High Art-D Extreme High	High limit ≤ 50: (High limit+ 1) to 360 High limit > 50: (High limit+ 5) to 360	IBP ≤ 50: 1 IBP > 50: 5
Art-S Extreme Low Art-M Extreme Low Art-D Extreme Low	low limit ≤ 50: -50 to (low limit- 1) low limit > 50: 50 to (low limit- 5)	

B.8 CCO Specifications

Standard	Meet the standard of ISO 80601-2-56: 2018	
TB Operating mode	Direct mode	
Minimum time for accurate TB measurement	10 s	
Measured parameters	**Measurement range**	**Coefficient of variation**
CCO	0.25 L/min to 25.0 L/min	≤2%
C.O.	0.25 L/min to 25.0 L/min	≤2%

GEDV	40ml to 4800 ml	≤3%
SV	1ml to 250 ml	≤2%
EVLW	10ml to 5000 ml	≤6%
ITBV	50ml to 6000 ml	≤3%
Measured parameters	**Measurement range**	**Measurement Accuracy**
TB	25°C to 45°C	±0.1°C (excluding probe error)
TI	0°C to 30°C	±0.1°C (excluding probe error))
pArt	-50 to 300 mmHg	±2% or ±1mmHg, whichever is greater (excluding sensor error)
pCvp	-50 to 300 mmHg	±2% or ±1mmHg, whichever is greater (excluding sensor error)
Alarm Limit	**Range**	**Step**
CCO High	(Low limit+0.1 L/min) to 25.0 L/min	0.1 L/min
CCO Low	0.3 L/min to (High limit - 0.1 L/min)	
CCI High	(Low limit + 0.1 L/min/m^2) to 15.0 L/min/m^2	0.1 L/min/m^2
CCI Low	0.1 L/min/m^2 to (High limit - 0.1 L/min/m^2)	
pArt-M/pArt-D/pArt-S High	pArt≤50: (Low limit + 2 mmHg) to 50 mmHg pArt>50: (Low limit + 5 mmHg) to 300 mmHg	pArt≤50: 1mmHg pArt>50: 5mmHg
pArt-M/pArt-D/pArt-S Low	pArt≤50: -50 mmHg to (High limit - 2mmHg) pArt>50: 50 mmHg to (High limit - 5 mmHg)	
pCVP-M High	pCVP≤50: (Low limit + 2 mmHg) to 50 mmHg pCVP>50: (Low limit + 5 mmHg) to 300 mmHg	pCVP≤50: 1mmHg pCVP>50: 5 mmHg
pCVP-M Low	pCVP≤50: -50 mmHg to (High limit - 2 mmHg) pCVP>50: 50 mmHg to (High limit - 5 mmHg)	

* Coefficient of variation is measured using synthetic and/or database wave forms (laboratory testing). Coefficient of variation= SD/mean error.

B.9 CO_2 Specifications

Test method described in ISO 80601-2-55 201.12.1.102 is used to determine the rated respiration rate range and the corresponding effects of end-tidal gas reading accuracy as a function of respiratory rate.

End-tidal CO_2 reading is calculated as per the maximum measurement value of expiratory phase.

End-tidal O2 reading is calculated as per the minimum measurement value of expiratory phase.

Measurement mode	Sidestream, Microstream™, mainstream
Technique	Infrared absorption
Apnea time	10 s, 15 s, 20 s, 25 s, 30 s, 35 s, 40 s

Alarm limit	Range	Step
$EtCO_2$ High	(low limit + 2) to 99 mmHg	1 mmHg
$EtCO_2$ Low	1 to (high limit - 2)mmHg	
$FiCO_2$ High	1 to 99 mmHg	
EtO_2 High	(low limit + 2%) to 100%	1%
EtO_2 Low	0% to (high limit - 2)%	
FiO_2 High	(low limit + 2%) to 100%	
FiO_2 Low	18% to (high limit - 2)%	

B.9.1 Sidestream CO_2 Module

Standard	Meet the standard of ISO 80601-2-55: 2018
CO_2 Measurement range	0 to 150 mmHg
CO_2 absolute accuracy*	Full accuracy mode: 0 to 40 mmHg: ± 2 mmHg 41 to 76 mmHg: ±5% of reading 77 to 99 mmHg: ±10% of reading 100 to150mmHg: ±(3mmHg + 8% of reading) ISO accuracy mode: add ±2mmHg to the full accuracy mode
*Inaccuracy specifications are affected by the breath rate and I:E. The EtCO2 accuracy is within specification for breath rate ≤ 60 rpm and I/E ratio ≤ 1:1, or breath rate ≤ 30 rpm and I/E ratio ≤ 2:1.	
CO_2 resolution	1 mmHg
O_2 measurement range	0 to 100%
O_2 absolute accuracy	$0 \le O_2$ concentration$\le 25\%$: ±1% $25 < O_2$ concentration$\le 80\%$: ±2% $80 < O_2$ concentration$\le 100\%$: ±3%
O_2 resolution	1%
Accuracy drift	Meet the requirement for measurement accuracy within 6 hours
Sample flowrate	Using internal CO_2 module: Adult, pediatric, neonatal: 50 ml/min Using external CO_2 module with O_2 sensor: Adult, pediatric: 120 ml/min Neonatal: 90 ml/min Connected a DRYLINE PRIME watertrap: 50 ml/min Using the CO_2 module without O_2 sensor: Adult, pediatric: 120 ml/min Neonatal: 70 ml/min, 90 ml/min Connected a DRYLINE PRIME watertrap: 50 ml/min
Sample flowrate tolerance	±10% or ±10 ml/min, whichever is greater.
Start-up time	Maximum: 90 s Typically: 20 s

Response time	For CO_2 measurements (using external CO_2 module without O_2 sensor): Measured with a DRYLINE II neonatal watertrap and a 2.5-meter neonatal sampling line: ≤5.0 s @ 70 ml/min Measured with a DRYLINE II neonatal watertrap and a 2.5-meter neonatal sampling line: ≤4.5 s @ 90 ml/min Measured with a DRYLINE II adult watertrap and a 2.5-meter adult sampling line: ≤5.0 s @ 120 ml/min Measured with a DRYLINE PRIME watertrap and a standard Oridion sampling line: ≤5.0 s@50 ml/min. Measured with a DRYLINE PRIME watertrap and a prolonged Oridion sampling line: ≤6.5 s@50 ml/min. For CO_2 measurements (using external CO_2 module with O_2 sensor): Measured with a DRYLINE II neonatal watertrap and a 2.5-meter neonatal sampling line: ≤4.5 s @ 90 ml/min Measured with a DRYLINE II adult watertrap and a 2.5-meter adult sampling line: ≤5.0 s @ 120 ml/min Measured with a DRYLINE PRIME watertrap and a standard Oridion sampling line: ≤5.0 s@50 ml/min. Measured with a DRYLINE PRIME watertrap and a prolonged Oridion sampling line: ≤6.5 s@50 ml/min. For CO_2 measurements (using internal CO_2 module): Measured with a standard Oridion sampling line: ≤5.0 s@50 ml/min Measured with a prolonged Oridion sampling line: <6.5 s@50 ml/min For O_2 measurements: Measured with a DRYLINE II neoonatal watertrap and a 2.5-meter neonatal sampling line: ≤4.5 s @ 90 ml/min Measured with a DRYLINE II adult watertrap and a 2.5-meter adult sampling line: ≤5.0 s @ 120 ml/min

Rise time	For CO_2 measurements (using external CO_2 module without O_2 sensor): Measured with a DRYLINE II neonatal watertrap and a 2.5-meter neonatal sampling line: <240 ms@70 ml/min. Measured with a DRYLINE II neonatal watertrap and a 2.5-meter neonatal sampling line: <240 ms@90 ml/min. Measured with a DRYLINE II adult watertrap and a 2.5-meter adult sampling line: <300 ms@120 ml/min Measured with a DRYLINE PRIME watertrap and a standard Oridion sampling line: <280 ms@50 ml/min. Measured with a DRYLINE PRIME watertrap and a prolonged Oridion sampling line: <300 ms@50 ml/min. For CO_2 measurements (using external CO_2 module with O_2 sensor): Measured with a DRYLINE II neonatal watertrap and a 2.5-meter neonatal sampling line: <240 ms@90 ml/min. Measured with a DRYLINE II adult watertrap and a 2.5-meter adult sampling line: <300 ms@120 ml/min Measured with a DRYLINE PRIME watertrap and a standard Oridion sampling line: <280 ms@50 ml/min. Measured with a DRYLINE PRIME watertrap and a prolonged Oridion sampling line: <300 ms@50 ml/min. For CO_2 measurements (using internal CO_2 module): Measured with a standard Oridion sampling line: ≤250 ms@50 ml/min Measured with a prolonged Oridion sampling line: ≤280 ms@50 ml/min For O_2 measurements: Measured with a DRYLINE II neonatal watertrap and a 2.5-meter neonatal sampling line: ≤800 ms@90 ml/min. Measured with a DRYLINE II adult watertrap and a 2.5-meter adult sampling line: ≤750 ms@120 ml/min
Data sample rate	100 Hz
awRR measurement range	0 to 150 rpm
awRR measurement precision	±1 rpm
awRR resolution	1 rpm

Effect of interference gases on CO_2 measurements		
Gas	**Concentration (%)**	**Quantitative effect***
N_2O	≤60	±1 mmHg
Hal	≤4	
Sev	≤5	
Iso	≤5	
Enf	≤5	
Des	≤15	±2 mmHg
*: means an extra error should be added in case of gas interference when CO_2 measurements are performed between 0 to 40mmHg.		

Effect of interference gases on O_2 measurements	
Gas	**Concentration**
CO_2	0.2%
N_2O	0.2%
Hal, Des, Sev, Iso, Enf	1.0%

B.9.2 Microstream™ CO_2 Module

Standard	Meet the standard of ISO 80601-2-55: 2018
CO2 Measurement range	0 to 99 mmHg
Accuracy*	0 to 38 mmHg: ±2 mmHg 39 to 99 mmHg: ± (5% × reading + 8% × (reading –39mmHg))
Accuracy drift	Meets the requirement for measurement accuracy as specified by 80601-2-55
* Accuracy applies for respiration rate up to 80 rpm. For respiration rate above 80 rpm and EtCO2 exceeding 18 mmHg, the accuracy is 4 mmHg or ±12% of the reading, whichever is greater. For respiration rate above 60 rpm, the above accuracy can be achieved by using the FilterLine H Set for Infant/Neonatal. In the presence of interfering gases, the above accuracy is maintained to within 4%.	
Resolution	1 mmHg
Sample flow rate	50 ml/min
Sample flowrate tolerance	-7.5/+15 ml/min
Initialization time	180 s (maximum)
Response time	4.3 s (with any 2-meter FilterLine) 5.5 s (with any 4-meter FilterLine)
Rise tim	190 msec (with any 2-meter FilterLine) 210 msec (with any 4-meter FilterLine)
Data sample rate	40 Hz
awRR measurement range	0 to 150 rpm
awRR measurement accuracy	0 to 70 rpm: ±1 rpm 71 to 120 rpm: ±2 rpm 121 to 150 rpm: ±3 rpm
awRR resolution	1 rpm

B.9.3 Mainstream CO2 Module

Standard	Meet the standard of ISO 80601-2-55: 2018
CO_2 Measurement range	0 to 150 mmHg
Accuracy	0 to 40 mmHg: ±2 mmHg 41 to 70 mmHg: ±5% of reading 71 to 100 mmHg: ±8% of reading 101 to 150 mmHg: ±10% of reading
Accuracy drift	Meet the requirement for measurement accuracy within 6 hours
Resolution	1 mmHg
Rise time	<60 ms

Effect of interference gases on CO_2 measurements (for module configured with the GA3701 sensor)	Additional worst case error when compensation for O_2, N_2O, anesthetic agents, or He is correctly selected: 0 to 40 mmHg: ±1 mmHg additional error Additional error should be added in case of the following gas interference: Xenon (≤100%): ±1 mmHg additional error Ethyl (≤0.1%): 0 mmHg additional error Acetone (≤1%): ±1 mmHg additional error
Response time (for module configured with the GA3701 sensor)	<2 s
Data sample rate	100 Hz
awRR measurement range	0 to 150 rpm
awRR measurement accuracy	±1 rpm
awRR resolution	1 rpm

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C EMC and Radio Regulatory Compliance

C.1 EMC

The equipment complies with the EMC standard IEC60601-1-2:2020.

Intended environments: this equipment is intended for use in professional healthcare facility EMC environment and home healthcare EMC environment.

WARNING

- **The use of unapproved accessories may diminish equipment performance.**
- **The equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided below.**
- **Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.**
- **Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.**
- **Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the equipment, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.**
- **Other devices may interfere with this equipment even though they meet the requirements of CISPR.**
- **When the input signal is below the minimum amplitude provided in technical specifications, erroneous measurements could result.**
- **Use of portable or mobile communications devices can degrade the performance of the equipment.**

Guidance and Declaration - Electromagnetic Emissions		
The equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the equipment should assure that it is used in such an environment.		
Emission tests	**Compliance**	**Electromagnetic environment - guidance**
Conducted and radiated RF EMISSIONS CISPR 11	Group 1	The equipment uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
Conducted and radiated RF EMISSIONS CISPR 11	Class B	The equipment is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Conducted and radiated RF EMISSIONS CISPR 11	Class A (Used with Dock)	The equipment is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic distortion IEC 61000-3-2	Class A	The equipment is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Voltage fluctuations and flicker IEC 61000-3-3	Complies	

If the equipment is operated within the electromagnetic environment listed in Table Guidance and Declaration – Electromagnetic Immunity, the equipment will remain safe and provide the following essential performance:

- Operating mode
- Accuracy
- Function
- Accessories identification
- Data stored
- Alarm
- Detect for connection

Guidance and Declaration - Electromagnetic Immunity			
The equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the equipment should assure that it is used in such an environment.			
Immunity test	**IEC60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact; ±2 kV, ±4 kV, ±8 kV, ±15 kV air	±8 kV contact; ±2 kV, ±4 kV, ±8 kV, ±15 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines; ±1 kV for input/output lines	±2 kV for power supply lines; ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±0,5 kV, ±1 kV line(s) to line(s); ±0,5 kV, ±1 kV, ±2 kV line(s) to earth	±0,5 kV, ±1 kV line(s) to line(s); ±0,5 kV, ±1 kV, ±2 kV line(s) to earth	
Voltage dips and voltage interruptions IEC 61000-4-11	0 % U_T for 0.5 cycle: at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0 % U_T for 1 cycle and 70 % U_T for 25/30 cycles: at 0° 0 % U_T for 250/300 cycle	0 % U_T for 0.5 cycle: at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0 % U_T for 1 cycle and 70 % U_T for 25/30 cycles: at 0° 0 % U_T for 250/300 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of our product requires continued operation during power mains interruptions, it is recommended that our product be powered from an uninterruptible power supply or a battery.
RATED power frequency magnetic fields IEC 61000-4-8	30 A/m 50 Hz/60 Hz	30 A/m 50 Hz/60 Hz	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: U_T is the AC mains voltage prior to application of the test level.			

Guidance and Declaration - Electromagnetic Immunity			
The equipment is intended for use in the specified electromagnetic environment. The customer or the user of the equipment should assure that it is used in such an environment as described below.			
Immunity test	**IEC60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted disturbances induced by RF fields IEC61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms 150 kHz to 80 MHz	Portable and mobile RF communications equipment should be used no closer to any part of the equipment, including cables, than the recommended separation distance calculated from the equation appropriate for the frequency of the transmitter. Recommended separation distances: $d = 1.2\sqrt{P}$
	6 Vrms in ISM bands[a] and amateur radio bands between 0.15 MHz and 80 MHz	6 Vrms in ISM bands[a] and amateur radio bands between 0.15 MHz and 80 MHz	
Radiated RF EM fields IEC61000-4-3	10 V/m 80 MHz to 2.7 GHz	10 V/m 80 MHz to 2.7 GHz	Recommended separation distances: 80 MHz to 800 MHz: $d = 1.2\sqrt{P}$ 800MHz - 2.7GHz: $d = 2.3\sqrt{P}$ Where, P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[b] should be less than the compliance level in each frequency range[c]. Interference may occur in the vicinity of equipment marked with the following symbol:
	20V/m 80 MHz to 2.5 GHz	20V/m 80 MHz to 2.5 GHz	

Note 1: At 80 MHz to 800 MHz, the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a]: The ISM (industrial, scientific, and medical) bands between 150 kHz and 80 MHz are 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz. The amateur radio bands between 0,15 MHz and 80 MHz are 1,8 MHz to 2,0 MHz, 3,5 MHz to 4,0 MHz, 5,3 MHz to 5,4 MHz, 7 MHz to 7,3 MHz, 10,1 MHz to 10,15 MHz, 14 MHz to 14,2 MHz, 18,07 MHz to 18,17 MHz, 21,0 MHz to 21,4 MHz, 24,89 MHz to 24,99 MHz, 28,0 MHz to 29,7 MHz and 50,0 MHz to 54,0 MHz.

[b]: Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the **ME EQUIPMENT or ME SYSTEM** is used exceeds the applicable RF compliance level above, the **ME EQUIPMENT or ME SYSTEM** should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the **ME EQUIPMENT or ME SYSTEM**.

[c]: Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3V/m.

GUIDANCE AND MINDRAY DECLARATION—ELECTROMAGNETIC IMMUNITY			
The equipment is intended for use in the electromagnetic environment specified below. The customer or the user of the equipment should assure that it is used in such an environment.			
IMMUNITY TEST	**IEC 60601 TEST LEVEL**	**COMPLIANCE LEVEL**	**ELECTROMAGNETIC ENVIROMENT – GUIDANCE**
Proximity magnetic fields IEC 61000-4-39	8 A/m 30 kHz CW	8 A/m 30 kHz CW	/
	65 A/m 134,2 kHz Pulse modulation 2,1 kHz	65 A/m 134,2 kHz Pulse modulation 2,1 kHz	
	7,5 A/m 13,56 MHz Pulse modulation 50 kHz	7,5 A/m 13,56 MHz Pulse modulation 50 kHz	

Test specifications and minimum distances

Recommended separation distances between portable and mobile RF communications equipment and this equipment

The equipment is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the equipment can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the equipment as recommended below, according to the maximum output power of the communications equipment. Portable and mobile radio communications equipment (e.g. two-way radio, cellular/ cordless telephones and similar equipment) should be used no closer to any part of this equipment, including cables, than determined according to the following method:

Test frequency (MHz)	Band(MHz)	Service	Modulation	Maximum power (W)	Distance (m)	Immunity test level (V/m)
385	380 - 390	TETRA 400	Pulse modulation 18Hz	1.8	0.3	27
450	430 -470	GMRS 460 FRS 460	FM ±5 kHz deviation 1 kHz sine	2	0.3	28
710 745 780	704 - 787	LTE Band 13,17	Pulse modulation 217 Hz	0.2	0.3	9
810 870 930	800 - 960	GSM 800/900, tetra 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation 18 Hz	2	0.3	28
1720 1845 1970	1700 -1990	GSM 1800, CDMA 1900, GSM 1900, DECT, LTE Band 1, 3,4,25,UMTS	Pulse modulation 217 Hz	2	0.3	28
2450	2400 -2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation 217 Hz	2	0.3	28
5240	5100 -5800	WLAN, 802.11 a/n	Pulse modulation 217 Hz	0.2	0.3	9

RECOMMENDED SEPARATION DISTANCES BETWEEN PORTABLE AND MOBILE RF COMMUNICATION DEVICE AND THE EQUIPMENT				
The equipment is intended for use in an electromagnetic environment in which radiated RF disturbance are controlled. The customer or the user of equipment can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and equipment as recommended below, according to the maximum output power of the communication equipment.				
Rated Maximum Output power of Transmitter (W)	**Separation Distance According to Frequency of Transmitter**			
	150kHz -80MHz Out ISM and amateur radio bands $d=1.2\sqrt{P}$	**150kHz -80MHz in ISM and amateur radio bands** $d=2\sqrt{P}$	**80MHz-800MHz** $d=1.2\sqrt{P}$	**800MHz-2.7GHz** $d=2.3\sqrt{P}$
0.01	0.12	0.2	0.12	0.23
0.1	0.38	0.64	0.38	0.73
1	1.2	2	1.2	2.3
10	3.8	6.4	3.8	7.3
100	12	20	12	23
For transmitters at a maximum output power not listed above, the recommended separation distanced in meters (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. Note 1: At 80 MHz and 800 MHz, the higher frequency range applies. Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.				

C.2 Radio Regulatory Compliance

CE

The radio device used in this product is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

For body worn operation, this equipment has been tested and meets the CE RF exposure guidelines when used with the accessories supplied or those approved for use with this product. Use of other accessories may not ensure compliance with CE RF exposure guidelines.

WARNING

- **Changes or modifications not expressly approved by the party responsible compliance could void the user's authority to operate the equipment.**
- **FCC Warning: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:**
  —Reorient or relocate the receiving antenna.
  —Increase the separation between the equipment and receiver.
  —Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
  —Consult the dealer or an experienced radio/TV technician for help.

Note: The Grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. such modifications could void the user's authority to operate the equipment.

The device has been evaluated to meet general RF exposure requirement. The SAR limit of USA(FCC) is 1.6 W/kg averaged over one gram of tissue. Device types BeneVision VP10 (FCC ID: ZLZ-BVVP10) has also been tested against this SAR limit. The highest reported SAR values for body-worn is 0.743W/kg. This equipment should be installed and operated with a minimum distance of 0mm between the radiator and your body. The use of accessories that do not satisfy these requirements may not comply with FCC RF exposure requirements, and should be avoided.

D Default Settings

D.1 Parameters Default Settings

D.1.1 ECG, Arrhythmia, ST and QT Default Settings

D.1.1.1 ECG Default Settings

Item		Default Setting
HR/PR	Alarm switch (On/Off)	On
	High limit	Adult: 120 bpm Pediatric: 160 bpm Neonate: 200 bpm
	Low limit	Adult: 50 bpm Pediatric: 75 bpm Neonate: 100 bpm
	Priority	Med
	Alarm Outputs	Off
	Alarm Source	Auto
Extreme Tachy	Alarm switch (On/Off)	On
	High limit	Adult: 160 bpm Pediatric: 180 bpm Neonate: 220 bpm
	Priority	High
	Alarm Outputs	Off
Extreme Brady	Alarm switch (On/Off)	On
	Low limit	Adult: 35 bpm Pediatric: 50 bpm Neonate: 60 bpm
	Priority	High
	Alarm Outputs	Off
Alarm Source		Auto
ECG1		II
ECG2 (5-lead, 6-lead, 12-lead)		V, Va, V1
Va (for 6-lead only)		Va
Vb (for 6-lead only)		Vb
ECG Gain		×1
Speed		25 mm/sec
Filter		OR: Surgery CCU: Diagnostic Other departments: Monitor
High Freq Cut-off (for 12-lead only)		35 Hz

Item	Default Setting
Notch Filter	On
Lead Set	Auto
D12L(for 6-lead only)	Off
Smart Lead	On
Baseline Drift Removal (for 12-lead only)	On
Waveform Layout	Standard
Analysis Mode	Multiple Leads
QRS Volume	General, OR: 2 Other department: 0
QRS Threshold	0.16 mV
Paced	Adult: Unspecified Pediatric/neonate: No
Pacer Reject	Off
CrozFusion	On

D.1.1.2 Arrhythmia Alarm Default Settings

Item	Alarm Switch	Priority	Alarm Outputs
Asystole	On	High, unadjustable	Off
V-Fib/V-Tach	On	High, unadjustable	Off
V-Tach	On	High, unadjustable	Off
Vent Brady	On	High, unadjustable	Off
Extreme Tachy	On	High, unadjustable	Off
Extreme Brady	On	High, unadjustable	Off
R on T	CCU: On Other departments: Off	Med	Off
Run PVCs	Off	Low	Off
Couplet	Off	Prompt	Off
Multiform PVC	Off	Med	Off
PVC	Off	Prompt	Off
Bigeminy	CCU: On Other departments: Off	Med	Off
Trigeminy	CCU: On Other departments: Off	Med	Off
Tachy	Off	Med	Off
Brady	Off	Med	Off
Pacer Not Capture	Off	Prompt	Off
Pacer Not Pacing	Off	Prompt	Off
Missed Beat	Off	Prompt	Off
Nonsus V-Tach	CCU: On Other departments: Off	Med	Off

Item	Alarm Switch	Priority	Alarm Outputs
Vent Rhythm	CCU: On Other departments: Off	Med	Off
Pause	Off	Low	Off
Irr Rhythm	Off	Prompt	Off
A-Fib	Off	Prompt	Off
PVCs/min	CCU: On Other departments: Off	Med	Off
Pauses/min	CCU: On Other departments: Off	Med	Off
SVT	CCU: On Other departments: Off	Med	Off
SVCs/min	Off	Med	Off

D.1.1.3 Arrhythmia Threshold Default Settings

Item	Default Setting		
	Adult	Pediatric	Neonate
Asystole Delay	5 sec	5 sec	3 sec
Tachy	120 bpm	160 bpm	200 bpm
Brady	50 bpm	75 bpm	100 bpm
Extreme Tachy	160 bpm	180 bpm	220 bpm
Extreme Brady	35 bpm	50 bpm	80 bpm
Multif PVCs Window	15 beats	15 beats	15 beats
PVCs/min	10	10	5
Pauses/min	8	8	8
Pause Threshold	2.0 sec	2.0 sec	1.5 sec
AF/Irr Rhy End Time	2 min	2 min	2 min
V-Tach Rate	130 bpm	130 bpm	150 bpm
V-Brady Rate	40 bpm	40 bpm	60 bpm
V-Tach PVCs	6	6	5
V-Brady PVCs	5	5	3
SVT SVCs	5	5	5
SVT HR	180 bpm	200 bpm	210 bpm
SVCs/min	10	10	10

D.1.1.4 ST Default Settings

Item	Default Setting
ST Alarm Mode	Absolute

Item		Default Setting
ST-I, ST-II, ST-III, ST-aVR, ST-aVL, ST-aVF, ST-V1, ST-V2, ST-V3, ST-V4, ST-V5,ST-V6, ST-Va, ST-Vb (ST Alarm Mode set to **Absolute**)	Alarm switch (On/Off)	Off
	High limit	0.2 mV
	Low limit	-0.2 mV
	Priority	Med
	Alarm Outputs	Off
ST Single, ST Dual (ST Alarm Mode set to **Relative**)	Alarm switch (On/Off)	Off
	High limit	0.1 mV
	Low limit	-0.1 mV
	Priority	Med
	Alarm Outputs	Off
ST Analysis		Off
ST Segment		Auto
Show Markers		Off
ST Point		J+60 ms
Auto Adjust		On
J		48
ISO		-80

D.1.1.5 QT Default Settings

Item		Default Setting
QTc	Alarm switch (On/Off)	Off
	High limit	Adult: 500 Pediatric: 480 Neonate: 460
	Priority	Med
	Alarm Outputs	Off
ΔQTc	Alarm switch (On/Off)	Off
	High limit	60
	Priority	Med
	Alarm Outputs	Off
QT Analysis		Off
QT Leads		All

D.1.1.6 Glasgow 12-lead ECG Algorithm Default Settings

Item	Default Setting
High Freq Cut-off	35 Hz
Baseline Drift Removal	On
Tachy	100

Item	Default Setting
Brady	50
Waveform Layout	Standard
Median Complex	Off
Measurements	On
Interpretation	On
Interpretation Summary	On
Amplitude	10 mm/mV
Speed	25 mm/sec
Auto Interval	Off
12-Lead Format	3×4+1
Rhythm Lead 1	II
Rhythm Lead 2	V2
Rhythm Lead 3	V5
Format Sequence	Sequential

D.1.2 Respiration Default Settings

Item		Default Setting
RR	Alarm switch (On/Off)	On
	High limit	Adult: 30 Pediatric: 30 Neonate: 100
	Low limit	Adult: 8 Pediatric: 8 Neonate: 30
	Priority	Med
	Alarm Outputs	Off
Apnea	Alarm switch (On/Off)	On
	Priority	Adult: Med, unadjustable Pediatric: Med, unadjustable Neonate: High, unadjustable
	Alarm Outputs	Off
Apnea Delay		20 sec
RR Source		Auto
Resp Lead		Adult: Auto Pediatric: Auto Neonate: II
Gain		×2
Speed		6.25 mm/s
Auto Threshold Detection		On

D.1.3 SpO_2 Default Settings

Item		Default Setting
SpO2	Alarm switch (On/Off)	On
	High limit	Adult: 100% Pediatric: 100% Neonate: 95%
	Low limit	Adult/Pediatric: 90% Neonate: 85%
	Priority	Med
	Alarm Outputs	Off
SpO2 Desat	Alarm switch (On/Off)	On
	Low limit	80%
	Priority	High
	Alarm Outputs	Off
Sat-Seconds (for Nellcor SpO_2)		Off
NIBP Simul		Off
Fast SAT(for Masimo SpO2)		Off
Display SIQ (for Masimo SpO2)		Off
Sensitivity (for Mindray SpO_2)		Med
Sensitivity (for Masimo SpO_2)		APOD
Averaging (for Masimo SpO_2)		8 s
Display PI (for Mindray SpO_2, Masimo SpO_2)		On
Speed		25 mm/s
PR	Alarm switch (On/Off)	On
	High limit	Adult: 120 Pediatric: 160 Neonate: 200
	Low limit	Adult: 50 Pediatric: 75 Neonate: 100
	Priority	Med
	Alarm Outputs	Off
	Alarm Source	Auto
	PR Source	Auto
	QRS Volume	General, OR: 2 Other departments: 0
	Display PR	On

D.1.4 Temperature Default Settings

Item		Default Setting
Txx (xx refers to temperature site)	Alarm switch (On/Off)	On
	High limit	38.0 ℃
	Low limit	35.0 ℃
	Priority	Med
	Alarm Outputs	Off
ΔT	Alarm switch (On/Off)	On
	High limit	2.0 ℃
	Priority	Med
	Alarm Outputs	Off

D.1.5 NIBP Default Settings

Item		Default Setting
NIBP-S	Alarm switch (On/Off)	On
	High limit	Adult: 160 mmHg Pediatric: 120 mmHg Neonate: 90 mmHg
	Low limit	Adult: 90 mmHg Pediatric: 70 mmHg Neonate: 40 mmHg
	Priority	Med
	Alarm Outputs	Off
NIBP-D	Alarm switch (On/Off)	On
	High limit	Adult: 90 mmHg Pediatric: 70 mmHg Neonate: 60 mmHg
	Low limit	Adult: 50 mmHg Pediatric: 40 mmHg Neonate: 20 mmHg
	Priority	Med
	Alarm Outputs	Off
NIBP-M	Alarm switch (On/Off)	On
	High limit	Adult: 110 mmHg Pediatric: 90 mmHg Neonate: 70 mmHg
	Low limit	Adult: 60 mmHg Pediatric: 50 mmHg Neonate: 25 mmHg
	Priority	Med
	Alarm Outputs	Off

Item		Default Setting
NIBP-S Extreme	Alarm switch (On/Off)	Off
	High limit	Adult: 175 mmHg Pediatric: 130 mmHg Neonate: 95 mmHg
	Low limit	Adult: 75 mmHg Pediatric: 60 mmHg Neonate: 35 mmHg
	Priority	High
	Alarm Outputs	Off
NIBP-D Extreme	Alarm switch (On/Off)	Off
	High limit	Adult: 105 mmHg Pediatric: 80 mmHg Neonate: 65 mmHg
	Low limit	Adult: 35 mmHg Pediatric: 30 mmHg Neonate: 15 mmHg
	Priority	High
	Alarm Outputs	Off
NIBP-M Extreme	Alarm switch (On/Off)	Off
	High limit	Adult: 125 mmHg Pediatric: 100 mmHg Neonate: 75 mmHg
	Low limit	Adult: 45 mmHg Pediatric: 40 mmHg Neonate: 20 mmHg
	Priority	High
	Alarm Outputs	Off
Initial Pressure		Adult: 160 mmHg Pediatric: 140 mmHg Neonate: 90 mmHg
Interval		OR: 5 min Neonatology: 30 min Other departments: 15 min
Start Mode		Clock
NIBP End Tone		Off
Venipuncture Pressure		Auto
Display Format		Sys/Dia(Mean)
Display Alarm Limits		Off
Display PR		Off

D.1.6 IBP Default Settings

Item		Default Setting
IBP-S	Alarm switch (On/Off)	On
	High limit	■ Art/pArt/Ao/UAP/BAP/FAP/LV/P1/P2 arterial pressure Adult: 160 mmHg Pediatric: 120 mmHg Neonate: 90 mmHg ■ PA Adult: 35 mmHg Pediatric and neonate: 60 mmHg
	Low limit	■ Art/pArt/Ao/UAP/BAP/FAP/LV/P1/P2 arterial pressure Adult: 90 mmHg Pediatric: 70 mmHg Neonate: 55 mmHg ■ PA Adult: 10 mmHg Pediatric and neonate: 24 mmHg
	Priority	Med
	Alarm Outputs	Off
IBP-D	Alarm switch (On/Off)	On
	High limit	■ Art/pArt/Ao/UAP/BAP/FAP/LV/P1/P2 arterial pressure Adult: 90 mmHg Pediatric: 70 mmHg Neonate: 60 mmHg ■ PA Adult: 16 mmHg Pediatric and neonate: 4 mmHg
	Low limit	■ Art/pArt/Ao/UAP/BAP/FAP/LV/P1/P2 arterial pressure Adult: 50 mmHg Pediatric: 40 mmHg Neonate: 20 mmHg ■ PA Adult: 0 mmHg Pediatric and neonate: -4 mmHg
	Priority	Med
	Alarm Outputs	Off
IBP-M	Alarm switch (On/Off)	On

Item		Default Setting
IBP-M	High limit	■ Art/pArt/Ao/UAP/BAP/FAP/LV/P1/P2 arterial pressure Adult: 110 mmHg Pediatric: 90 mmHg Neonate: 70 mmHg ■ PA Adult: 20 mmHg Pediatric and neonate: 26 mmHg ■ CVP/pCVP Adult: 14 cmH_2O Pediatric and neonate: 5 cmH_2O ■ ICP/RAP/LAP/UVP/P3/P4 venous pressure Adult: 10 mmHg Pediatric and neonate: 4 mmHg ■ IAP Adult/Pediatric/neonate: 10 mmHg ■ APP Adult/Pediatric/neonate: 100 mmHg
IBP-M	Low limit	■ Art/pArt/Ao/UAP/BAP/FAP/LV/P1/P2 arterial pressure Adult: 70 mmHg Pediatric: 50 mmHg Neonate: 35 mmHg ■ PA Adult: 0 mmHg Pediatric and neonate: 12 mmHg ■ CVP/pCVP Adult: 0 cmH_2O Pediatric and neonate: 0 cmH2O ■ ICP/RAP/LAP/UVP/P3/P4 venous pressure Adult: 0 mmHg Pediatric and neonate: 0 mmHg ■ IAP Adult/Pediatric/neonate: 0 mmHg ■ APP Adult/Pediatric/neonate: 60 mmHg
IBP-M	Priority	Med
	Alarm Outputs	Off
Art-S Extreme	Alarm switch (On/Off)	Off
	High limit	Adult: 175 mmHg Pediatric: 130 mmHg Neonate: 95 mmHg
	Low limit	Adult: 75 mmHg Pediatric: 60 mmHg Neonate: 50 mmHg
	Priority	High
	Alarm Outputs	Off

Item		Default Setting
Art-D Extreme	Alarm switch (On/Off)	Off
	High limit	Adult: 105 mmHg Pediatric: 80 mmHg Neonate: 65 mmHg
	Low limit	Adult: 35mmHg Pediatric: 30 mmHg Neonate: 15 mmHg
	Priority	High
	Alarm Outputs	Off
Art-M Extreme	Alarm switch (On/Off)	Off
	High limit	Adult: 125 mmHg Pediatric: 100 mmHg Neonate: 75 mmHg
	Low limit	Adult: 55 mmHg Pediatric: 40 mmHg Neonate: 30 mmHg
	Priority	High
	Alarm Outputs	Off
CPP	Alarm switch (On/Off)	On
	High limit	Adult: 130 mmHg Pediatric: 100 mmHg Neonate: 90 mmHg
	Low limit	Adult: 50 mmHg Pediatric: 40 mmHg Neonate: 30 mmHg
	Priority	Med
	Alarm Outputs	Off
Measure (for P1, P2)		All
Measure (for P3, P4)		Mean Only
Sensitivity		Med
Speed		25 mm/sec
Auto Scale		Off
Upper Scale	Art, LV, Ao, FAP, BAP, P1, P2	160 mmHg
	CVP, ICP, LAP, RAP, UVP	20 mmHg
	UAP, P3, P4	80 mmHg
	PA	30 mmHg
Lower Scale		-5 mmHg
PPV Measure		Off
PPV Source		Auto

Item		Default Setting
PAWP	Reference Waveform 1	II
	Reference Waveform 2	Resp
	Speed	12.5 mm/sec
	PA Scale (mmHg)	0-30
Overlapping Waveform Setup	Left Scale (mmHg)	0-160
	Right Scale (mmHg)	0-20
	CVP Scale (cmH2O)	0-30
	ICP Scale (mmHg)	0-20
	PA Scale (mmHg)	0-30
	Speed	25 mm/sec
	Gridlines	Off
Display Format		Sys/Dia(Mean)
Display Alarm Limits		Off
Use PA-D as PAWP (only available for independent external display)		Off

D.1.7 CCO Default Settings (PiCCO)

Item		Default Setting
CCO	Alarm switch (On/Off)	On
	High limit	Adult: 8.5 Pediatric: 3.7
	Low limit	Adult: 4.0 Pediatric: 2.6
	Priority	Med
	Alarm Outputs	Off
CCI	Alarm switch (On/Off)	On
	High limit	4.3
	Low limit	Adult: 2.0 Pediatric: 2.6
	Priority	Med
	Alarm Outputs	Off
Auto pCVP		On
Auto Start		On
Injectate Volume		Adult: 15 ml Pediatric: 10 ml
TD Reminder		8 hr
Select Parameter		CCI, GEDI, ELWI, SVRI, GEF

D.1.8 CO_2 Default Settings

D.1.8.1 General Settings

Item		Default Setting
EtCO2	Alarm switch (On/Off)	On
	High limit	Adult and pediatric: 50 mmHg Neonate: 45 mmHg
	Low limit	25mmHg
	Priority	Med
	Alarm Outputs	Off
FiCO2	Alarm switch (On/Off)	On
	High limit	4 mmHg
	Priority	Med
	Alarm Outputs	Off
Apnea Delay		20 s
RR Source		Auto
Speed		6.25 mm/s
Scale		50 mmHg
Waveform Type		Draw

D.1.8.2 Sidestream CO_2 Default Settings

Item		Default Setting
EtO2	Alarm switch (On/Off)	On
	High limit	88%
	Low limit	18%
	Priority	Med
	Alarm Outputs	Off
FiO2	Alarm switch (On/Off)	On
	High limit	Adult and pediatric: 100% Neonate: 90%
	Low limit	18%
	Priority	Med
	Alarm Outputs	Off
BTPS Compensation		Off
O2 Compensation		OR: 100% Other departments: 21%
AG Compensation		0%
N2O Compensation		0%
Auto Standby		60 min
Operating Mode		Measure

D.1.8.3 Microstream™ CO_2 Default Settings

Item	Default Setting
BTPS Compensation	Off
Maximum Hold	20 sec
Auto Standby	Off
Operating Mode	Measure

D.1.8.4 Mainstream CO_2 Default Settings

Item	Default Setting
Maximum Hold	10 sec
O2 Compensation	Off
Balance Gas	Room Air
AG Compensation	0%
Operating Mode	Measure

D.2 Routine Default Settings

D.2.1 Alarm Default Settings

Item	Default Setting
Alarm Volume	Neonatology: 7 CCU: 2 Other departments: 4
High Alarm Volume	Alarm Volume+3
Reminder Volume	2
Apnea Delay	20 sec
Printing Duration On Alarm	20 sec
SpO2 Low Escalation Time	2 min
Alarm Limits Recommendation	Off

D.2.2 Review Default Settings

Item		Default Setting
Tabular Trends	Trend Group	Standard
	Interval	OR: 5 min Other departments: 30 min
Graphic Trends	Trend Group	Standard
	Zoom	8 hrs
	Trends	5

Item		Default Setting
Events	Filter	All
	Beat Anno:	Off
	Speed	25 mm/s
	Gain	×1
Full Disclosure	Display(Maximum: 3)	II
	Storage	II
	Duration	1 min
	Scale	×1
	Beat Anno:	Off
	Speed	25 mm/sec
	Gain	×1
12-Lead ECG	Speed	25 mm/sec
	Gain	×1
	Layout	3×4+1

D.2.3 Minitrends Default Settings (Only Available for the Independent External Display)

Item		Default Setting
Alarm Statistics		OR: Off Other departments: On
Alarm Statistics Duration		OR: 2hrs Other departments: 8 hrs
Minitrend Length		OR: 30 min Other departments: 2 hrs
Baseline (for OR department only)		Off
Routine Vital		Off
Time	(For **Routine Vital** set to **Auto**)	08:00
Interval	(For **Routine Vital** set to **Auto**)	8 hrs

D.2.4 OxyCRG Default Settings (Only Available for the Independent External Display)

Section	Item	Default Setting
Parameters Setup	Trend1	btbHR
	Trend2	SpO2
	Compressed	Resp

Section	Item	Default Setting
Apnea Event	Threshold (HR)	100
	Duration (HR)	0 s
	Threshold (SpO2)	80
	Duration (SpO2)	0 s
	Apnea	15 sec
	Event Storage Format	2 min+2 min

D.2.5 Remote View Default Settings (Only Available for the Independent External Display)

Item	Default Setting
Rollup Alarm Beds	Off
Rollup Interval	Off
Alarm Priority	High Only
Switch Bed Prompt Voice	Off

D.2.6 Display Default Settings

Item		Default Setting
Choose Screen		Normal Screen
Display	Screen Lock Duration (Only Available for the Independent External Display)	General: Permanent CCU: Permanent Other departments: 10 sec
	Brightness	Auto
	Key Volume	2
Night Mode	Brightness	Auto
	All Mute	Off
	Alarm Volume	2
	QRS Volume	0
	Key Volume	0
	Reminder Volume	1
	NIBP End Tone	Off
	Stop NIBP	Off
	Auto Night Mode	Off
	Night Time Period	22:00 - 6:00

D.2.7 Report Default Settings

D.2.7.1 Report Setup

Item		Default Setting
ECG Report	Amplitude	10 mm/mV
	Speed	25 mm/sec
	Auto Interval	Off
	12-Lead Format	3×4+1
	Rhythm Lead 1	II
	Rhythm Lead 2	V2
	Rhythm Lead 3	V5
	Format Sequence	Sequential
Realtime Report	Speed	Auto
	Select Waveform	Current Waveforms
Tabular Trends Report	Period	Auto
	Interval	Auto
	Report Format	Parameter Oriented
	Trend Group	Standard
Graphic Trends	Period	Auto
	Trend Group	Standard

D.2.8 Calculations Default Settings (Only Available for the Independent External Display)

Item			Default Setting
Drug	Calculator	Weight Based	Off
		Drug Amount	mcg
		Solution Volume	ml
		Dose	mcg/min
		Concentration	mcg/ml
		Infusion Time	hr
		Infusion Rate	ml/hr
	Titration Table	Dose Type	Dose/hr
		Interval	1
Oxygenation	OxyCont Unit		ml/L
	Hb Unit		g/dl
	Pressure Unit		mmHg
Ventilation	Pressure Unit		mmHg

D.2.9 System Time Default Settings

Item	Default Setting
Date Format	yyyy-mm-dd
24-Hour Time	On
Daylight Savings Time	Off

E Alarm Messages

E.1 Physiological Alarm Messages

This section lists physiological alarms, their default priority, and the actions that can be taken when an alarm occurs.

E.1.1 General Physiological Alarm Messages

Alarm messages	Default priority	Cause and solution
XX High	Med	XX value has risen above the high alarm limit or fallen below the low alarm limit. Check the patient's condition and check if the patient category and alarm limit settings are correct.
XX Low	Med	

Note: XX represents a measurement or parameter label, such as HR, NIBP, PVCs, RR, SpO_2, PR, and so on.

E.1.2 Arrhythmia Alarm Messages

Alarm message	Default priority
Asystole	High
V-Fib/V-Tach	High
V-Tach	High
Vent Brady	High
Extreme Tachy	High
Extreme Brady	High
PVCs/min High	Med
Pauses/min High	Med
R on T	Med
Bigeminy	Med
Trigeminy	Med
Tachy	Med
Brady	Med
Multiform PVC	Med
Vent Rhythm	Med
Nonsus V-Tach	Med
Run PVCs	Low
Pause	Low
Couplet	Prompt
PVC	Prompt
Irr Rhythm	Prompt
Pacer Not Pacing	Prompt
Pacer Not Capture	Prompt

Alarm message	Default priority
Missed Beat	Prompt
A-Fib	Prompt
SVT	Med
SVCs/min High	Med

Note: When arrhythmia alarms occur, check the patient's condition and the ECG connections.

E.1.3 ST Physiological Alarm Messages

ST alarm mode	Alarm messages	Default priority	Cause and solution
Absolute	ST-XX High	Med	The ST value of respective ECG lead has risen above the high alarm limit or fallen below the low alarm limit. Check the patient's condition and check if the patient category and alarm limit settings are correct.
	ST-XX Low	Med	
Relative	ST Single	Med	ST value of any ECG leads has risen above the high alarm limit or fallen below the low alarm limit. Check the patient's condition and check if the patient category and alarm limit settings are correct.
	ST Dual	Med	ST values of two or more ECG leads have risen above the high alarm limit or fallen below the low alarm limit. Check the patient's condition and check if the patient category and alarm limit settings are correct.

Note: XX represents the ECG lead label.

E.1.4 Resp Physiological Alarm Messages

Alarm message	Default priority	Cause and solution
Resp Artifact	High	The patient's heartbeat has interfered with his respiration. Check the patient's condition and the Resp connections.
Apnea	Adult: Med Pediatric: Med Neonate: High	The respiration signal was so weak that the monitor cannot perform respiration analysis. Check the patient's condition, module and patient connections.

E.1.5 SpO_2 Physiological Alarm Messages

Alarm message	Default priority	Cause and solution
SpO2 Low (YY hrs YY min YYsec)	High	The SpO_2 value falls below the alarm limit. Check the patient's condition and check if the alarm limit settings are correct.
SpO2 Desat (YY hrs YY min YYsec)	High	The SpO_2 value falls below the desaturation alarm limit. Check the patient's condition and check if the alarm limit settings are correct.

Note: YY hrs YY min YYsec represents the period of time that the SpO_2 alarm has lasted.

E.1.6 PR Physiological Alarm Messages

Alarm message	Default priority	Cause and solution
No Pulse	High	The pulse signal was so weak that the monitor cannot perform pulse analysis. Check the patient's condition, SpO2 sensor and measurement site.

E.1.7 NIBP Physiological Alarm Messages

Alarm message	Default priority	Cause and solution
NIBP-S Extremely High/ NIBP-D Extremely High/ NIBP-M Extremely High	High	The NIBP value is higher than the NIBP Extreme alarm high limit. Check the patient's condition and check if the alarm limit settings are correct.
NIBP-S Extremely Low/NIBP-D Extremely Low/NIBP-M Extremely Low	High	The NIBP value is lower than the NIBP Extreme alarm low limit. Check the patient's condition and check if the alarm limit settings are correct.

E.1.8 IBP Physiological Alarm Messages

Alarm message	Default priority	Cause and solution
Art-S Extremely High/Art-D Extremely High/Art-M Extremely High	High	The Art value is higher than the Art Extreme alarm high limit. Check the patient's condition and check if the alarm limit settings are correct.
Art-S Extremely Low/Art-D Extremely Low/Art-M Extremely Low	High	The Art value is lower than the Art Extreme alarm low limit. Check the patient's condition and check if the alarm limit settings are correct.

E.1.9 CO_2 Physiological Alarm Messages

Alarm message	Default priority	Cause and solution
FiO2 Shortage	High	FiO_2 concentration is less than18%. Check the patient's condition, the ventilated O_2 content and the airway connection.

E.1.10 EWS Physiological Alarm Messages

Alarm message	Default priority	Cause and solution
EWS Score ≥ N[1]	High/Med	The total score exceeds the configured alarm limit. Check the patient condition.
XX[2] score is 3	Med	The parameter score is 3. Check the patient condition.

Note1: 1. N represents the EWS score.

Note2: 2. XX represents RR, SpO_2, Temp, BP-S, BP-D, BP-M, HR, $EtCO_2$, or FiO_2.

E.1.11 Combined Alarm Messages

Alarm message	Default priority	Cause and solution
HR>XX with IBP-S<XX and RR>XX over YY min	High	This indicates a risk of early stage shock. Check patient status.
qSOFA score ≥2 over YY min	Med	This indicates a risk of early stage sepsis. Check patient status.
ICP-M > XX over YY min	High	This indicates an increased the risk of death. Check patient status.
CPP > XX over YY min	Med	This indicates increased the risk of death and poor prognosis. Check patient status.
CPP < XX over YY min>	Med	

EtCO2 ≤ XX over YY min	High	This indicates a risk of respiratory depression. Check patient status.
EtCO2 ≥ XX over YY min		
RR ≤ XX over YY min		
SpO2 ≤ XX over YY min		
IBP-S ↓ XX within YY min	Prompt	This indicates probable septic shock, gastrointestinal bleeding, or cardiac failure. Check patient status.
IBP-S ↑ XX within YY min		
HR ↓ XX within YY min		
HR ↑ XX within YY min		
PR ↓ XX within YY min		
PR ↑ XX within YY min		
A-Fib with RVR over YY min	High	This indicates critical atrial fibrillation. Check patient status.
A-Fib with Long R-R Interval	High	
R on T with QT Prolonged	Med	The patient has obvious prolonged QT interval with R on T premature ventricular contraction. Check patient status.
Frequent PVCs with QT Prolonged	Med	Premature ventricular contractions with prolonged QT intervals. Check patient status.

Note: XX refers to a parameter threshold and YY represents a time threshold. " ↓ " represents a decrease of parameter measurement. " ↑ " represents an increase of parameter measurement.

E.2 Technical Alarm Messages

This section lists technical alarms, their default priority, indication on alarm reset, and the actions that can be taken when an alarm occurs.

Technical alarms give different alarm indicators when the alarm system is reset. In this section we classify the technical alarms into three categories for easy clarification:

- A: technical alarms are cleared. The monitor gives no alarm indications.
- B: technical alarms are changed to the prompt messages.
- C: the alarm is silenced and a check mark ✔ appears before the alarm message.

In the following tables we will use A, B, and C to refer to the indications on alarm reset.

E.2.1 General Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
XX Module Error	High	C	XX module does not work properly. Replug the module, if the alarm persists, contact your service personnel.

Note: XX represents a measurement or parameter label, such as HR, RR, SpO_2, $EtCO_2$, and so on.

E.2.2 ECG Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
ECG Noisy	Low/Prompt	A	The ECG signal is noisy. Check for any possible sources of signal noise around the cable and electrode, and check the patient for excessive motion.

Alarm message	Default priority	Indication on alarm reset	Cause and solution
ECG Amplitude Too Small	Low	C	The ECG amplitude does not reach the detected threshold. Check for any possible source of interference around the cable and electrode.
ECG XX Lead Off	Low	B	The electrode has become detached from the patient or the lead wire has become disconnected from the adapter cable. Check the connections of the electrodes and leadwires.
ECG Lead Off (YY hrs YY min YYsec)	Low	B	The electrode has become detached from the patient or the lead wire has become disconnected from the adapter cable. Check the connections of the electrodes and leadwires.
ECG Signal Invalid	Low	A	Patient skin impedance is too high. Check ECG electrode application.
ECG Learning	Prompt	/	ECG learning is manually or automatically triggered.
Cannot Analyze QT	Prompt	/	/
D12L Not Available	Prompt	/	The current Va and Vb combination does not support D12L. Choose an available Va and Vb combination. For more information, see *10.5 Using 6-lead Placement to Derive 12-lead ECG (D12L)*.

Note: The alarm priority of ECG XX Lead Off depends on whether HR value is available. If HR value is available, the priority of ECG XX Lead Off is "Low". If HR value is not available. the priority of ECG XX Lead Off is defined by the setting of ECG Lead Off from the Maintenance menu. For more information, see ECG Lead Off in *23.4.7 The Other Tab*.

Note: XX represents ECG lead label, for example LL, V, Va, Vb, and so on.

Note: YY hrs YY min YYsec represents the period of time that the ECG Lead Off alarm lasts.

E.2.3 Resp Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
Resp Interference	Prompt	/	The respiration circuit is disturbed. Check for any possible sources of signal noise.
Electrode Poor Contact	Prompt	/	Check the electrode application. Reposition or replace the electrodes if necessary.

E.2.4 SpO_2 Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
SpO2 Sensor Off	Low	B	The SpO_2 sensor has become detached from the patient or the module. Check the sensor connection. If the alarm persists, replace the sensor.
SpO2 No Sensor	Low	A	The SpO_2 extension cable is detached from the SpO_2 module, or the SpO_2 sensor is detached from the SpO_2 extension cable. Check the SpO_2 cable and the sensor connection. If the alarm persists, replace the sensor.

Alarm message	Default priority	Indication on alarm reset	Cause and solution
SpO2 Excess Light	Low	C	Ambient light is too strong. Move the sensor to a place with lower level of ambient light or cover the sensor to minimize the ambient light.
SpO2 No Pulse	Low	C	The SpO_2 sensor failed to obtain pulse signal. Check the patient's condition and replace the sensor application site. If the alarm persists, replace the sensor.
SpO2 Sensor Incompatible	Low	C	Incompatible or an unspecified SpO_2 sensor is used. Use specified sensors.
SpO2 Low Signal Quality	Low	C	1. Check the sensor and sensor position. 2. Make sure the patient is not shivering or moving. 3. The patient's pulse may be too low to be measured.
SpO2 Interference	Low	C	The SpO_2 signal has been interfered. Check for any possible sources of signal noise and check the patient for excessive motion.
SpO2 Sensor Error	Low	C	Replace the sensor and measure again.
SpO2 Searching Pulse	Prompt	/	SpO_2 is searching for pulse.
SpO2 Low Perfusion	Prompt	/	The SpO_2 sensor is not properly placed or the patient's perfusion index is too low. 1. Check the sensor and sensor position. 2. Reposition the sensor if necessary.

E.2.5 Temp Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
T1/T2 Sensor Off	Low	A	Check the sensor connection and reconnect the sensor.

E.2.6 NIBP Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
NIBP Cuff Loose	Low	A	There is a leak in the cuff or air tubing. Use a cuff of correct type based on the patient size. Apply the cuff and connect the air tubing as instructed in the manual.
NIBP Cuff or Airway Leak	Low	A	Check the NIBP cuff and pump for leakages.
NIBP Airway Error	Low	A	The air tubing may be occluded. Check the air tubing for an occlusion or kinking. If the alarm persists, contact your service personnel.
NIBP Weak Signal	Low	A	The patient's pulse is weak or the cuff is loose. Check the patient's condition and replace the cuff application site.
NIBP Overrange	Low	A	The measured NIBP value exceeds the module measurement range. Check the patient's condition.
NIBP Excessive Motion	Low	A	Check the patient's condition and reduce patient motion.

Alarm message	Default priority	Indication on alarm reset	Cause and solution
NIBP Cuff Overpressure	Low	A	The NIBP airway may be occluded. Check the airway and measure again. If the alarm persists, contact your service personnel.
NIBP Timeout	Low	A	The measurement time exceeds 120 seconds in the adult or pediatric mode, or exceeds 90 seconds in the neonatal mode, and the BP value cannot be obtained. Check the patient's condition and NIBP connections, or replace the cuff and measure again.
NIBP Cuff and Patient Mismatch	Low	A	The cuff type mismatches the patient category. Verify the patient category or replace the cuff if necessary. If patient category is correct, check that the tubing is not bent and the airway is not occluded.
NIBP Airway Leak	Low	A	Airway leakage is found during the NIBP leakage test. Check the NIBP cuff and pump for leakages.

E.2.7 IBP Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
XX Sensor Error	Med	C	The IBP sensor fails. Replace the sensor.
XX No Sensor	Med	A	The IBP patient cable and/or corresponding IBP sensor is not connected or detached. Check the cable and sensor connection.
XX No Pulse	Low	A	The catheter may be occluded. Please flush the catheter.
XX Disconnected	High	C	The liquid way is disconnected from the patient, or the three-way valve is open to the air. Check the connection of the liquid way. Make sure that the valve is open to the patient. If the alarm persists, contact your service personnel.
Host Monitor Version Low	Low	A	The N Series system software version is too low. In order for the N Series monitor to connect to the N1 which connects to the external IBP module and perform IBP monitoring, the system software of N 1 and N series monitor should be V02.25 and above.

Note: XX represents an IBP label, for example PA, CVP, FAP, P1, and so on.

E.2.8 CCO Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
Invalid PiCCO Catheter	Low	C	Erroneous or invalid catheter is used. Replace the catheter with the recommended catheter.
TI Sensor Off/TB Sensor Off	Low	A	Check the sensor connections.
TI Sensor Error	Low	C	Replace the sensor.
Abnormal pArt Curve	Low	C	pArt is not detected. Check that pArt is properly measured. For example IBP sensor is properly zeroed and the sensor is properly connected to the patient.

E.2.9 CO_2 Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
CO2 Module High Temp	Low	C	Ambient temperature is too high or there is a module failure. 1. Lower the operating temperature. 2. Replug the module. 3. If the alarm persists, the CO_2 module may fail, contact your service personnel.
CO2 Module Low Temp	Low	C	Ambient temperature is too low or there is a module failure. 1. Raise the operating temperature. 2. Replug the module. 3. If the alarm persists, the CO_2 module may fail, contact your service personnel.
CO2 Zero Failed	Low	C	For mainstream CO_2 module, check the connections between the adapter and CO_2 transducer. Wait till the sensor's temperature becomes stabilized, and then perform a zero calibration again. For sidestream CO_2 module, replug the module. If the alarm persists, contact your service personnel.
CO2 No Watertrap	Low	B	Check the watertrap connections.
CO2 No Adaptor	Low	B	Check the adaptor connection.
CO2 High Airway Pressure	Low	C	1. Check the airway pressure settings of the ventilator/anesthesia machine. 2. Disconnect the module from the ventilator/ anesthesia machine. 3. Replug the module. 4. If the alarm persists, contact your service personnel.
CO2 Low Airway Pressure	Low	C	1. Check the airway pressure settings of the ventilator/anesthesia machine. 2. Disconnect the module from the ventilator/ anesthesia machine. 3. Replug the module. 4. If the alarm persists, contact your service personnel.
High Barometric	Low	C	The ambient pressure exceeds the operating pressure range or CO_2 module fails. 1. Make sure that the ambient pressure meets the specifications, and check for sources that affect the ambient pressure. 2. Replug the module. If the alarm persists, contact your service personnel.
Low Barometric	Low	C	The ambient pressure exceeds the operating pressure range or CO_2 module fails. 1. Make sure that the ambient pressure meets the specifications, and check for sources that affect the ambient pressure. 2. Replug the module. If the alarm persists, contact your service personnel.
CO2 Airway Occluded	Low	C	1. Check if the sample line is kinked or occluded. 2. Replace the sample line. 3. Replug the module. 4. If the alarm persists, contact your service personnel.

Alarm message	Default priority	Indication on alarm reset	Cause and solution
CO2 No Filterline	Low	A	Make sure that the filterline is connected.
CO2 Calibration Required	Low	C	Perform a calibration.
CO2 Airway Error	Low	C	1. Check if the sample line is kinked or occluded. 2. Replace the sample line. 3. Replug the module. 4. If the alarm persists, contact your service personnel.
CO2 Adapter Error	Low	A	Check, clean or replace the airway adapter. Perform a zero calibration.
CO2 No Sensor	Low	A	Make sure that the CO_2 transducer is connected.
CO2: Change Watertrap	Low	C	Replace the watertrap.
CO2 Watertrap and Patient Mismatch	Low	C	Check the patient category and use a correct watertrap.

E.2.10 EWS Technical Alarms

Alarm message	Default priority	Indication on alarm reset	Cause and solution
EWS param XX is timeout	Low	A	The manually input parameter is timeout. Input a parameter numeric again.
EWS score needs to be confirmed	Low	A	Confirm to save or give up current score.

XX represents RR, SpO2, Supp. O2, Temp, BP, HR, Consciousness, Blood Sugar, Urine Output, Catheter, Pain Score, Pain, EtCO2, FiO2, Airway, or Customer defined parameter.

E.2.11 Power Supply Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
Low Battery	Med	C	Connect the monitor to an AC power source and allow the batteries to charge.
Critically Low Battery	High	C	Connect the monitor to an AC power source and allow the batteries to charge.
Battery aged, replace the battery.	Low	B	The battery reaches its lifetime. Replace the battery.
Power Board Comm Error	High	C	Restart the monitor. If the alarm persists, contact your service personnel.
Battery Error	High	C	The battery may fail. Contact your service personnel.
Battery Charging Error	High	C	The charging circuit fails or the battery fails. Contact your service personnel.
Battery Temperature Too High	High	C	Stop using the monitor after this alarm appears, and contact your service personnel.
Battery Off	High	C	Restart the monitor. If the alarm persists, contact your service personnel.
RT Clock Need Reset	High	C	Contact your service personnel.
RT Clock Not Exist	High	C	Contact your service personnel.

Alarm message	Default priority	Indication on alarm reset	Cause and solution
XX V Too High	High	C	There is a problem with the system power supply. Restart the monitor.
XX V Too Low	High	C	

Note: XX represents 2.5 V, 3.3 V,5 V, or 12 V.

E.2.12 Printer Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
Printer Buffer Full	Prompt	/	The printer buffer is full. Wait till the printer finishes the printing task.
Fail	Prompt	/	The printer runs out of paper or cannot be connected. Check the printer.
Printing Stopped	Prompt	/	Printing is manually stopped.
Printer Unavailable	Prompt	/	The printer may fail. Check the printer.
PDF storage space is nearly full	Prompt	/	Delete the files saved under the PDF file path to release storage space. Otherwise you cannot save new PDF files.
Error storing PDF file	Prompt	/	The PDF file path settings on the printer server and the PDFCreator are not consistent or the PDF storage space is full. Check the PDF file path settings for consistency, or delete the files saved under the PDF file path to release storage space.
Change the print server language to be consistent with this monitor	Prompt	/	Verify that the language settings of the printer server and the monitor are consistent, Otherwise you cannot perform printing.
Print Server Disconnected	Prompt	/	Check that the monitor is properly connected with the printer server.

E.2.13 Technical Alarm Messages Related to Networked Monitoring

Alarm message	Default priority	Indication on alarm reset	Cause and solution
CMS/eGW Disconnected	Low	B	The monitor is disconnected from the CMS. Check the network connection.
View Bed XX YY-ZZ, Network Disconnected.	Low	A	The network is interrupted when the monitor is viewing the remote device. Check the network connection.
Viewed by Bed XX YY-ZZ, Network Disconnected.	Low	A	The network is interrupted when the monitor is viewed by another remote device. Check the network connection.
WLAN IP Address Conflict	Low	C	Wireless network IP network conflicts. Check the network settings.
LAN1 IP Address Conflict	Low	C	Wired network LAN1 IP network conflicts. Check the network settings.
Fail To Get WLAN IP Address	Low	C	Unable to automatically obtain the wireless network IP address. Check the network settings.
Fail To Get LAN1 IP Address	Low	C	Unable to automatically obtain the wired network LAN1 IP address. Check the network settings.

Note: XX refers to the department name, YY refers to the room number, and ZZ refers to the bed number.

E.2.14 Technical Alarm Messages Related to MRV Pod

Alarm message	Default priority	Indication on alarm reset	Cause and solution
MRV Pod Temperature Too High	High	C	Ambient temperature is too high or there is a module failure. 1. Lower the operating temperature. 2. If the alarm persists, the MRV Pod may fail, contact your service personnel.
MRV Pod disconnected	High	C	The MRV Pod is not connected to the monitor. 1. Move the MRV Pod in the network coverage. 2.Connect the MRV Pod to the monitor via MRV Pod Pocket. 3. If the alarm persists, contact your service personnel.
MRV Pod Cable Disconnected	High	A (Non-fault Condition) C (Fault Condition)	1.The MRV Pod communication cable is unplugged. 2.If the MRV Pod communication cable is still connected to the monitor, reconnect it. If the alarm persists, replace the communication cable or contact your service personnel.
MRV Pod weak signal	Low	A	1.When the wireless MRV Pod is connected to the monitor wirelessly, the network signal is poor. Move the MRV Pod in the network coverage or connect the MRV Pod to the monitor via MRV Pod Pocket. If the alarm persists, contact your service personnel. 2.When the wireless MRV Pod is connected to the monitor wired, the multi-function interface of the communication cable may be in poor contact or the communication cable is damaged. Please reconnect the communication cable. If the alarm persists, replace the communication cable or contact your service personnel.
MRV Pod charging error	High	C	Replug the MRV Pod to the MRV Pod Pocket. If the alarm persists, contact your service personnel.
MRV Pod battery aging	Prompt	A	Contact your service personnel.
MRV Pod Low Battery	Med	C	Connect the MRV Pod to the monitor via MRV Pod Pocket.
MRV Pod Battery Depleted	High	C	Connect the MRV Pod to the monitor via MRV Pod Pocket.
MRV Pod IP address conflict	Low	C	The MRV Pod IP address conflicts with another device on the network. Check the network setup.
MRV Pod Module Error	High	C	Contact your service personnel.
MRV Pod and MPM conflict	Prompt	C	The MRV Pod and internal MPM module cannot be used simultaneously for patient monitoring. Disconnect MRV Pod from N1, or disconnect the parameter cable from N1 and clear the technical alarm.
MRV Pod 12-lead ECG Monitoring Not Supported	Prompt	C	N1 does not support MRV Pod 12-lead ECG monitoring. If needed, please use N1 with an "Ultimate" label, or contact your service personnel.

E.2.15 Other System Technical Alarm Messages

Alarm message	Default priority	Indication on alarm reset	Cause and solution
Read dock E2PROM error!	High	C	1. Check if you're using the specified external display. • If you're using the specified external display, remove the N1 from the Dock, and reconnect the N1 and the Dock. • If you're not using the specified external display, replace current external display with the specified external display. Then remove the N1 from the Dock, and reconnect the N1 and the Dock. 2. If the alarm persists, contact your service personnel.
Storage Error	High	C	The storage card fails or files are damaged. Restart the monitor. If the alarm persists, contact your service personnel.
Loading Default Config Failed	Low	A	The default configuration is not correctly loaded. The monitor will restore to the factory default configuration for the current patient category.
XX Conflicts (XX refers to the module label)	Prompt	/	The same type of corresponding module being used exceeds the supported number. Remove the conflict module.
XX Measurement has been closed (XX refers to the module label)	Prompt	/	The parameter module is disabled. Switch on the module if you want to use it. For more information, see *3.11.1 Switching On or Off a Parameter*.
The display setup for XX is disabled. (XX refers to the parameter label)	Prompt	/	The parameter of the newly inserted module is not displayed on the screen. Select a desired area to display the parameter numerics and waveforms. For more information, see *3.11.2 Displaying Parameter Numerics and Waveforms*.
The patient data storage space is nearly full. Please delete some discharged patients.	Med	B	Delete unnecessary earlier discharged patient.
Patient ID conflicts with XX (XX represents Department-Room number-Bed number)	Med	B	Patient ID of the current patient conflicts with that on another device. Discharge the patient from unused device.
Visit number conflicts with XX (XX represents Department-Room number-Bed number)	Med	B	Visit number of the current patient conflicts with that on another device. Discharge the patient from unused device.

F 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 electrical safety inspection should be periodically performed every two years.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.

F.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.

F.2 Device Enclosure and Accessories

F.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.).

F.2.2 Contextual Inspection

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

F.3 Device Labeling

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

- Main unit label
- Integrated warning labels

F.4 Protective Earth Resistance

1. Plug the probes of the analyzer into the device's protective earth terminal and protective earth terminal of the AC power cord.
2. Test the earth resistance with a current of 25 A.
3. Verify the resistance is less than limits.

LIMITS

For all countries, R = 0.2 Ω Maximum

F.5 Earth Leakage Test

Run an Earth Leakage test on the device being tested before performing any other leakage tests.

The following outlet conditions apply when performing the Earth Leakage test:

- normal polarity (Normal Condition),
- reverse polarity (Normal Condition),
- normal polarity with open neutral (Single Fault Condition),
- reverse polarity with open neutral (Single Fault Condition)

LIMITS

For UL60601-1,

- 300 µA in Normal Condition
- 1000 µA in Single Fault Condition

For IEC60601-1,

- 500 µA in Normal Condition
- 1000 µA in Single Fault Condition

F.6 Patient Leakage Current

Patient leakage currents are measured between a selected applied part and mains earth. All measurements have a true RMS only

The following outlet conditions apply when performing the Patient Leakage Current test.

- normal polarity (Normal Condition);
- reverse polarity (Normal Condition),
- normal polarity with open neutral (Single Fault Condition);
- reverse polarity with open neutral (Single Fault Condition).
- normal polarity with open earth (Single Fault Condition);
- reverse polarity with open earth (Single Fault Condition).

LIMITS

For CF  applied parts

- 10 µA in Normal Condition
- 50 µA in Single Fault Condition

For BF  applied parts

- 100 µA in Normal Condition
- 500 µA in Single Fault Condition

F.7 Mains on Applied Part Leakage

The Mains on Applied Part test applies a test voltage, which is 110% of the mains voltage, through a limiting resistance, to selected applied part terminals. Current measurements are then taken between the selected applied part and earth. Measurements are taken with the test voltage (110% of mains) to applied parts in the normal and reverse polarity conditions

The following outlet conditions apply when performing the Mains on Applied Part test.

- Normal Polarity;
- Reversed Polarity

LIMITS

- For CF  applied parts: 50 µA
- For BF  applied parts: 5000 µA

F.8 Patient Auxiliary Current

Patient Auxiliary currents are measured between any selected Applied Part connector and the remaining Applied Part connector s. All measurements may have a true RMS only response.

The following outlet conditions apply when performing the Patient Auxiliary Current test.

- normal polarity (Normal Condition);
- reverse polarity (Normal Condition),
- normal polarity with open neutral (Single Fault Condition);
- reverse polarity with open neutral (Single Fault Condition).
- normal polarity with open earth (Single Fault Condition);
- reverse polarity with open earth (Single Fault Condition).

LIMITS

For CF  applied parts,

- 10 µA in Normal Condition
- 50 µA in Single Fault Condition

For BF  applied parts,

- 100 µA in Normal Condition
- 500 µA in Single Fault Condition

NOTE

- **Make sure the safety analyzer is authorized comply with requirement of IEC60601-1.**
- **Follow the instructions of the analyzer manufacturer.**

G Abbreviations

Abbreviation	In Full
°C	centigrade
°F	Fahrenheit
µA	microampere
µV	microvolt
µs	microsecond
Ω	ohm
A	ampere
Ah	ampere hour
AaDO2	alveolar-arterial oxygen gradient
AC	alternating current
Adu	adult
AG	anaesthesia gas
AHA	American Heart Association
Ao	aortic pressure
APP	Abdominal (Intra) perfusion pressure
Art	arterial
ATMP	barometric pressure
aVF	left foot augmented lead
aVL	left arm augmented lead
aVR	right arm augmented lead
awRR	airway respiratory rate
BAP	brachial arterial pressure
BoA	Balance of Anesthesia
bpm	beat per minute
bps	bit per second
BSA	body surface area
BSR	burst suppression ratio
BT	blood temperature
BTPS Compensation	body temperature and pressure, saturated
CAA	Clinical Assistive Application
CaO2	arterial oxygen content
cc	cubic centimeter
CCI	continuous cardiac index
CCO	continuous cardiac output

Abbreviation	In Full
CCU	cardiac (coronary) care unit
CE	Conformité Européenne
CFI	cardiac function index
C.I.	cardiac index
CIS	clinical information system
CISPR	International Special Committee on Radio Interference
cm	centimeter
cmH2O	centimeters of water
CMOS	complementary metal oxide semiconductor
CMS	central monitoring system
C.O.	cardiac output
CO2	carbon dioxide
COHb	carboxyhemoglobin
Compl	compliance
CPI	cardiac power index
CQI	CPR quality index
CPO	cardiac power output
CVP	central venous pressure
dB	decibel
DC	direct current
Des	desflurane
Dia	diastolic
dpi	dot per inch
dPmx	left ventricular contractility
DS	dyne second
DVI	digital video interface
DO_2	oxygen delivery
DO_2I	oxygen delivery index
ECG	electrocardiograph
EDV	end-diastolic volume
EE	Energy Expenditure
EEC	European Economic Community
EMC	electromagnetic compatibility
EMG	electromyograph
EMI	electromagnetic interference
Enf	enflurane
ESI	Encephalon State Index
ESU	electrosurgical unit
Et	end-tidal

Abbreviation	In Full
EtAA	end-tidal anesthetic agent
EtDes	end-tidal anesthetic agent
EtEnf	
EtHal	
EtIso	
EtSev	
$EtCO_2$	end-tidal carbon dioxide
EtN_2O	end-tidal nitrous oxide
EtO	ethylene oxide
EtO_2	end-tidal oxygen
EVLW	extravascular lung water
ELWI	extravascular lung water index
EWS	Early Warning Score
FAP	femoral arterial pressure
FCC	Federal Communication Commission
FDA	Food and Drug Administration
$FeCO_2$	Mixed Expired CO2 Concentration
Fi	fraction of inspired
FiAA	inspired anesthetic agent
FiDes	inspired anesthetic agent
FiEnf	
FiHal	
FiIso	
FiSev	
FiCO2	fraction of inspired carbon oxygen
FiN_2O	fraction of inspired nitrous oxide
FiO_2	fraction of inspired oxygen
FPGA	field programmable gate array
FV	flow-volume
g	gram
GCS	Glasgow Coma Scale
GEDV	global end diastolic volume
GEDI	global end diastolic volume index
GEF	global ejection fraction
GHz	gigahertz
GTT	gutta
h	hour
Hal	halothane
Hb	hemoglobin

Abbreviation	In Full
Hct	haematocrit
HIS	hospital information system
HR	heart rate
Hz	hertz
in	inch
IABP	intra-aortic balloon pump
IAP	Intra abdominal pressure
IBP	invasive blood pressure
IBW	ideal body weight
ICG	impedance cardiography
ICP	intracranial pressure
ICT/B	intracranial catheter tip pressure transducer
ICU	intensive care unit
ID	identification
I:E	inspiratory time: expiratory time ratio
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IP	internet protocol
IPS	individual parameter score
Iso	isoflurane
ITBI	intrathoracic blood volume index
ITBV	intrathoracic blood volume
k	kilo
kg	kilogram
kPa	kilopascal
LA	left arm
LAP	left atrial pressure
LCD	liquid crystal display
LCW	left cardiac work
LCWI	left cardiac work index
LDAP	Lightweight Directory Access Protocol
LED	light emitting diode
LL	left leg
LVET	left ventricular ejection time
LVSW	left ventricular stroke work
LVSWI	left ventricular stroke work index
L	litre
lb	pound
m	meter
MAC	minimum alveolar concentration

Abbreviation	In Full
mAh	milliampere hour
MAP	mean arterial pressure
Mb	mega byte
Mb	Myoglobin
mcg	microgram
mEq	milli-equivalents
MetHb	methemoglobin
MEWS	Modified Early Warning Score
MF	Median Frequency
mg	milligram
min	minute
ml	milliliter
MLDAP	Mindray LDAP, Mindray Lightweight Directory Access Protocol
mm	millimeter
mmHg	millimeters of mercury
MRI	magnetic resonance imaging
ms	millisecond
mV	millivolt
mW	milliwatt
MΩ	megaohm
MV	minute volume
MValv	Alveolar Minute Volume
$MVCO_2$	CO_2 minute production
MVe	expiratory minute volume
MVi	inspiratory minute volume
MVO_2	O_2 minute consumption
N/A	not applied
N_2	nitrogen
N_2O	nitrous oxide
Neo	neonate
NEWS	National Early Warning Score
NIBP	noninvasive blood pressure
NIF	negative inspiratory force
nm	nanometer
O_2	oxygen
O_2%	oxygen concentration
OR	operating room
oxyCRG	oxygen cardio-respirogram
PA	pulmonary artery

Abbreviation	In Full
pArt	artery pressure from the PiCCO module
pArt-D	diastolic artery pressure from the PiCCO module
pArt-M	mean artery pressure from the PiCCO module
pArt-S	systolic artery pressure from the PiCCO module
Paw	airway pressure
PAWP	pulmonary artery wedge pressure
pCVP	central venous pressure
Ped	pediatric
PEEP	positive end expiratory pressure
PEF	peak expiratory flow
PEP	pre-ejection period
PIF	peak inspiratory flow
PI	perfusion index
PIP	peak inspiratory pressure
Pleth	plethysmogram
Pmean	mean pressure
PO_2	oxygen supply pressure
PPF	Peak Power Frequency
Pplat	plateau pressure
PPV	pulse pressure variation
PR	pulse rate
PVC	premature ventricular contraction
PVPI	pulmonary vascular permeability index
PVR	pulmonary vascular resistance
PVRI	pulmonary vascular resistance index
qSOFA	quick Sepsis-Related Organ Failure Assessment
RA	right arm
RAP	right atrial pressure
Raw	airway resistance
Rec	record, recording
Resp	respiration
RL	right leg
RM	respiratory mechanics
rpm	breaths per minute
RQ	respiratory quotient
RR	respiration rate
RSBI	rapid shallow breathing index
s	second
Sev	sevoflurane

Abbreviation	In Full
SI	stroke index
$SlopeCO_2$	Slope of the alveolar plateau
SMR	satellite module rack
SOFA	Sepsis-Related Organ Failure Assessment
SpO_2	arterial oxygen saturation from pulse oximetry
SQI	signal quality index
SR	suppression ratio
SSC	Surviving Sepsis Campaign
SSI	signal strength index
STR	systolic time ratio
SV	stroke volume
SVC	Supra Ventricular Contraction
SVI	stroke volume index
SVR	systemic vascular resistance
SVRI	systemic vascular resistance index
SVT	Supra Ventricular Tachycardia
SVV	stroke volume variation
SvO_2	venous oxygen saturation
Sync	synchronization
Sys	systolic pressure
TB	Blood Temperature
TD	temperature difference
Temp	temperature
TFT	thin-film technology
TI	injectate temperature
TRC	tube resistance compensation
UAP	umbilical arterial pressure
UPS	uninterruptible power supply
USB	universal serial bus
UVP	umbilical venous pressure
V	volt
VA	volt ampere
VAC	volts alternating current
VEPT	volume of electrically participating tissue
VPB	ventricular premature beat per minute
W	watt

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H Declaration of Conformity

Declaration of Conformity V3.0

Declaration of Conformity

CE

Manufacturer: Shenzhen Mindray Bio-Medical Electronics Co., Ltd.
Mindray Building, Keji 12th Road South, High-tech Industrial Park,
Nanshan, Shenzhen, 518057, P. R. China

EC-Representative: Shanghai International Holding Corp. GmbH (Europe)
Eiffestraße 80
20537 Hamburg, Germany

Product: **Patient Monitor (Including Accessories)**

Model: BeneVision N1 / BeneVision M1

We herewith declare under our sole responsibility that the above mentioned products meet the provisions of the Council Directive 2014/53/EU concerning radio equipment. All supporting documentation is retained under the premises of the manufacturer.

Standards Applied:

☒ EN 60601-1:2006+A1:2013+A2:2021	☒ EN 60601-1-2:2015/A1:2021
☒ EN IEC 62311:2020	☒ EN 50566:2013
☒ EN 62209-2:2010	☒ ETSI EN 301 489-1 V2.2.2
☒ ETSI EN 301 489-17 V3.2.4	☒ EN 300 328 V2.2.2
☒ ESTI EN 301 893 V2.1.1	

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Signature: .....

Name of Authorized Signatory: Mr. Wang Xinbing

Position Held in Company: Deputy Director, Technical Regulation

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