BM3

User's Manual

Patient Monitor

Rev. 4.00

May. 06, 2020

Warning

To ensure proper use of this medical equipment, you must read and comply with this user manual.

BM3 User Manual

Before using Bionet devices, read all the manuals that are provided with your device carefully. Patient monitoring equipment, regardless of the complexity of the equipment, should never be used as a substitute for the patient care, attention, and critical judgment that only trained health care professionals can provide.

Table of Contents

Intended Use

The BM3 monitor is for multi-parameter patient monitoring. The instrument generates visual and audible alarms when a variety of physiological parameters are monitored over a pre-set limit and time, or where recording begins.

Note
All Bionet hardware and screenshots in this user guide are for illustration purposes only. Actual products or screens may vary slightly.

General Description

The BM3 monitor can monitor the following:

- Heart Rate
- Respiration Rate
- Non-Invasive blood pressure
- Temperature
- SpO2
- Pulse Rate
- EtCO2(option)
- FiO2(option)

This equipment is designed to be used in an environment where a health care professional can determine when to use the equipment for its intended purpose, based on an expert assessment of the patient's medical condition, including physicians, nurses.

Patient Classification

BM3 monitors are designed for use on adults, pediatrics and neonates.

Functional safety

The essential performance of the patient monitor is to provide the clinician with meaningful parameter values and to sound an alarm when the established parameter value is exceeded or the function that provides the value is not working properly. We assessed the risks associated with the use of these monitors in light of these essential performance features and mitigated the risk of lowering the residual risk to a level that could be used without compromise as long as the product maintained its regular lifecycle maintenance and service recommendations.

Warning, Caution, Note

The following terms are defined in the User Guide to emphasize the agreement as follows:

The user must follow all warnings and precautions.

The specifications and functions shown in this manual are subject to change without prior notice.

Warning
"Warning" A warning contains important information regarding possible danger to you or the patient that is present during normal operation of the equipment

Caution
"Caution" A caution provides information or instructions that must be followed to ensure proper operation and performance of the equipment.

Note
"Note" A note presents information that helps you operate the equipment or connected devices.

Defined groups

The defined groups for this product are users, service personnel, and experts.
Defined groups should read the user manual before using the product and be trained in the use, installation, reprocessing, maintenance and repair of the product.
This product can only be used, installed, reprocessed, maintained and repaired by a defined group.

User

Users use the product for their intended use.

Service personnel

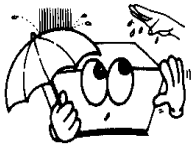
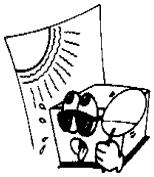
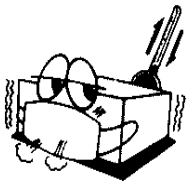
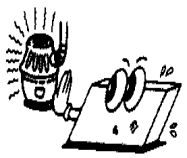
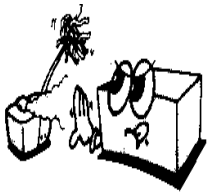
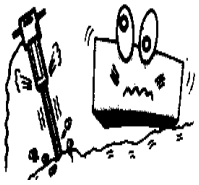
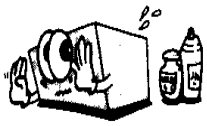
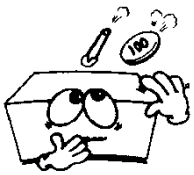
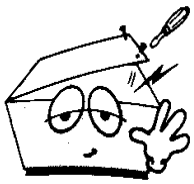
Service personnel are responsible for the maintenance of the product.
They must be trained in the maintenance of the medical device, install, reprocess and maintain the product.

Expert

The specialist repairs the product or performs complex maintenance tasks. The expert has the knowledge and experience to perform complex maintenance tasks on your product.

General precaution on environment

- Do not keep or operate the equipment in the environment listed below.

	Avoid placing in an area exposed to moisture. Do not touch the equipment with wet hands.		Avoid exposure to direct sunlight
	Avoid placing in an area where there is a high variation of temperature.		Avoid placing in the vicinity of Electric heaters
	Avoid placing in an area where there is an excessive humidity rise or ventilation problem.		Avoid placing in an area where there is an excessive shock or vibration.
	Avoid placing in an area where chemicals are stored or where there is danger of gas leakage.		Avoid inserting dust and especially metal material into the equipment
	Do not disjoint or disassemble the equipment. This voids your warranty.		Power off when the equipment is not fully installed. Otherwise, equipment could be damaged.

Electromagnetic Compatibility

The monitor has been designed and tested for compliance with current regulatory standards as to its capacity to limit electromagnetic emissions (EMI), and also as to its ability to block the effects of EMI from external sources.
The monitor complies with the following standards pertaining to EMI emissions and susceptibility: EN60601-1-2.

To reduce possible problems caused by electromagnetic interference, we recommend the following:

- Use only Bionet approved accessories.
- Ensure that other products used in areas where patient monitoring and life support is used comply to accepted emissions standards (CISPR 11, Class A).
- Try to maximize the distance between electro-medical devices. High-power equipment related to electrical simulators, electrosurgical instruments and radiators (X-ray machines) as well as evoked potential devices may cause monitor interference.
- Strictly limit exposure and access to portable radio frequency sources (e.g. cellular phones and radio transmitters). Be aware that portable phones may periodically transmit even when in standby mode.
- Maintain good cable management. Do not route cables over electrical equipment. Do not intertwine cables.
- Ensure all electrical maintenance is performed by qualified personnel.

Caution
Infectious devices and parts must be sanitized and cleaned before disposal.

1. Basic

Overview

This patient monitor is for adult, pediatric, and neonatal monitoring. It can be used as an independent device. Use of the monitor is limited to one patient at a time.

Electric safety precautions

Caution
Please check the following before using the product.

1. Be sure that AC power supply line is appropriate to use. (AC100 - 240V)

2. Be sure that the power source is the one supplied from Bionet. (DC18V,2.8A,BPM050 Made in Bridge Power Co., Ltd.)

3. Be sure that the entire connection cable of the system is properly and firmly fixed.

4. Be sure that the equipment is completely grounded. (If not, there might be problems In the product.)

5. The equipment should not be placed in the vicinity of electric generator, X-ray, broadcasting apparatus to eliminate the electric noise during operation. Otherwise, it may cause incorrect result.

Caution

The Equipment should be placed far from generators, X-ray equipment, broadcasting equipment or transmitting wires, so as to prevent electrical noises from being generated during the operation, When these devices are near the Equipment, it can produce inaccurate measurements. For BM3both independent circuit and stable grounding are essentially required. In the event that the same power source is shared with other electronic equipment, it can also produce inaccurate output.

Note
BM3 is classified as follows: - BM3classifies as Class **I,** BF**&**CF concerning electric shock. It is not proper to operate this Equipment around combustible anesthetic or dissolvent. - Noise level is A class regarding IEC/EN 60601-1 and the subject of Nose is A level concerning IEC/EN60601-1-2.

Warning
Do not touch the patient while using the defibrillator. The user may be at risk. When using the defibrillator, be careful about safety and use only the supplied cable.

Warning
In case the Equipment does not operate as usual or is damaged, do not use on patient, and contact the medical equipment technician of the hospital or the equipment supply division.

Equipment connection

Caution
Doctors and patients in hospitals are exposed to the risk of uncontrollable currents. This current is caused by a potential difference between the equipment and a conductive object that can be contacted. Use auxiliary equipment to meet this requirement in accordance with EN60601-1; 2011.

Biocompatibility

When used as intended, the parts of the product described in this operator manual, including accessories that come in contact with the patient during the intended use, fulfill the biocompatibility requirements of the applicable standards. If you have questions about this matter, please contact Bionet or its representatives.

Product Configuration

1. Main body of BM3 Monitor	1 EA
2. 3-Lead Patient Cable with extension cable	1EA
3. Disposable electrodes	10 EA
4. NIBP extension horse	1EA
5. Reusable Adult NIBP Cuff	1EA
6. SpO2 extension cable	1EA
7. Reusable Adult SpO2 Probe	1 EA
8. DC Adaptor (BPM050S18F02 made in Bridgepower Co., Ltd.)	1 EA
9. Operator`s Manual	1 EA
10. Thermal roll Paper	2ROLL

Optional Products

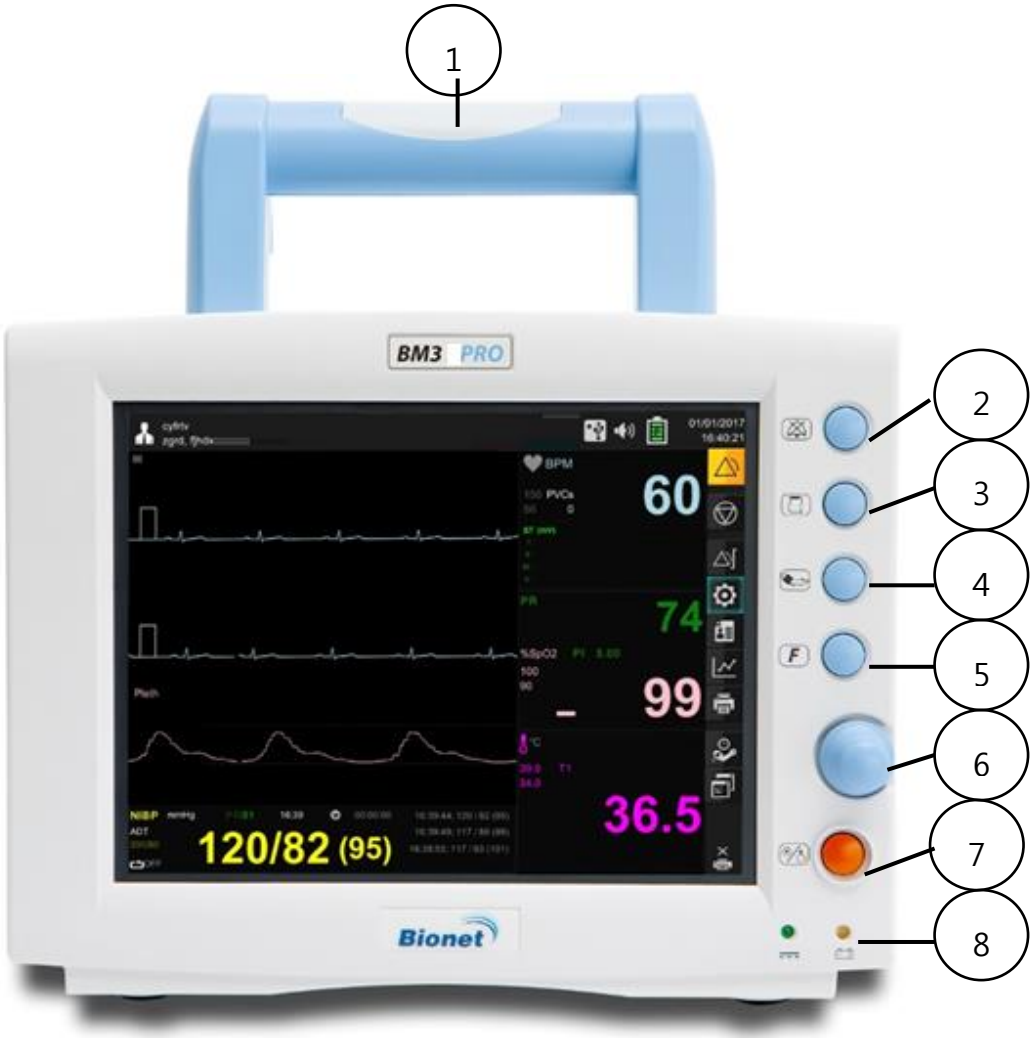
1. Reusable Temperature Probe (Surface/Skin, TEMPSENS-430)
2. Sidestream EtCO2 Module (Respironics)
3. Mainstream EtCO2 Module (Respironics)
4. Sidestream EtCO2 airway adapter sampling kit
5. Mainstream EtCO2 airway adapter
6. 5-Lead Patient Cable with extension cable

Warning
In order to avoid electrical shock, do not open the cover. Disassembling of the equipment should be done only by the service personnel authorized by Bionet

Warning
Users must pay attention on connection any auxiliary device via LAN port or nurse calling. Always consider about summation of leakage current, please check if the auxiliary device is qualified by IEC 60601-1, or consult your hospital biomedical engineer.

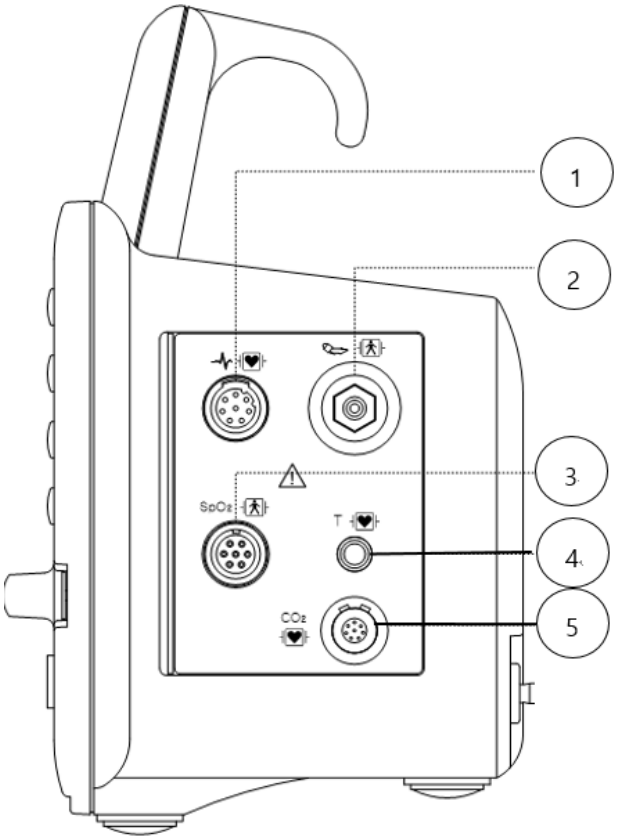
Basic Unit

Front view



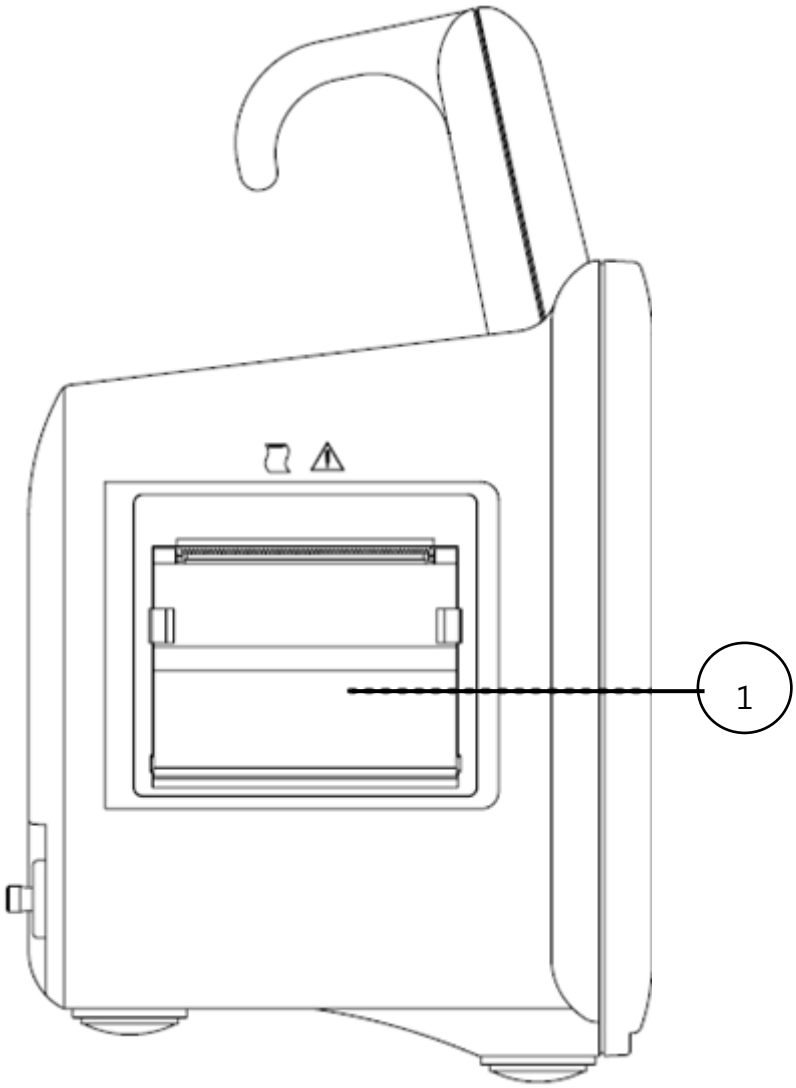
1	Alarm lamp handle	5	Home key
2	Alarm control key	6	Rotary knob key
3	Printer key	7	Power ON/OFF Key
4	Blood-pressure measurement key	8	Battery status indicator

Right side view



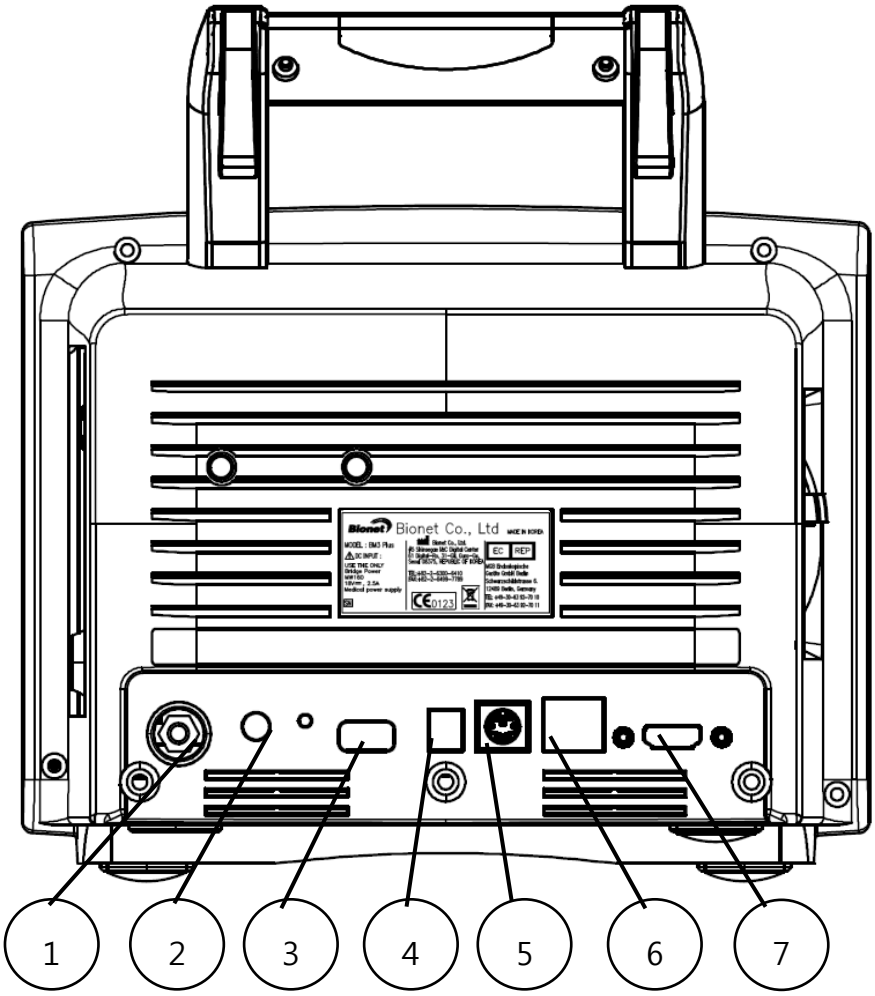
1	ECG connector
2	Blood pressure Hose connector
3	SpO2connector
4	Temperature connector
5	EtCO2 connector

Left side view



1	Printer

Back side view

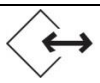
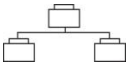
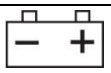
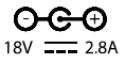


1	Potential equivalent
2	NURSE CALL connector
3	USB connector (USB 2.0 5Vdc / Max. 500mA),
4	DC input
5	Service port connector
6	Network connector

7	HDMI output

Warning
USB Compatible ● The BM3 is compatible with external USB memory drives up to 64GB. ● We recommend brands products listed in the manual (Sandisk, PNY, Transcend, Samsung). ● When using a product with high power consumption, such as an external hard drive, be sure to use the provided adapter for suitable power supply. (Cannot be used alone as a power supply) ● You should save the data of connected device before connecting the additional device. ● It may not support some devices that require high power.

Device Markings

	Caution : Consult accompanying documents		Ground terminal
	TYPE CF APPLIED PART		TYPE BF APPLIED PART
	Printer		Auxiliary Port
	LAN port	HDMI	HDMI external port
	DC Input Indicator		USB port
	Battery Operation indicator		DC input connector
	Temperature		NIBP
	Power ON /OFF		Function
	WEEE (Waste Electrical and Electronic Equipment)		ECG
	European Medical Device Directive 93/42/EEC		Date of manufacture
	Consult instructions for use. This symbol advises the reader to consult the operating instructions for information needed for the proper use of the device.		Safety Sign : To signify that the instruction manual must be read. Reading the instruction manual before starting work or before operating equipment.
	Nurse call		Change the Alarm Mode

	IP (Ingress Protection)		

Power

The BM3 monitor uses a DC adapter (100-240 VAC / 18VDC 2.8A). In the event of a power outage or cable shortage, the monitor automatically switches to battery power to continue patient monitoring without data loss. The built-in battery is intended for back-up use only during power-off.

DC Product information

Manufacture: BRIDGEPOWER CORP.

Model name: BPM050S18F02

Input Power: 100~240V 1.2A

Output Power: 18 V, 2.8 A

DC Power LED is lighted on when the DC Power is plugged into the inlet at the back of the product. A press of power key makes the machine ready for use.

Caution
This equipment must be connected to a protective earth grounded power supply. Using non-standard products other than the adapters supplied by us may cause signal distortion or noise. Be sure to use a genuine adapter that is supplied by our company and is insulated.

Battery power

DC adapter, it uses battery power when power failure and portable use.

The battery is attached to the bottom of the equipment and the additional extended battery is connected to the left side.

- Battery: 3BL335-BIO-S (10.8V / 3250mAh, Li-ion) or

  031PpTC3(3ICR19/65) (10.8V / 2150mAh, Li-ion)

The Lithium-Ion battery is a rechargeable battery containing Lithium-Ion cells. Each battery contains an integrated electronic fuel gauge and a safety protection circuit.

Operation

1. Battery Power LED is lighted on when the machine is in use.

2. Battery is automatically charged when the machine is connected to DC Power Supply. The charging status is displayed at the top right of the screen

3. The charging status of the batteries is displayed with 5 green boxes, each indicating a different charging. (5% -> 25% -> 50% ->75% -> 100%)

4. When discharging, the battery image is displayed in Red.

The monitor automatically turns off when the battery is depleted. The table below describes the function of the battery charging bar graph at the top of the screen.

Battery charge/discharge display		
Display	Charging remain time	Description
	Your battery is charging.	Not applicable
	Your battery is fully charged	Not applicable
	Your battery is 75% charged	Not applicable
	Your battery is charged at 50%	If possible, connect it to the AC adapter.

	Your battery is charged at 25%	Immediately connect the monitor to the AC adapter.
	The internal battery is very low. (The power will turn off about 5min.)	Immediately connect the monitor to the AC adapter.
	There is no built-in battery.	Connect the battery.

Caution
The battery charge display is displayed correctly only when the battery is operating normally

Note
If no AC power is applied, the battery charge display will take up to 15seconds to reflect the actual capacity of the internal battery.

Warning
Older or defective batteries will have significantly reduced capacity or operating time.

note
● To maximize the charge for transport, keep the monitor connected until you are ready to transport the patient. Reconnect the monitor immediately after transport. ● Bionet recommends replacing the lithium ion battery after 24 months of use. ● Battery life depends on usage. If battery life continues, battery life will decrease and frequency of replacement will increase. ● To prevent pre-discharge, recharge after the battery is discharged.

Caution
The battery charge display is accurate only when the battery is operating normally.

-Battery Charging Time: more than 3hours

-Continuous Battery Usage Time: 2 hours or more when fully charged (measured every 15 minutes Nibp with SpO2 and ECG)

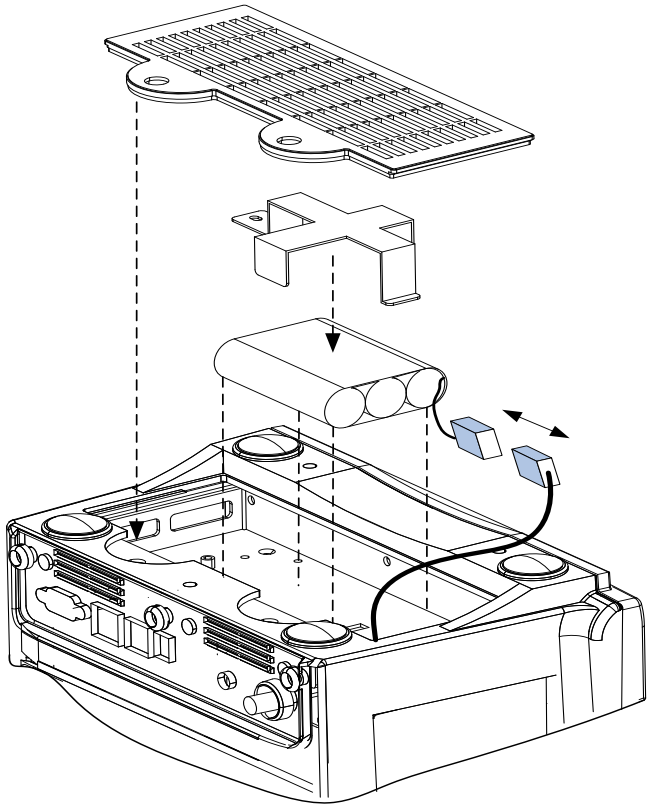
Warning
Be careful of the polarity when replacing the battery. We strongly recommend that you use the battery supplied by Bionet. Using unauthorized batteries may damage the equipment

5. Presence of battery: When the battery is disconnected from the equipment and it malfunctions, it shows 'X' as shown below.

Note
Charging is not possible at low power (below 16V). Cannot be used in vehicles with 24V power supply. When replacing the battery, be sure to remove the DC adapter and replace it.

How to replace the battery

Please assemble and replace as shown below.



The Impact of Lithium-Ion Battery Technology on the Battery

The following are the key points you should know about Lithium-Ion battery technology:

The battery will discharge on its own, even when it is not installed in a monitor. This discharge is the result of the Lithium-Ion cells and the bias current required for the integrated electronics.

By the nature of Lithium-Ion cells, the battery will self-discharge.

The self-discharge rate doubles for every 10°C (18°F) rise in temperature.

The capacity loss of the battery degrades significantly at higher temperatures.

As the battery ages, the full-charge capacity of the battery will degrade and be permanently lost. As a result, the amount of charge that is stored and available for use is reduced.

Warning
When replacing the battery, only use the battery provided by Bionet. Check the battery is properly secured to the bracket. Do not cause a serious impact on the battery. Ignoring the above warnings will cause battery explosion and serious damage to devices.

Conditioning Guideline

The battery in the monitor full charged and discharged every six months and condition it using the battery charger.

Storage Guideline

Store the battery outside of the monitor at a temperature between 20°Cto 25°C (68°F to 77°F).

When the battery is stored inside a monitor that is powered by an AC power source, the battery cell temperature increases by 15°C to 20°C(59°F to 68°F) above the room's ambient temperature. This reduces the life of the battery.

When the battery is stored inside a monitor that is continuously powered by an AC power source and is not powered by battery on a regular basis, the life of the battery may be less than 12 months. Bionet recommends that you remove the battery and store it near the monitor until it is needed for transport.

How to Recycle the Battery

When the battery no longer holds a charge, it should be replaced. The battery is recyclable. Remove the old battery from the monitor and follow your local recycling guidelines.

Warning
EXPLOSION HAZARD — DO NOT incinerate the battery or store at high temperatures. Serious injury or death could result.

Getting Started

Starting the monitor:

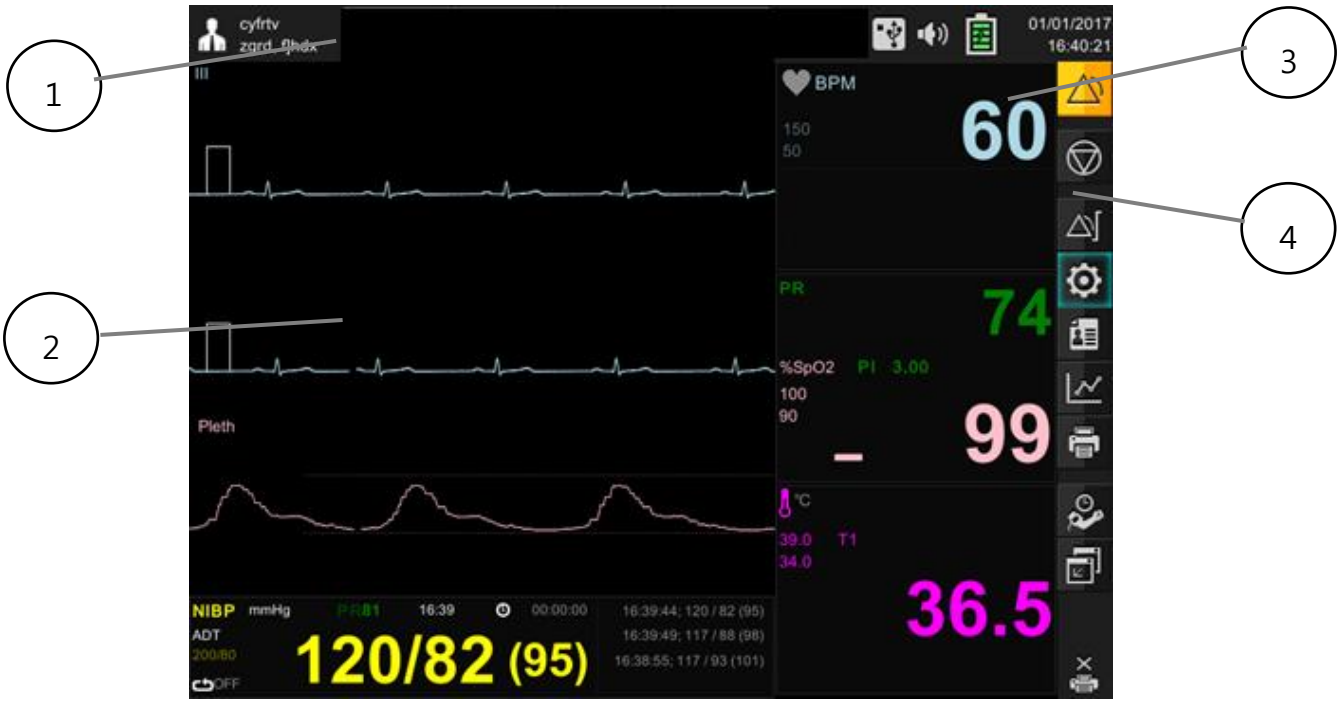
Press the power key (O) at the bottom right of the monitor front panel. The power light on the monitor lights up, the alarm bar lights up, the power is turned on, the screen lights up, the main screen is displayed after running the self-test.

Stopping the monitor:

Press and hold the power key (O) for 3 seconds. The screen goes off.

Main screen setup

After the monitor is turned on, the main screen is displayed.



1	Status Message	3	Numeric Window
2	Waveform Window	4	Menu Window

The parameter box displays values, alarm limits and icons for the selected parameter. You can set the parameters and their associated waveforms so that they are easy to distinguish.
The message appears at the top of the screen. The patient name is displayed in the upper left corner of the screen. The top right of the screen displays the time and device management status.

Using Rotary knob switch

The rotary knob switch allows the user to navigate menus, select settings, and perform menu functions. Rotate the rotary knob to move the menu item. To confirm the selection, press the rotary knob switch.

Fixed key

The fixed keys on the front panel of the monitor allow you to perform commonly performed functions.

Fixed key	Description	Fixed key	Description
	The alarm control key switches between Normal / Audio Paused and Alarm Paused mode. Press more than 3 seconds to switch to Audio Off or Alarm Off mode		Start or end non-invasive blood pressure (NIBP) measurements.
	Start or stop recording on time.	F	Return to the main screen or switch the extended parameter screen mode.

Function key

On the right side of the monitor's front panel, the touch screen icon on the touch screen allows you to perform frequently-used functions.

Fixed key	Description	Fixed key	Description
	Opens a table where you can set the maximum and minimum alarm limits.		This is an alarm mode key, so it enables to change Normal/ Audio Paused/ Alarm Paused mode.
	Access the Hospital / Emergency menu.		Displays the setup menu.
	Enable waveform stop function.		Displays the automatic blood pressure measurement interval setting menu.
	Displays the printer setup menu.		Displays trend menu.
	Displays the mini Trend window.		Set parameters in text screen.

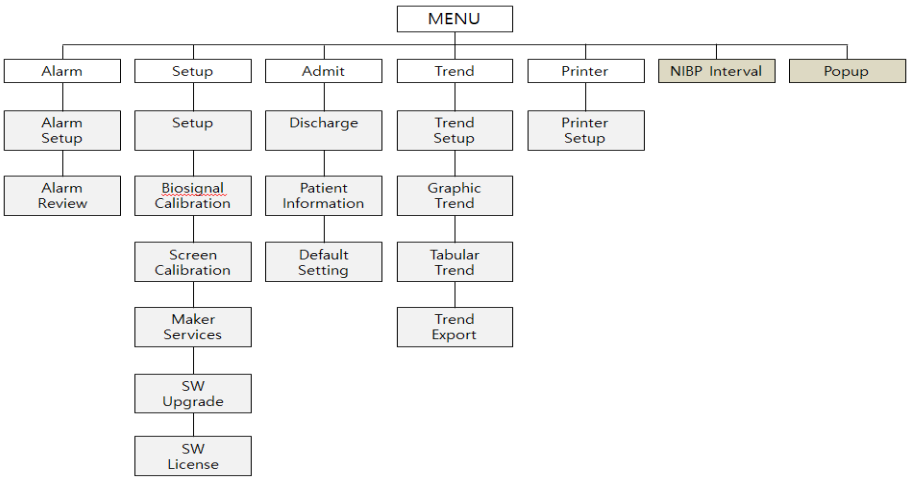
2. SETUP

Overview

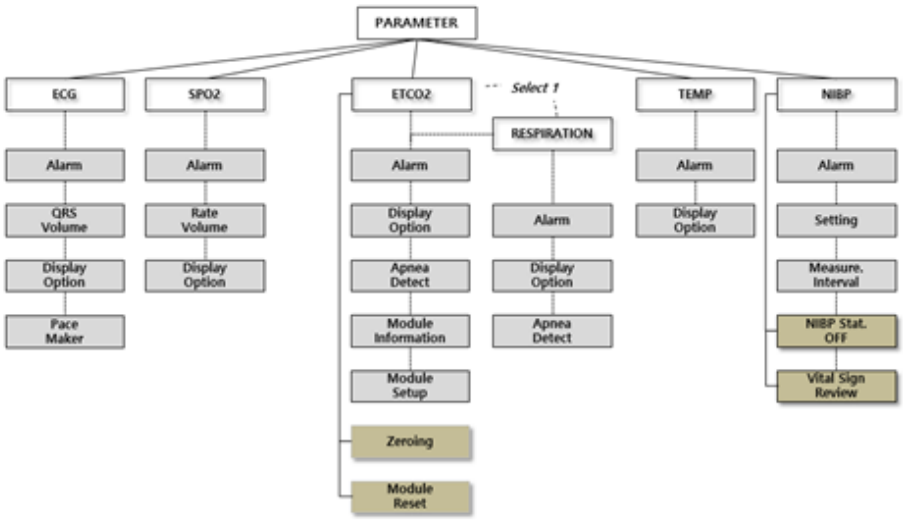
This chapter describes how to configure your monitor and how to upgrade your software.

Monitor configuration

Setup Menu tree



Parameter menu tree



Main menu setup

The Setup menu allows the user to access submenus, display screens, and perform specific monitor setup functions.

1. To display the Settings menu, click the Settings  icon to open the submenu.
2. Click the desired setting to access the submenu that performs the desired function or goes one step further down.
3. Click Close at the bottom of the submenu list to return to the previous menu or screen.

	Main menu	Sub menu
	**A.** SETUP	**A-1.** PARAMETER SETUP
		A-2. PARAMETER UNITS
		A-3. USER SERVICES
		A-4. SYSTEM INFORMATION
		A-5. ALARM SETUP
		A-6. DISPLAY OPTION
		A-7. HOSPITAL INFORMATION
	B. BIOSIGNAL CALIBRATION	**B-1**. ECG & RESP
		B-2. NIBP
	C. SCREEN CALIBRATION	
	D. MAKER SERVICE	**D-1.** MAC Address
		D-2. Factory Reset
	E. SW UPGRADE	
	F. SW LICENSE	

A. SETUP menu		
MENU	Description	Available settings
A-1.PARAMETER SETUP	measurement on the monitor Parameter selection and color setting menu: ECG,SPO2,RESP,NIBP,TEMP, ETCO2	PARAMETER enable ON/OFF PARAMETER COLOR setup
A-2.PARAMETER UNITS	Unit setting menu used for monitor measurement	
A-2-1. Weight UNIT	Weight measurement unit	Kg Lbs
A-2-2. Height UNIT	Height measurement unit	Cm Inch
A-2-3.BLOOD PRESSURE UNIT	blood pressure measurement unit	mmHg kPa
A-2-4.TEMPERATURE UNIT	Temperature measurement unit	°C °F
A-2-5.GAS PRESSURE UNIT	Gas measurement unit	mmHg kPa vol%
A-2-6.MULTI GAS PRESSURE UNITS	Select whether to set the pressure unit for each gas type. When OFF, unit setting menu by gas type is displayed	ON / OFF
A-3.USER SERVICES	User configuration menu	
A-3-1.HOSPITAL UNIT	Set Monitor Environment Group	GENERAL ICU NICU OR CCU USER DEFINE

A-3-2.KEY Sound	Set Key activation	ON / OFF
A-3-3.KEY Volume	Set Key sound	OFF ~ 100%
A-3-4.AC FILTER	Power filter settings	OFF, 50Hz, 60Hz
A-3-5.SCREEN BRIGHTNESS	Set screen brightness	10~100%
A-3-6.DATE DISPLAY	Set type of date display	ON / OFF
A-3-7.DEMO	Set Demo	ON / OFF
A-4.SYSTEM INFORMATION		
A-4-1.MAIN VERSION	Display main S/W version	
A-4-2.NIBP VERSION	Display NIBP Module version	
A-4-3.LANGUAGE	Set language	English, Korean French, Bulgarian Polish, German Chinese, Portuguese Hungarian, Czech Romanian, Italian Turkish, Spanish Russian, Greek Japanese
A-5. ALARM SETUP	Alarm settings menu	
A-5-1. ALARM PASSWORD	Alarm setup password activation menu	ON/OFF
A-5-2. SETUP PASSWORD	Password setup menu	
A-5-3. ALARM SOUND	Alarm sound type selection menu	IEC60601 BIONET
A-5-4. Patient Privacy	Patient Information Privacy option (used in Trend Export function)	ON/OFF
A-6. DISPLAY OPTION		
A-6-1. SWEEP SPEED		**6.25 mm/sec** **12.5 mm/sec**

(ECG/SPO2/RESP)		**25 mm/sec** (default) **50 mm/sec**
A-6-2. SWEEP SPEED (RESP/ETCO2)		**6.25 mm/sec** **12.5 mm/sec** (default) **25 mm/sec**
A-10. HOSPITAL Information	Set Hospital information	
A-10-1. Name	Hospital Name	
A-10-2. Address 1	Address information1	
A-10-3. Address 2	Address information2	
A-10-4. Postal Code	Set postal Code	
B. BIOSIGNAL CALIBRATION	Set calibration menu	
B-1.ECG & RESP		
B-1-1. ECG Calibration	ECG calibration menu	10mm/mV input calibration display
B-1-2. RESP Calibration	RESP calibration menu	1ohm 1cmm display
B-2.NIBP		
B-2-1. ZERO Calibration	NIBP Zero calibration menu	Zero calibration menu at atmospheric pressure
B-2-2. Gain Calibration	NIBP Gain control menu	Perform 250mmHg pressure calibration and select menu
B-2-3. Pneumatic Pump	NIBP Pump control menu	ON/ OFF
B-2-4. Pneumatic Valve	NIBP valve control menu	Close /Open
C. SCREEN Calibration		Perform touch screen calibration point input
D.MAKER SERVICES		

D-1. MAC ADDRESS Editing		Enter a unique address for the device
D-2. Factory Reset	Reset menu for setting the device to factory default state	Perform factory reset
E. SW Upgrade	Software Upgrade menu	
F. SW LICENSE	Software License menu	

Parameter color

Parameter	Basic color
Selectable colors Green, light blue, yellow, purple, blue, sky blue, orange, gray, light green, pink, white, red, light yellow	
ECG (ST)	Green
SpO2	Blue
RESP	Yellow
NIBP	Purple
TEMP	Green
ETCO2	Yellow

3. Admission and Discharge

Overview

The Patient admission menu allows you to enter and edit a patient's personal data (name, ID, Birthday, Height, Weight). If your monitor is operating in a network monitoring, you can also review or change the monitor's care unit and bed label assignments.
Patient data and trends can also be transferred to PC. The transfer procedure depends on whether the Inbound and Outbound monitors are connected to the Central network.

Patient admission

How to admit a patient:

1.  Press the **Patient icon** button.
2. Click on **Admit**.
3. Click on **Patient Information**.
4. Please select a field. The data entry screen appears.
5. Click the letter of the word you want to input.
   If you made a mistake, click Backspace and try again.
6. Click ↵**Enter** to confirm your entry.
7. Click on the next field and repeat steps5 and 6.

Note:

- To change a patient's classification (adult, pediatric or neonate), access the patient settings menu.
- Additional settings (Gestational Age) are available for neonate mode.

Patient discharge

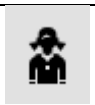
The patient should be discharged before the other patient is admitted. Otherwise The monitor attaches the existing data to the patient already admitted.

How to discharge a patient:

1.  Press the **Patient icon** button.
2. Click on **Discharge** menu.
3. A discharge confirmation message is displayed.
4. Press the **Yes button**. The discharge procedure is in progress.

The monitor displays a Discharge message and a Discharge image in the upper left corner.

Display images by PATIENT TYPE

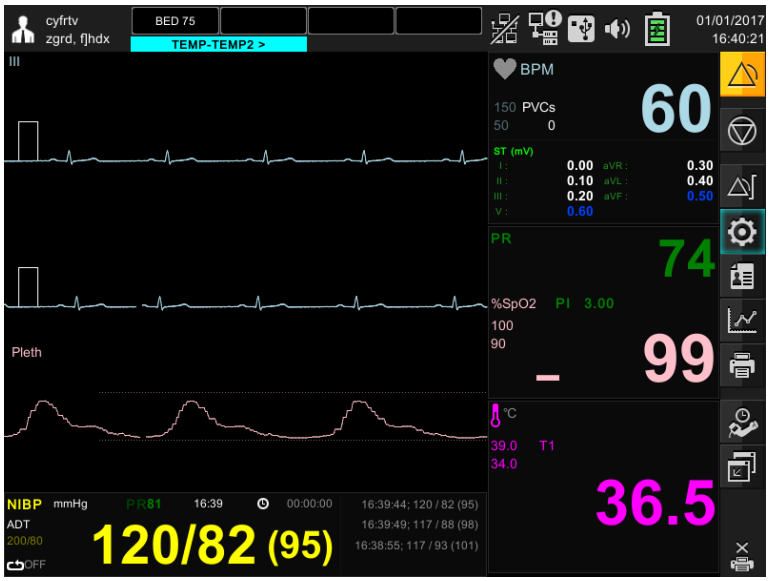
TYPE	Male Admit	Female Admit	Discharge
ADULT			
PEDIATRIC			
NEONATE			

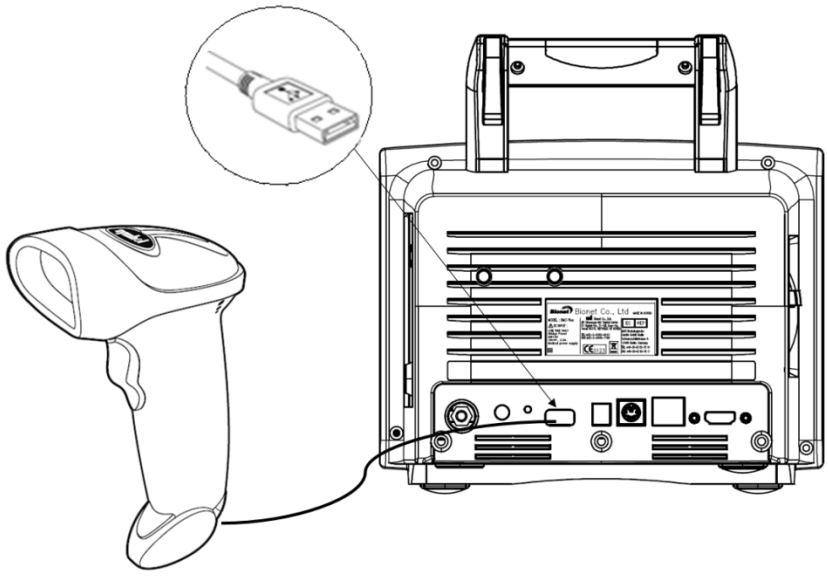
	Main menu	Sub menu
	**A.** Admit / Discharge	
	B. Patient Information	**B-1**. Patient Information
	C. Default Setting	
	D. User Drug Change	

MENU	Description	Available Settings
A. Admit / Discharge	Admission and discharge setting	
B. Patient Information		
B-1. Patient Information		
B-1-1. Patient Type	Patient Typesetting	ADULT, PEDIATRIC, NEONATE
B-1-2. ID	Patient ID setting	
B-1-3. First Name	First Name setting	
B-1-4. Last Name	Last Name setting	
B-1-5. Gender	Gender setup	MALE , FEMALE
B-1-6. Birthday	Birthday setting menu	YYYY/MM/DD
B-1-7. Weight	Weight setting	XXX.XX Kg
B-1-8. Height	Height setting	XXX.XX Cm
B-1-9. Blood Type	Default setting	**A** Rh+/ Rh-/ -D-/ Rh Null **B** Rh+/ Rh-/ -D-/ Rh Null **O** Rh+/ Rh-/ -D-/ Rh Null **AB** Rh+/ Rh-/ -D-/ Rh Null **Unknown**
C. Default Setting	Set Patient Info to Default Value.	

Registration of patient ID using barcode

This product can input the PATIENT ID in barcode format to the device using USB barcode scanner. First, connect the barcode scanner to the USB HOST connector on the left as shown in the figure below. After the BEEP sound is generated, the barcode icon ( ) appears at the bottom of the instrument screen.





The barcode that you want to input is matched to the index LED generated by the scanner, and if you press the input button, the corresponding ID is read and sent to the equipment. The sender ID is displayed at the top center of the screen.

4. Alarm

Overview

The monitor displays the alarm limits (parameter threshold) and can be configured by the user to raise an alarm if exceeded. Limits are displayed both in the alarm limits table and in the parameter box. If this limit is exceeded, a visual or audible alarm will occur.
The bedside monitor is the primary alarm device, and there may be other secondary alarm devices depending on how you configured the device / network. Depending on the alarm condition, the monitor generates an alarm using one or more of the following devices:

- Auditory alarm reflecting alarm severity
- Change the color in the parameter box of the alarm parameter
- Alarm messages in the local message area
- Alarm banner indicating alarm status
- External alarm device such as nurse call system
- Activate alarm recording

The monitor generates an alarm when the parameter in the Alarm Limits table is **ON**. It is not a prerequisite that the parameter is displayed on the display or connected in the event of an alarm.

Alarm priority

The alarm type is divided into a patient status alarm and a product status alarm.
The patient status alarm sounds when the diagnostic function (ECG 3 auto diagnosis) and alarm upper and lower limits are exceeded, and there are levels of HIGH, MEDIUM, LOW and MESSAGE, and there is a difference in the order and volume of the alarm.
You can set the alarm level for each parameter and function.
The patient status alarm provides the highest priority alarm.
The features of each alarm are described as follows. The alarm priority is HIGH> MEDIUM> LOW> MESSAGE. For alarms over MEDIUM, the printer output is supported when ARMRM PRINT ON is set.

Alarm priority	Alarm sound	Alarm Color	Alarm printer	Handle Alarm Lamp
HIGH	-5	Every 2 seconds Blinking		2.0 Times/Sec Blinking
MEDIUM	-3	Every 2 seconds Blinking		Every 2 seconds Blinking
LOW	-2	Every 2 seconds Blinking		Non Blinking
MESSAGE		Non Blinking		

: Alarm sounds

: Waveforms are printed when ALARM PRINT is set to ON.

: Red color alarm indicator on the screen.

: Yellow color alarm indicator on the screen.

: Blue color alarm indicator on the screen.

Audible alarm		
Alarm priority	BIONET	IEC
HIGH	1 high tone every 5 seconds	5 consecutive beeps every 5 seconds
MEDIUM	1 high tone every 15 seconds	3 consecutive beeps every 15 seconds

LOW	1 low tone every 30 seconds	2 consecutive beeps every 30 seconds

Alarm management

You can use the lock key on the front of the monitor to hold the alarm.

To change Alarm Mode: A short press of the alarm control key circulates through the Normal / Audio_Paused / Alarm_Paused alarm modes. Press and hold the key for more than 3 seconds to switch to Alarm_Off / Audio_Off mode using the mode selection dialog regardless of which alarm mode the monitor is currently in

Audio_Paused: Stop the audible alarm for 1 minute but the visual alarm is activated still. Banner with the message Audio Paused and countdown timer are displayed on the screen. After the user switches to another alarm mode or after the timeout period has elapsed if the alarm occurs still,visual and audible alarms will be activated again

Alarm_Paused: Stop visual and audible alarms during user defined time. Banner with the message Alarm Paused and countdown timer are displayed on the screen. After the user switches to another alarm mode or after the timeout period has elapsed if the alarm occurs still, visual and audible alarms will be activated again

Alarm_Off: Stop visual and audible alarms. A banner with the message Alarm Off is displayed on the screen. The monitor maintains Alarm Off mode until user switch to another alarm mode.

Audio_Off: Stop the audible alarm. A banner with the message Audio Off is displayed on the screen. The monitor maintains Audio Off mode until user switch to another alarm mode

Alarm control:
Various alarm functions, such as alarm hold, validity and alarm limit indicators, can only be configured in the alarm control menu, accessible only through the password protected unit manager menu.

Nurse call:
If the monitor is sounding an alarm, the nurse call system is signaling.
When an audible alarm is silenced (Audio Paused or Audio Off) at the bedside unit, the nurse call system will not alarm.
Your system administrator can change the alarm priority level for the nurse call signal.

if the priority level is set to **High,** only high-priority alarms will sound on the nurse call system.

Note
• Audio Paused and Audio Off modes only stop the audible alarm sound and touch or key sound is activated always. • To adjust the Touch or Key Sound, use the Key Sound menu in Setup.

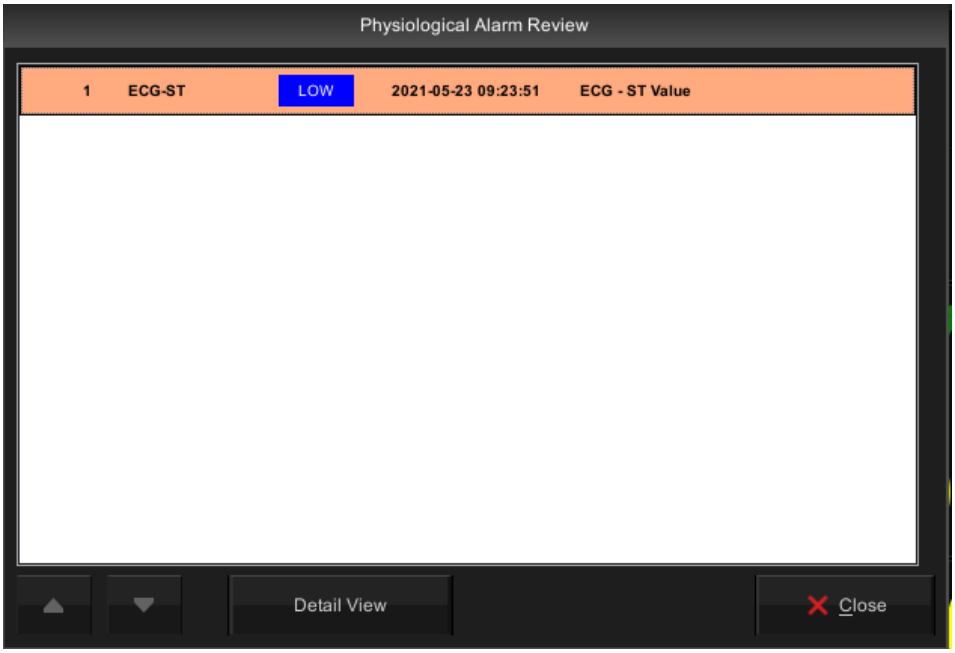
Alarm settings

	Main menu	Sub menu
	**A.** Alarm Setup	**A-1.**Parameter Alarm Limit
		A-2. System Alarm Condition
		A-3. Alarm Parameter
		A-4. Nurse Call
	B. Alarm Review	

MENU	Description	Available Settings
A. Alarm Setup menu		
A-1. Parameter Alarm Limit	All parameter alarm, level, activate Setup menu	
A-2.SYSTEM ALARM CONDITION	System alarm, level, activate setting menu. LOW BATTERY	
A-3. Alarm Parameter	Alarm Settings menu	
A-3-1. Alarm Volume	The volume can be changed from OFF to 10% to 100%.	10~ 100%

A-3-2. Alarm Pause Time	No sound for 5minutes, Release on alarm again	1,2,3,5,10,15min
A-4. Nurse call	User Settings menu.	
A-4-1. Nurse call on Alarm	NURSE CALL function ON / OFF; After setting ON, check if relay sound is heard in ALARM situation.	ON/OFF
A-4-2. Call Type	NORMAL CLOSE / NORMAL OPEN; ACTIVE state change check	Normal open Normal close
A-4-3. Duration	ONE TIME / CONTINUE / CYCLING	One time Continue Cycling
A-4-4. Level		Message/ Low/ Medium/High

Alarm Review



5. TREND

Overview

The monitor stores trend data for all connected signals. Users can request trend recording and can also print the screen of trends displayed.

Triggered alarm events are displayed in red inverted triangles on the Event List and Timeline

Trend setup

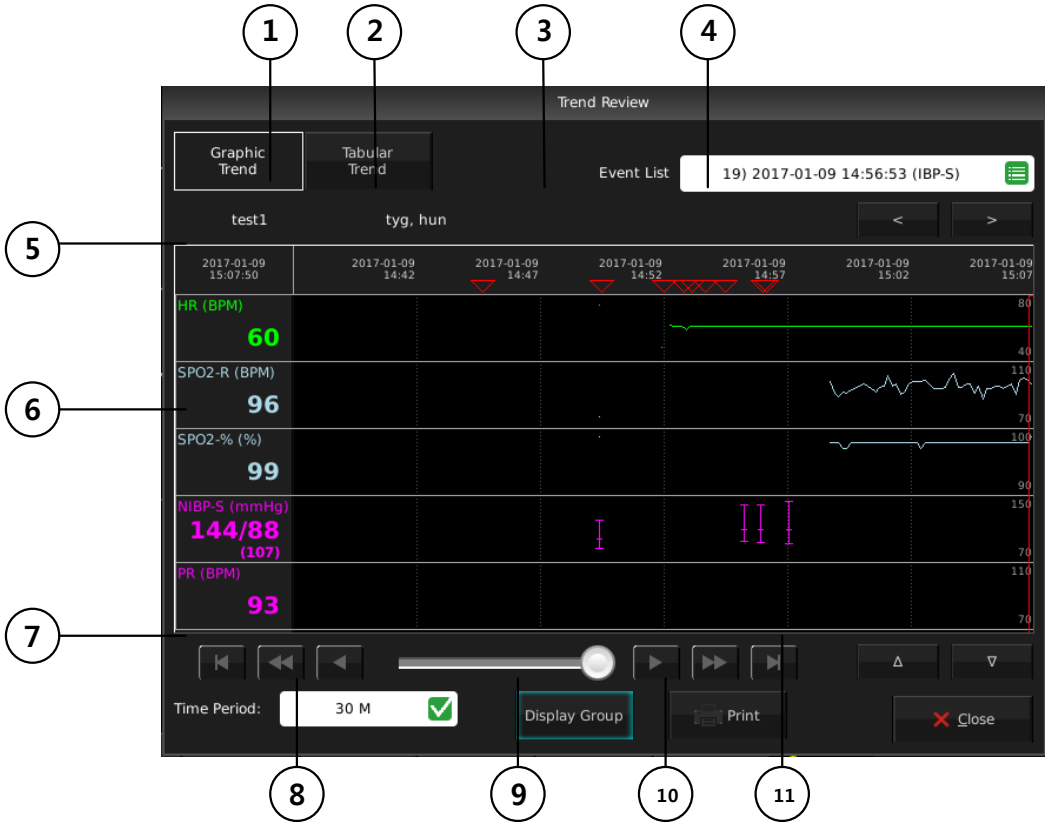
	Main menu	Sub menu
	**A.** Trend Setup	**A-1.** Popup Trend
	B. Graphic Trend	**B-1**. Graphic Trend
		B-2. Tabular Trend
	C. Tabular Trend	**C-1**. Graphic Trend
		C-2. Tabular Trend
	D. Trend Export	

MENU	Description	Available settings
A. Trend Setup menu		
A-1. Popup Trend		
A-1-1. Time Period	Show time interval setting menu	30min, 60min, 90min, 3hour, 6hour
A-1-2. Configure Parameters		
B. Graphic Trend menu		
B-1. Graphic Trend		
B-1-1. Event List		
B-1-2. Time Period	Time Period Setting	30min, 60min, 90min, 2hour, 3hour, 4hour, 6hour, 8hour, 12hour
B-1-3. Display Group		
B-1-4. Print	Graph trend print out	
C. Tabular Trend menu		
C-1. Tabular Trend		
C-1-1. Event List		
C-1-2. Time Period	Time period setting	1min, 5min, 10min, 15min, 30min, 1hour, 2hour
C-1-3. Display Group		
C-1-4. Print	Tabular trend print output	
D. Trend Export menu		
D-1. Start Time	Parameter save start time setting menu	hh:mm

D-2. End Time	Parameter Save Last Time Setting Menu	hh:mm
D-3. Export Time Period	Time period setting	1min, 5min, 10min, 15min, 30min, 1hour
D-4. Export Order	Sequence of parameters	Descending Ascending
D-5. Export		

Graphical trend

Trend graph shows saved trend data as individual graph type for each parameter. These graphs show that the displayed parameters are active over a significant period of time Shows five channels at a time. Confirmation color and scale Meter labels and numbers are displayed on the left side of the trend channel. Vertical lines in each graph. This displays the time distribution. Trends keeps the most up-to-date data. It is automatically updated on the right side of the graph.



①	Graphic trend select menu
②	Tabular trend select menu
③	Event list menu
④	Event previous/next menu
⑤	Patient ID
⑥	Parameter numeric window
⑦	Interval search window
⑧	Trend interval setup menu
⑨	Parameter selection menu to show
⑩	Printer menu
⑪	Parameter window selection menu

Tabular trend

The Trends table displays the trend data in an easy-to-read table format. Up to six are displayed, updated every minute. The time stamp above each column indicates the interval at which the data in that column was trended. The value displayed is the last one acquired during the interval, and the most recent data is displayed in the rightmost column.

①	Graphic trend select menu
②	Tabular trend select menu
③	Event list menu
④	Event previous/next menu
⑤	Patient ID
⑥	Numeric Parameter window
⑦	Selection Navigation window
⑧	Trend interval setting menu
⑨	Parameter selection menu
⑩	Printer menu

⑪	Parameter select window menu

File export

The file extract function can transfer trend to a file using USB memory.

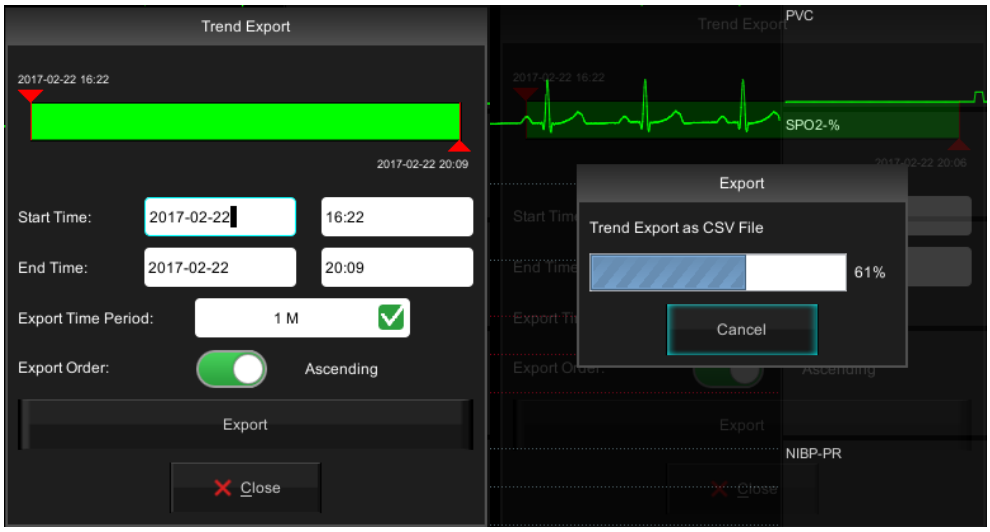
① Confirm USB memory connection.

② Press TREND > Trend Export button.

③ Set a start time, end time, export time period, and export order.

④ Press Export button

⑤ The data is transferred to USB memory. A completion message is displayed when the transmission is completed.



Warning
USB Compatible ● The BM3 is compatible with external USB memory drives up to 64GB. ● We recommend product brands listed in the manual (Sandisk, PNY, Transcend, Samsung). ● When using a product with high power consumption, such as an external hard drive, be sure to use the provided adapter for suitable power supply. (Cannot be used alone as a

power supply)

- You should save the data of connected device before connecting the additional device.
- Devises that require high power may not be supported.

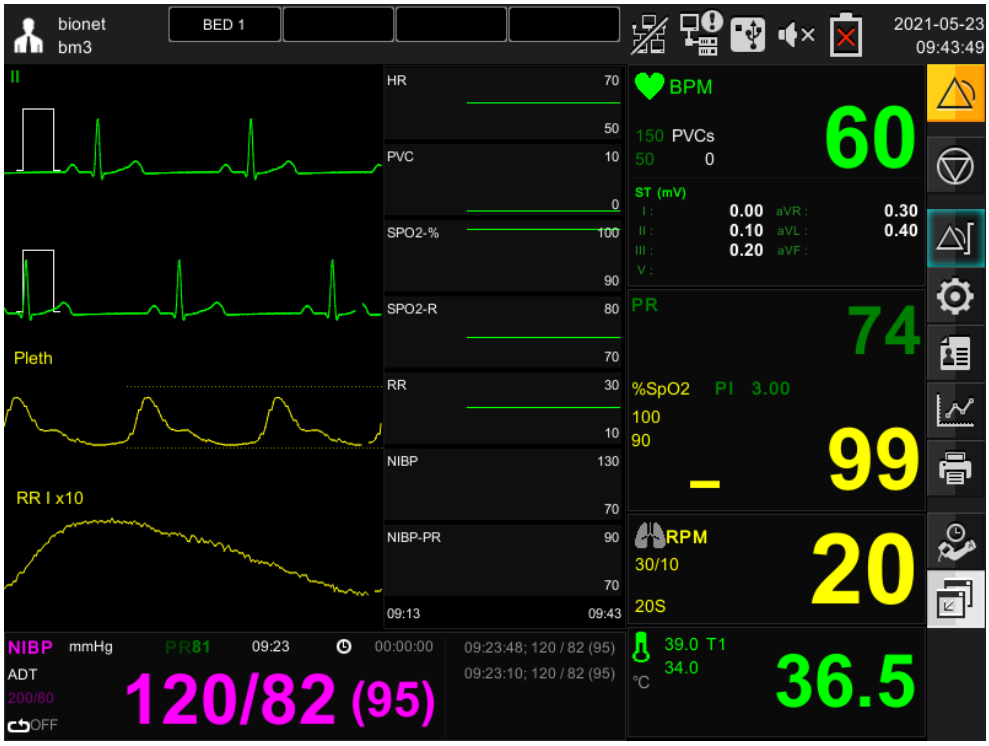
Note
Saving Patient Data to a USB ● Exported patient data on a USB memory drive is not encrypted and therefore raises privacy concerns. So, only authorized personnel should be allowed to view, handle, store or transmit patient data. ● The file format of the USB memory drive used for the BM7 patient monitoring device is FAT32.

Popup trend

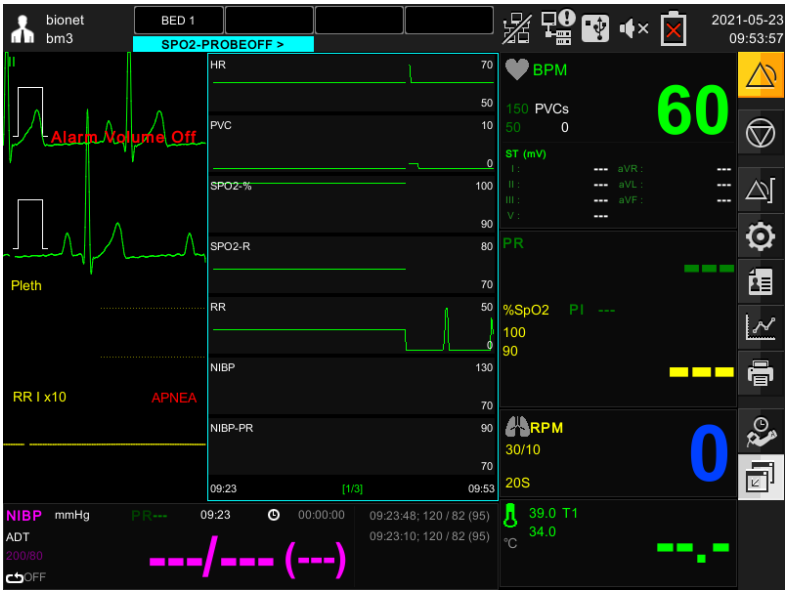
The user can continue to monitor the main screen waveform and parameter box while displaying trend data for up to 5 parameters for up to 6 hours. The pop-up trend graph follows the display order indicated by each parameter in the trend setup and is updated with new trend data every 60seconds. When selecting pop-up trend.

If there is no parameter set in Trend setup> Configure parameters.
To change the popup menu window, touch the top and bottom of the popup menu with the touch key, or select it with the rotary switch.

Popup trend window



You can change the size of the popup menu by pressing and releasing the center of the popup menu for at least 1second.

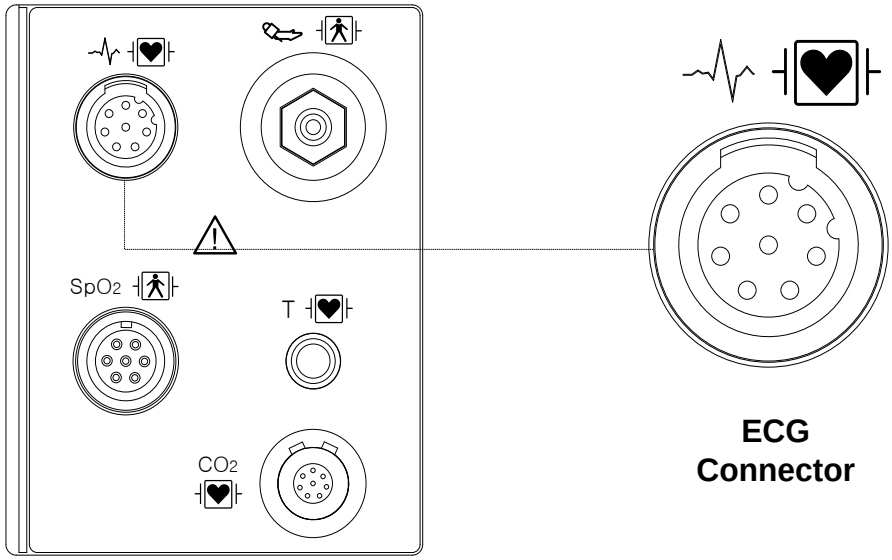


6. ECG

Overview

The monitor can calculate heart rate and display ECG data. The electrocardiogram screen provides 1 channel display. It calculates the heart rate by detecting the electrocardiogram signal of the patient and alarms according to the set upper and lower limit of alarm.

ECG connector position and measurement cable



Electrode placement

1. If you have a lot of hair, shave. With alcohol-soaked cotton, wipe the patient's skin to attach the electrode. Avoid wrinkled or uneven skin, and wipe off alcohol with a dry cotton towel.
2. Unpack the electrode package and remove the electrode
3. Remove the rear mounting surface of the electrode. Be careful not to touch the adhesive side.
4. Attach disposable electrodes to the previously sterilized skin.

5. Connect the lead of the electrode and the wire of the monitor
6. Fix the electrode to the skin, and secure the cable with the remaining length between the instrument and the electrode with surgical tape. This fixation prevents the electrode from moving.

Note
● Make sure that the contact area of the disposable electrode is not dry to maintain a good connection between the electrode and the skin. ● If you suspect that the disposable electrode is in poor contact, replace it immediately with a new electrode. Otherwise, the contact impedance of the skin and electrode will increase, and the correct ECG signal will not be obtained. ● If the contact condition gets worse before expiration date on the packaging, replace with a new one. ● To get a stable ECG waveform, rub the skin with gel or benzoin tincture.

ECG Precaution

Caution
● Use caution when using evoked potential equipment as it may interfere with ECG monitoring.

Warning
CABLES — Route all cables away from patient's throat to avoid possible strangulation. **CONDUCTIVE CONNECTIONS** — Extreme care must be exercised when applying medical electrical equipment. Many parts of the human/machine circuit are conductive, such as the patient, connectors, electrodes, transducers. It is very important that these conductive parts do not come into contact with other grounded, conductive parts when connected to the isolated patient input of the device. Such contact would bridge the patient's isolation and cancel the protection provided by the isolated input. In particular, there must be no contact

of the neutral electrode and ground.

DEFIBRILLATION — Do not come into contact with patients during defibrillation. Otherwise serious injury or death could result.

To avoid the risk of serious electrical burn, shock, or other injury during defibrillation, all persons must keep clear of the bed and must not touch the patient or any equipment connected to the patient.

After defibrillation, the screen display recovers within 10seconds if the correct electrodes are used and applied in accordance with the manufacturer's instructions.

Patient cables can be damaged when connected to a patient during defibrillation. Check cables for functionality before using them again.

The peak of the synchronized defibrillator discharge should be delivered within 60ms of the peak of the R wave. The signal at the ECG output on the patient monitors is delayed by a maximum of 30ms.

If the ECG waveform on the screen is too unstable to synchronize with the patient's heart beat because of the following reason, remove the cause of an alarm, message, or unstable ECG, and then use a stable ECG lead for synchronization.

- ✓ ECG electrode is detached or broken. Lead wire is detached or broken.
- ✓ Lead wire moves. AC interference, EMG noise or noise from ESU is superimposed.
- ✓ Connection cable is broken or has a short circuit. Connector has poor contact.

INTERFACING OTHER EQUIPMENT — Devices may only be interconnected with each other or to parts of the system when it has been determined by qualified biomedical engineering personnel that there is no danger to the patient, the operator, or the environment as a result. In those instances where there is any element of doubt concerning the safety of connected devices, the user must contact the manufacturers concerned (or other informed experts) for proper use. In all cases, safe and proper operation should be verified with the applicable

Manufacturer's instructions for use and system standards IEC 60601-1-1/EN 60601-1-1 must be complied with.

Electrosurgery Unit

- ✓ Electrosurgical units (ESU) emit a lot of RF interference. If the monitor is used with an ESU, RF interference may affect the monitor operation.
- ✓ Locate the monitor as far as possible from the ESU. Locate them on opposite sides of the operating table, if possible.
- ✓ Connect the monitor and ESU to different AC outlets located as far as possible from each other.
- ✓ When using this monitor with an electrosurgical unit, its return plate and the electrodes for monitoring must be firmly attached to the patient. If the return plate is not attached correctly, it may burn the patient's skin where the electrodes are attached.

During surgery:

Use the appropriate orange electrode ECG safety cable, or lead cable with a red connector, for measuring ECG in the operating room. These cables have extra circuitry to protect the patient from burns during cautery, and they decrease electrical interference. This also reduces the hazard of burns in case of a defective neutral electrode at the HF device. These cables cannot be used for measuring respiration.

Patient preparation

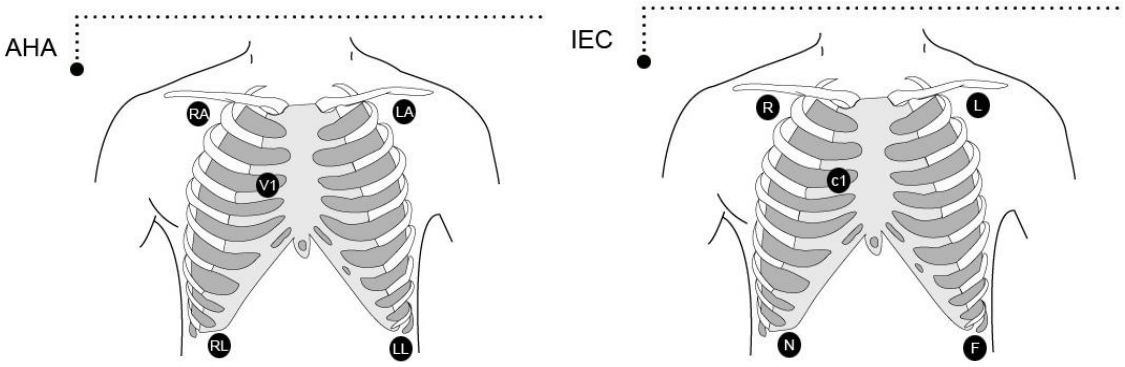
Careful skin preparation and proper electrode placement allow you to receive a strong signal that minimizes handwriting. If a technical alarm (e.g. lead disconnect) has occurred, prepare the patient again according to the following recommendations.
Follow hospital approved clinical procedures to prepare the patient's skin. Change the electrode every 24 to 48 hours to improve signal quality. You may need to replace the electrode more often in the following situations:

- ECG signal degradation
- Excessive sweating of the patient
- Patient's skin irritation

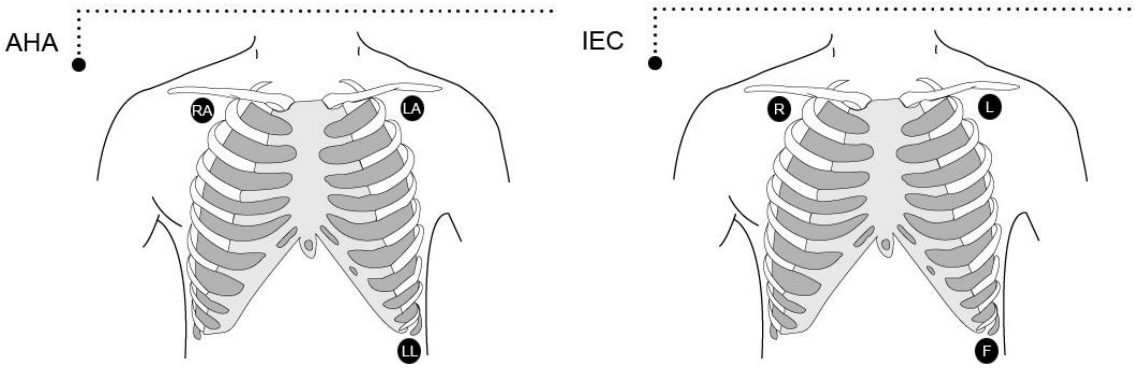
There are a variety of reusable and disposable electrodes available. Choose the electrode that best fits your monitoring situation. Bionet recommends Ag / AgCl disposable electrodes.
If you are using an electrode with a gel beforehand, make sure that the electrode is sufficiently gelled. Never use this product if the disposable electrode has expired or the gel is dry.
Determine the electrode location that will provide the best ECG in the configuration (P-wave and T-wave amplitudes should not exceed 1/3 of the QRS amplitude). Choose a flat, muscular location to maximize contact with the electrodes and minimize muscle fatigue. Avoid joints or bony protrusions. When choosing a location for electrode placement, consider the following special conditions: Surgery - Place electrodes as far away from the surgical site as possible. Burn patient - use sterile electrodes. Thoroughly clean the equipment. Follow hospital infection control procedures.
Use a waterproof tape (about 2 inches wide) or Steri-Drape to secure the electrode Protect from liquids. Make a small loop from the lead wire just below the connection and secure with tape.

ECG lead

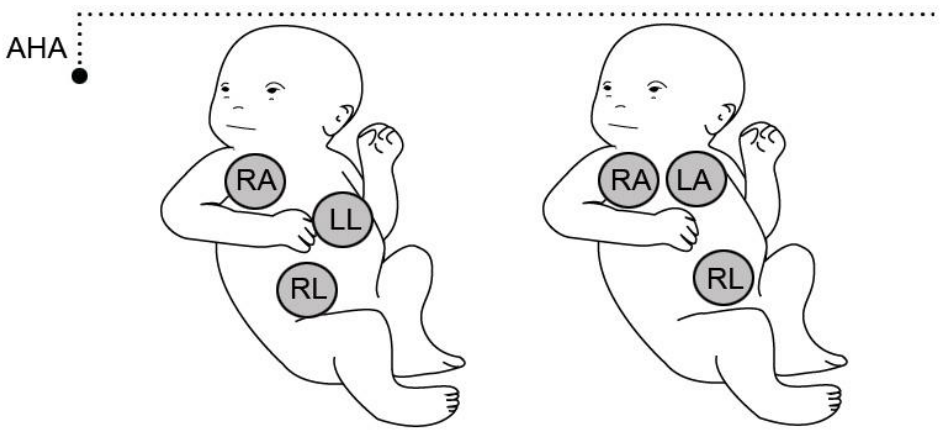
5 LEAD electrode placements

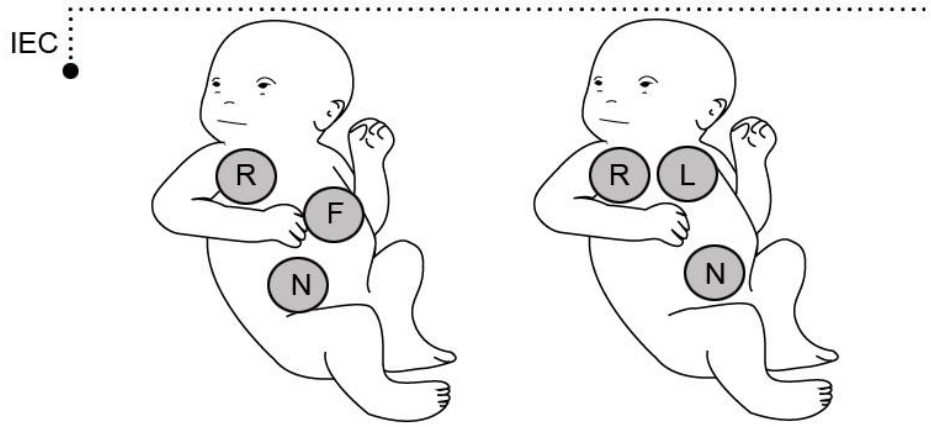


3 LEAD electrode placement



How to attach neonate electrodes





Cable color and size

AHA : American Heart Association (U.S.A. standard)

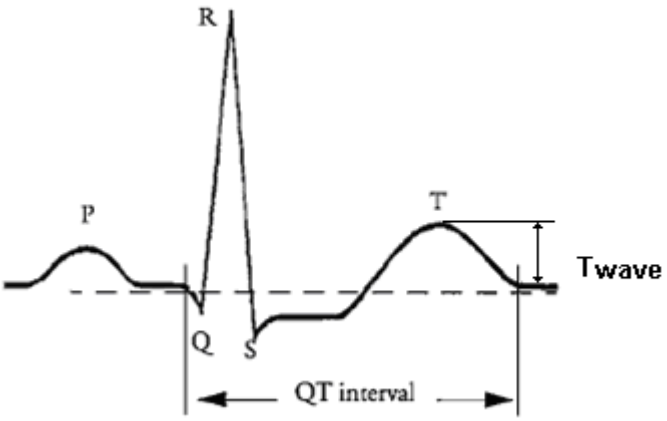
IEC : International Electro technical Commission (Europe standard)

3LEAD / 5LEAD

Lead wire	AHA Color code	AHA Label	IEC Color code	IEC Label
Right arm	White	RA	Red	R
Left arm	Black	LA	Yellow	L
Right leg	Green	RL	Black	N
Left leg	Red	LL	Green	F
V1(precordial)	Brown	V1	White	C1

ECG signal processing and display

The monitor is a QRS Complex with a QRS complex amplitude of 0.4 to 5.0 mV (0.2-5.0 mV with a scale setting of 0.5 mV / cm or less) and an adult with a QRS width of 70-120ms (or a newborn with a QRS / ARR Select chapter). The heart rate is calculated from 15 to 300 times per minute using the last 10seconds of the R-R interval and the two longest intervals and the two shortest intervals at the R-R interval. The remaining interval is averaged, and the current heart rate is displayed in the HR parameter box of the main screen as a result.

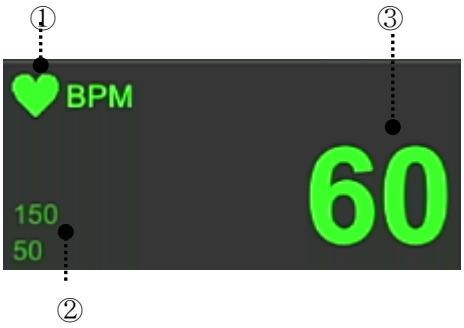


When the ECG signal is 80 BPM, the interval of the T wave is 180ms, and the QT period is 350ms.

Alarm and alarm status

High P-wave and T-wave - Long P-wave or T-wave with high amplitude duration can be detected by QRS Complex. Place the leads on the ECG1 channel with the highest R-wave (compare to T-wave and / or P-wave) to allow the monitor to properly detect low heart rate conditions in this situation. If the monitor continues to misinterpret the P-wave or T-wave, use a pulse oximeter to reposition the electrodes or monitor the patient's pulse rate.

Display



①	Heart rate detector: It detects heart rate and flickers simultaneously.
②	HR Alarm limits: Heart rate threshold is displayed.
③	Heart rate: Displays the heart rate per minute.

ECG Settings

	Main menu	Sub menu
ECG	**A.**ECG Parameters	**A-1.** Alarm
		A-2. QRS Volume
		A-3. Display Option
		A-4. Pace Maker

A. ECG menu		
MENU	Description	Available settings
A-1. Alarm	ECG alarm setting menu	
A-1-1.PARAMETER ALARM LIMIT	HR, alarm limits, level, activation setup menu.	

A-1-2.TECHNICAL ALARM CONDITION	ECG-LEADFAULT ECG-CHECKELECTRODE ECG-HR-SEARCH	
A-2.QRS VOLUME	QRS detection volume setting menu. When you set the SpO2 volume, it is automatically set to OFF.	OFF, 0%~100%
A-3.DISPLAY OPTION		
A-3-1.SWEEP SPEED	The speed of the ECG displayed on the screen can be set. Default setting: 25mm/s	6.25mm/s, 12.5mm/s, 25mm/s, 50mm/s
A-3-2. FILTER	The filter setting is MONITOR by default. ECG FILTER : Selects among four frequency bands to filter the signal. MONITOR 0.5Hz ~ 40Hz MODERATE 0.5Hz ~25Hz MAXIMUM 5Hz ~ 25Hz DIAGONOSIS 0.05Hz ~150Hz	MONITOR MODERATE MAXIMUM DIAGONOSIS
A-3-3. SIZE (SENSITIVITY)	Changes the display amplitude of the ECG waveform.	0.25 , 0.5, 1, 2, 4mm/mV
A-3-4. HR SOURCE	The cardiac source can be selected as ECG or SpO2, AUTO.	ECG, SpO2,AUTO
A-3-5. VIEW CHANNEL	Number of channels in the ECG waveform to be shown on the screen. Display two lines of 1CH ECG waveform.	1CH,
A-3-6.TRACE 1	The ECG channel is selectable from I to V6. 3 When using the lead cable selection, only TRACE I can select I, II, III. 5 lead cable selection I, II, III, aVR, aVL,	I, II, III, aVR, aVL, aVF, V

	aVF, V can be selected.	
A-4. Pace Maker	Pace Maker detection display setting	ON/OFF

Trouble shooting

Problem:

Inaccurate heart rate and/or false asystole.

Solution:

Check ECG signal from patient:

1. Check and adjust the electrode placement.

2. Check the electrode attachment to the skin and attach it correctly.

3. Check the condition of the electrode and replace it if necessary.

Check amplitude of ECG waveform:

1. Select ECG parameter label.

2. Select DISPLAY LEAD,

3. Scroll through all ECG leads and check for 0.5mV amplitude at normal (1X) size.(at least0.5mV amplitude is required for QRS detection.) For borderline signals, validate on a graph.

4. If amplitudes are low, electrodes may need to be repositioned or replaced.

Problem:

False ventricular fibrillation occurs.

Solution:

Check ECG signal from patient: (the chest lead may exhibit polarity changes which may occasionally cause an inaccurate call.)

1. Check and adjust the electrode placement.

2. Check the electrode attachment to the skin and attach it correctly.

3. Check the condition of the electrode and replace it if necessary. (if chest lead is a problem, move the chest electrode to another chest position or leg position.)

Problem:

Inaccurate pacemaker detection

Solution:

Use pacemaker processing:

1. Select ECG parameter label.
2. Display the lead of ECG with the greatest amplitude in the top waveform position.
3. Select Pace Maker.
4. SELECT PACE MAKER ON.

7. SpO2

Overview

SpO2 monitoring is a non-invasive technique that measures the total amount of oxygen in hemoglobin. The pulse rate is measured by measuring the absorption of the wavelength of the selected light. The light emitted by the sensor in the probe passes through the tissue and is converted into an electrical signal by the light-detecting sensor in the probe. The monitor processes the electrical signal and displays the waveform, %SpO2, and pulse rate on the screen as quantified values. Red and infrared rays are passed through the capillaries of the fingertip to detect the pulsating component, calculate HR and oxygen saturation, and alarm according to the set alarm value.

Precaution

SpO2 measurements are particularly sensitive to arterial and arteriolar pulse rates. Patients experiencing shock, hypothermia, anemia, or patients taking medications that reduce arterial blood flow may have incorrect measurements.

Warning:

- The pulse oximeter cannot be used as an apnea monitor.
- High oxygen levels can make premature babies vulnerable to retrolental fibroplasia. When this is the case, do not set the maximum alarm limit to 100%, such as the effect of turning off the alarm. Percutaneous pO2 monitoring is recommended for premature infants receiving supplemental oxygen.
- Inspect the applied area every 2-3 hours to check the skin condition and check if it is attached to the naked eye. If skin conditions change, move the sensor to another location. Change the application site every 4 hours at least.
- Use only Bionet-designated sensors. Other sensors may not provide adequate protection against defibrillation or may put the patient at risk.
- Disposable accessories (disposable electrodes, transducers, etc.) should be used only once. Do not reuse disposable accessories.

Patient preparation

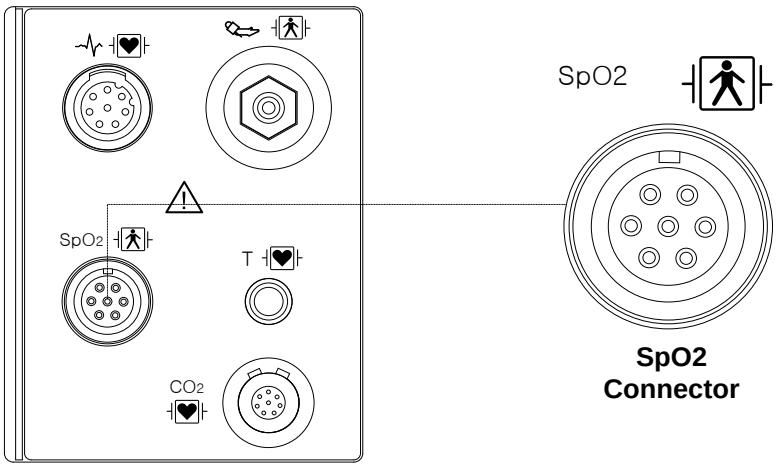
The accuracy of SpO2 monitoring is largely dependent on the strength and quality of the SpO2 signal.
If you use your fingers as a monitoring site, remove the nail polish. Cut the patient's fingernail if needed to improve placement of the sensor. Only use sensors provided by Bionet and apply them according to manufacturer's recommendations on a per-sensor basis.
If the sensor is not attached correctly, the ambient light may interfere with the pulse oximetry, making the measurement irregular or causing the value to disappear. If you suspect interference from ambient light, make sure that the sensor is properly positioned and that the sensor cover with the opaque body is covered.

1. Select the sensor type and size that best suits your patient.
2. If the sensor can be reused, please wash it before use for each patient.
3. Position the sensor correctly and attach it to the patient.
4. Connect the sensor to the patient cable.
5. Check the application area of the sensor from time to time. If the sensor is too tight, it may delay blood flow or overheat the skin and damage the tissue. Do not use a damaged sensor.

Note: Read the documentation that came with your sensor for the best application technology and safety information. Never use a damaged sensor.

Note: If the sensor does not turn on after connecting the sensor, observe that a message appears on the monitor. If the sensor-LED does not turn on, replace the sensor.

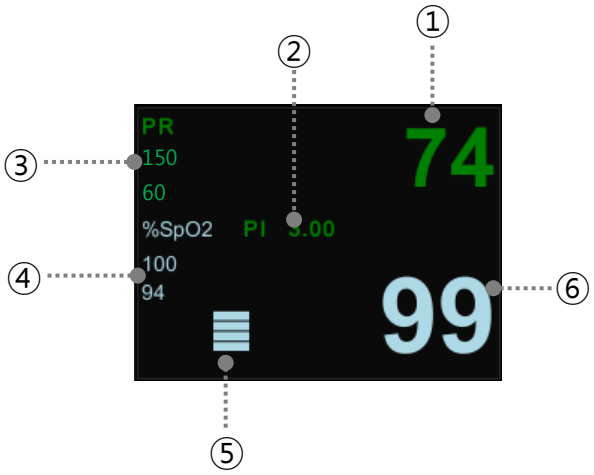
SpO2connector



SpO2 measurementCable

Note
The signal input is a high-insulation port and it is defibrillator proof().  The insulated input ensures patient safety and protects the device during defibrillation and electrosurgery.

Display



①	SpO2 pulse rate display
②	SpO_2 PI (Perfusion Index) measurement display
③	SpO2 pulse rate alarm limits display
④	%SpO2 alarm limits display
⑤	SpO2 strength indicator
⑥	%SpO2 Value display

The current SPO2 value and the derived pulse rate (RATE) are displayed. The block sets indicate the strength of the signal (twenty block bars indicate the strongest signal). The SPO2 measurements are averaged over a 6-second period of time.

The monitor display is updated every second.

The SPO2 monitoring features are found in the SPO2 menu. These features include alarm limit adjustment, display of RATE, and RATE volume.

Note
SpO2 WAVE SIZE is changed automatically.

Signal and Data Validity

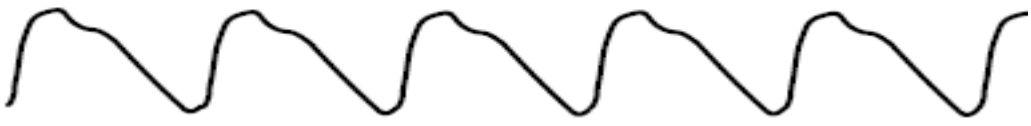
It is extremely important to determine that the probe is attached to the patient correctly and the data is verifiable. To make this determination, three indications from the monitor are of assistance—signal strength bar, quality of the SPO2 waveform, and the stability of the SPO2values. It is critical to observe all three indications simultaneously when ascertaining signal and data validity.

Signal Strength Bar

The signal strength bar is displayed within the SPO2 values window. This bar consists of 10 blocks set depending on the strength of the signal. Proper environmental conditions and probe attachment will help to ensure a strong signal.

Quality of SPO2 Waveform

Under normal conditions, the SPO2 waveform corresponds to (but is not proportional to) the arterial pressure waveform. The typical SPO2 waveform indicates not only a good waveform, but helps the user find a probe placement with the least noise spikes present. The figure below represents an SPO2 waveform of good quality.



Good Quality SPO2 Waveform

If noise (artifact) is seen on the waveform because of poor probe placement, the photodetector may not be flush with the tissue. Check that the probe is secured and the tissue sample is not too thick. Pulse rate is determined from the SPO2 waveform which can be disrupted by a cough or other hemodynamic pressure disturbances. Motion at the probe site is indicated by noise spikes in the normal waveform. (See the figurebelow.) It has been noted that letting the patient view the SPO2 waveform enables them to assist in reducing motion artifact.

SPO2 Waveform with Artifact

Stability of SPO2Values

The stability of the displayed SPO2 values can also be used as an indication of signal validity. Although stability is a relative term, with a small amount of practice one can get a good feeling for changes that areartifactual or physiological and the speed of each. Messages are provided in the SPO2 values window to aid you in successful SPO2 monitoring.

WARNING
In the monitoring of patients the coincidence of adverse conditions may lead to a disturbed signal going unnoticed. In this situation artifacts are capable of simulating a plausible parameter reading, so that the monitor fails to sound an alarm. In order to ensure reliable patient monitoring, the proper application of the probe and the signal quality must be checked at regular intervals.

SPO2Settings

A. SPO2menu		
MENU	Description	Available Settings
A-1. Alarm	SPO2 Alarm setup menu	
A-1-1.PARAMETER ALARM LIMIT	PERCENT, PR parameter alarm , level , activate setup menu	
A-1-2.TECHNICAL ALARM CONDITION	SPO2-PROBEOFF SPO2-CHECKPROBE SPO2-POORSIGNAL SPO2-LOSTPULSE SPO2-ARTIFACT SPO2-PULSE SEARCH	
A-2.RATE VOLUME	Menu in which RATE VOLUME is set up When the ECG volume is set, it is automatically set to OFF.	OFF, 0%~100%
A-3.DISPLAY OPTION	SPO2waveform display setting	
A-3-1.SWEEP SPEED	It can set the speed of SPO2 displayed on the screen. Default: 25 mm/s.	6.25mm/s, 12.5mm/s, 25mm/s, 50mm/s

Status messages

Below is a list of system status alarm messages which may be displayed in the SPO2 parameter window during monitoring.

CHECK PROBE

Reusable finger probe is off the patient. Check the probe. The factory default for this alarm is

MESSAGE ALARM.

PULSE SEARCH

Detection by the monitor of a repeatable pulse has ceased. Check the patient and the probe site.

POOR SIGNAL

The SPO2 signal is too low. No SPO2 data is displayed. This can be due to a low patient pulse, patient motion, or some other interference. Check the patient and the probe.

LOST SIGNAL

SPO2 data continues to be displayed, but the quality of the signal is questionable. Check the patient and the probe.

ARTIFACT

It indicates that something happened to the pulses; determine if the artifact to be abnormal and irregular

8. RESPIRATION

Overview

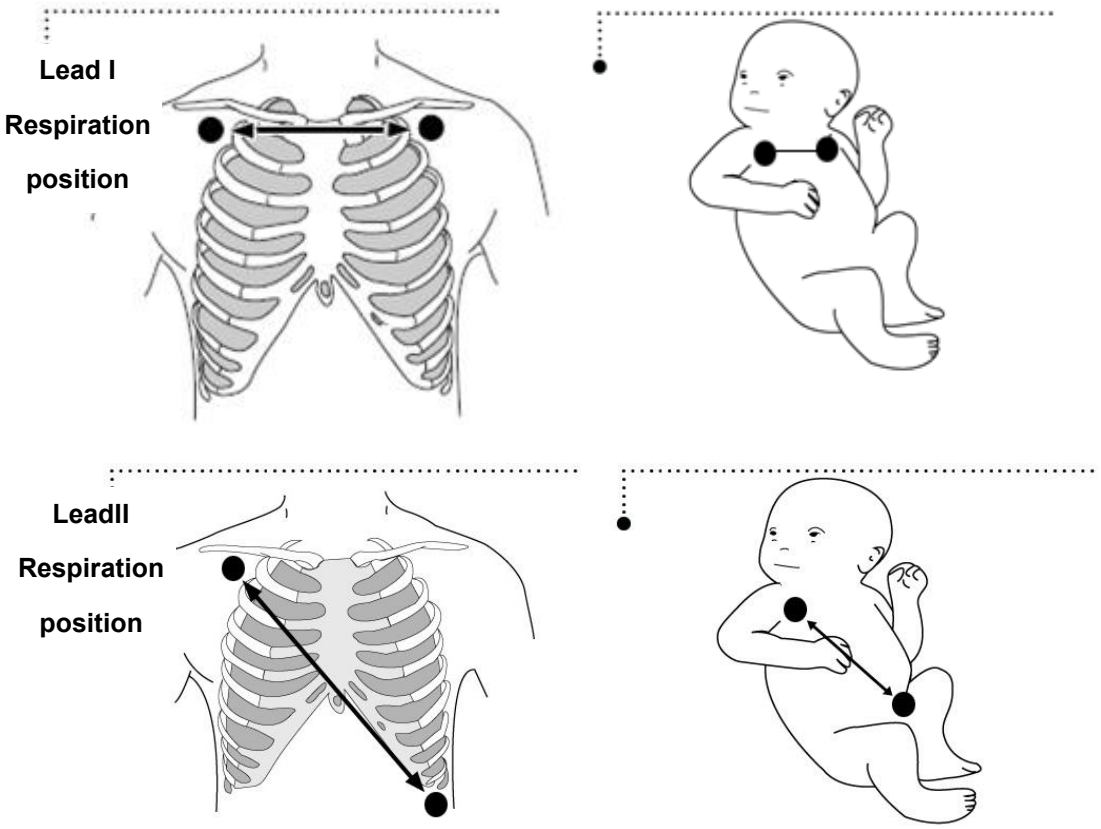
Respiration via ECG Lead I or Lead II electrode makes the skin area of the chest enlarged, causing changes in the resistance of skin. Through this it calculates respiration value per minute and performs the alarm function according to limit value.
The monitor can use ECG leads I or II for breath detection, regardless of the leads selected for QRS processing. The measurement range for impedance breath monitoring is 0 to 155 breaths per minute. The alarm setting range is 5 ~ 150 breaths per minute. You can monitor the heart rate, SpO2 using the appropriate accessories, and display the relevant values in the Oxy cardio respirogram.

RESP precaution

- Impedance breath monitoring should not be considered the only way to detect breathing stops. Bionet recommends monitoring of additional parameters, such as EtCO2 and SpO2 that indicate the patient's oxygen supply status.
- • If you use an ESU block or cable, the impedance breath monitor may not work and the pacemaker detection performance may be degraded. If pacemaker detection is enabled, ESU interference may be detected as a pacemaker.
- • Large amplitude pacemaker pulses (>100mV) may interfere with the monitor's breath measurement or detection function.

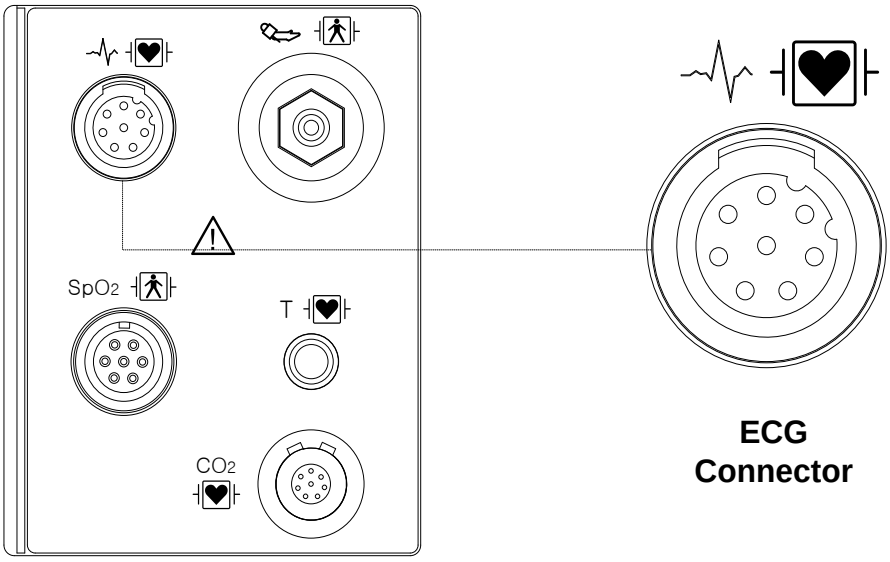
Patient Preparation

Skin preparation and electrode placement must be properly and carefully monitored in impedance breath monitoring. You can produce reliable results. Follow the same recommendations as ECG monitoring Please. In general, the electrodes should be placed as clean as possible with the 60Hz noise minimized to make it possible to generate a signal. The best results can be obtained when the electrode is firmly bonded and the electrode area is wide. To improve the RESP signal, use a 5-lead cable set (RL as a neutral electrode). It is recommended that the electrode be placed in the maximum expansion and contraction range of the lung, especially if deep breathing is involved. For newborns, place the RA and LA electrodes on the mid-armpit line with the nipple. Place the LL electrodes under the diaphragm and navel. Avoid the liver and the ventricles of the heart to prevent 60Hz noise from pulsatile blood circulation. The following figure shows where we recommend placing ECG leads for impedance breathing in adults and neonates



Respiration connector and measurement cable

Respiration connector

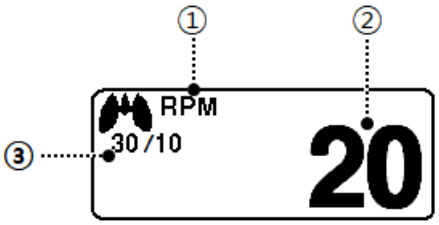


Respiration

cable

Note
Respiration Rate measures the cable and connector will be used as the ECG and common.

Display



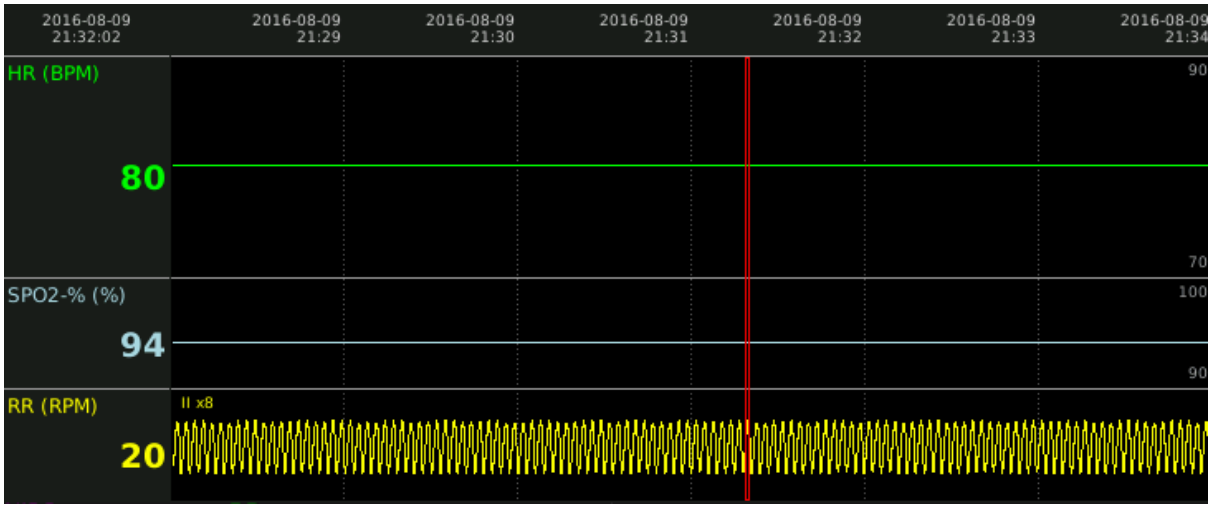
①	**Breathe indicator: indicates the detected breath**
②	**Breathing number : displays the number of respiration per minute**
③	**Respiration alarm limit: indicates respiration limits**

RESP Settings

A. RESP menu		
Menu	Description	Available Settings
A-1. Alarm	RESP Alarm setting menu	
A-1-1.PARAMETER ALARM LIMIT	RR, , Activation setup menu	
A-1-2.TECHNICAL ALARM CONDITION	RESP-CABLE OFF RESP-LEAD FAULT RESP-CHECK ELETRODE	
A-2.DISPLAY OPTION	This is for changing the reference LEAD for respiration	
A-2-1.SWEEP SPEED	A menu to setup Wave Display of speed	6.25mm/s, 12.5mm/s, 25mm/s,

A-2-2.SIZE	A menu to setup Wave Display	2, 4, 6, 8, 10
A-2-3.LEAD SELECT	This is for changing the reference LEAD for respiration	LEAD Ⅰ LEAD Ⅱ

Respiration waveform



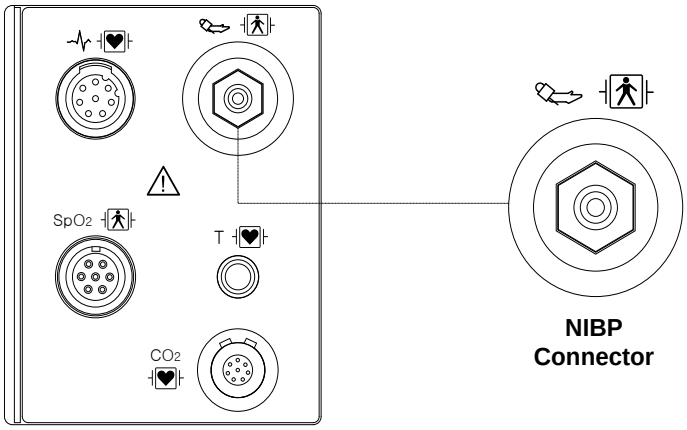
9. NIBP

Overview

The monitor can acquire and process non-invasive blood pressure (NIBP) signals and display the output. Blood pressure measurements are determined by the oscillometric method and are equivalent to those obtained by intra-arterial methods, within the limits prescribed by the Association for Advancement of Medical Instrumentation, Electronic Automated Sphygmomanometers (AAMI/ANSI SP-10).

If the pulse signal is poor due to patient movements, improper cuff placement or noise in the signal, the cuff deflates and the monitor attempts a second measurement. For causes and possible remedies for a poor pulse signal see the alarm message tables. The hose connects the cuff to the monitor to determine the contraction, expansion and mean blood pressure of an adult, pediatric or neonatal patient. The monitor can start the blood pressure measurement alone with set intervals, or persistence lasting more than 5minutes.

NIBP Connector



Adult Cuff

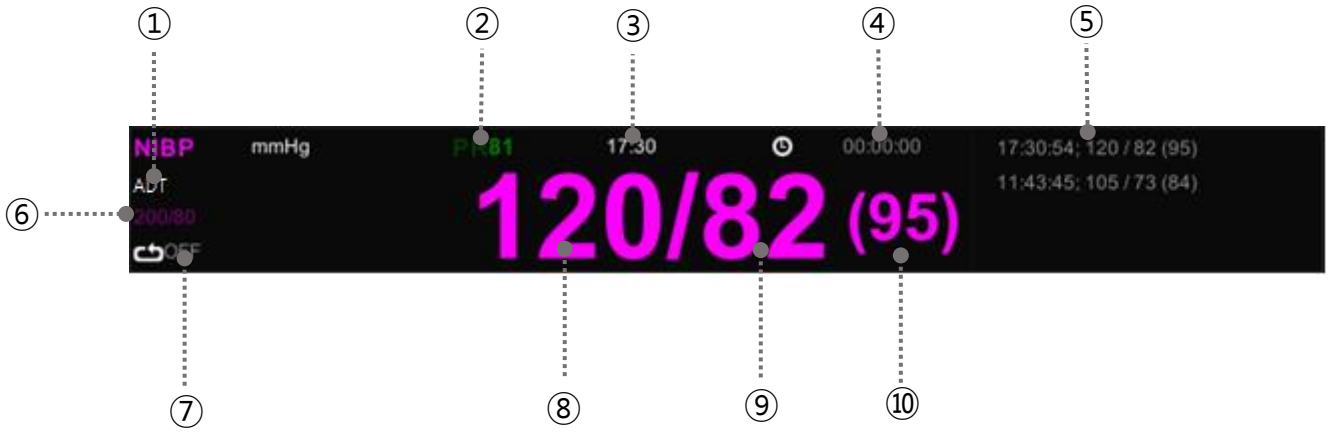
Optional accessory list

Thigh Adult		**Big Adult NIBP Cuff** Cuff Size : 458 * 143 Arm circumference : **45 to 56.5**CmOption
Big Adult		**Big Adult NIBP Cuff** Cuff Size : 458 * 143 Arm circumference : 35.5 to 46 Cm Option
Child		**Child NIBP Cuff** Cuff Size : 430 * 108 Arm circumference : 20.5 to 28.5 Cm Option
Pediatric		**Pediatric NIBP Cuff** Cuff Size : 313 * 88 Arm circumference : 13.8 to 21.5 Cm Option
Infant		**Infant NIBP Cuff** Cuff Size : 210 * 60 Arm circumference 9 to 14.8 Cm Option
Neonate		NIBP Disposable Cuff Neonate 1 (3.3~5.6cm) Option

		NIBP Disposable Cuff Neonate 2 (4.2~7.1cm) Option
		NIBP Disposable Cuff Neonate 3 (5.0~10.5cm) Option
		NIBP Disposable Cuff Neonate 4 (6.9~11.7cm) Option

Note
The NIBP should be set in the menu because the measured value differs depending on the patient's age and gender.

Display



①	Measurement Cuff type.
②	Pulse rates: Indicates pulse rate.
③	Measurement time: Indicates the complete on time of measuring.

④	Measure time: Indicates the schedule counter time of measuring.
⑤	Indicates recent measurement data.
⑥	Systolic Alarm limit: Indicates alarm limit of blood pressure.
⑦	Interval Time: indicates interval time when measures the blood pressure periodically.
⑧	Systolic blood pressure: Indicates the maximum limit of systolic blood pressure.
⑨	Diastolic blood pressure: Indicates the maximum limit of diastolic blood pressure.
⑩	Mean blood pressure: Indicates the maximum limit of mean blood pressure.

NIBP Settings

A. NIBP menu		
Menu	Description	Available Settings
A-1. Alarm	NIBP Alarm setup menu	
A-1-1.PARAMETER ALARM LIMIT	SYS, MEAN, DIA Parameter alarm limit, level , activation setup	
A-1-2.TECHNICAL ALARM CONDITION	NIBP-OVER PRESSURE NIBP-OVERTIME PRESSURE NIBP-INFLATION FAILURE NIBP-DEFLATION FAILUER NIBP-MEASUREMENT ERROR NIBP-PULSE TOO WEAK NIBP-AIR LEAK NIBP-EXCESSIVE MOTION NIBP-SYSTEM FAULT	

A-3.INFLATION	It is a function to set the range that is usually used by setting pressure at the beginning because it can give pain to the patient when the equipment is turned on and pressurized to the maximum pressure range at the initial pressurization. Default Settings value: ADT : 170 mmHg PED : 140mmHg NEO : 120mmHg	ADT : 120 – 250 mmHg PED : 80 – 170mmHg NEO : 60 – 140mmHg
A-4.SETTING TIME	How to apply pressure value setting. Once: When the blood pressure is measured for the first time, the pressure is set to the set pressure value, but automatically adjusted according to the patient's blood pressure value. Every Time: Whenever blood pressure is measured, pressurize to the set pressure value every time	Once, Every Time
A-5.AUTO MEASUREMENT INTERVAL	A menu to set Interval time when measures the blood pressure periodically. After setting INTERVAL, you must press NIBP KEY to start NIBP START periodically.	1min, 2, 3, 4, 5, 10, 15, 20, 30, 1hour, 2, 4, 8
B-1.NIBP STAT	Patients with severe state changes in blood pressure are in continuous mode for 5minutes to check for changes in blood pressure continuously.	OFF / ON

C-1.VITAL SIGN REVIEW	Record the 40 most recently measured blood pressure values.	

Warning
Check periodically to see if the circulation from the cuff to the distal part of the patient's arm is good. 1minute and 2minute intervals When using automatic measurement, check the patient's condition frequently. It is not recommended for measuring blood pressure for a long time if the measurement time period is set to 10minutes or less.

Note
Safety Considerations Software and Hardware for Cuff pressure Blocking: The cuff is automatically reduced when the measurement time is longer than two minutes in Adult / Pediatric mode and more than 90seconds in Neonatal mode. Extension limits are set for all patient categories to prevent overpressure on the patient. The maintenance is performed every 2 years. Check the following list to the ensure monitor operates properly and safely at all times. 1. Check for proper cuff size. 2. Check for residual air left in the cuff from a previous measurement. 3. Make sure cuff is not too tight or too loose. 4. Make sure cuff and heart are at same level, otherwise hydrostatic pressure will offset the NIBP value. 5. Minimize patient movement during measurement. 6. Watch for pulses paradox us. 7. Check for leak in cuff or tubing.

8. Patient may have a weak pulse.

It is recommended the PATIENT position in NORMAL measurement, as below;

1) Comfortably seated

2) Legs uncrossed

3) Feet flat on the floor

4) Back and arm supported

5) Middle of the CUFF at the level of the right atrium of the heart

a recommendation that 5min should elapse before the first reading is taken

Measurement Limitations

Measurements are impossible with heart rate extremes of less than 40 bpm or greater than 300 bpm, or if the patient is on a heart-lung machine.

The measurement may be inaccurate or impossible:

• With excessive and continuous patient movement such as shivering or convulsions

• if a regular arterial pressure pulse is hard to detect

• With rapid blood pressure changes

• With severe shock or hypothermia that reduces blood flow to the peripheries

• With obesity, where a thick layer of fat surrounding a limb dampens the oscillations coming from the artery

• On an edematous extremity.

The effectiveness of this sphygmomanometer has not been established in pregnant, including preeclamptic patients.

Cuff Selection and Placement

The quality of NIBP monitoring depends largely on the quality of the signals received by the

monitor.

For this reason, it is important to select the correct cuff size for your patient. Cuff sizes are clearly marked on the cuff. Measure the circumference of your patient's limb. Use only Bionet cuffs with your monitor.

Warning
Non-invasive blood pressure monitoring is not recommended for patients with hypotension, hypertension or extremely high or low heart rate. The software algorithm cannot accurately compute NIBP or patients with these conditions.

Warning
As the value of NIBP can vary according to the age and sex of a patient, the user needs to set up correct data in parameter Menu before measurement. Make certain tubes between the cuff and the monitor are not kinked or blocked. Pay attention to not block connecting hose when you put cuff on patient. Check cuff and hose connection for leaks periodically. Measurements can be inaccurate if air leaks. The air pad should be exactly over the branchial artery. Tubing is immediately to the right or left of the branchial artery to prevent kinking when elbow is bent. Try to measure infants when they are calm. A kicking or crying baby may disturb or jiggle the cuff, causing noise within the system and resulting in unstable blood pressure readings. If necessary, hold the cuffed limb steady, without impeding circulation. Do not hold onto the cuff and do not pat the cuffed limb to comfort the child. NIBP cannot be taken under all conditions. Even manual methods, employing a sphygmomanometer and stethoscope, will not work on unstable or active patients. Pressurization of the CUFF can temporarily cause loss of function of simultaneously used monitoring ME EQUIPMENT on the same limb Ensure the need to check that operation of the NIBP does not result in prolonged

impairment of the circulation of the blood of the PATIENT

Status Messages

If the cuff hose is not connected properly	→INFLATION FAILURE CHECK CUFF
When the cuff pressure is excessive	→ OVER PRESSURE
When the cuff breaks and cannot exhaust	→DEFLATION FAILURE
When the cuff pressure exceeds the set time	→ OVER TIME CUFF PRESSURE
When there is no measurement signal	→MEASUREMENT ERROR

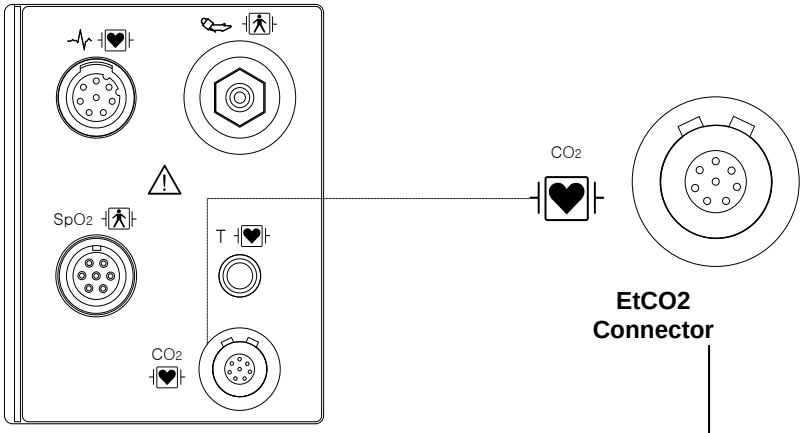
10. EtCO2(*)

Overview

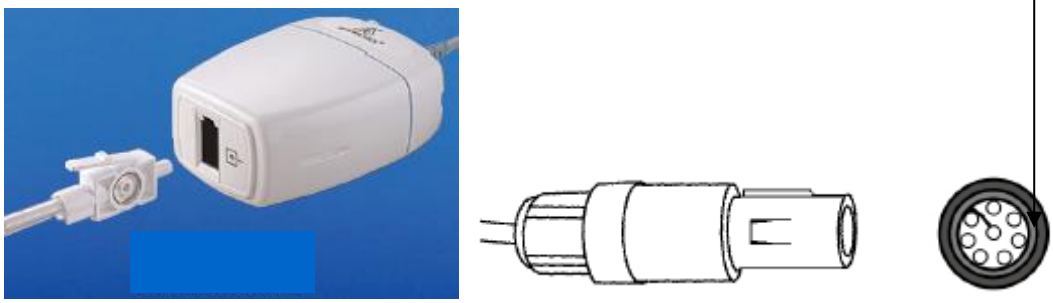
On supported models only(*), the BM Series monitor measures concentrations of end-tidal CO2 (EtCO2) when this option is enabled and the EtCO2 module is connected to your monitor. The EtCO2 module can perform mainstream measurements in all monitoring modes and sidestream measurements in the adult and pediatric monitoring modes. For sidestream measurements, the capnostat fits on the nasal sampling cannula tubing.

EtCO2 connector position and Accessory (Sidestream, Respironics)

EtCO2 connector

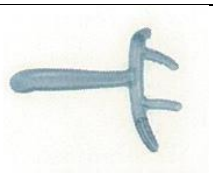


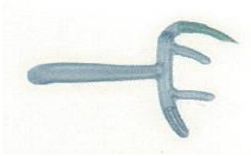
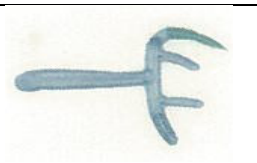
LoFlo sidestream CO2 sensor and connector



Sidestream sensor **Sidestream sensor connector**

Sidestream EtCO2 Accessories

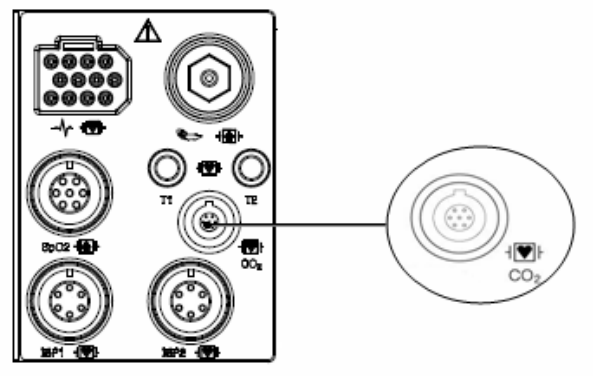
Intubation Sidestream accessories			
PART	FIGURE	Description	type
3468ADU-00		NasalCO_2 Sampling Cannula	Adult
3468PED-00		Nasal CO_2 Sampling Cannula	Child
3468INF-00		Nasal CO_2 Sampling Cannula	Neonate
3470ADU-00		Oral/Nasal CO_2 Sampling Cannula	Adult
3470PED-00		Oral/Nasal CO_2 Sampling Cannula	Child
3469ADU-00		Nasal CO_2 Sampling Cannula w/ O_2 Delivery	Adult
3469PED-00		Nasal CO_2 Sampling Cannula w/ O_2 Delivery	Child

3469INF-00		Nasal CO_2 Sampling Cannula w/ O_2 Delivery	Neonate
3471ADU-00		Oral/Nasal CO_2 Sampling Cannula w/ O_2 Delivery	Adult
3471PED-00		Oral/Nasal CO_2 Sampling Cannula w/ O_2 Delivery	Child

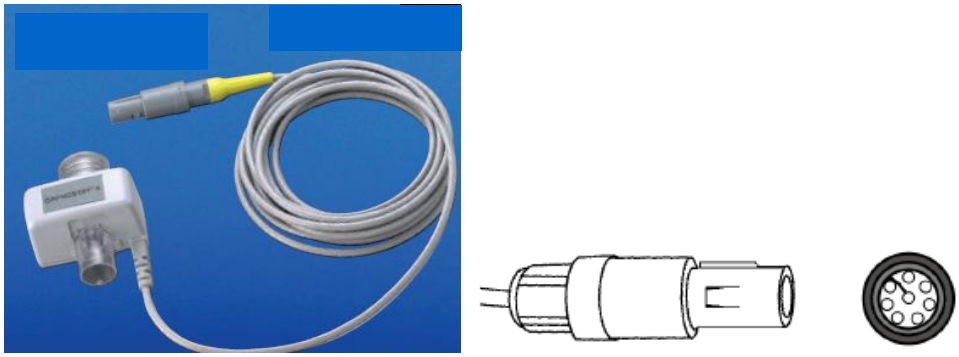
Intubation accessories			
3473ADU-00		Airway Adapter Kit w/ Dehumidification Tubing	Adult /chid **(ETTube Size>4.0 mm)**
3473INF-00		Airway Adapter Kit w/ Dehumidification Tubing	child/Neonate **(ETTube Size<=4.0 mm)**

EtCO2 Placements and Accessories (Mainstream, Respironics)

EtCO2 connector



CAPNOSTAT 5 mainstream CO2 sensor and connector



Mainstream Sensor / Mainstream Sensor Connector

Mainstream EtCO2 Accessories

Intubation patient Airway adaptor		
Model	Picture	Description
6063-00		Adult/Neonate(disposable)
312-00		Neonate(Disposable)
7007-00		Adult/Neonate (Reusable)
7053-00		Neonate(Reusable)

Precaution

Warning
• The CO2 alarm is not activated until the first breath is detected after the monitor is turned on or the patient is discharged. • Accuracy of the CO2 and breathing rate measurements may be impaired due to improper attachment of the sensor or due to certain patient conditions and certain environmental conditions. • If the tube connection is faulty, loose or damaged, gas may leak and the accuracy of the measurement may be lowered, resulting in poor breathing. To prevent this, connect all component is securely and check the connection according to standard clinical procedures to ensure that there are no leaks.

Warning
• Industrial safety: Carefully dispose of used sampling tubes and T-connectors as they may cause infection. There is a risk of infection. Dispose of all equipment in accordance with local regulations. • Optimize reaction time by minimizing dead space and keeping sample collection tubes as short as possible. Long sampling tubes can lead to poor accuracy and slow response times for sidestream measurement techniques. • Do not place the airway adapter between the suction catheter and the endotracheal tube when using the sample collection line as a closed suction device for tuberous patients. This is to ensure that the airway adapter does not interfere with the function of the suction catheter.

Sampling method

Connecting the CAPNOSTAT® 5 CO2 Sensor to the Host System

1. Insert the CAPNOSTAT 5 CO2 Sensor connector into the receptacle of the host monitor as shown in Figure 1.

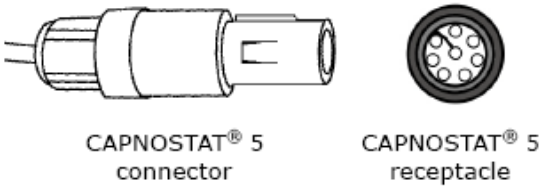


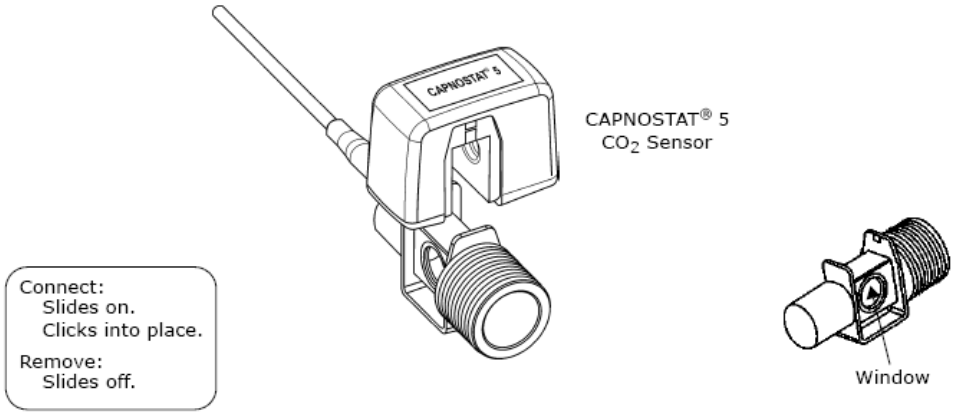
Figure 1

2. Make sure the arrows on the connector are at the top of the connector and line up the two keys of the connector with the receptacle and insert.

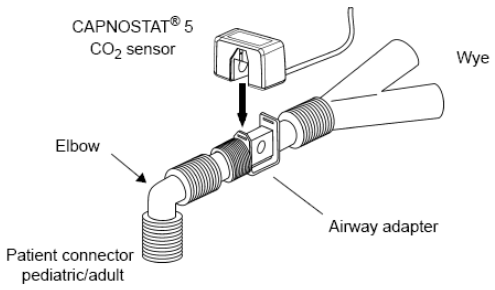
3. To remove the connector, grasp the body portion of the connector back and remove.

Note: Do not remove by pulling cable.

Shown below is the CAPNOSTAT 5 CO_2 Sensor connection to a Respironics Novametrix CO_2 adapter:



Shown below is the CAPNOSTAT 5 CO_2 Sensor with a patient circuit:



Connecting the LoFlo Sample Kit

1. The sample cell of the sampling kit must be inserted into the sample cell receptacle of the LoFlo CO_2 Module as shown in Figure 1. A "click" will be heard when the sample cell is properly inserted.

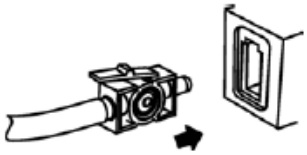


Figure 1

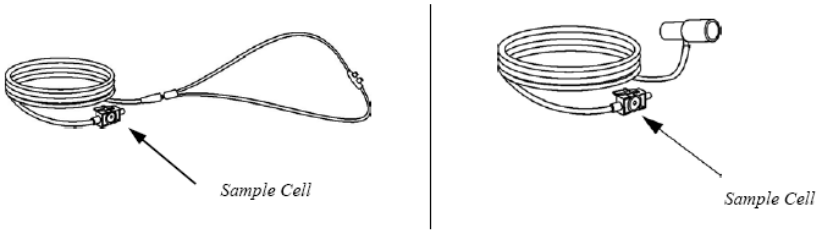


Figure 2

2. Inserting the sample cell into the receptacle automatically starts the sampling pump.

Removal of the sample cell turns the sample pump off.

3. To remove the sampling kit sample cell from the sample cell receptacle, press down on the locking tab and pull the sample cell from the sample cell receptacle.

Display

①	EtCO2 CO2 concentration alarm upper and lower limit value display
②	Display CO2 concentration value at exhalation
③	Display the carbon dioxide concentration value at inhalation
④	Show respiratory rate per minute

EtCO2 setup

A. EtCO2 menu

Menu	Description	Available settings
A-1. Alarm	EtCO2 Alarm Setup Menu	
A-1-1.PARAMETER ALARM LIMIT	ETCO2, FICO2, AWRR, APNEA parameter alarm ,level , action setup menu	
A-1-2.TECHNICAL ALARM CONDITION	ETCO2-MODULE OFF ETCO2-CHECK ADAPTOR	

	ETCO2-CHECK LINE ETCO2-CHECK LINE DISCONNECT ETCO2-CO2 INVALID ETCO2-OVER RANGE ETCO2-ZERO REQUIRED ETCO2-SYSTEM FAULT ETCO2-TEMP UNSTABLE	
A-2. DISPLAY OPTION	EtCO2Parameter Wave Display Setup Menu	
A-2-1. SWEEP SPEED	Waveform sweep speed setup	6.25mm/s, 12.5mm/s, 25mm/s
A-2-2. SCALE	Display waveform scale setup. The selectable value is the maximum pressure range shown in the waveform. When you select a range value, the selected pressure range value is displayed below the dotted line above the two dotted lines in the left middle of the WAVE window.	40mmHg (5.3 vol%) 50mmHg (6.6 vol%) 60mmHg (7.9 vol%) 80mmHg (10.5 vol%) 100mmHg(13.2 vol%) 150mmHg(19.7 vol%)
A-2-3. FILL	Choose whether to fill the waveform inside	ON/OFF
A-2-4. Gas Pressure Unit	Choose Gas Pressure Unit	mmHg kPa vol%
A-2-5. Use One Gas Unit	Choose to set the pressure unit for	ON/OFF

	each gas type Unit setting menu by gas type appears when OFF	
A-4.MODULE INFORMATION		
A-3-1.SENSOR PN	The sensor part number	PNXXXXXX
A-3-2.OEM ID	The id is a 7bit identifier which is set at the factory to a unique value for each OEM.	0X01
A-3-3.SENSOR SN	The serial number of the module.	
A-3-4.H/W VERSION	The hardware version number of the module.	
A-3-5.TOTAL USAGE TIME	Total use time of the module.	
A-3-6.LAST ZERO TIME	This is the total time that has elapsed with the sensor in service the last zero.	Min. display
A-3-7.PUMP TOTAL TIME	This is the total time the pump has been on. (LoFlo only)	Min. display
A-3-8.PUMP MAX TIME	This value indicates the maximum rated lifetime of the sampling pump. (LoFlo only)	Min. display
A-4.MODULE SETUP		
A-4-1.CURRENT PERIOD	This setting is used to set the calculation period of the $ETCO_2$ value. The end-tidal CO_2 value is the highest peak CO_2 value of all end of expirations (end of breaths) over the selected time period. If less than two breaths exist in the selected time period, the value will be the maximum	1 BREATH, 10SEC, 20SEC

	$ETCO_2$ value for the last two breaths.	
A-4-2. BALANCE GAS	This setup mode to setup the gas in the measurement. the type of gas that is mixed with the breathing gas measuring	ROOM AIR N2O HELIUM
A-4-3. SLEEP MODE	Sleep mode is used to save power when the host monitor is in standby mode. There are two sleep modes available for the Capnostat. Using Sleep Mode 1 maintains the heaters so the Capnostat is able to run immediately after exiting the sleep mode. Mode 2 will require the Capnostat to go through its warm up sequence when exiting this mode and a delay will be introduced until the system has stabilized.	NORMAL MODE TURNOFF MODE POWER SAVING
A-4-4. BARO. PRESSURE	This setting is used to set current Barometric Pressure.	760mmHg
A-4-5. GAS TEMPERATURE	This setting is used to set temperature of the gas mixture. This setting is useful when bench testing using static gasses where the temperature is often room temperature or below.	35.0°C
A-4-6. O2 COMPENSATION	Use this setting to correct for the compensation of the gas mixture administered to the patient.	
A-4-7. ANESTHETIC AGENT	Anesthetic agent is ignored when the balance gas is set to helium.	
A-4-8. ZERO TYPE		ROOM AIR

	When performing a zero on room air, this setting should be set to room air (the default). Only change to nitrogen (N_2) when performing a zero on 100% N_2 gas; this is provided for use in a laboratory environment.	N2
B-1.ZEROING	This function is used to initiate a Capnostat Zero. A zero is used to correct for differences in airway adapter types. The Capnostat zero must be performed free of any CO2 1. Set the Host to the zeroing function. 2. Connect the CAPNOSTAT 5 CO2 Sensor 3. Place the CAPNOSTAT 5 CO2 Sensor onto a clean and dry CO2 adapter that is exposed to room air and away from all sources of CO2, including the ventilator, the patient's breath and your own. Start the adapter zero. The maximum time for a CAPNOSTAT zero is 40seconds. The typical time for a zero is 15~20seconds.	
C-1.MODULE RESET	EtCO2 MODULE initializing.	

Note
For best result, connect the CAPNOSTAT 5 CO2 Sensor to an adapter and wait 2minutesbefore performing the Adapter Zero procedure.

Status Message

Following is a list of some of the message that may appear on the monitor when monitoring CO2. The message should clear when normal operating criteria are met or a solution is found.

*** SENSOR OVER TEMP**

- Cause : The sensor temperature is greater than 40'C

- Solution : Make sure sensor is not exposed to extreme heat(heat lamp etc.)

*** SENSOR FAULTY**

- Cause: One of the following conditions exist : Capnostat Source Current Failure

  EEPROM Checksum Faulty , Hardware Error

- Solution : Check that the sensor is properly plugged in. Reinsert or reset the sensor if necessary.

*** SENSOR WARM UP**

- Cause : Sensor under temperature , Temperature not stable, Source Current unstable

- Solution : This error condition is normal at startup. This error should clear when the warm up is complete.

*** CHECK SAMPLING LINE**

- Cause : This error occurs whenever the pneumatic pressure is outside the expected range.

- Solution : Check that the sampling line is not occluded or kinked. Replace the sample line

*** ZERO REQUIRED**

- Cause : Zero Required , Zero Error
- Solution : To clear, check airway adapter and clean if necessary. If this does not correct the error, perform an adapter zero. If you must adapter zero more than once, a possible hardware error may exist.

*** CO2 OUT OF RANGE**

- Cause : The value being calculated is greater than the upper CO2 limit(150mmHg)
- Solution : If error persists, perform a zero.

*** CHECK AIRWAY ADAPTER**

- Cause: Usually caused when the airway adapter is removed from the Capnostat or when there is an optical blockage on the windows of the airway adapter. May also be caused by failure to perform Capnostat zero to when adapter type is changed.
- Solution: To clear, clean airway adapter if mucus or moisture is seen. If the adapter is clean, perform a Capnostat zero.

message	status	solution
MODULE OFF	It occurs when the equipment and module are separated. Message output	Verify module connections Service request

CO2 measurement failure

CO2 value is not output, or numerical error.

Troubleshoot procedure

1. Check the connection between the main unit and the module
2. Check the module line connection with the filter line or airway
3. Replace filter line or airway
4. Service Request

Note
In the following monitoring conditions, the measured values may be inaccurate. Read the measured values carefully. 1. When using this in an environment of using nitrous oxide gas of high concentration 2. When using this in an environment where abrupt temperature change takes place 3. When using this in an environment with severely high humidity.

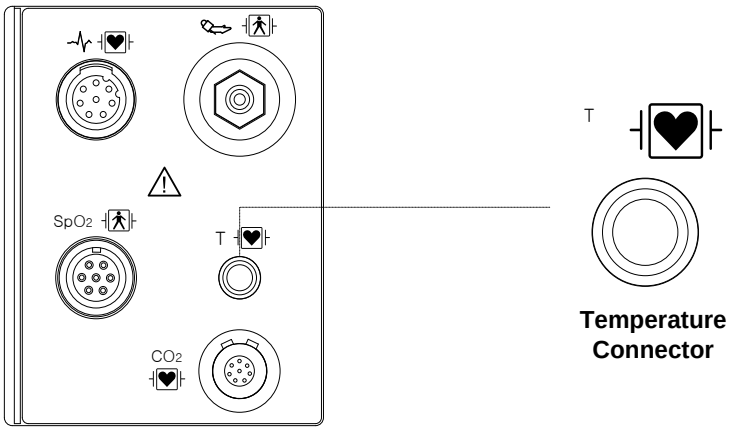
Caution
● The measured values may be inaccurate when using this equipment for patients who have very fast or irregular respiration. ● When measuring CO2 from the patient under the anesthesia, check it when gas mixture comes in. Otherwise, the measured result values may be inaccurate. ● When using a anesthesia machine that uses a volatile anesthetic, CO2 values may be inaccurate.

11. Temperature

Overview

This function is used to indicate the changes of resistance generated by the changes of temperature in numbers. The function involves the process of transferring the changes into electric signals.

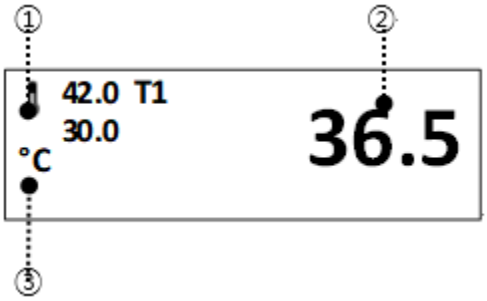
Temperature Connector and Measuring Cable



Temperature measuring Cable

Note
Temperature probe is correctly positioned and fixed to not disconnect on the patient. Temperature cable is attached to the monitor.

Display



①	Temperature alarm limit display
②	Temperature value display
③	Temperature unit display

Note
The minimum measuring time required to obtain accurate readings at the specific body site is at least 3minutes. If the measurement site is directly exposed to air, the temperature may be lower than normal. It takes about 20 ~ 30minutes to reach temperature equilibrium by attaching this sensor.

Warning
To measure the ambient temperature, connect the probe to your ankle or wrist. If the patient is sweating or moving heavily, fix the pads with surgical tape.

Temperature settings

A. Temp menu		
MENU	Description	Available Settings
A-1. Alarm	Temp Alarm Settings menu	
A-1-1.PARAMETER ALARM LIMIT	TEMP1 Parameter Alarm level , Action setup menu Settings range from 0℃ to 50.0℃/ 32° F to 122°F.	
A-1-2.TECHNICAL ALARM CONDITION	TEMP1-PROBE OFF	

12. Printer

Overview

The monitor can print out monitoring data, including trends and alarm data. Recordings of waveforms are either timed or continuous and print at a recording speed of 25mm/s. All recordings are identified by the patient's name, ID as well as the date and time of the recording request. The monitor can trigger alarm recordings automatically for life-threatening alarms and limit violations, if the Record function is enabled on the alarm limits table.
A printer is used to print data onto thermal paper.

Size of the thermal paper roll: 58mm wide x 38mm in diameter any thermal paper of same size can be used for the printer.

Side view of printer

Caution
● Due to the nature of thermal paper, it generates heat when continuously output, so it is recommended to pause after 5minutes of output and after 10minutes of idle time.

Printer settings

Menu	Description	Available settings
A. Print Setup menu		
A-1. Printer Setup		
A-1-1. Use Of Printer	PRINTER activation menu	ON / OFF
A-1-2. Printer Speed	Printer speed can select between 25 and 50mm/s.	25 mm/s 50 mm/s
A-1-3. Waveform1	Channel 1 waveform select menu	OFF, SPO2, RESP, ETCO2, ECG
A-1-4. Waveform2	Channel 2 waveform select menu	
A-1-5. Waveform3	Channel 3 waveform select menu	
A-1-6. Print From Time	This is configuration of printed time in normal printing. If the print out is not stopped in manual by PRINTER KEY, BM3 print out for setup time after starting print out with PRINTER KEY. REAL TIME: Prints the data from the point where the PRINTER key was pressed.	Real Time Delay (5sec)

	DELAY: Prints data before 5seconds when PRINTER key is pressed	
A-1-7. Time Interval	Set the time for printing the printout on normal printout. If you do not stop manually after pressing the PRINTER KEY, the output will be output only for the following period of time.	Continue, 10sec, 20sec, 30sec

Note
During printing time, the wave forms of IBP1, IBP2, ETCO2, M-GAS(D-GAS) on paper look different from the wave forms on screen. That is the reason that the wave forms on screen cannot be scaled, but the wave forms on paper can be scaled.

Thermal Paper Storage

To avoid print quality degradation or attenuation of printouts, follow these precautions:

Note
These precautions apply to both unused paper as well as paper that has already been run through the printer.

• Store in cool, dark locations. Temperature must be below 27°C (80°F). Relative humidity must be between 40% and 65%.

• Avoid exposure to bright light or ultraviolet sources such as sunlight, fluorescent, and similar lighting which causes yellowing of paper and fading of tracings.

• AVOID CONTACT WITH: cleaning fluids and solvents such as alcohols, ketones, esters, ether, etc.

• DO NOT STORE THERMAL PAPER WITH ANY OF THEFOLLOWING:

- Carbon and carbonless forms.
- Non-thermal chart papers or any other products containing tributylphosphate, dibutyl phthalate, or any other organic solvents. Many medical and industrial charts contain these chemicals.
- Document protectors, envelopes, and sheet separators containing polyvinyl chloride or other vinyl chlorides.

• DO NOT USE: mounting forms, pressure-sensitive tapes or labels containing solvent-based adhesives.

To assure MAXIMUM TRACE IMAGE LIFE, thermal paper should be stored separately in: manilla folders, polyester or polyimide protectors.

Plastic document protectors, envelopes, or sheet separators made of polystyrene, polypropylene, or polyethylene will not degrade thermal traces in themselves. However, these materials afford no protection against fading from external causes.

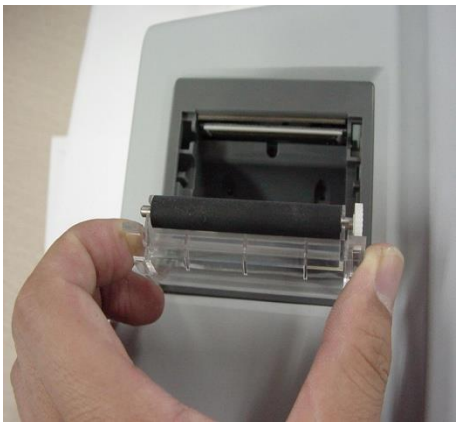
Paper manufacturers advise us that these thermal products should retain their traces when properly imaged and stored for about 3-5 years.

If your retention requirements exceed these guidelines, we recommend you consider alternate image storage techniques.

Paper Change

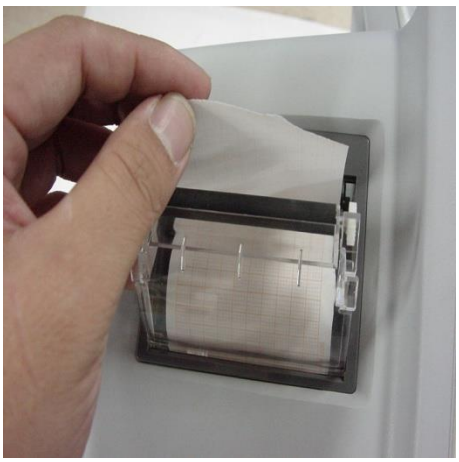
1

Open the window of the printer.



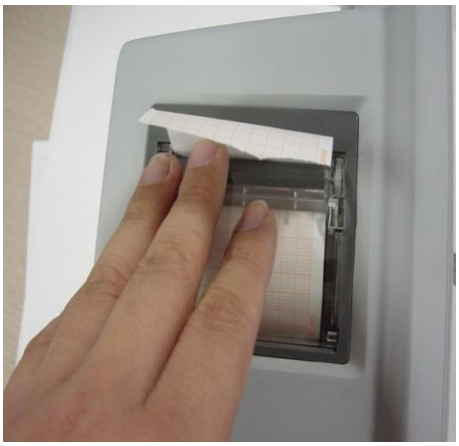
2

Insert the paper roll offered with the product into the printing unit. Place the roll in a proper way so that the printed paper can roll out upwards.



3

Press the printer window until it is properly shut. Inaccurate shutting may cause failure in printing.



13. Maintenance and Troubleshooting

Inspection Equipment

You should perform a visual inspection before every use, and in accordance with your hospital's policy. With the monitor switched off:

- Examine unit exteriors for cleanliness and general physical condition. Make sure that the housings are not cracked or broken, that everything is present, that there are no spilled liquids and that there are no signs of abuse.
- If the EtCO2module is mounted on the monitor, make sure that they are locked into place and do not slide out without releasing the locking mechanism.
- Inspect all accessories (cables, transducers, sensors and so forth). If any show signs of damage, do not use.

Switch the monitor on and make sure the backlight is bright enough. Check that screen is at its full brightness. If the brightness is not adequate, contact your service personnel or your supplier

Warning
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

Inspection Cables

- Examine all system cables, the power plug for damage. Make sure that the prongs of the plug do not move in the adaptor. If damaged, replace it with an appropriate Bionet power cord and adaptor.
- Inspect the parameter cable and ensure that it makes good connection with the Monitor. Make sure that there are no breaks in the insulation.
- Apply the transducer or electrodes to the patient, and with the monitor switched on, flex the Patient cables near each end to make sure that there are no intermittent faults

Warning
To avoid contaminating or infecting personnel, the environment or other equipment, make sure you disinfect and decontaminate the monitor appropriately before disposing of it in accordance with your country's laws for equipment containing electrical and electronic parts. For disposal of parts and accessories such as thermometers, where not otherwise specified, follow local regulations regarding disposal of hospital waste.

Maintenance Task and Test Schedule

All maintenance tasks and performance tests are documented in detail in the service documentation

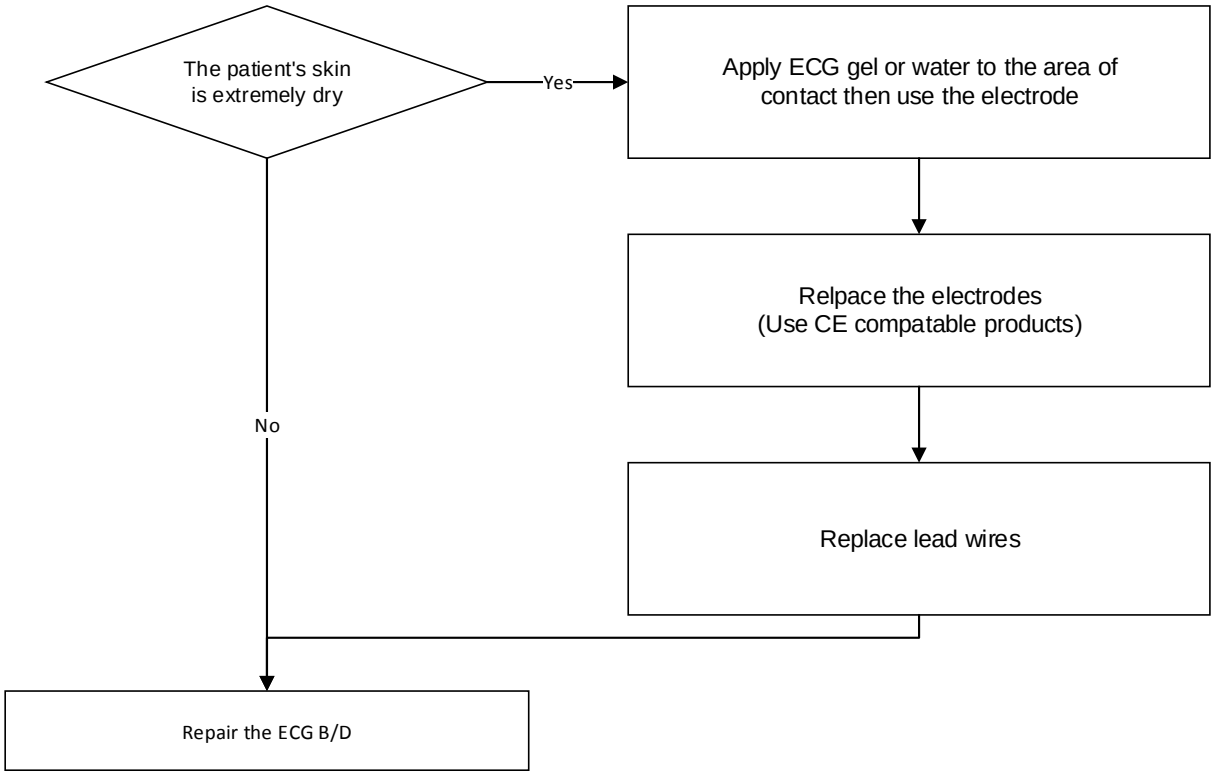
Maintenance and Test Schedule	Frequency
Monitor Tests	
Safety checks. Selected tests on the basis of IEC 60601-1	At least once every two years, or as needed, after any repairs where the power supply is removed or replaced, or if the monitor has been dropped
Monitor Maintenance	
Check ECG synchronization of the monitor and defibrillator (only if hospital protocol requires use of monitor during defibrillation)	At least once every two years, or as needed.
Replace backlight (integrated displays only)	35,000 - 40,000 hours (about four years) of continuous usage, or as needed.
Parameter Module Tests	
Performance assurance for all measurements not listed below.	At least once every two years, or if you suspect the measurement values are incorrect.
Parameter Module Maintenance	
NBP calibration	At least once every two years, or as specified by local laws.

Mainstream and sidestream CO_2 calibration check	At least once a year, or if you suspect the measurement values are incorrect.
Battery Maintenance	
Battery	See the section on Maintaining Batteries in chapter 1.

Noise in ECG

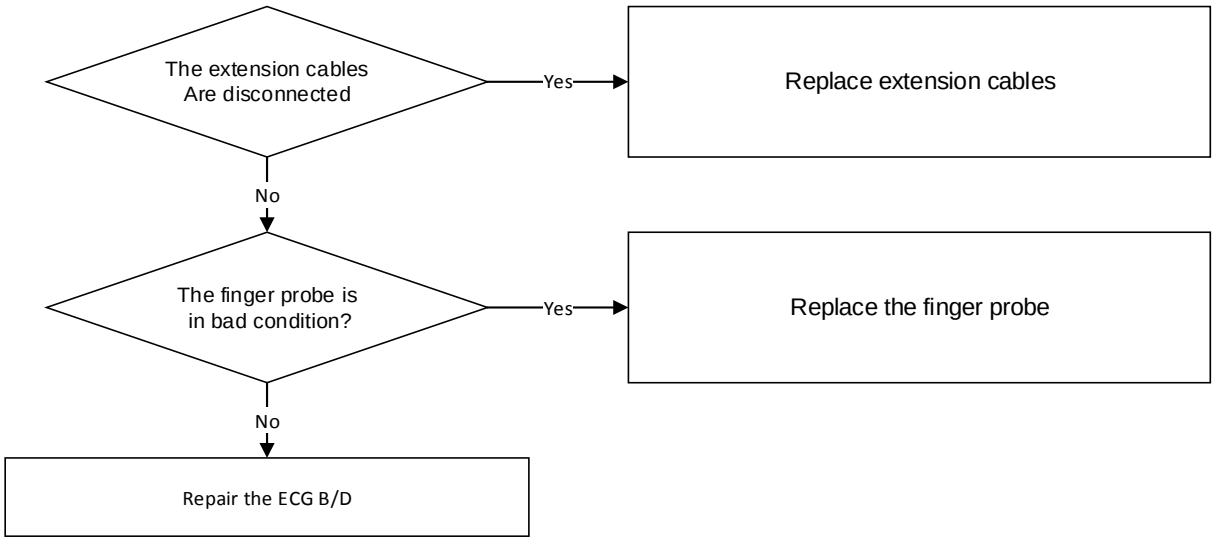
- Gel is dry

- Electrodes do not stick well to skin



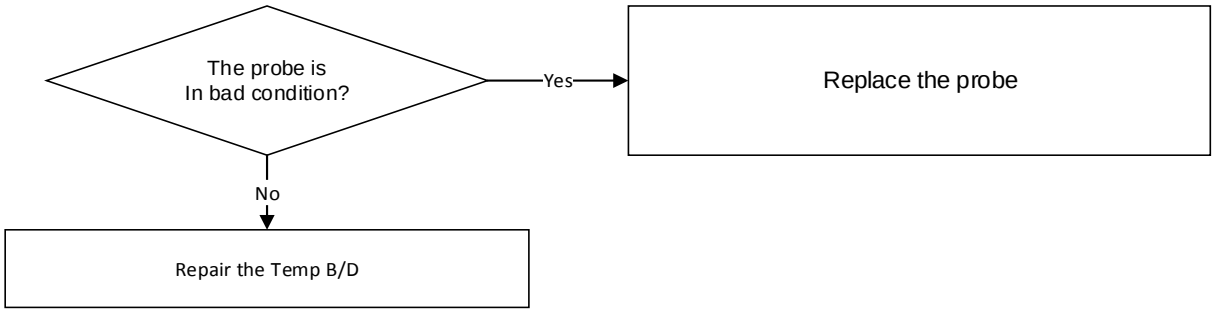
SpO2 malfunction

Connectors of the equipment are in bad condition?



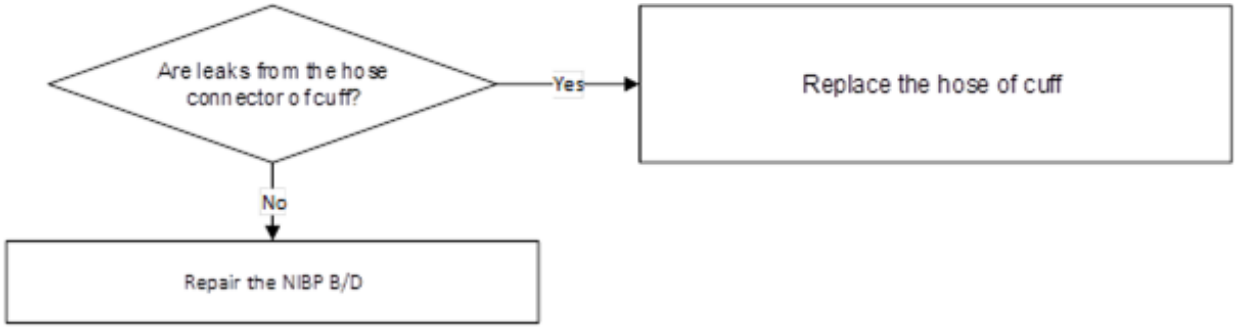
Temperature malfunction

- If the temperature cannot be measured, check the connection with the equipment

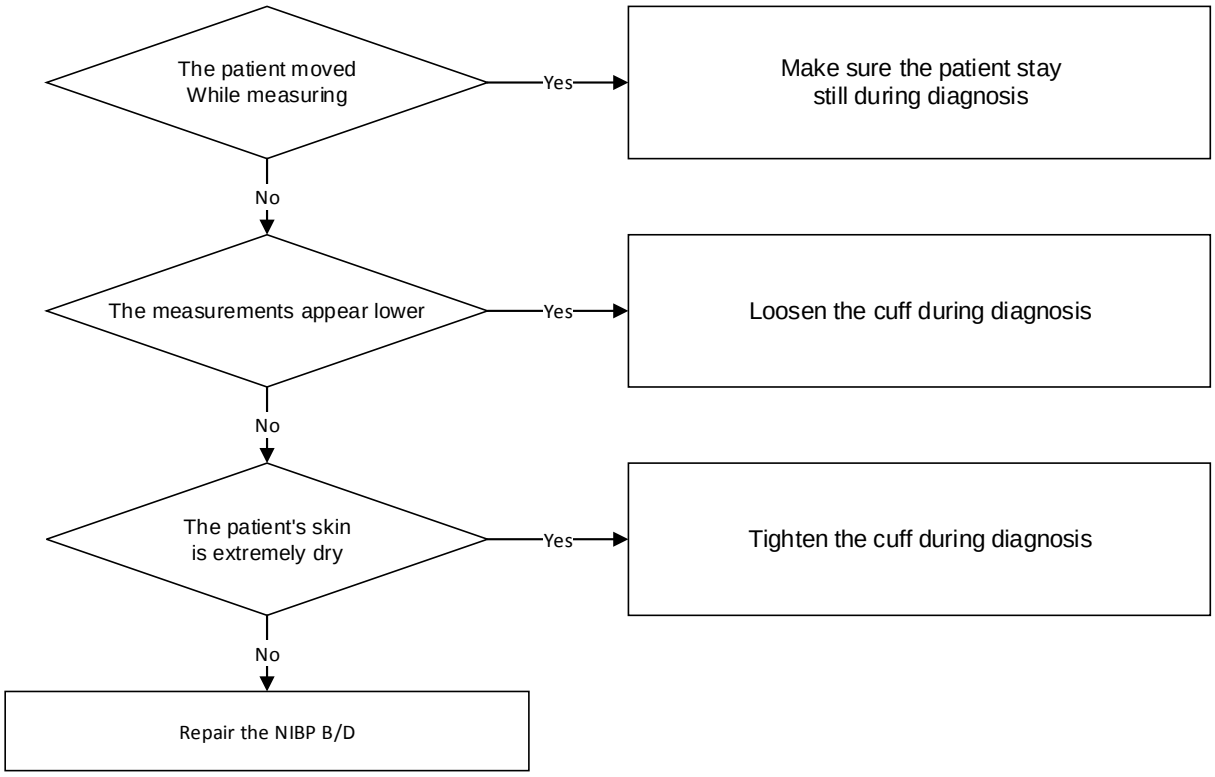


NIBP malfunction

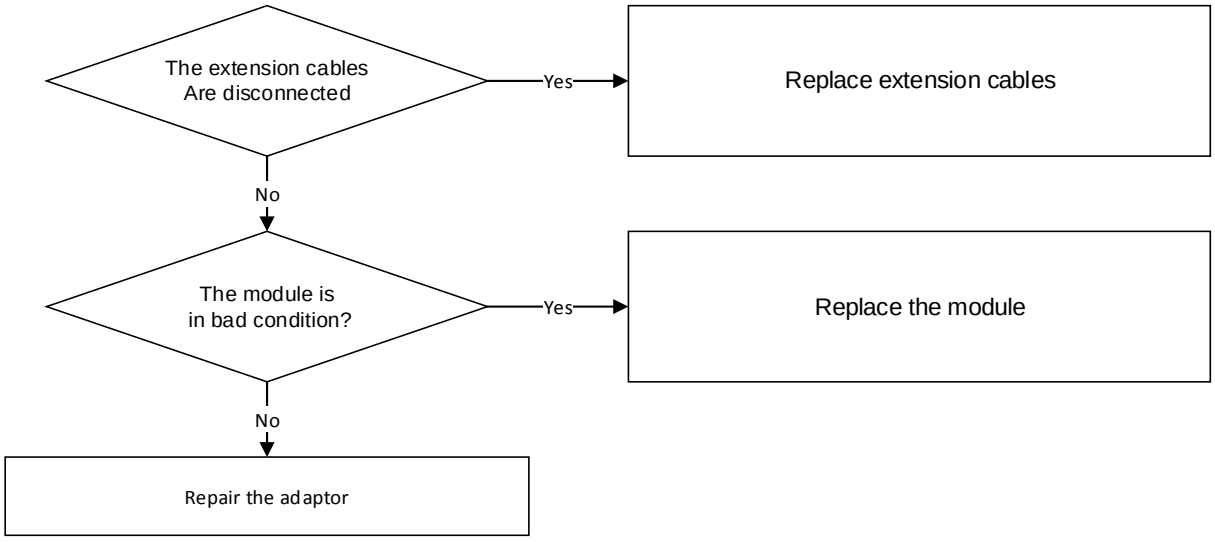
- Connector connection status, confirmation that the hose is normally connected



Abnormality in NIBP measurements

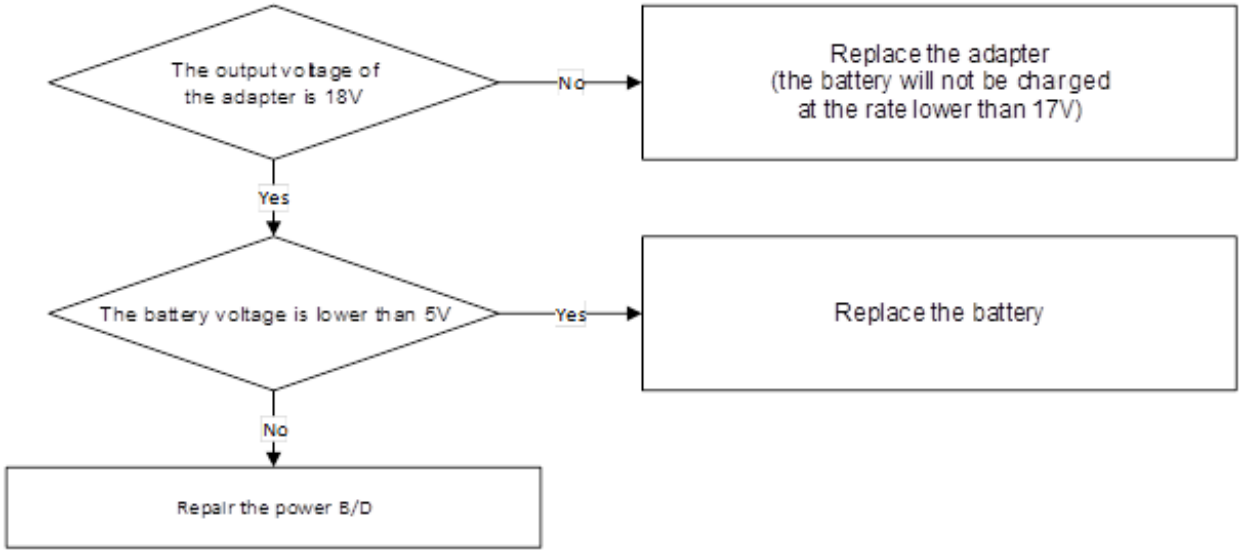


EtCO2malfunction

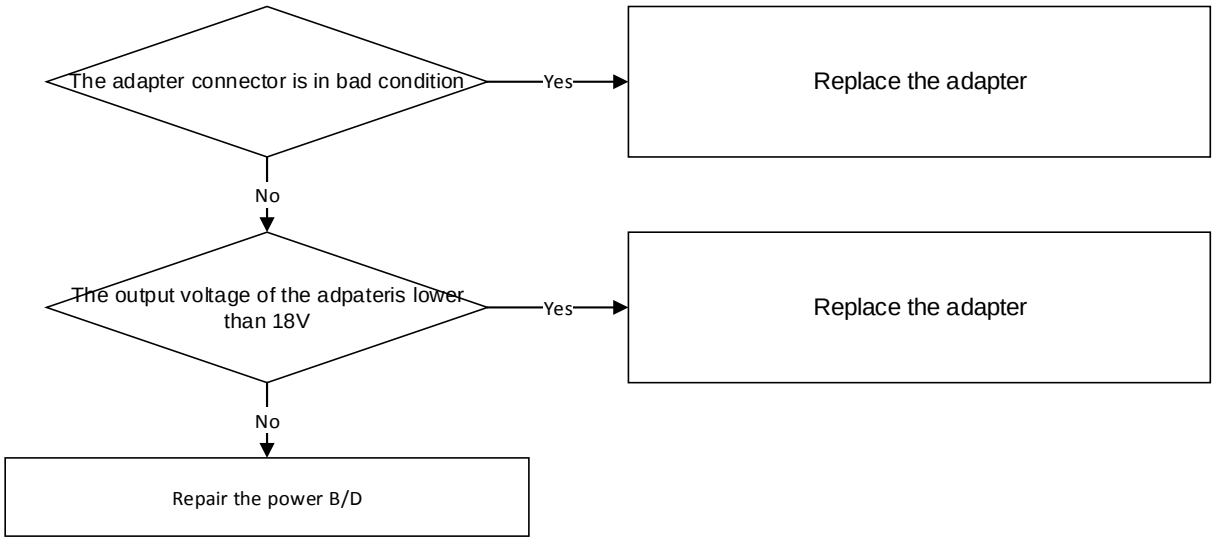


Failure in battery recharge

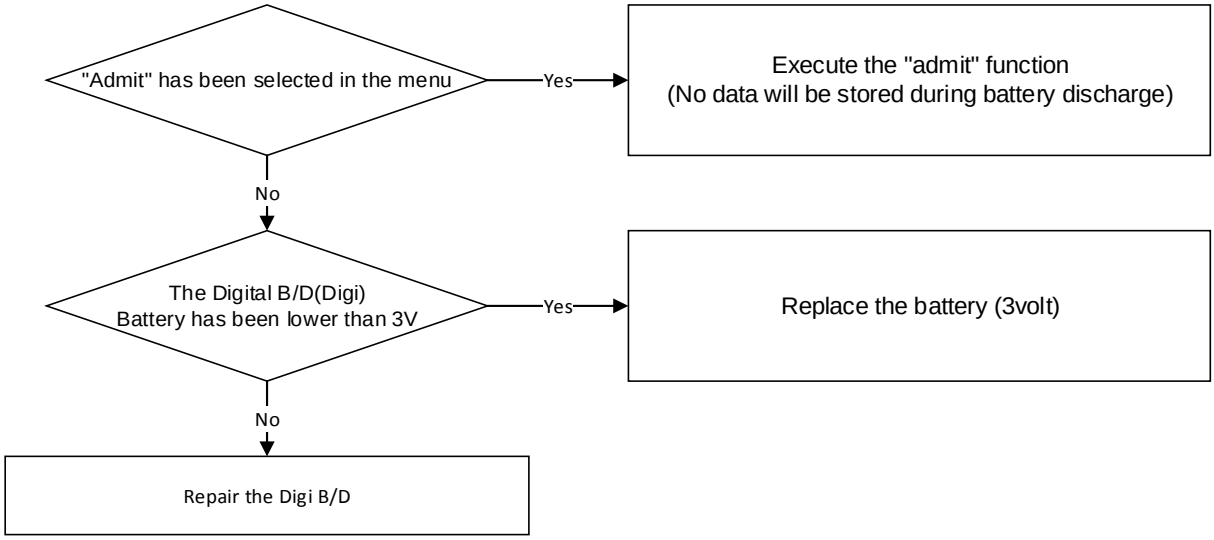
(the battery does not fully recharge in 6 hours or more)



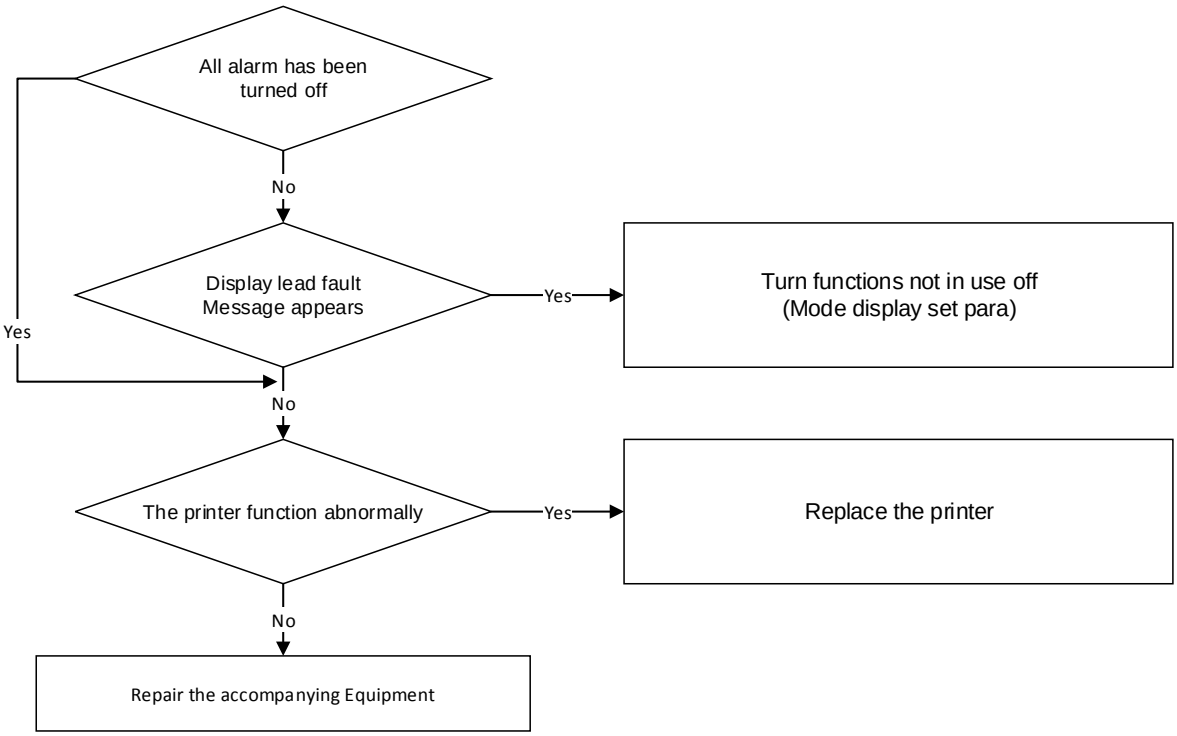
Power failure



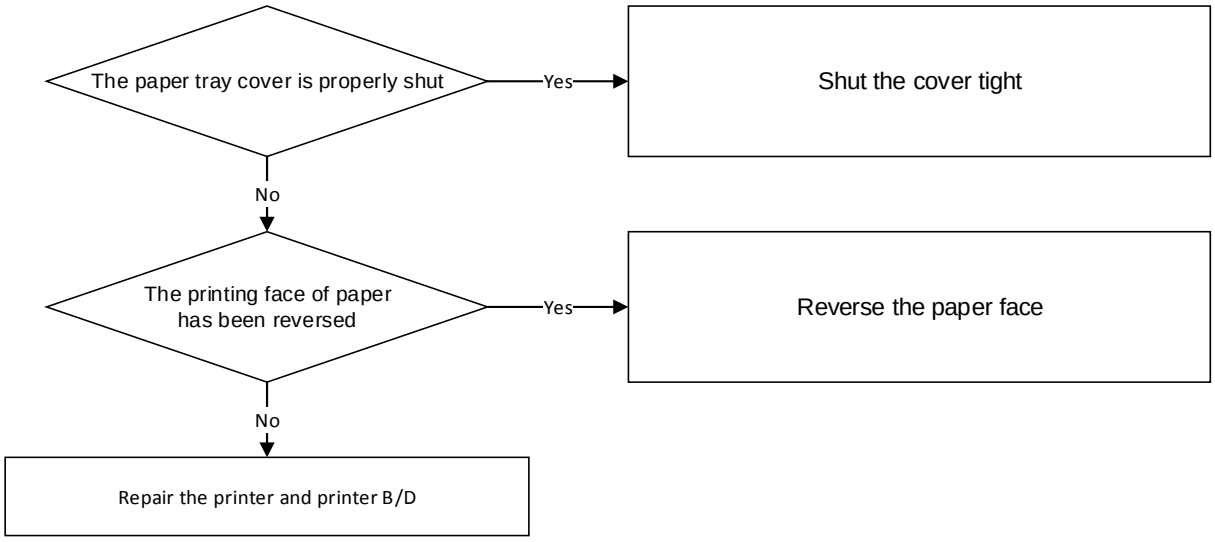
Data storage failure



Periodic noises



Print failure



14. Clean and Care

Overview

Clean the monitor and all accessories after each patient or daily according to your hospital's standard protocol. We recommend the following cleaning solution and procedures. To avoid contamination and unnecessary damage to the equipment, follow the instructions below.

Bionet does not claim responsibility for the following chemical efficacy, disinfectant method, the ability of the drug to inhibit bacterial infection, environmental impact, safe handling or precautions related to use. For more information on these topics, see the information provided by the detergent manufacturer.

Monitor and Peripherals

Moisture can damage the monitor and peripherals. (For example, around connectors, EtCO2 modules).

Please read the following instructions carefully before cleaning the basic unit or peripherals.

The following pages contain precautions for cleaning certain equipment and peripherals.

- Do not spray detergent on the monitor or peripheral devices. Wipe it off with a damp cloth.
- Disinfect the surface with gauze with diluted alcohol.
- Dry thoroughly with a lint-free cloth.

CAUTION
Do not wet or rinse the monitor and accessories. Disconnect the unit from the power source if you accidentally spilled liquid on the equipment. Contact your technician for stability before operating the equipment. To prevent damage to the equipment, do not use sharp tools or abrasives. Never immerse the electrical connector in water or other liquids. When cleaning, be careful not to let the

liquid stick to the edge of the screen.

Patient's Cable

- Clean the patient cables with a gauze pad moistened with a soap solution.
- To disinfect patient cables, wipe the cables with a gauze moistened with diluted alcohol or a glutaraldehyde-based dis-infectant.
- Ethylene oxide is suitable for intensive disinfection (almost sterilization), but it shows that the service life of cables and lead wires is reduced.
- Dry thoroughly with a lint-free cloth.

CAUTION

Do not use disinfectants that contain phenol as they can spot plastics. Do not autoclave or clean accessories with strong aromatic, chlorinated, ketone, ether, or ester solvents. Never immerse electrical connectors.

When cleaning, do not apply excessive pressure or bend the cable unnecessarily. Excessive pressure can damage the cable.

Reusable ECG Electrodes

Clean the electrode cup regularly with a toothbrush. When removing gel-like residues, use a soft brush with flowing water. Wipe the electrode with a soapy cloth moistened with soapy water.

- Sterilize the electrode by soaking the diluted alcohol in cloth.
- Dry thoroughly with a lint-free cloth.

Reusable SpO2sensor

Clean the SpO2 sensor by wiping it with soapy water soaked gauze. Disinfect the sensor by wiping with 70% alcohol solution. Dry the sensor completely with a lint-free cloth before applying to the patient.

Capnostat sensor

Wipe the sensor surface and sensor window with a damp cloth. Do not attempt to wet the sensor or disinfect it with hot water. Allow to dry completely with a lint-free cloth. Make sure the sensor window is clean and dry before use.

Reusable Temperature probes and cables

Do not use excessive pressure or flex the cables as this can stretch the covering and break the internal wires.

- Clean the probes with a 3% hydrogen peroxide or 70% alcohol.
- Quickly immerse the cables in a detergent solution.
- Make sure the probe's tip is firmly connected.

CAUTION
Never boil or autoclave the cable. Vinyl withstands temperatures up to 100°C but begins to soften at around 90°C. Handle gently when hot and wipe away from the tip toward the cable.

CAUTION
Decisions on disinfection should be made by the user organization in accordance with the integrity of the wires or lead wires.

Note
The equipment should be inspected regularly once a year. For inspection items, refer to the user manual or service manual.

Carefully inspect the main unit and sensor after cleaning the equipment. Do not use damaged or old equipment.

Clean the exterior of the equipment at least once a month using a soft cloth moistened with

lukewarm water or alcohol. Do not use lacquers, thinners, ethylene, or oxidizers that could damage the equipment.

Make sure that the cables and accessories are free from dust and dirt, then wipe them with a soft cloth moistened with 40 ° C water. Please wipe it with clinical alcohol at least once a week.

Do not immerse the accessories in liquid or detergent. Also, make sure that no liquid penetrates the instrument or probe.

Caution
Do not dispose of the disposable probe in a potentially hazardous area. Always be careful about environmental pollution.

Caution
There is a backup battery inside the system. When disposing of the battery, dispose of it in an appropriate place for environmental protection.

Warning
When replacing the backup battery, check the battery electrode.

·If you suspect the installation or disposition of the external ground wire, operate the equipment by means of the internal power supply.

·If the unit is not used for a certain period of time, remove the backup battery so safety hazards do not occur.

15. Technical Specification

Overview

The monitor is not user installable. It must be installed by qualified service personnel.

The monitor is intended to be used for monitoring, recording, and alarming of multiple physiological parameters of adults, pediatrics, and neonates in health care facilities. The device is to be used by trained health care professionals.

The monitor is intended for use in health care facilities; the BM3 Monitor is additionally intended for use in transport situations within the hospital setting.

EMC Compatibility (EMC)

Much of the information below has been borrowed from the requirements set forth in the Electromagnetic Compatibility Standard IEC 60601-1-2 for medical electrical equipment issued by the International Electro technical Commission and is available from a variety of sources. Although primarily aimed at equipment manufacturers, most of the information contained here is useful for users interested in medical equipment.
The information contained in this section (such as separation distance) is generally information about the Bionet Patient Monitor detailed above. The numbers provided here are not guaranteed, but are provided with reasonable assurance of error-free operation. This information may not apply to other medical and electrical systems, and older equipment may be particularly susceptible to interference.

Note

Medical electrical equipment requires special precautions for electromagnetic compatibility and must be installed and serviced in accordance with the EMC information in this section and in the operating instructions supplied with the monitor.

Portable and mobile RF communication equipment can affect medical electrical equipment.

Cables and accessories not specified in the user guide are not certified. Using other cables and / or accessories may adversely affect safety, performance, and electromagnetic compatibility (increased electromagnetic emissions and reduced immunity).

This equipment should not be used near or on top of other equipment. If you need to

use it on its side or stacked, you should observe the equipment to make sure it works properly within your configuration.

This patient monitoring device communicates over a 2.4 GHz 802.11b / g wireless network. Other equipment may interfere with data reception on this wireless network. This is also true if the equipment complies with the CISPR emission requirements. When using patient monitoring equipment to communicate over a wireless network, be sure to check that it is compatible with existing or new wireless systems (eg, cell phones, pager systems, cordless phones, etc.). For example, a Bluetooth-compliant device using the 2.4 GHz frequency band may interfere with the wireless communication of the patient monitor. For more information on wireless deployment, please contact your Bionet representative.

Low amplitude signals such as EEG and ECG are particularly sensitive to interference from electromagnetic energy. This equipment complies with the tests listed at the bottom, but does not guarantee complete operation. The "quiet" electrical environment is better. In general, the greater the distance between electrical equipment, the lower the likelihood of interference.

Manufacturer's declaration - electromagnetic emission

The BM3system is intended for use in the electromagnetic environment specified below. The customer or the user of BM3system should assure that it is used in such an environment		
Emission test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The BM3system 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
RF emissions CISPR 11	Class A	The BM3system is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supplies buildings used for domestic purposes.
Harmonics emission IEC 61000-3-2	A	
Voltage fluctuation IEC 61000-3-3	Complies	

Manufacturer's declaration - electromagnetic immunity

The **BM3**system is intended for use in the electromagnetic environment specified below. The customer or the user of the **BM3**system should assure that it is used in such an environment			
Immunity test	**IEC 60601** **Test level**	**Compliance level**	**Electromagnetic** **Environment -guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	6kV Contact 8kV Air	6kV Contact 8kV Air	Floors should be wood ,concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least30%
Electrical fast Transient/burst IEC 61000-4-4	2kV for power supply lines1kV for input/output lines	2kV for power supply lines 1kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	1kV differential mode 2kV common mode	1kV differential mode 2kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Power frequency (50/60Hz) Magnetic field IEC 61000-4-8	3.0 A/m	3.0 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Voltage dips, short Interruptions and Voltage variations on power supply input lines IEC 61000-4-11	<5% UT(>95% dip in UT) for 0.5cycle 40% UT(60% dip in UT) for 5 cycle 70% UT(30% dip in UT) for 25 cycle <5% UT(<95% dip in UT) for 5 s	<5% UT(>95% dip in UT) for 0.5cycle 40% UT(60% dip in UT) for 5 cycle 70% UT(30% dip in UT) for 25 cycle <5% UT(<95% dip in UT) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of the **BM3**system require continued operation during power mains interruptions, it is recommended that the BM3system be powered from an uninterruptible power supply or a battery
Note: UT is the a.c. mains voltage prior to application of the test level.			

The **BM3**system is intended for use in the electromagnetic environment specified below. The customer or the user of the **BM3**system should assure that it is used in such an environment			
Immunity test	**IEC 60601** **Test level**	**Compliance level**	**Electromagnetic environment -guidance**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80MHz	3 Vrms 150 kHz to 80MHz	Portable and mobile RF communications equipment should be used no closer to any part of the BM3system, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = [\frac{3,5}{V_1}]\sqrt{P}$

<table>
<tr>
<td>Radiated RF

IEC 61000-4-3</td>
<td>3 V/m
80.0 MHz to 2.5GHz</td>
<td>3 V/m
80.0 MHz to 2.5GHz</td>
<td>Recommended separation distance

$d = [\frac{3,5}{E1}]\sqrt{P}$ 80 MHz to 800 MHz

$d = [\frac{7}{E1}]\sqrt{P}$ 800 MHz to 2,5 GHz

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 deter-mined by an electromagnetic site survey,

(a) Should be less than the compliance level in each frequency range (b).

Interference may occur in the vicinity of

equipment marked with the following symbol:

  </td>
</tr>
<tr>
<td colspan="4">Note 1) Uт is the A.C. mains voltage prior to application of the test level.

Note2) At 80 MHz and 800 MHz, the higher frequency range applies.

Note3) These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</td>
</tr>
</table>

a 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 EUT is used exceeds the applicable RF compliance level above, the EUT should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the EUT.

B Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [V1] V / m.

Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and **BM3** system.

The **BM3** system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The user of the **BM3** system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the BM3 system as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power (W) of transmitter	Separation distance (m) according to frequency of transmitter		
	150 kHz to 80 MHz	80 MHz to 800 MHz	800 MHz to 2.5 GHz
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.70	3.70	7.37
100	11.70	11.70	23.30

For transmitters rated at a maximum output power not listed above, the recommended separation distance (d) in meters (m) can be estimated 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 separation distance for the higher frequency range applies

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected b y absorption and reflection from structures, objects, and people.

Immunity and Compliance Level			
Immunity test	IEC 60601 Test Level	Actual Immunity Level	Compliance Level
Conducted RF IEC 61000-4-6	3Vrms, 150kHz to 80MHz	3Vrms, 150kHz to 80MHz	3Vrms, 150kHz to 80MHz
Radiated RF IEC 61000-4-3	3V/m, 80MHz to 2.5GHz	3V/m, 80MHz to 2.5GHz	3V/m, 80MHz to 2.5GHz

Guidance and manufacturer's declaration - electromagnetic immunity

The **BM3**system is intended for use in the electromagnetic environment specified below. The customer or the user of the **BM3**system should assure that it is used in such an environment			
Immunity test	IEC 60601 Test level	Compliance level	Electromagnetic environment -guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80MHz	3 Vrms 150 kHz to 80MHz	**BM3**system must be used only in a shielded location with a minimum RF shielding effectiveness and, for each cable that enters the shielded location with a minimum RF shielding effectiveness and, for each cable that enters the shielded location
Radiated RF IEC 61000-4-3	3 V/m 80.0 MHz to 2.5GHz	3 V/m 80.0 MHz to 2.5GHz	Field strengths outside the shielded location from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than3V/m. Interference may occur in the vicinity of equipment marked with the following symbol: 
Note 1) These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people. **Note 2)** It is essential that the actual shielding effectiveness and filter attenuation of the shielded location be verified to assure that they meet the minimum specification.			

A 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 outside the shielded location in which the EUT is used exceeds 3V/m, the EUT should be observed to verify normal operation.

If abnormal performance is observed, additional measures may be necessary, such as relocating the EUT or using a shielded location with a higher RF shielding effectiveness and filter attenuation.

Note
For Type A Professional ME Equipment intended for use in domestic establishment instructions for use includes a warning: This ME equipment is intended for use by professional healthcare personnel only.

Warning
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 [ME EQUIPMENT or ME SYSTEM], including cables specified by the manufacturer

Warning
Use of accessories 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

System Specification

Physical	
Dimension(H x W x D)	250 x 238 x 163 mm
Weight	Approx. 3.1kg
Indicator	3 LED
Cooling	Air flow
Interface	RJ45 , USB , HDMI
Power	AC 100-240V (50/60Hz) Adapter18 V, 2.8 A
Power consumption	< 50Watts
Operating Mode	Continuous
Environments	
Temperature	Operating:5 ~ +40 °C (41 ~ 104 °F) Storage: –20 ~ +60 °C (–4 ~ +140 °F)
Humidity	Operating: 30% ~ 85%, Storage: 10% ~ 95% (PACKAGE)
Operating Attitude	Operating: 525 ~ 795 mmHg (70 ~ 106 kPa) Storage: 375 ~ 795 mmHg (50 ~ 106 kPa)
Display	TFT-LCD
Resolution	800 X 600
Display size	8″
Measurement Parameter	ECG, Heart Rate, Respiration Rate, SpO2, Pulse Rate, Systolic BP, Diastolic BP, Mean BP, Temperature, EtCO2, FiCO2, Airway Respiration Rate
TRACE	4 waveforms : 2*ECG, SpO2, RR or EtCO2 Sweep speed : 6.25, 12.5, 25, 50 mm/sec

Indicator	Categorized alarms (3 priority levels), Visual alarm lamp handle SpO2 pulse pitch tone, Battery status, External power LED
Interface	DC input connector : 18VDC, 2.8A LAN digital output for transferring data Nurse call system connection DC output : 5VDC, 1A Max
Battery	Rechargeable Li-ion battery
Thermal Printer (option)	Speed : 25, 50mm/sec, Paper width : 58mm
Data Storage	168hours trends, 20cases of 10sec alarm waveform
Language	English, French, Spanish, Italian, Germany, Chinese, Russian, Czech, Bulgarian, Portuguese, Romanian, Hungarian, Turkish, Polish

ECG	
Lead type	3-lead, 5-lead(option)
Lead Selection	3-lead : I, II, III
	5-lead : I, II, III, aVR, aVL, aVF, V
ECG waveforms	3-lead : 1 channel
	5-lead :1 channel
Heart Rate Range	Adult : 30 – 300 bpm
	Neonate/Pediatric : 30 – 350 bpm
Heart Rate Accuracy	±1bpm or ±1%, whichever is greater
Sweep speed	6.25, 12.5, 25, 50 mm/sec
Filter	Diagnostic mode : 0.05Hz - 150Hz
	Monitoring mode : 0.5 – 40 Hz
	Surgical mode :0.5 – 25 Hz
Pacemaker Detection Mode	Indicator on waveform display (user selectable)
Protection	Against electrosurgical interference and defibrillation

Respiration Performance	
Method	Thoracic impedance
Channel selection	RA-LL
Measurement range	5 – 120 Breath per minute
Accuracy	±1 Breath per minute

SpO2 Performance	
Saturation range	0 to 100%
Saturation accuracy	70 to 100% ±2 digits
	0 to 69% unspecified
Pulse rate range	30 to 254 bpm
Pulse rate accuracy	±2 bpm

NIBP Performance	
Method	Oscillometry with linear deflation
Operation Mode	Manual/Automatic/Continuous
Measurement range	Adult Pressure : 20 to 260 mmHg
	Pediatric Pressure : 20 to 230 mmHg
	Neonate Pressure : 20 to 120 mmHg
Accuracy	mean error : less than ±5 mmHg
	standard deviation : less than 8 mmHg

Temperature Performance	
Measurement range	0 to 50℃ (0 to 122˚F)
Accuracy	25℃to 50℃: ±0.1℃
	0℃to 24℃: ±0.2℃
Compatibility	YSI Series 400 temperature probes

Sidestream CO2 (Option)	
Measurement range	0 to 150 mmHg, 0 to 19%
Accuracy	0-40mmHg ±2 mmHg,
	41-70mmHg ±5% of reading
	71-100mmHg ±8% of reading,
	101-150mmHg ±10% of reading
Respiration rate	2 to 150 breath per minute
Respiration accuracy	±1breath per minute

Mainstream CO2 (Option)	
Measurement range	0 to 150 mmHg, 0 to 19%
Accuracy	0-40mmHg ±2 mmHg,

	41-70mmHg ±5% of reading
	71-100mmHg ±8% of reading,
	101-150mmHg ±10% of reading
Respiration rate	0 to 150 breath per minute
Respiration accuracy	±1breath per minute

C.O. (Option)

Method	Thermodilution Technology
Measuring Range	TB : 23 ~ 45℃
	TI : 0 ~ 27℃
	Alarm range 23 ~ 45℃

Product Configuration

1. Main body of BM3 Monitor	1 EA
2. 3-Lead patient Cable	1EA
3. Disposable electrodes	10 EA
4. NIBP extension horse	1EA
5. Reusable Adult NIBP Cuff	1EA
6. SpO2 extension cable	1EA
7. Reusable Adult SpO2 Probe	1 EA
8. DC Adaptor (BPM050S18F02 made in Bridgepower Co., Ltd.)	1 EA
9. Operator`s Manual	1 EA
10. Thermal roll Paper	2ROLL

Option Product

1. Reusable Temperature Probe (Surface/Skin, TEMPSENS-430)	1 EA
2. Sidestream EtCO2 Module (Respironics)	1 SET
3. Mainstream EtCO2 Module (Respironics)	1 SET

4. Sidestream EtCO2 airway adapter sampling kit	1 EA
5. Mainstream EtCO2 airway adapter	1 EA
6. Mainstream EtCO2 airway adapter	1 EA
7. 5-Lead Patient Cable with extension cable	1 EA

Adult& Pediatric-ICU Mode

Alarm level

	High	Medium	Low	Message
HR		0		
NIBP - S		0		
NIBP - M		0		
NIBP - D		0		
NIBP- PR			0	
SpO_2			0	
SpO_2-Rate			0	
RR			0	
T1(° C)			0	
EtCO2			0	
FiCO2			0	
AWRR			0	
LEAD FAULT			0	
CABLE OFF			0	
LOW BATTERY			0	

Neonate-ICU Mode

Alarm level

	High	Medium	Low	Message
HR		0		
NIBP - S		0		
NIBP - M		0		
NIBP - D		0		
NIBP- PR			0	
SpO_2			0	
SpO_2-Rate			0	
RR			0	
T1(° C)			0	
EtCO2			0	
FiCO2			0	
AWRR			0	
LEAD FAULT			0	
CABLE OFF			0	
LOW BATTERY			0	

Parameter Limits

	Adult	Pediatric	Neonate
HR	50 – 150	50 – 160	50 – 170
NIBP-S	80 – 200	60 – 160	40 – 100
NIBP-M	40 – 140	40 – 120	30 – 70
NIBP-D	20 – 120	30 – 100	20 – 60
NIBP-PR	50 – 150	50 – 160	50 – 170
SpO_2	90 – 100	90-100	88-100
SpO_2-Rate	50 – 150	50 – 160	50 – 170

RR(RESP)	**10 – 30**	**10 – 50**	**15-100**
T1°C/°F	**34.0/93.2 - 39.0/102.2**	**34.0/93.2 - 39.0/102.2**	**34.0/93.2 - 39.0/102.2**
AWRR	**10 – 30**	**10 – 50**	**15 – 100**
EtCO2	**25 – 50**	**25 – 50**	**25 – 50**
FiCO2	**0 – 5**	**0 – 5**	**0 – 5**

Display

Patient Age	Adult	PEDIATRIC	NEONATE
Primary ECG	II	II	II
Detect Pace	Off	Off	Off
Print Waveform1	LEAD II	LEAD II	LEAD II
Print Waveform2	SpO2	SpO2	SpO2
Print Waveform3	Resp	Resp	Resp
Alarm Print	Off	Off	Off
NIBP Interval	Off	Off	Off
NIBP Cuff Size	Adult	PEDIATRIC	NEONATE
RR(RESP) Lead	II	II	II
Alarm Volume	50%	50%	50%
QRS Volume	Off	Off	Off
Pulse Volume	Off	Off	Off
ECG Lead Fault	Message	Message	Message
SpO_2 Probe Off	Message	Message	Message
Units for Height	cm	cm	cm
Units for Weight	Kg	kg	kg
Temperature Units	° C	° C	° C
NIBP Limit Type	Systolic	Systolic	Systolic
ECG Filter	Monitor	Monitor	Monitor

Abbreviations and Symbols

Abbreviations and symbols are alphabetized by reference, which can be read while reading the manual or using the equipment.

Abbreviations

A

A	amps
AC	alternating current
ADT	adult
Auto, AUTO	automatic
AUX	Auxiliary
aVF	left foot augmented lead
aVL	left arm augmented lead
aVR	right arm augmented lead

B

BPM	beats per minute

C

C	Celsius
CAL	calibration
cm, CM	centimeter

D

D	diastolic
DC	direct current

DEFIB, Defib	defibrillator
DIA	diastolic

E

ECG	electrocardiograph
EMC	electromagnetic compatibility
EMI	electromagnetic interference
ESU	electrosurgical cautery unit

F

F	Fahrenheit

G

g	gram

H

HR	heart rate, hour
Hz	hertz

I

ICU	intensive care unit
Inc	incorporated

K

kg, KG	kilogram

kPa	kilopascal

L

L	liter, left
LA	left arm, left atrial
LBS	pounds
LCD	liquid crystal display
LED	light emitting diode
LL	left leg

M

M mean,	minute
m	meter
MIN,	minminute
MM, mm	millimeters
MM/S	millimeters per second
MMHG, mmHg	millimeters of mercury
mV	millivolt

N

NIBP	non-invasive blood pressure
NEO, Neo	neonatal

O

OR	operating room

P

PED	pediatric

Q

QRS	interval of ventricular depolarization

R

RA	right arm, right atrial
RESP	respiration
RL	right leg
RR	respiration rate

S

sec	second
SpO2	arterial oxygen saturation from pulse oximetry
SYNC, Sync	synchronization

T

Temp, TEMP	temperature

U

V

V	precordial lead
V	volt

W

X	multiplier when used with a number (2X)

Symbols

&	and
°	degree(s)
>	greater than
<	less than
–	minus
#	number
%	percent
±	plus or minus

PRODUCT WARRANTY

Product Name	**Patient Monitor**
Model Name	**BM3**
Approval Number	
Approval Date	
Serial Number	
Warranty Period	**2 year from date of purchase**
Date of Purchase	
Customer section	**Hospital Name :** **Address :** **Name :** **Phone :**
Sales Agency	
Manufacturer	

* Thank you for purchasing BM3

* The product is manufactured and passed through strict quality control and through inspection.

* Compensation standard concerning repair, replacement, refund of the product complies with "Consumer's Protection Law" noticed by Korea Fair Trade Commission.

International Sales & Service Contact

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