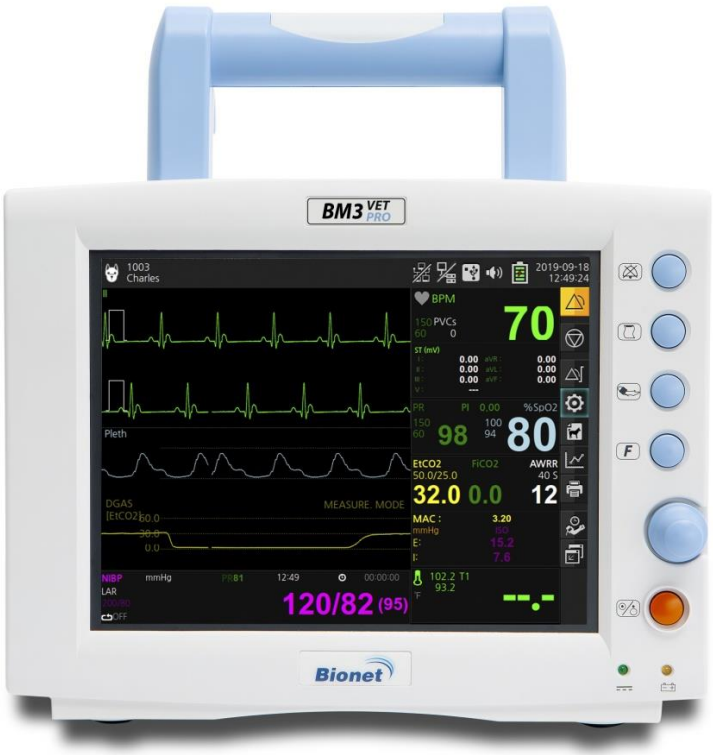
BM3Vet *Pro*

Operation Manual

Veterinary Patient Monitor

Rev. 3.1

2020.02.06



Warning

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

BM3Vet Pro Operation Manual

Before using Bionet devices, read all the manuals that are provided with your device carefully.
Veterinary patient monitoring equipment, however sophisticated, should never be used as a substitute for the human care, attention, and critical judgement that only trained health care professionals can provide.

Table of Contents

Intended Use

The BM3Vet Pro monitor is for multi-parameter veterinary monitoring. The BM3Vet Pro monitor generates visual and audio alarms when various measured physiological parameters exceed preset limits and times. This equipment is connected to the BM Vet Central System (BT-Link, B-Link).

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 BM3Vet Pro monitor can monitor the following:

- Heart rate
- Respiration rate
- Invasive blood pressure
- Non-Invasive blood pressure
- Arrhythmia
- Temperature
- SpO_2
- Pulse rate
- Apnea
- ST segment analysis
- 5-Lead ST segment analysis
- $EtCO_2$
- $FiCO_2$
- Anesthetic concentration monitoring

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 animal's medical condition, including veterinarians and technicians

Animal Classification

BM3Vet Pro monitors are designed for use on animals. At this time, ST segment analysis and arrhythmia should be used for veterinary only.

Functional Safety

The essential performance of the veterinary patient monitor is to provide the veterinarian 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 animal 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.

Define 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 the intended use.

Service Personnel

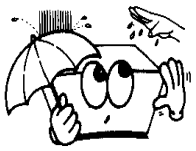
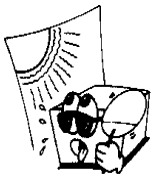
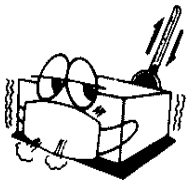
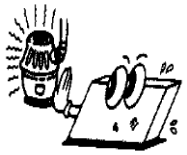
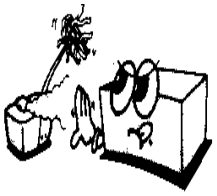
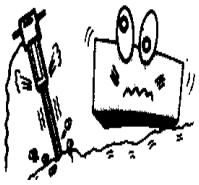
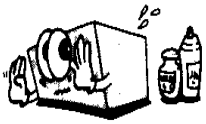
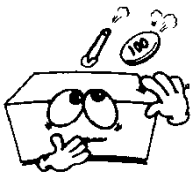
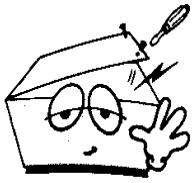
Service personnel are responsible for the maintenance of the product.
They must be trained in the maintenance of the medical device, install, reprocess and maintain the product.

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 in the vicinity of an electric heater
	Avoid placing in an area where there is excessive humidity or a ventilation problem.		Avoid placing in an area where there is excessive shock or vibration.
	Avoid placing in an area where chemicals are stored or where there is danger of gas leakage.		Avoid dust and, especially, metal material inserted into the equipment
	Do not disjoint or disassemble the equipment. This will void your warranty.		Power off when the equipment is not fully stationary. Otherwise, equipment could be damaged.

Electromagnetic Compatibility

The monitor is designed and tested to comply with current regulatory standards (IEC 60601-1-2 and CISPR 11 Class A) on its ability to reduce electromagnetic emissions (EMI) and to isolate EMI from external sources.

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

- Use only Bionet approved accessories. Otherwise, this equipment may not work correctly.
- Ensure that other products used in areas where veterinary patient monitoring and life support is used comply to accepted emissions standards (CISPR 11, Class A).
- Try to maximize the distance between electromedical 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 veterinary patient monitor is designed to be used for monitoring the biological vital signs of canines, felines, and horses. It can be used as an independent device or connected to the BM Vet Central (BT-Link, B-Link) network. Use of the monitor is limited to one animal at a time.
The following optional software features are available:

- Arrhythmia analysis.
- 3-lead ST segment analysis.
- It is common to connect B2B VIEWs, and the two connections are optional.
- Wireless network connection

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, BPM050S18F02 Made by BridgePower 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 with 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 generator, 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 BM3Vet Pro both 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
BM3Vet Pro is classified as follows: - BM3Vet Pro classifies as Class **II,** 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 animal 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 damaged, do not use on animal, and contact to the medical equipment technician of the hospital or the equipment supply division.

Equipment connection

Caution
Doctors and animals 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; 1996.

Biocompatibility

When used as intended, the parts of the product described in this operator manual, including accessories that come in contact with the animal 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 Vet Pro Monitor 1EA
2. 3-Lead patient Cable (MECA3(AHA) or MECE3(IEC)) 1EA
3. NIBP extension tube 1EA
4. NIBP vet cuff infant reusable 1EA
5. SpO2 extension cable 1EA
6. Reusable multisite SpO_2 probe 1EA
7. DC Adaptor (BPM050S18F02 made in Bridgepower Co., Ltd.) 1EA
8. Operator`s Manual 1EA
9. Power Cable 1EA
10. Battery 1EA

Optional Products

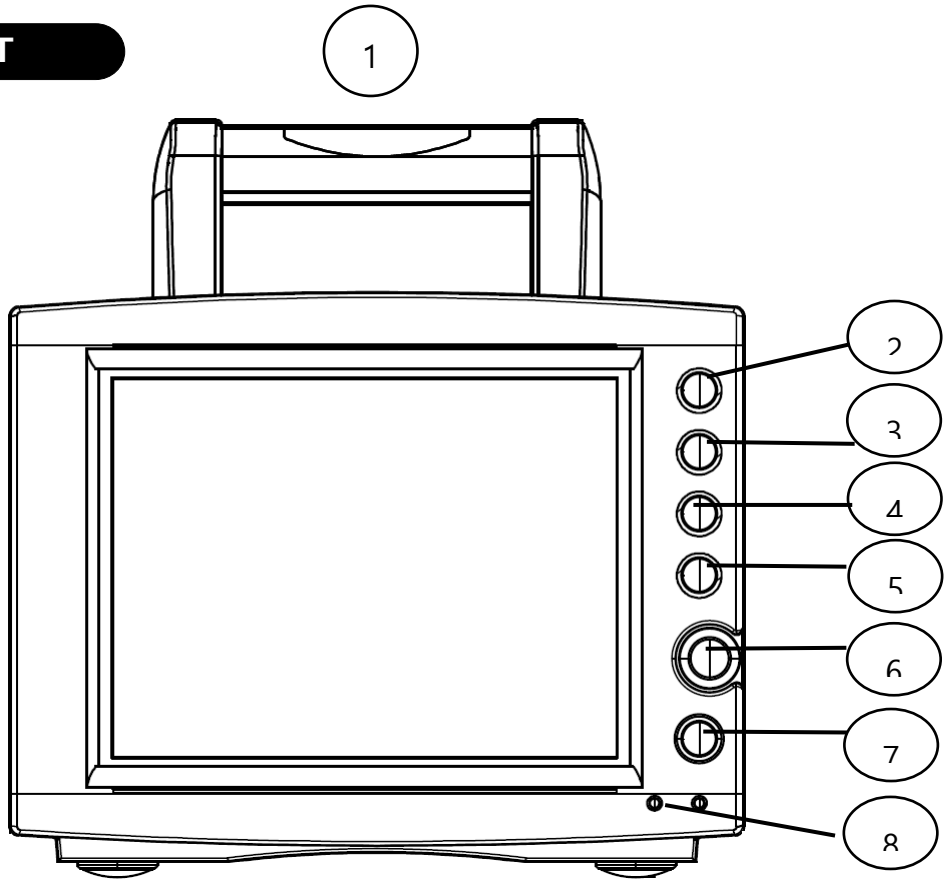
1. Reusable Temperature Probe
2. Printer
3. 5-Lead patient Cable (MECA3(AHA) or MECE3(IEC))
4. EtCO2 MODULE
5. NIBP Large Cuff (20.5~28.5Cm)
6. NIBP Cuff (13.8~21.5Cm)
7. NIBP Cuff (9~14.8Cm)
8. Disposable NIBP Cuff1
9. Disposable NIBP Cuff2
10. Disposable NIBP Cuff3
11. Disposable NIBP Cuff4
12. Disposable NIBP Cuff5
13. Sidestream Multigas Module (Masimo Sweden)
14. Mainstream Multigas Module (Masimo Sweden)
15. Sidestream Multigas Nomoline
16. Sidestream Multigas Nomoline Adapter
17. Sidestream Multigas Nomo Extension
18. Sidestream Multigas T-Adapter
19. Mainstream Multigas IRMA Airway Adapter (Large/ Medium)
20. Mainstream Multigas IRMA Airway Adapter (Small)
21. Bionet Dual Gas Module Set
22. Water Trap
23. Sample Line Luer Lock (8")
24. Airway Adapter (Straight)
25. Airway Adapter (L type)
26. Thermal roll Paper

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.

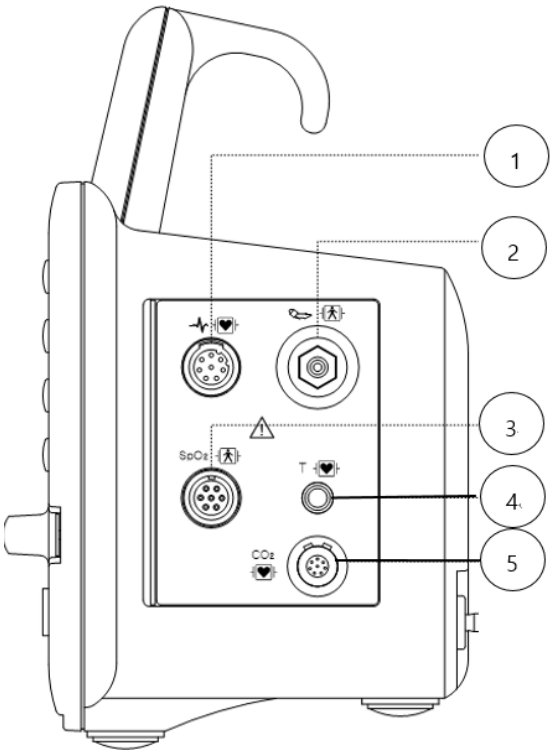
Basic Unit

FRONT



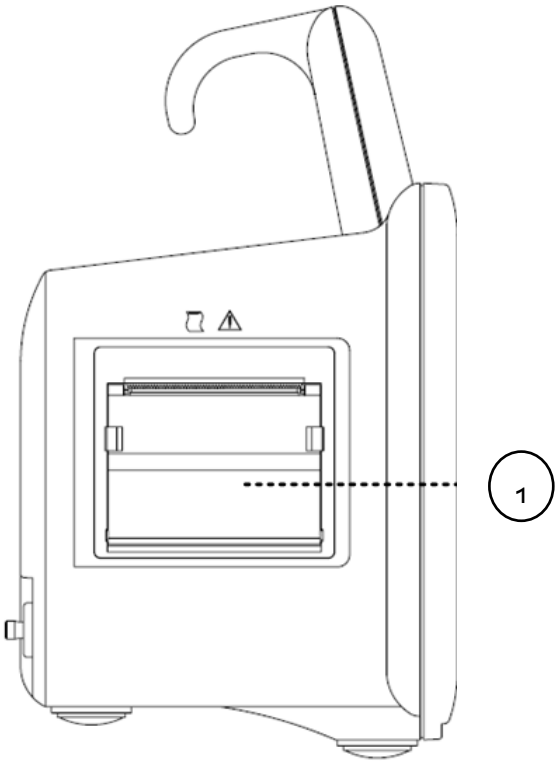
1	Alarm lamp handle
2	Alarm control key
3	Printer key
4	Blood-pressure measurement key
5	Home key
6	Rotary knob key
7	Power ON/OFF Key
8	Battery status indicator

Right Side



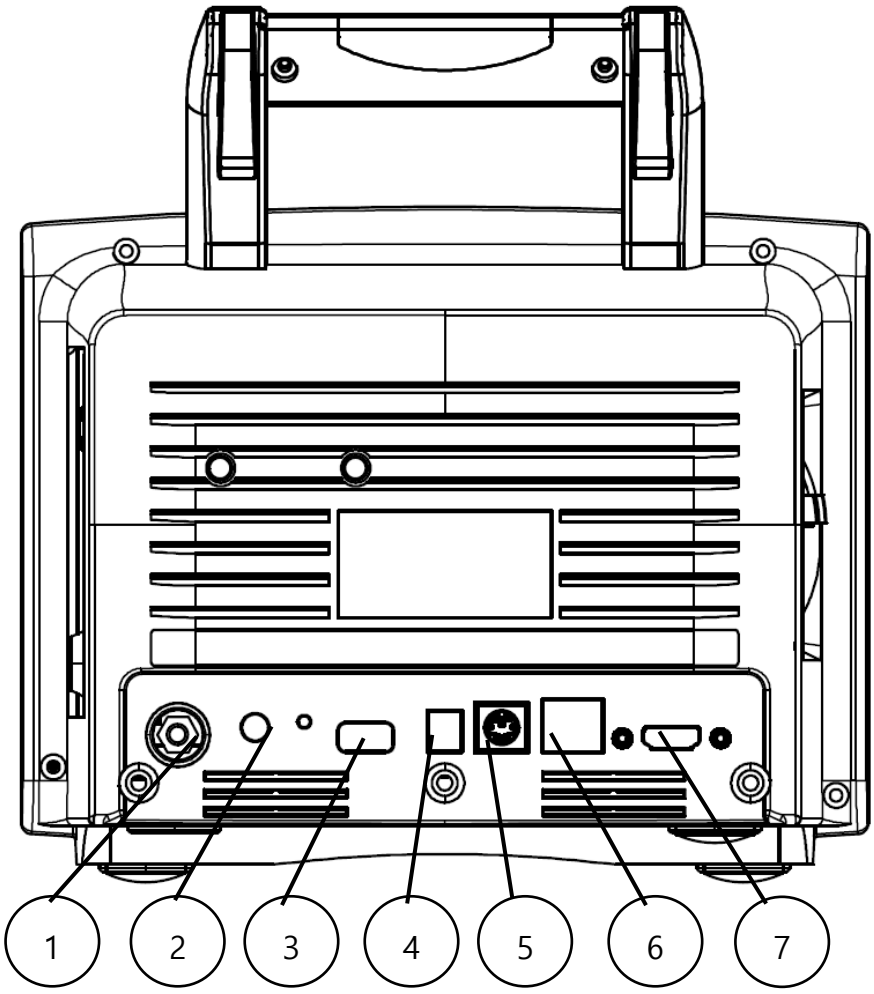
1	ECG connector
2	Blood pressure hose connector
3	SpO_2 connector
4	Temperature connector
5	$EtCO_2$ connector
6	IBP connector

Left Side



1	Printer

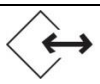
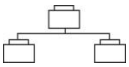
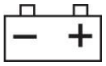
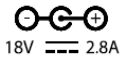
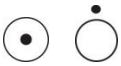
BACK



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	Video output (HDMI)

Warning
USB Compatibility ● The BM3Vet Pro is compatible with external USB memory drives up to 64GB. ● We recommend products by the following brands: San Disk, 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. (Unit cannot be used alone as a power supply). ● Before connecting a new device, it is recommended to save the data of the connected device ● It may not be supported by some devices that required 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 BM3Vet Pro 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 veterinary 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 lit when the DC Power is plugged into the inlet at the back of the product. A press of the 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

It is usually used plugged into the DC adapter and uses battery power during power outages and portable use.

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

Operation

1. Battery Power LED is lit when the machine is in use.

2. Battery is automatically charged when the machine is connected to DC Power Supply. Battery LED is lit after blinking.

3. The charging status of the battery is displayed with 5 green boxes, each indicating a different charging level.

(5% -> 25% -> 50% -> 75% -> 100%)

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

Battery : 3BL335-BIO-S (10.8V / 3350mAh, 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.

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 15 seconds 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 animal. 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 6 hours

- Continuous Battery Usage Time: 3 hours or more when fully charged 3BL335-BIO-S (measured every 5 minutes NIBP with SpO2 and ECG)

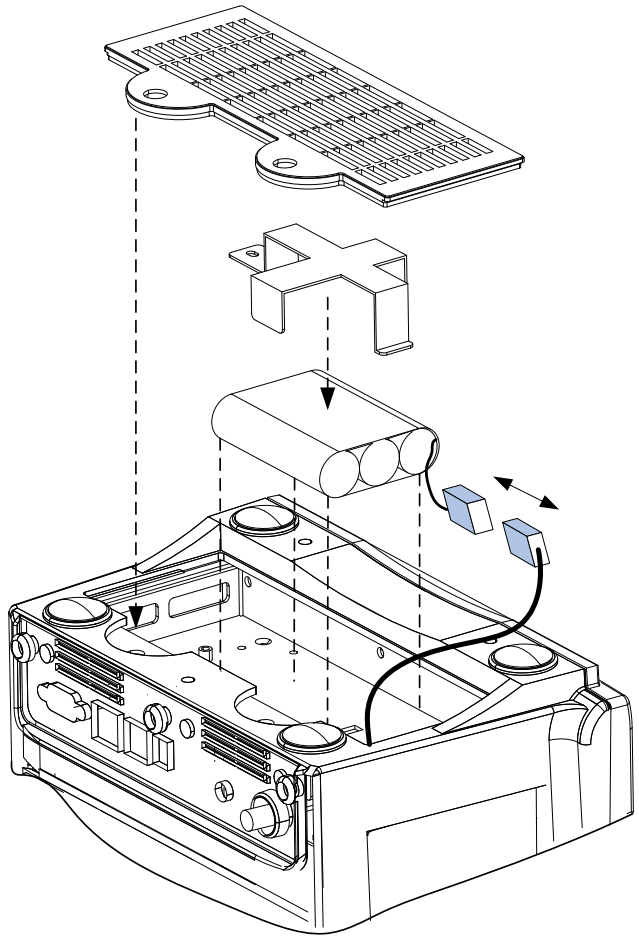
Warning
Be careful of the polarity when replacing the battery. We strongly recommend that you use the battery supplied by BIONET. Using unauthorized batteries may damage the equipment.

5. Presence of battery: When the battery is disconnected from the equipment and it malfunctions, it displays an '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 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 (50°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.

Conditioning Guideline

The battery in your monitor should be conditioned every six months by charging it fully then allow it to completely discharge before recharging it again.

Storage Guideline

Store the battery outside of the monitor at a temperature between 20°C to 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, thus reducing the life span 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
Do not incinerate batteries or store at high temperatures as there is a risk of explosion. Serious injury from explosion may result. If the battery has an external shock, external damage or flooding, dispose of the battery without using it.

Getting Started

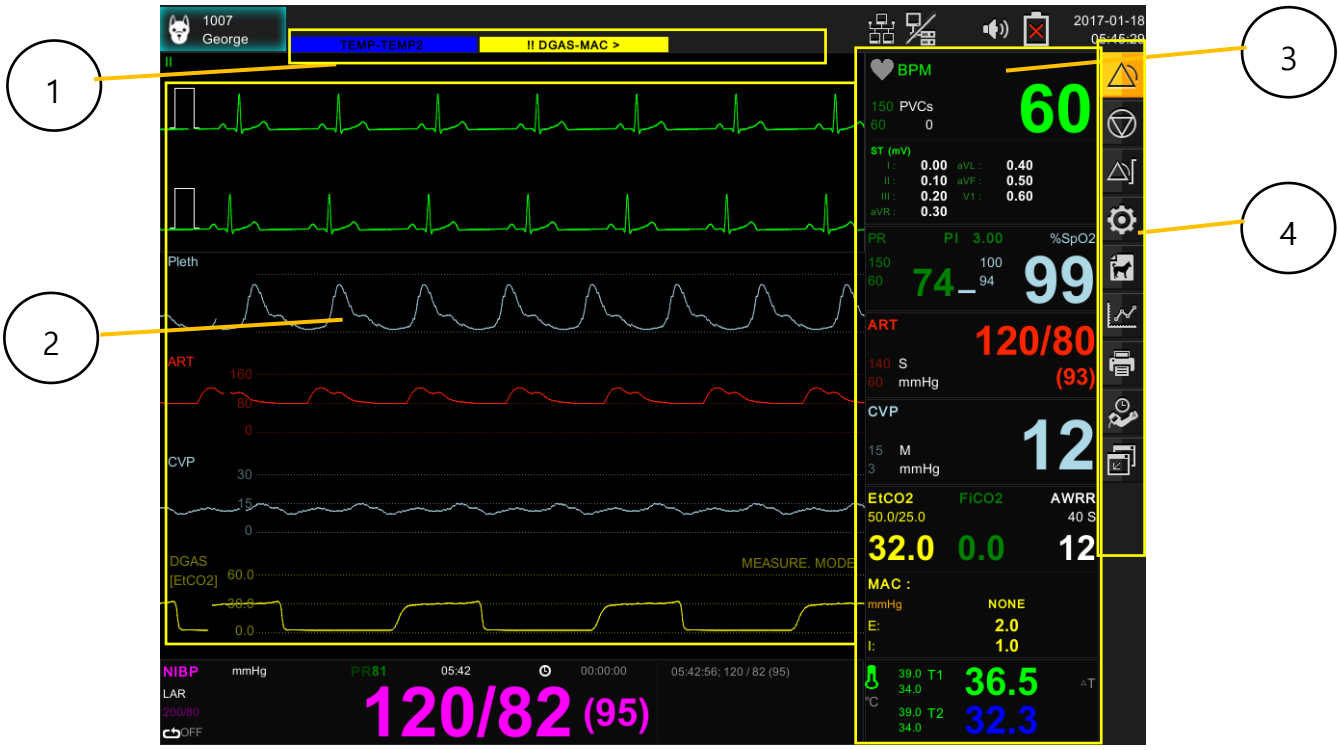
Starting the monitor: Press the power key (O) at the bottom right of the monitor front panel. The power light on the monitor lights up, the alarm bar lights up, the screen lights up, and the main screen is displayed after running the self-test.

Stopping the monitor: Press and hold the power key (O) for 3 seconds. The screen goes off after saving data.

Main screen setup

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

From the keys on the right side of the monitor's front screen, press the Home screen key. The main screen is displayed, as shown in the following figure.



1	Status Message
2	Waveform Window
3	Numeric 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 animal name and bed label are displayed in the upper left corner of the screen. The top right of the screen displays the time, network, 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 printing.	F	Return to the main screen or switch the parameter extended screen mode.
 + F	Pressing the alarm control key and the home key simultaneously switches to the user input lock mode. In lockdown mode, all touch screens and key inputs except the power key are ignored. Press the alarm button and the home button simultaneously to unlock.		

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 Animal Information 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 the parameters in the parameter enlargement screen.

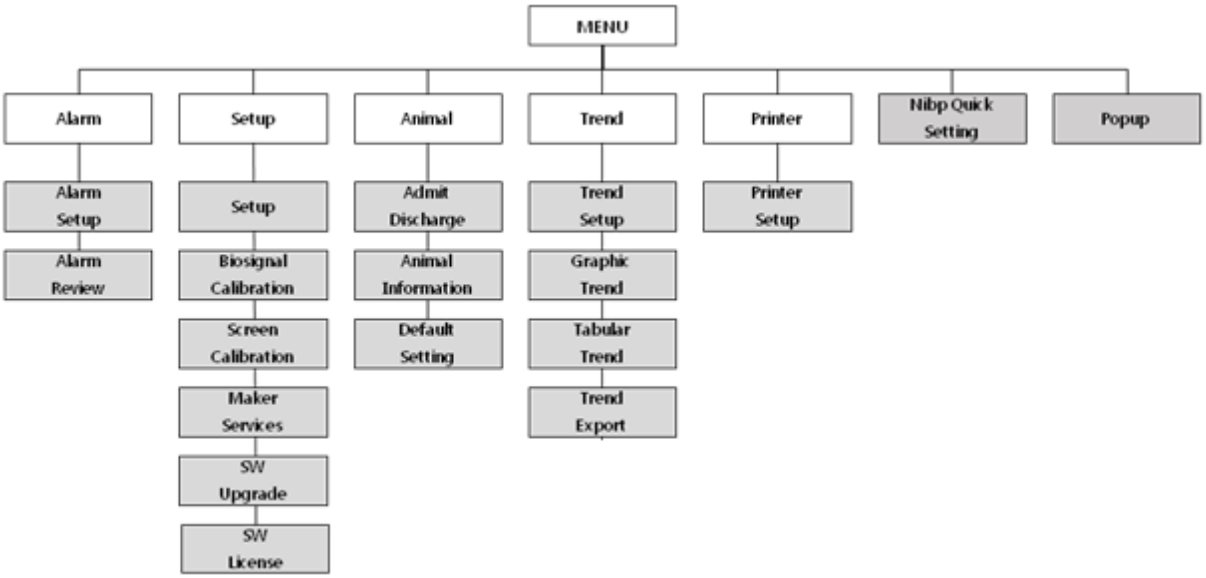
2. Setup

Overview

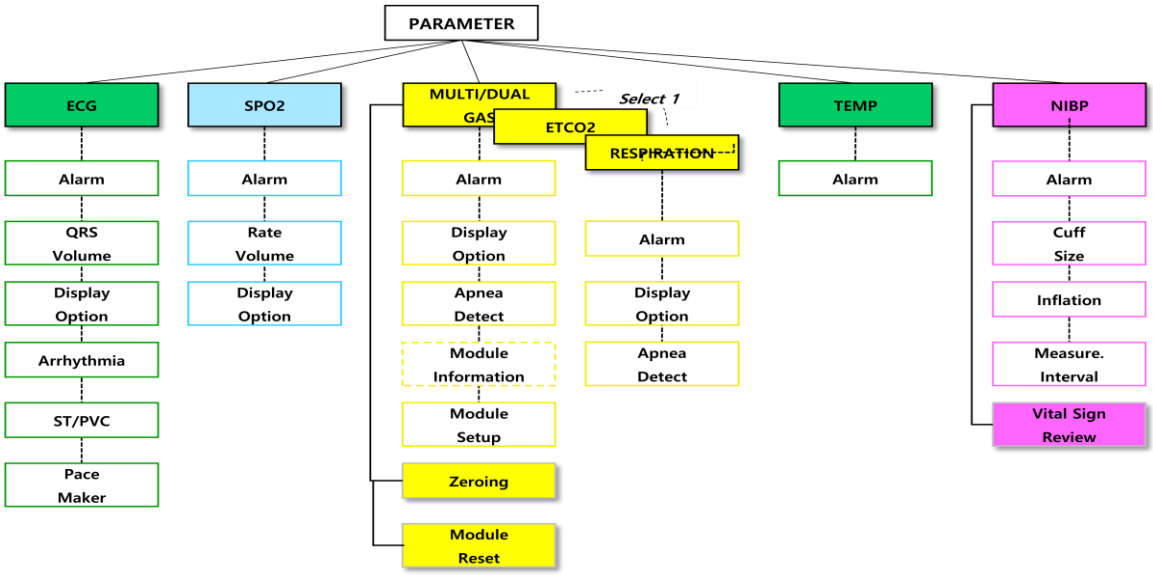
This chapter describes how to configure your monitor and how to upgrade your software.

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. UNITS
		A-3. USER SERVICES
		A-4. SYSTEM INFORMATION
		A-5. NETWORK INFORMATION
		A-6. EXPORT
		A-7. HL7
		A-8. ALARM SETUP
		A-9. DISPLAY OPTION
		A-10. HOSPITAL INFORMATION
	B. BIOSIGNAL CALIBRATION	B-1. ECG & RESP
		B-2. NIBP
		B-3. IBP
	C. SCREEN CALIBRATION	
	D. MAKER SERVICE	D-1. MAC Address
		D-2. MGAS Services
	E. SW UPGRADE	
	F. SW LICENSE	

A. SETUP		
Sub Menu	Description	Available Settings
A-1. Parameter Setup	Parameter selection and color setting menu: ECG, SPO2, RESP, NIBP, TEMP, IBP1, IBP2, ETCO2, M/D Gas	PARAMETER enable ON/OFF PARAMETER COLOR setup
A-2. Units	Unit setting menu used for monitor measurement	
A-2-1. Weight Unit	Weight unit	Lbs Kg
A-2-2. Blood Pressure Unit	Blood pressure measurement unit	mmHg kPa
A-2-3. ST Unit	ST measurement unit	mm mV
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. USE ONE GAS UNIT	select whether to set the pressure unit for each gas type. When ON, the unit setting menu for each gas type is displayed.	ON/OFF
A-3. User Services	User configuration menu	
A-3-1. Unit Name	Setting Monitor Environment Group. * The B2B function is valid between the same hospital unit (group).	RECOVERY, OR
A-3-2. Bed No	Set device number	1~300
A-3-3. Key Sound	Set Key activation	ON / OFF
A-3-4. Key Volume	Set Key sound	OFF ~ 100%
A-3-5. AC Filter	Power filter settings	OFF, 50Hz, 60Hz
A-3-6. Screes Brightness	Set screen brightness	10~100%
A-3-7 Date Display		YYYY-MMM-DD MM/DD/YYYY DD/MM/YYYY
A-3-8. Demo	Set Demo	ON / OFF
A-4. System Information		
A-4-1. S/W VERSION	Display main S/W version	
A-4-2. NIBP VERSION	Display NIBP Module version	
A-4-3. LICENSE	Display License of the Product.	
A-4-4. Language	Set language	English, Korean/ French, Bulgarian/ Polish, German Chinese/ Portuguese/ Hungarian/ Czech/ Romanian/ Italian/ Turkish, Spanish/ Russian/ Greek/ Japanese
A-5. Network Information	Network information and setup	
A-5-1. Wireless	Wireless setup	ON/OFF
A-5-2. DHCP	Auto IP allocation setting menu	ON/OFF
A-5-3. Device IP	IP setting menu	XXX.XXX.XXX.XXX
A-5-4. Subent Mask	SUBNET MASK setting menu	XXX.XXX.XXX.XXX
A-5-5. Gateway IP	GATEWAY setting menu	XXX.XXX.XXX.XXX
A-5-6. Network Interface		

A-6. Export	BM Vet Central Setup Menu (BT-LINK &B-LINK)	
A-6-1. BT-LINK Protocol Version	Network protocol menu	1.3.0
A-6-2. BT-LINK Transmission	Remote Communication menu	ON/OFF
A-6-3. BT-LINK Host IP	Remote phone & PC IP address setting	XXX.XXX.XXX.XXX
A-6-4. B-LINK Protocol Version	Network protocol menu	v1.5
A-6-5. B-LINK Transmission	Remote Communication menu	ON/OFF
A-6-6. B-LINK Host IP	Remote PC IP address setting	XXX.XXX.XXX.XXX
A-6-7. B2B	Select whether to use B2B function	ON/OFF
A-7. HL7	HL7 Network message settings	
A-7-1. HL7 Comm	Communication	ON/OFF
A-7-2. HL7 IP	Remote PC IP address setup	XXX.XXX.XXX.XXX
A-7-3. Port	Remote PC PORT address	XXXX
A-7-4. HL7 Period	Transmission cycle settings menu	10sec, 30sec, 1,3,5,10,15,30min, 1 hour, 6 hours
A-7-5. HL7 NAK	NAK Transmission menu setup	ON/OFF
A-7-6. EDIT HL7 LABEL	Edit each parameter LABEL edit menu	
A-8. Alarm Setup	Alarm Settings Menu	
A-8-1. Alarm Sound	Alarm sound type selection menu	IEC60601 / BIONET
A-9. Display Option		
A-9-1. Sweep Speed (ECG/SPO2/RESP)		6.25 mm/sec, 12.5 mm/sec 25 mm/sec (default),50 mm/sec
A-9-2. Sweep Speed (RESP/ETCO2/ MD-GAS)		6.25 mm/sec, 12.5 mm/sec (default), 25 mm/sec
A-10. Hospital Information	Set Hospital information	
A-10-1. Hospital Name	Hospital Name	
A-10-2. Address 1	Address information 1	

A-10-3. Address 2	Address information 2	
A-10-4. Postal Code	Set postal Code	
A-10-5. Doctor Name	Set Doctor Name	
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 Setting		
D-1. MAC Address Editing		Enter a unique address for the device
D-2. MGAS Services	Back-up Data of MGAS	
E. SW Upgrade	Software Upgrade Menu	
F. SW LICENSE	SW License menu	

Parameter Color

Parameter	Basic color
Selectable colors Green, light blue, yellow, magenta, blue, sky blue, gray, white, scarlet, purple, pale green, orange, pink, pale yellow	
ECG (ST)	Green
SpO_2	Light Blue
RESP	Yellow
NIBP	Magenta
TEMP	Green
$ETCO_2$	Yellow
M/D-GAS	Yellow

3. Network

Overview

When you connect the monitor to the network, you can access animal information from another monitor or central station connected to the network. These devices provide main screen information for remote viewing from each other.
BM Vet Central System(BT-Link, B-Link) connects the monitors to the central station and each device to provide various monitoring functions.(For more information about the central station, see the BM Vet Central (BT-Link, B-Link) Station User Guide.)

The User Monitor's B2B View (Bed to Bed View) feature allows the user to view other monitor screens connected to the network and to silence remote control and alarms [Audio Paused].

With the Remote Control feature in BM Vet Central station (BT-Link, B-Link), you can perform the following tasks on a veterinary patient monitor that can be remotely controlled from a central station.

- Start recording
- Modify alarm limit
- Alarm Mute
- Start to check Arrhythmia
- Enter, edit and view animal data

Network connection

In the network, data can be exchanged via wired or wireless technology. This device can exchange information with other devices over the network during operation and supports the following features.

- Display waveform and parameter data
- Alarm signal
- Remote control (e.g. alarm management)
- View another Veterinary patient monitor by remote access
- Device setup and transmission of animal data

Connecting this device to an integrated network with other devices, or subsequent changes to that network, can be a new risk to animals, users, and third parties. These risks must be identified, analyzed and evaluated before the device is connected to the network or the network is changed,

and appropriate action must be taken.

Subsequent changes to the network example:

- Network configuration change
- Removing a device from the network
- Adding new devices to the network
- Upgrading or updating devices connected to the network

Warning
Recommendations for wireless connections ● BM3Vet Pro has a change in the number of equipment connections depending on wireless AP (Access Point) performance. ● When using a general AP, it is recommended to connect 8 units to the same network. ● Due to the nature of wireless, connectivity may not be good depending on the environment. ● If you want to use B2B function, Wired LAN is recommended.

IT Network connection

No one other than service personnel can connect this device to your network. Please consult with the hospital IT staff in advance. Please refer to the following documents to proceed with the installation.

- Documents attached to this unit
- Network Interface Manual
- BM Vet Central (BT-Link, B-Link) user documentation

We recommend that you follow IEC 80001-1 (Hazard Management of IT Networks Connected with Medical Devices).

LAN Network

LAN networks are usually configured through a star topology. Individual devices can be combined into groups via a layer-n-switch. Other data traffic is separated by separate VLAN networks. Configure the device's network settings according to this user manual and network specifications. LAN connection specifications are described in the following standard specifications.

- Wired Network: IEEE 802.3
- Wireless network: IEEE 802.11 (a, b, g, n)

If the device is to be used as a layer-2-switch or layer-3-switch, the port setting must be

configured on the network switch. Bionet equipment must be configured to make the network settings compatible with the specifications of the operating organization.

This device exchanges data with other medical devices over a LAN network. The network supports the following transports and protocols:

- TCP / IP
- Broadcast

VLAN Network

If data is exchanged within a single network, an independent VLAN network for the clinical information system must be established. At least one of the following independent VLAN networks must be established.

- Network for medical devices in hospital
- Network for portable veterinary patient monitors

If you use an inappropriate network

If your network does not meet the requirements, the following dangerous situations can occur.

If the distributed alarm system is not safe:

- The alarm will not be delivered.
- The alarm or data is delayed.
- An error alarm appears

If the network connection is interrupted:

- The alarm will not be delivered.
- Reactivates with the alarm off or the alarm sound off

If you do not have firewall and antivirus software:

- Your data is not protected.
- The device settings are changed.
- The device raises an error alarm or does not generate an alarm.
- Data is sent incomplete, to the wrong device, or not at all.
- Animal patient data is blocked, falsified, or corrupted.
- The time stamp of the data is inaccurate

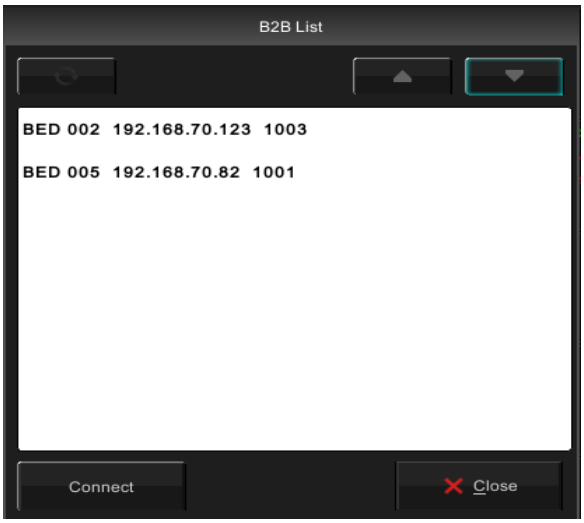
Overloading this unit due to very high network loading (e.g. denial of service attacks) can cause

interface deactivation. The interface can only be used again after the device is restarted. Rarely, booting may be slow or repeated reboots may occur

Remote View—B2B

If the monitor is connected to a network, you can view other monitors connected to the network on your monitor and silence the alarm. The procedure for displaying the remote view screen is as follows. To set the menu display time, refer to the setting page below.

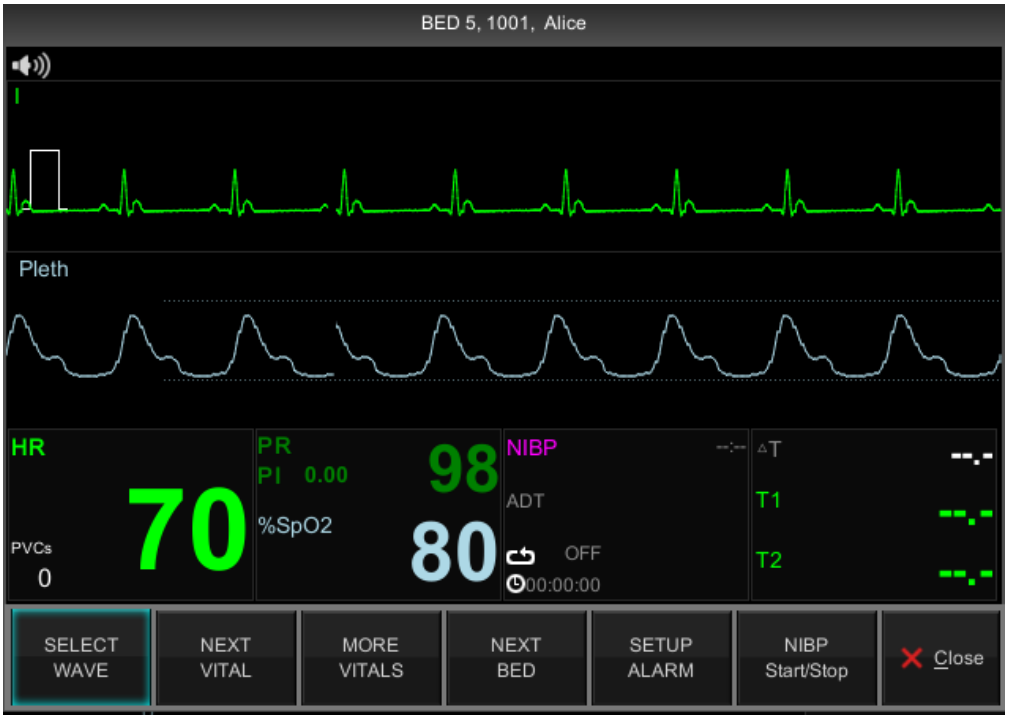
The menu below is a setup menu for retrieving data from other veterinary patient monitoring devices connected to the same network. To view the menu settings, touch the My BED number box in the top menu bar.



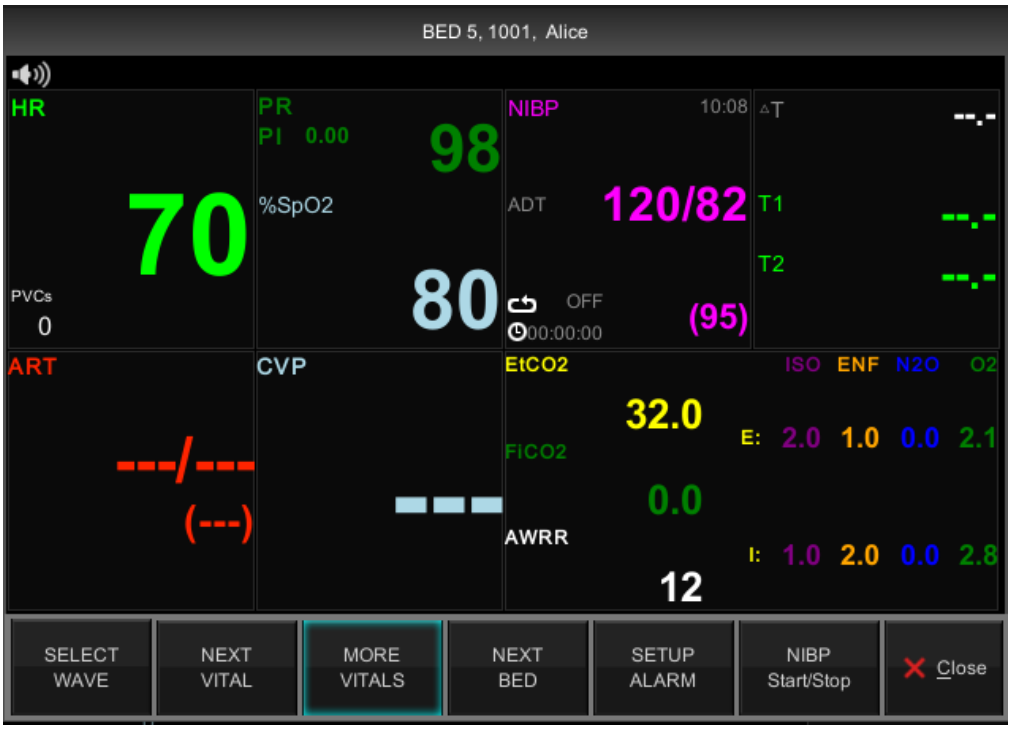
MENU	Description	Available Settings
B2B VIEW MONITOR LIST sub menu		
REFRESH	Menu to update monitor list connected to network	
UP	Move to upper list	
DOWN	Move to lower list	
MONITOR LIST	List of monitor information connected to the network	
CONNECT	Monitor connection menu for remote connection	

Display Mode

Wave and Numeric Mode



Numeric Mode



MENU	Description	Available settings
A-1 SELECT WAVE	Waveform selection menu	
A-1-1. TRACE I	The waveform selection menu for TRACE I in the B2B View window	ECG, SPO2, IBP1, IBP2, RESP, ETCO2, MULTIGAS
A-1-2. TRACE II	The waveform selection menu for TRACE II in the B2B View window	ECG, SPO2, IBP1, IBP2, RESP, ETCO2, MULTIGAS
A-2 NEXT VITAL	Additional parameter selection menu	
A-3 MORE VITALS	WAVE screen and TEXT screen selection menu	
A-4 NEXT BED	Connect to the following connected monitor devices	
A-5 SETUP ALARM	Alarm setting menu of remotely connected monitor	Normal Audio Paused Alarm Paused Audio Off Alarm Off
A-6 NIBP START/STOP	NIBP measurement start and stop menu	START STOP
A-7 CLOSE	Close remote viewer menu	

4. Animal Information

Overview

The Animal Inpatient Menu allows the user to enter and edit individual animal information (ID, Animal and Guardian Name, Animal Type, Gender, Weight). You can hospitalize animals on a monitor, or you can be hospitalized on a central station where your monitor is networked.
You can also transfer animal data and trends to other monitors. The transmission procedure depends on whether the receiving and sending monitors are connected to the BM Vet Central (BT-Link, B-Link) network.

Animal Admission

How to admit an animal

1.  Press the **animal icon** button.
2. Press Admit
3. Click on **Animal Information**.
4. Please select a blank 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 an animal's classification (Dog, Puppy, Horse, or Cat), access the animal settings menu.

Animal discharge

You must be discharged from the current animal before you are admitted to another animal. Otherwise, the monitor attaches the existing data to the animal hospitalized behind. Animal discharge can be done on the bedside monitor.

How to discharge an animal.

1.  Press the **animal icon** button.
2. Press **Discharge**.
3. Check a discharge confirmation message.
4. Press the Yes button. The discharge process is in progress.

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

Display the image by ANIMAL TYPE in the upper left corner

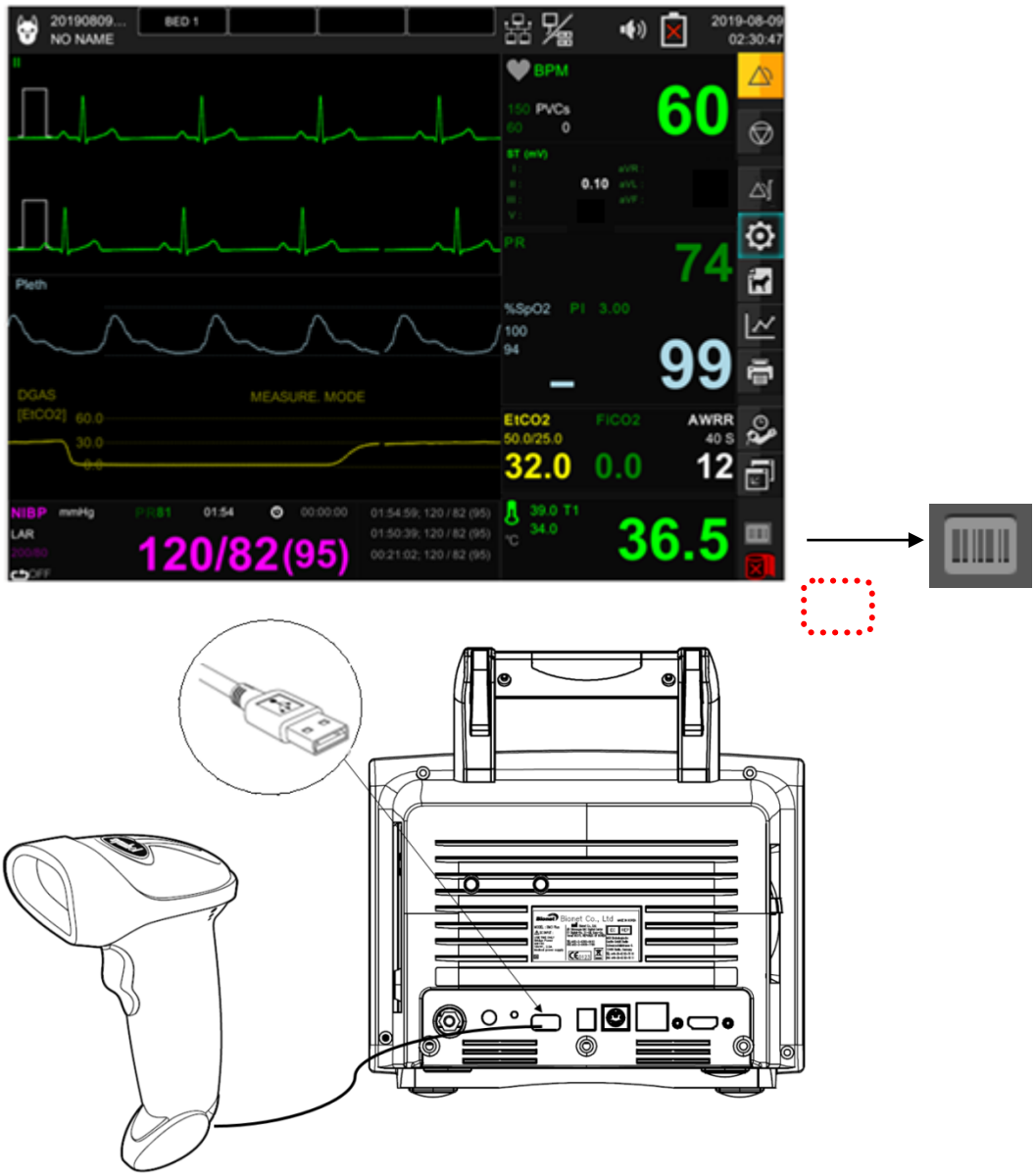
TYPE	Admit	Discharge
PUPPY		
CAT		
DOG		
HORSE		

	Main menu	Sub menu
	**A.** Admit / Discharge	
	B. Animal Information	**B-1**. Animal Information
	C. Default Setting	

Sub menu	Description	Available Settings
B. Animal Information menu		
B-1. Animal Information		
B-1-1. Animal Type	Animal type setting	Dog / Puppy / Horse / Cat
B-1-2. ID	Animal ID setting	
B-1-3. Auto ID	Auto ID generation	
B-1-4. Pet Name	Animal name	
B-1-5. Client/Owner	Guardian name	
B-1-6. Gender	Gender setup	MALE, FEMALE
B-1-7. Weight	Weight setting	XXX.XX Kg (Lbs)
C. Default Setting menu	**Default setting animal information**	

Registration of Animal ID Using Barcode

This product can input the ANIMAL 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 Icon window 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.

5. Alarm

Overview

The monitor displays the alarm limit (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:

- Alarm sound according to alarm severity
- Change the color in the parameter box of the alarmed 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 an animal status alarm and a product status alarm.
The animal status alarm sounds when the diagnostic function (ECG 13 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 animal 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 ALARM PRINT ON is set.

Alarm Priority	Alarm Sound	Alarm Color	Alarm Printer	Handle Alarm Lamp
HIGH	-5	Every 2 seconds Blinking		2 times Blinking a second
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 is blinked

: Yellow color alarm indicator on the screen is blinked

: Blue color alarm indicator on the screen is displayed

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 Pause 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. Arrhythmia Alarm Condition
		A-3. System Alarm Condition
		A-4. Alarm Parameter
		A-5. Nurse Call
	B. Alarm Review	

Sub menu	Description	Available Settings
A. Alarm Setup menu		
A-1. Parameter Alarm Limit	All parameter alarm, level, activate Setup menu	
A-2. Arrhythmia Alarm Condition	ASYSTOLE, VTAC, VTAC /VFIB, BIGEMINY, TRIGEMINY, ACCVENT, COUPLET, IRREGULAR, PAUSE, RONT, VBRADY, SHORTRUN, PVC	
A-3. SYSTEM ALARM CONDITION	LOW BATTERY	
A-4. Alarm Parameter	Alarm Settings menu	
A-4-1. Alarm Volume	The volume can be changed from OFF to 10% to 100%.	10~ 100%
A-4-2. Alarm Pause Time	No sound for 5minutes, Release on alarm again	1, 2, 3, 5, 10, 15 min
A-5. Nurse call	User Settings menu.	
A-5-1. Nurse call on Alarm	NURSE CALL setup menu	ON/OFF
A-5-2. Call Type	Nurse call type setup menu	Normal open Normal close

A-5-3. Duration	Nurse call duration setup menu	One time Continue Cycling
A-5-4. Level	Alarm level setup menu	Low / Medium / High

Alarm Event (Physiological Alarm Review)

6. 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.
The triggered alarm event is displayed in red inverted triangle on the Event List and Timeline.

Trend Setup

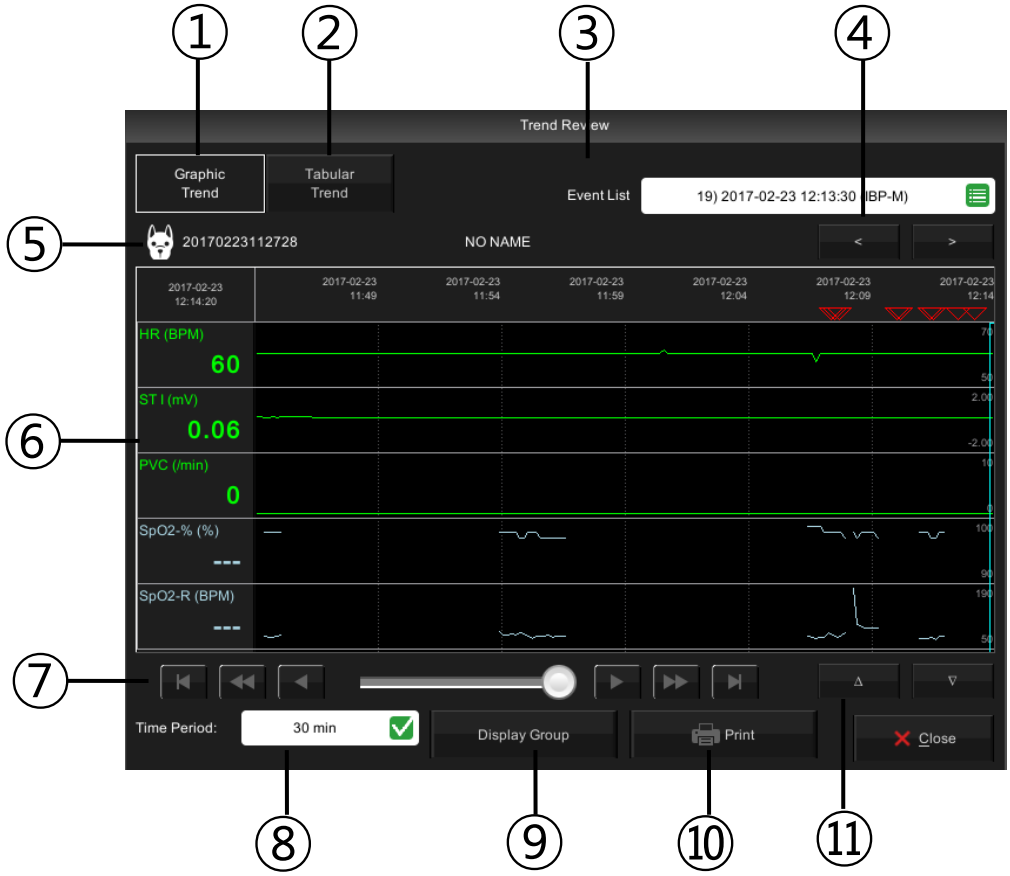
	Main menu	Sub menu
	**A.** Trend Setup	**A-1.** Popup Trend
	B. Graphic Trend	**B-1**. Graphic Trend
		B-2. Tabular Trend
	C. Tabular Trend	**C-1**. Graphic Trend
		C-2. Tabular Trend
	D. Trend Export	

Sub 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	Configure the bio signal to be shown in the popup trend window	
B. Graphic Trend menu		
B-1. Graphic Trend		
B-1-1. Event List	Selectable alarm list is displayed	
B-1-2. Time Period	Set the time and see the stored values at each set time.	30min, 60min, 90min, 2hour, 3hour, 4hour, 6hour, 8hour, 12hour
B-1-3. Display Group	Configure the bio signal to be shown in the Graphic trend window	

B-1-4. Print	Graphic trend print output	
C. Tabular Trend menu		
C-1. Tabular Trend		
C-1-1. Event List	Selectable alarm list is displayed	
C-1-2. Time Period	Time period setting	1min, 5min, 10min, 15min, 30min, 1hour, 2hour
C-1-3. Display Group	Configure the bio signal to be shown in the Tabular trend window	
C-1-4. Print	Tabular trend print output	
D. Trend Export menu		
D-1. Start Time	Parameter save start time setting menu	
D-2. End Time	Parameter Save Last Time Setting Menu	
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	Save data to USB memory	

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 and can display up to five channels at a time. Confirmation color, scale meter labels and numbers are displayed on the left side of the trend channel. The vertical lines in each graph displays the time distribution. Trend Review keeps the most up-to-date data, which 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	Animal ID
⑥	Numeric Parameter window
⑦	Selection Navigation window

⑧	Trend interval setting menu
⑨	Parameter selection slider
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	Animal ID
⑥	Numeric Parameter window
⑦	Selection Navigation window
⑧	Trend interval setting menu
⑨	Parameter selection slider
⑩	Printer menu
⑪	Parameter window selection menu

File Export

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

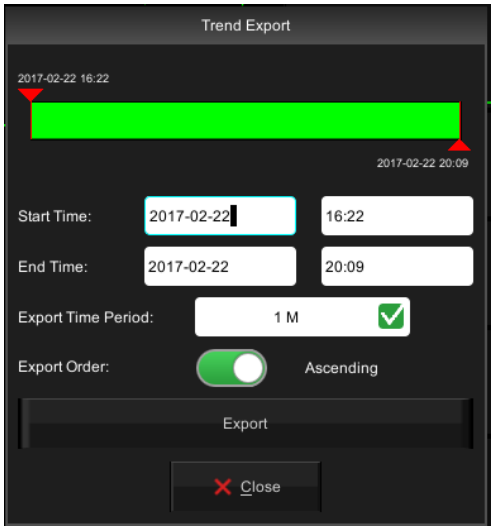
① Confirm USB memory connection.

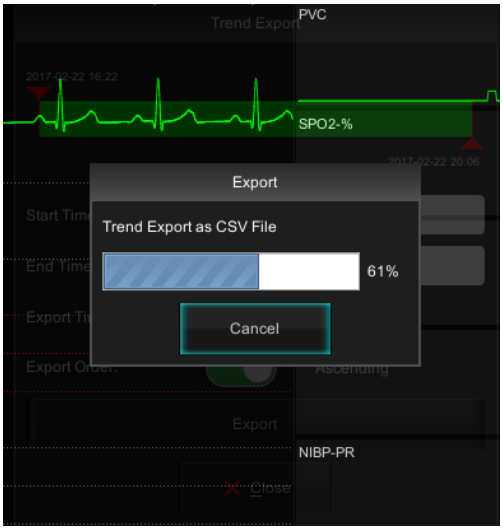
② Press TREND > Trend Export button.

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 Compatibility

- The BM3Vet Pro is compatible with external USB memory drives up to 64GB.
- We recommend products by the following brands: San Disk, 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. (Unit cannot be used alone as a power supply).
- It may not be supported by some devices that required high power.

Note

Saving Animal Data to a USB

- Exported animal 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 animal data.
- The file format of the USB memory drive used for the BM3Vet Pro veterinary patient monitoring device is FAT32.

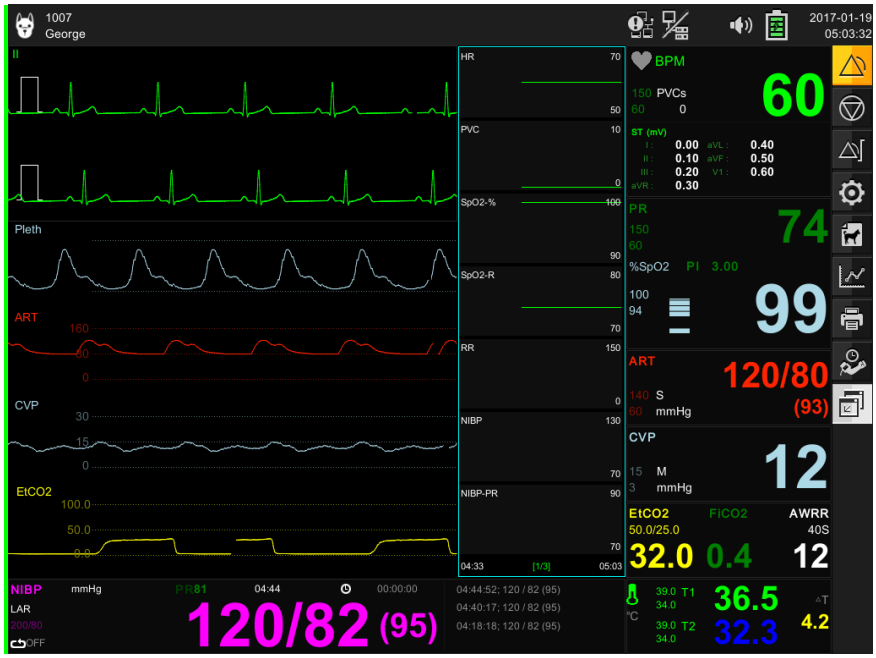
Pop-up Trend

The user can continue to monitor the main screen waveform and parameter box while displaying trend data for up to 7 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 60 seconds. When selecting Pop-up Trend, you can switch to the ST analysis window and double-zoom mode.

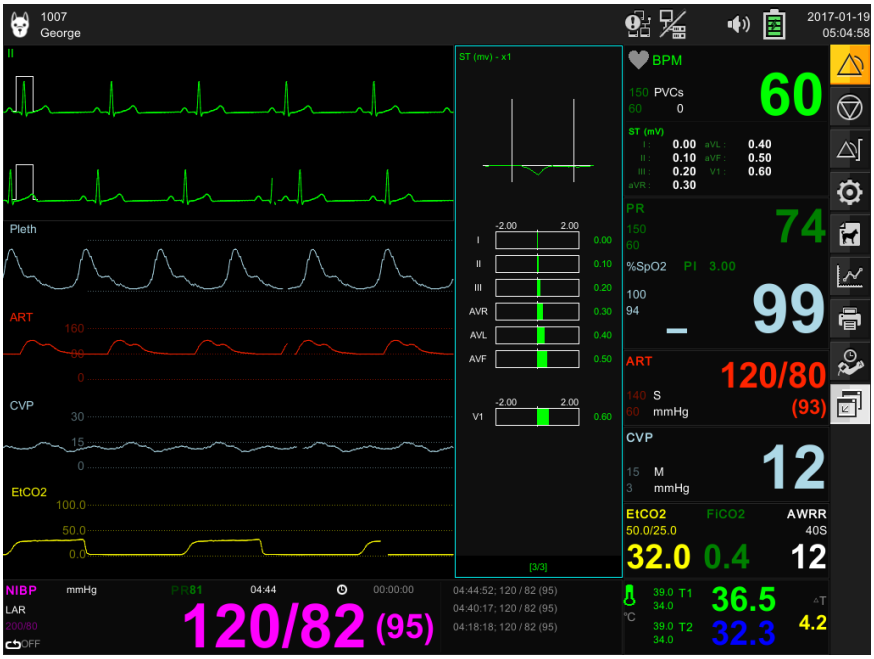
If there is no parameter set in Trend Setup> Configure Parameters, only ST analysis window is displayed.

To change the popup menu window, touch the top and bottom of the Pop-up menu with the touch key, or select it with the rotary switch.

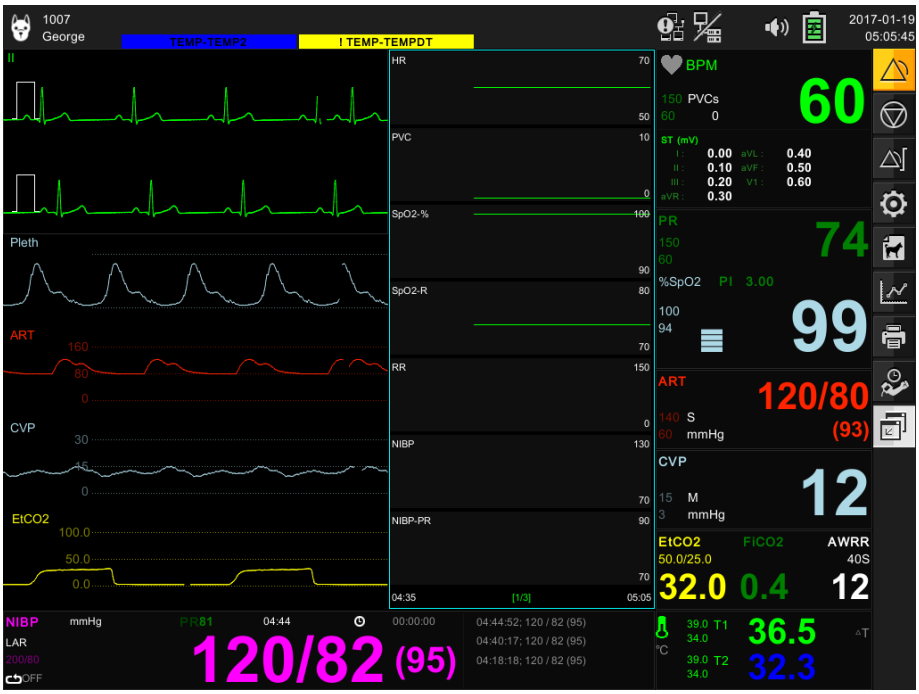
Pop-up Trend window



Pop-up ST Window



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

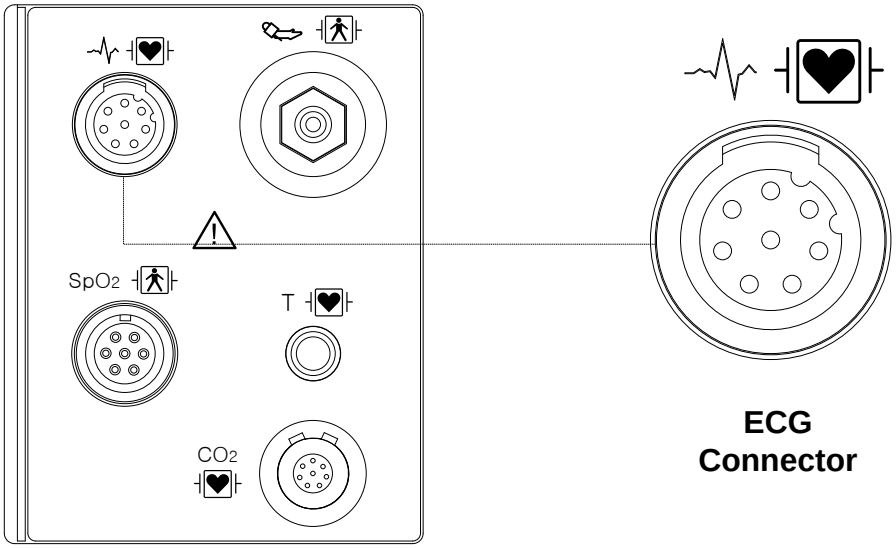


7. ECG

Overview

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

ECG connector position and measurement cable



Electrode placement

1. If animal has a lot of hair, shave it. With alcohol-soaked cotton, wipe the animal'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 pick up 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
● ECG diagnostic interpretation should be performed by a veterinarian or an individual trained under the supervision of a veterinarian. ● Use caution with potential source equipment as they may interfere with ECG monitoring. ● Animals prone to epilepsy should not rely entirely on ECG. Electrical waves of non-cardiac sources such as seizures can interfere with the detection of certain arrhythmias.

Warning
CABLES — Route all cables away from animal'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 animal, 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 animal input of the device. Such contact would bridge the animal'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 animals 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 animal or any equipment connected to the animal.

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 an animal 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 veterinary patient monitor s is delayed by a maximum of 30ms.

If the ECG waveform on the screen is too unstable to synchronize with the animal'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 animal, 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.

Electro surgery Unit

- ✓ Electrosurgical unit (ESU) emits 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 animal. If the return plate is not attached correctly, it may burn the animal'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 animal 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.

Animal Preparation

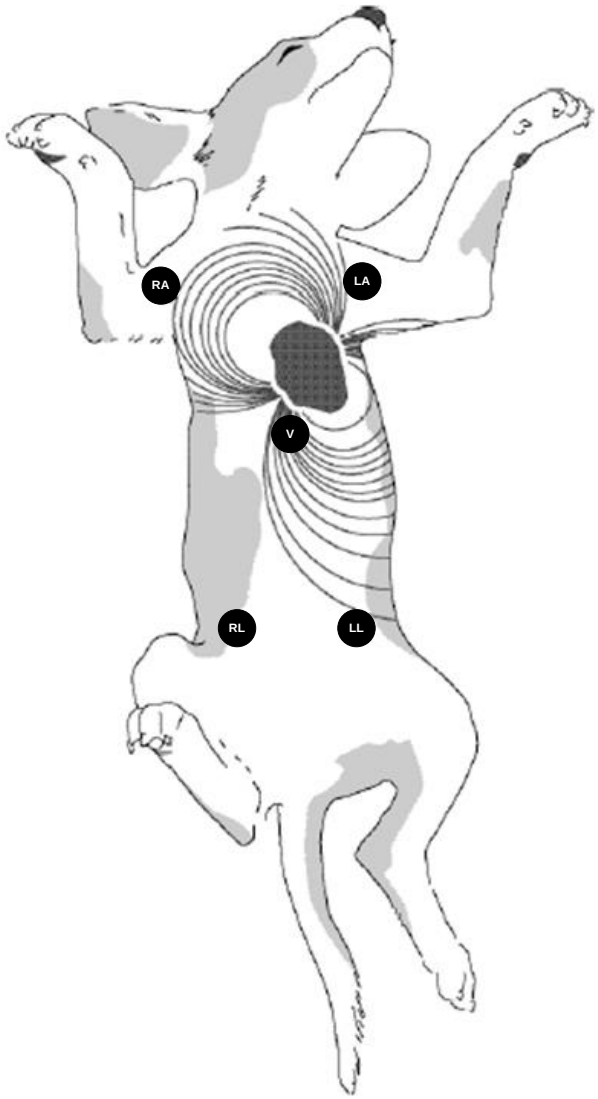
Careful skin preparation and proper electrode placement allow you to receive a strong signal that minimizes handwriting. If a technical alarm (e.g. lead disconnect) has occurred, prepare the animal again according to the following recommendations.
Follow hospital approved clinical procedures to prepare the animal'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 Animal
- Animal's skin irritation

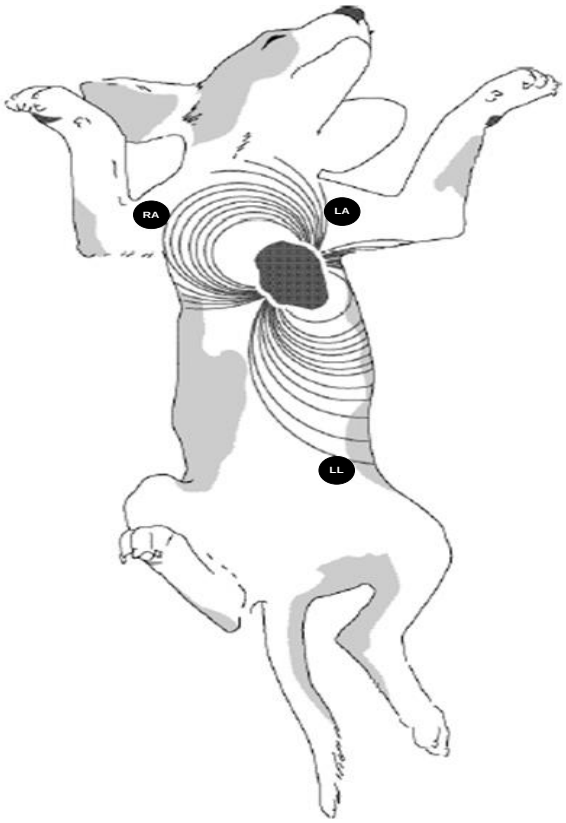
There are a variety of reusable and disposable electrodes available. Choose the electrode that best fits your monitoring situation. Bionet recommends Ag / AgCl disposable electrodes.
If you are using an electrode with a gel beforehand, make sure that the electrode is sufficiently gelled. Never use this 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 animal - 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 Positions of 5 Lead Placement



3 Positions of 3 Lead Placement



ECG Cable color

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

IEC：International Electrotechnical Commission (Europe)

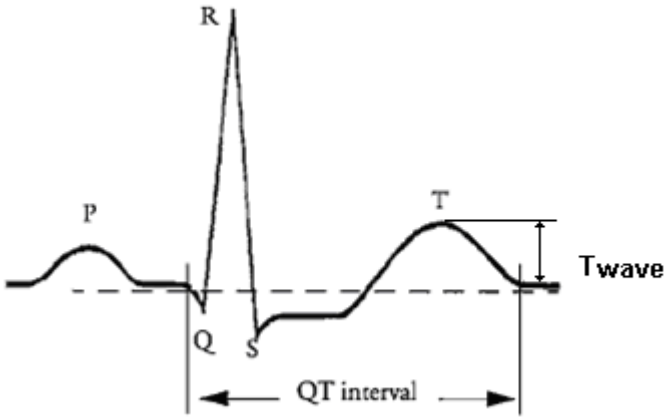
3LEAD / 5LEAD

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 displays QRS Complex for an amplitude of 0.4 to 5.0 mV (0.2 -5.0 mV for scale settings below 0.5 mV / cm) and a QRS width of 70 to 120 ms for large animals (also for small animals with 40 to 100 ms). The heart rate is calculated from 15 to 300 times per minute using the last 10 seconds 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.

If arrhythmia monitoring is possible, the HR parameter box will change accordingly. If you select Basic, you can display three basic arrhythmias called ASYS, VFIB, and VTAC. If Full is selected, a separate ARR parameter box will be displayed next to the HR parameter box (for details on selecting the arrhythmia mode, refer to the Arrhythmia Setting chapter).



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

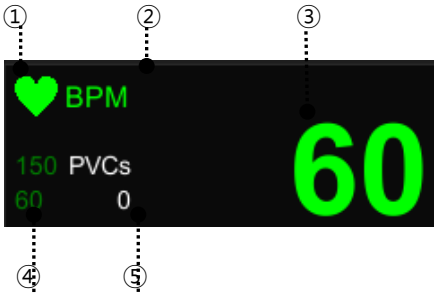
ST Signal Processing and Display

ST segment deviation is defined as the movement above or below the equipotential level (mm). The difference measurement compares the isoelectric point with the ST measurement point. The isoelectric point defines a zero volt point (no electrical activity, 0 mm) with a base position on the horizontal axis (in hours) of 28ms before QRS complex generation. In the ST segment, the ST point occurs between the QRS offset (J point) and the T-wave. The default position is 80ms after the QRS offset. The following figure shows a typical QRS complex.
The ST analysis method examines ECG signals classified as "normal" beats on up to seven selected ECG electrodes. The monitor measures the ST level of the normal bit ECG signal and displays the deviation from the average ST level value. If ST monitoring is active, the trend of the ST level can be reviewed in the trend display window

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 animal's pulse rate.

Display



① Heart rate detector: It detects heart rate and flickers simultaneously.

② Pace maker: Pace maker signal is detected and flashes simultaneously.

③ Heart rate: Displays the heart rate per minute.

④ HR Alarm limits: Heart rate upper and lower thresholds are displayed.

⑤ PVC count number per 1 minute is display.

ECG Settings

	Main menu	Sub menu
ECG	**A.** ECG Parameters	**A-1.** Alarm
		A-2. QRS Volume
		A-3. Display Option
		A-4. Arrhythmia
		A-5. ST/PVC
		A-6. Pace Maker

A. ECG menu		
MENU	Description	Available settings
A-1. Alarm	ECG alarm setting menu	
A-1-1. PARAMETER ALARM LIMIT	HR, ST, PVC parameter alarm limits, level, activation setup menu.	
A-1-2. TECHNICAL ALARM CONDITION	ECG-CABLEOFF 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	Set the number of channels of ECG waveform to be displayed on the screen.	1CH, 2CH,

	When selecting 1CH, ECG waveform of 1CH is displayed in two lines. 3LEAD: Only 1CH is displayed 5LEAD: 1CH, 2CH, 7CH display	7CH
A-3-6. TRACE 1, TRACE 2	The ECG channel is selectable from I to V When using the 3 lead cable selection, only TRACE I can select I, II, III. When using 5 lead cable selection, I, II, III, aVR, aVL, aVF, V can be selected.	I, II, III, aVR, aVL, aVF, V
A-4. Arrhythmia	Arrhythmia alarm setting menu	
A-5.ST/PVC	PVC Diagnostic setting, ST template channel selection, ST analysis and ISO (R-) / ST (R +) value setting	
A-5-1. PVC Analysis	PVC Diagnostic Results Display Setup Menu	ON/OFF
A-5-2. ST Template Ch	ST Diagnostic ECG Channel Setup Menu (Menu display according to the currently connected cable)	Lead I, II, III, aVR, aVL, aVF, V
A-5-3. ST Analysis	ST Diagnostic ECG Channel Setup Menu	
A-5-4. ISO(R-)	ISO Point Position Setting Menu	120 ~ 4ms
A-5-5. ST(R+)	ST point position setting Menu	4~160 ms
A-5-6. Initial Setup	ISO, ST point position initial value setting Menu	ISO: 80 ST: 108
A-6. 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 least 0.5mV 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.

8. Arrhythmia Monitoring

Overview

Arrhythmia monitoring is available for animals only. The selected mode (Full, Lethal or OFF) determines which events are processed. The monitor compares the received beats to the reference beats that have been recorded and stored in the reference template. Through this process, the monitor can identify the occurrence of an arrhythmia event, classify it, and then draw clinically useful conclusions based on the frequency and type of the signal. The monitor will observe all beats in question if the baseline moves beyond a defined limit. The monitor uses QRS processing results for arrhythmia analysis. During multiple lead arrhythmia treatment, the machine measures the QRS Complex of each lead and compares it to the main learned beats. The monitor classifies the beats based on information obtained from all available leads.

Arrhythmia Template

ASYSTOLE: Ventricular asystole occurs whenever the displayed heart rate drops to zero.

VTAC/ VFIB: Ventricular fibrillation occurs when the ECG waveform indicates a chaotic ventricular arrhythmia.

VTAC: Ventricular fibrillation occurs when six or more ventricular beats are detected when the average heart rate is greater than or equal to 150 beats per minute.

NOTE
The Tachy limit matches the high heart rate limit. If the high heart rate limit is changed, the Tachy limit changes.

Arrhythmia Settings

A. ECG menu		
MENU	Description	Available Settings
A-1. Arrhythmia	Arrhythmia parameter alarm setup menu.	
A-1-1. Arrhythmia Type	Arrhythmia diagnosis level setup menu. OFF: Do not perform arrhythmia	OFF, LETHAL, FULL

	diagnosis. LETHAL: Performs the detection of Asys, VTAC/VFIB, and VTAC at the selected lead FULL: Performs the detection of all 13 arrhythmia.	
A-1-2. Arrhythmia Alarm Condition	Alarm setting menu by arrhythmia type	

Warning

Display Heart Beat Equipment Signal

Heart Beat equipment signal displays when the PACE mode is. The signal appears series form. The signal size or form are meaningless clinically

Number Of Heart Beat

Attention to the animal with heart beat equipment. The heart beat equipment can show heart beat even during arrhythmia continuously. Therefore, do not depend on heart beat alarm excessively.

Warning

VENTRICULAR ARRHYTHMIAS

The arrhythmia analysis program is intended to detect ventricular arrhythmia. This program is not designed to detect trial or supra ventricular arrhythmias. In some cases, it may not be possible to distinguish the presence or absence of arrhythmias. Therefore, doctors should analyze the arrhythmia information like other medical information.

SUSPENDED ANALYSIS

Certain conditions can delay the arrhythmia analysis. Detection and alarms associated with arrhythmias do not occur when arrhythmia conditions are delayed. This message is generated when the arrhythmia analysis is delayed:

LEADS FAULT, ALARM PAUSE, ALL ALARMS OFF, DISCHARGED.

9. SpO_2

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 light are passed through the capillaries of the animal's tongue to detect pulsating waveforms, calculate HR and blood oxygen saturation, and perform alarm functions according to the set alarm value.

Precaution

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

Warning:

- The pulse oximeter cannot be used as an apnea monitor.
- Visually check the attachment state of the sensor frequently and make sure it is properly attached.
- Use only Bionet-designated sensors. Other sensors may not provide adequate protection against defibrillation or may put the animal at risk.
- Disposable accessories (disposable electrodes, transducers, etc.) should be used only once. Do not reuse disposable accessories.

Animal preparation

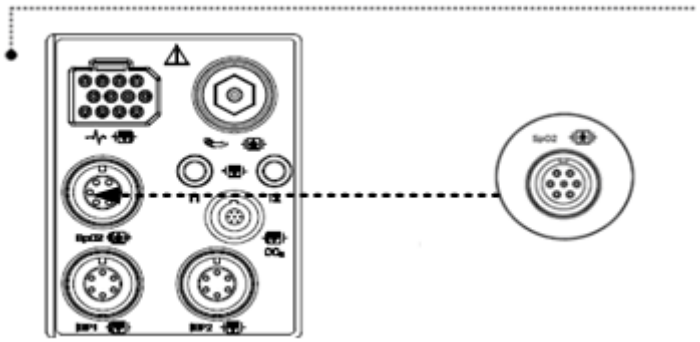
The accuracy of SpO2 monitoring is largely dependent on the strength and quality of the SpO2 signal. Install a sensor at the tip of the animal's tongue for the SpO2 measurement.
Only use sensors provided by Bionet and apply them according to manufacturer's recommendations on a per-sensor basis.
If the 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.

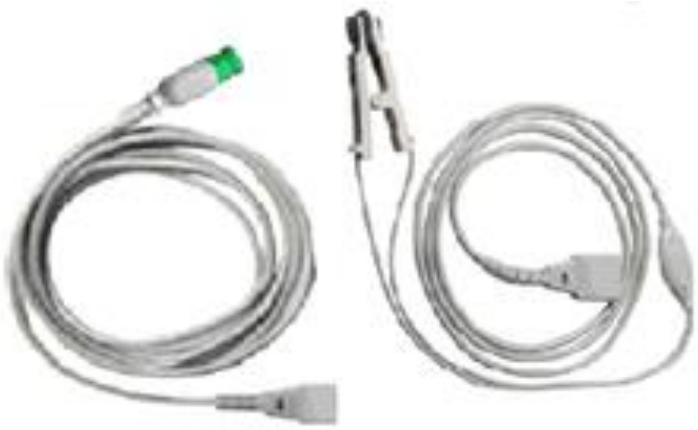
1. Select the sensor type and size that best suits your animal.
2. If the sensor can be reused, please wash it before use for each animal.
3. Position the sensor correctly and attach it to the animal.
4. Connect the sensor to the patient cable.
5. Check the application area of the sensor from time to time. Fix the sensor so that it does not move.

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

SpO_2 Connector

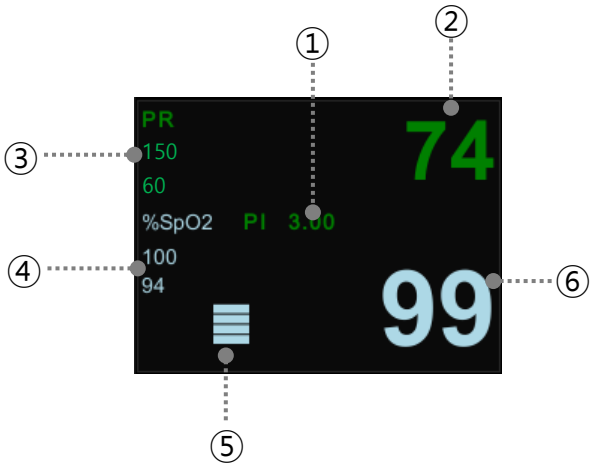


SpO_2 measurement cable



Note
The signal input is a high-insulation port and it is defibrillator proof. The insulated input ensures animal safety and protects the device during defibrillation and electro surgery.

Display



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

The current SPO_2 value and the derived pulse rate (RATE) are displayed as shown above. The block set indicates the strength of the signal (ten block bars indicate the strongest signal). The SPO_2 measurements are averaged over a 6-second period.

The monitor display is updated every second.

Note
SpO_2 WAVE SIZE changes automatically.

Signal and Data Validity

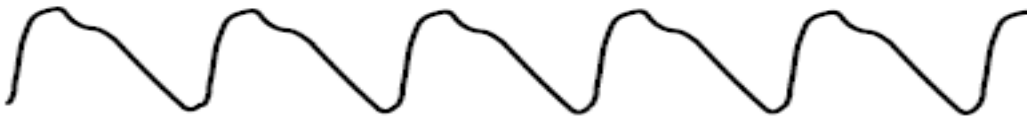
It is extremely important to determine that the probe is attached to the animal correctly and the data is verifiable. To make this determination, three indications from the monitor are of assistance—signal strength bar, quality of the SPO_2 waveform, and the stability of the SPO_2 values. It is critical to observe all three indications simultaneously when ascertaining signal and data validity.

Signal Strength Bar

The signal strength bar is displayed within the SPO_2 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 SPO_2 Waveform

Under normal conditions, the SPO_2 waveform corresponds to (but is not proportional to) the arterial pressure waveform. The typical SPO_2 waveform indicates not only a good waveform, but also helps the user find a probe placement with the least noise spikes present. The figure below represents a good SPO_2 waveform



Good Quality SPO_2 Waveform

If noise (artifact) is seen on the waveform because of poor probe placement, the photo detector 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 SPO_2 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 figure below.) In order to reduce motion noise, you should

carefully look at the SpO2 waveform and check the probe position in the animal.

SPO_2 Waveform with Artifact

Stability of SPO_2 Values

The stability of the displayed SPO_2 values can also be used as an indication of signal validity. Messages are provided in the SPO_2 values window to aid you in successful SPO_2 monitoring.

WARNING
In the monitoring of animal, it is possible that adverse conditions may lead to a disturbed signal going unnoticed. In this situation, artifacts can simulate a plausible parameter reading, so that the monitor fails to sound an alarm. In order to ensure reliable animal monitoring, the proper application of the probe and the signal quality must be checked at regular intervals.

SPO_2 Settings

A. SPO_2 menu		
MENU	**Description**	**Available Settings**
A-1. Alarm	SPO_2 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-PULSESEARCH	
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	SPO_2 waveform display setting	
A-3-1. SWEEP SPEED	It can set the speed of SPO_2 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 SPO_2 parameter window during monitoring.

CHECK PROBE

Occurs when a reusable probe separates from an animal. Check out the Probe.

PULSE SEARCH

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

POOR SIGNAL

The SPO_2 signal is too low and no SPO_2 data is displayed. This can be due to a low veterinary animal pulse, animal motion, or some other interference. Check the animal and the probe.

LOST SIGNAL

SPO_2 data continues to be displayed, but the quality of the signal is questionable. Check the animal and the probe.

ARTIFACT

It indicates that something happened to the pulses; determine if the artifact is abnormal or irregular

10. Respiration

Overview

The monitor measures impedance respiration by sending a high frequency current between two ECG electrodes placed on the animal's chest. At inspiration and exhalation, the electrical resistance (impedance) between the electrodes changes with the contraction and expansion of the chest. You can get respiratory waveforms and beats from these impedance changes.

The monitor can use ECG leads I or II for respiratory detection regardless of the lead selected for QRS processing. The measuring range for impedance breath monitoring is 0 to 155 breaths per minute. The alarm setting range is 5 to 150 breaths per minute.

RESP Precaution

Safety and efficacy of respiration measurement methods for apnea detection, especially apnea of premature babies and apnea of infants, have not yet been established.

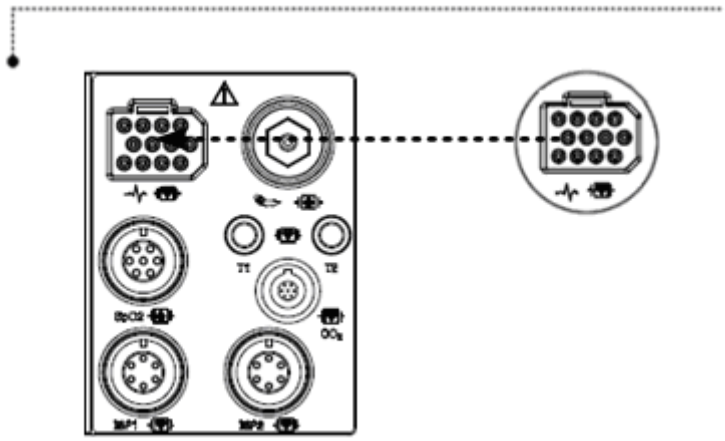
- This device does not monitor obstructive apnea. Animals in a breathing crisis should be closely monitored.
- Impedance breath monitoring should not be considered the only way to detect a stop in breathing. Bionet recommends monitoring of additional parameters, such as $EtCO_2$ and SpO_2, that indicates the animal's oxygen supply status.
- If you use an ESU block or cable, the impedance breathing monitor may not function and the pacemaker detection may be impaired. If pacemaker detection is activated, ESU interference may be detected as pacemaker extremes.
- Large amplitude pacemaker pulses (greater than 100 mV) can interfere with the monitor's respiration measurement or detection capabilities

Animal Preparation

Skin preparation and lead placement must be properly and carefully monitored in impedance breath monitoring. Doing so will produce reliable results. Follow the same recommendations as for ECG monitoring.
In general, the lead should be placed as clean as possible with the 60Hz noise minimized to make it possible to generate a signal. To improve the RESP signal, use a 5-lead cable set (RL as a neutral electrode). It is recommended that the lead be placed in the maximum expansion and contraction range of the lung, especially if deep breathing is involved.
Avoid the liver and the ventricles of the heart to prevent 60Hz noise from pulsatile blood circulation.

Respiration Connector and Measurement Cable

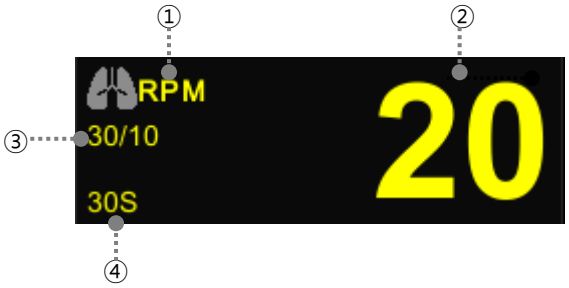
Respiration connector



Respiration cable

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

Display



①	Breath indicator: Indicates the detected breath
②	Breathing number: Displays the number of respirations per minute
③	Respiration alarm limit: Indicates respiration limits
④	Apnea Limit Setting: Apnea limit sign

RESP Settings

A. RESP Menu		
Menu	**Description**	**Available Settings**
A-1. Alarm	RESP Alarm setting menu	
A-1-1. Parameter Alarm Limit	RR, APNEA Parameter alarm, level, 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
A-3. Apnea Detect	A menu to setup APNEA alarm display	ON/OFF

11. NIBP

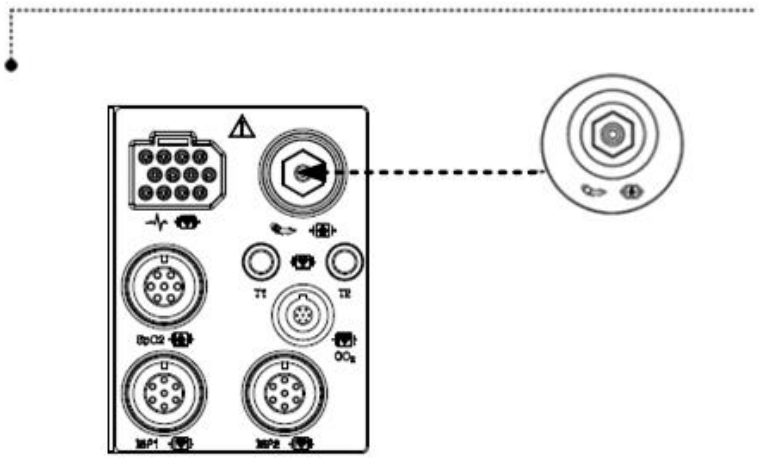
Overview

The monitor can acquire and process non-invasive blood pressure (NIBP) signals and display the numerical values. NIBP can also be used during electrosurgery

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).

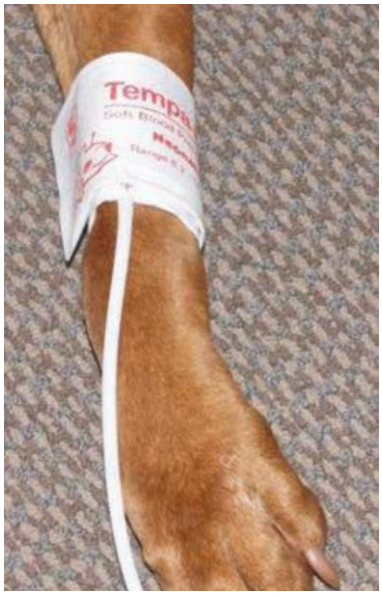
The hose connects the cuff to the monitor to determine the contraction, expansion and mean blood pressure of animals. The monitor can start the blood pressure measurement with set intervals, or persist for more than 5 minutes.

NIBP Connector



Cuff (For USA Only)

POSITION OF CUFF (DOG)



Incorrect Placement

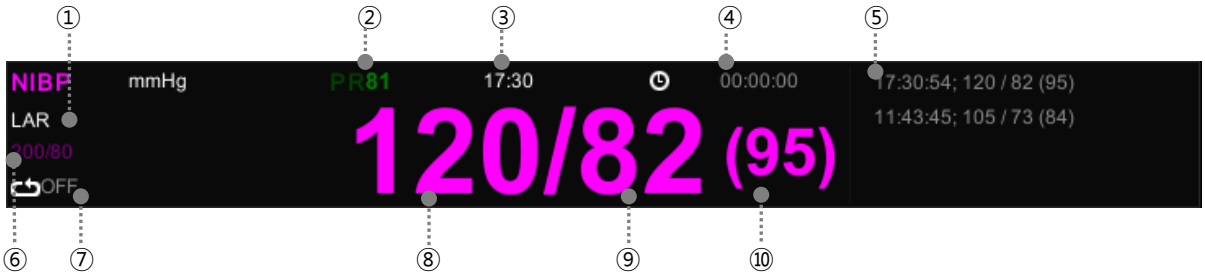
Correct Placement

The hose should line up with the vessel that you are trying to measure. When using a leg, this is on the underside (backside) of the leg.

Note: The cuff must be at the same level as the patient's heart for best accuracy.

Note
As the value of NIBP can vary according to the age and sex of an animal, the user needs to set correct data in the Parameter Menu before measurement.

Display



①	Measurement Cuff type.
②	Pulse rates: Indicates pulse rate.
③	Measurement time: Indicates the completion time of measuring.
④	Measure time: Indicates the schedule counter time of measuring.
⑤	Current Measurement data: Indicates recent measurement.
⑥	Systolic Alarm limit: Indicates alarm limit of blood pressure.
⑦	Interval Time: indicates interval time when the blood pressure is measured.
⑧	Systolic blood pressure: Indicates the maximum limit of blood pressure.
⑨	Diastolic blood pressure: Indicates the maximum limit of blood pressure.
⑩	Mean blood pressure: Indicates the maximum limit of 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-AIRLEAK, NIBP-EXCESSIVEMOTION, NIBP-SYSTEMFAULT	
A-2. Cuff Size	A menu to select cuff size * When changing the cuff, be sure to adjust the actual size of the cuff and the size of the cuff set on the equipment.	SMALL (1-2) MEDIUM (3-4) LARGE (5>)
A-3. Inflation	A function to set the range that is usually used by setting pressure at the beginning because it can cause pain for the animal when the equipment is turned on and pressurized to the maximum pressure range at the initial pressurization. Default Settings value:	SMALL: 60-140mmHg MEDIUM: 80-140mmHg LARGE: 120-250mmHg

	SMALL: 60-140mmHg MEDIUM: 80- 140mmHg LARGE: 120-250mmHg	
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 animal's blood pressure value. Every Time: Whenever blood pressure is measured, pressurize to the set pressure value every time	Once, Every Time
A-5. Measure Interval	A menu to set Interval time when the blood pressure is measured. After setting INTERVAL, you must press NIBP KEY to start NIBP measurement.	1min, 2, 3, 4, 5, 10, 15, 20, 30, 60, 90, 2 hours, 4, 8.
A-6. VITAL SIGN REVIEW	Record the last 40 blood pressure readings	

Warning
Check periodically to see if the circulation from the cuff to the distal part of the animal's arm is good. 1minute and 2minute intervals when using automatic measurement, check the animal'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. When changing the cuff, be sure to adjust the actual size of the cuff and the size of the cuff set on the equipment.

Safety Considerations

Software and Hardware for Cuff pressure Blocking

The cuff is automatically reduced when the measurement time is longer than two minutes in Cat/ Dog/ Horse mode and more than 90 seconds in Puppy mode. Extension limits are set for all animal categories to prevent overpressure on the animal.

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 animal. Cuff sizes are clearly marked on the cuff. Measure the circumference of your animal's limb. Use only Bionet provided cuffs with your monitor.

Warning
Ensure you do not block the connecting hose when you put the cuff on the animal. Check cuff or hose connection for leaks periodically. Measurements can be inaccurate if air leaks. NIBP cannot be taken under all conditions. Even manual methods, employing a sphygmomanometer and stethoscope, will not work on unstable or active animals. Pressurization of the CUFF can temporarily cause loss of function to simultaneously used monitoring medical electrical equipment on the same limb Check that operation of the NIBP does not result in prolonged impairment in the circulation of the blood of the animal

Warning
When placing the cuff on an animal, be careful not to bend the NIBP extension tube or the NIBP cuff connection hose. Check periodically the cuffs and connecting hoses. Leaking air can cause inaccurate measurements

Status Messages

An error message is displayed in the following situations

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

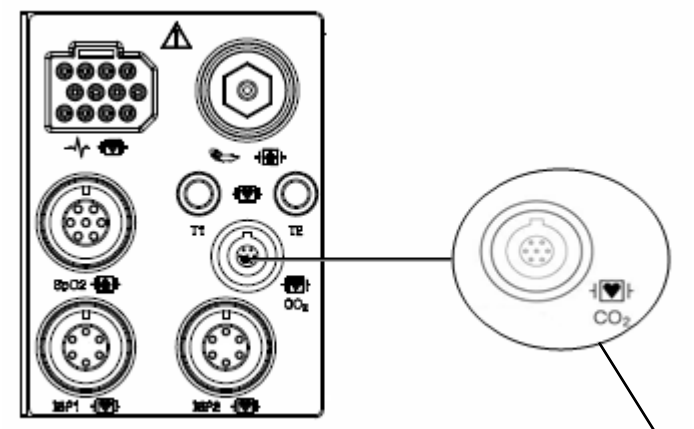
12. $EtCO_2$

Overview

The BM Series monitor measures concentrations of end-tidal CO_2 ($EtCO_2$) when this option is enabled and the $EtCO_2$ module is connected to your monitor.
The $EtCO_2$ module can perform mainstream measurements in all monitoring modes and as well as sidestream measurements

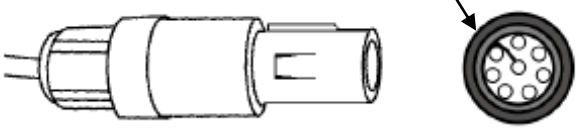
$EtCO_2$ connector position and Accessory (Sidestream, Respironics)

$EtCO_2$ connector



LoFlo sidestream CO_2 sensor and connector

Sidestream sensor



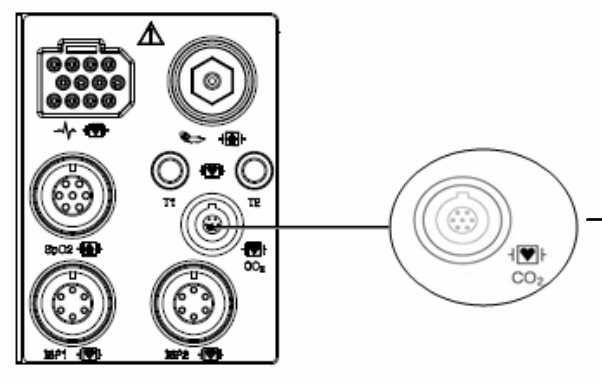
Sidestream sensor connector

Sidestream $EtCO_2$ Accessories

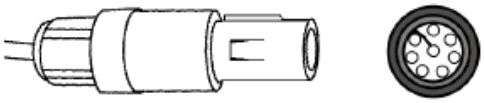
Intubation accessories			
3473ADU-00		Airway Adapter Kit w/ Dehumidification Tubing	Intended for use when monitoring Large animals (Cat / Dog / Horse) with ETTube sizes > 4.0 mm
3473INF-00		Airway Adapter Kit w/ Dehumidification Tubing	Intended for use when monitoring Small animals (Puppy) with ETTube sizes ≤ 4.0 mm

$EtCO_2$ Placements and Accessories (Mainstream, Respironics)

$EtCO_2$ connector



CAPNOSTAT 5 mainstream CO_2 sensor and connector



Mainstream connector

Mainstream sensor

Mainstream $EtCO_2$ Accessories

Intubation animal Airway adaptor		
Model	Picture	Description
6063-00		Large animals (Cat / Dog / Horse) (Disposable)
6312-00		Small animals (Puppy) (Disposable)

Precaution

Warning
• Animal monitors that measure CO_2, anesthetics, and/or respiratory mechanics cannot be used as apnea monitoring and/or recording equipment. While these products provide an apnea alarm, the alarm condition begins with the elapsed time from when the last breath was detected. However, there are a number of physiological indications for the clinical diagnosis of real apnea events. • The CO_2 alarm is not activated until the first breath is detected after the monitor is turned on or the animal is discharged. • Accuracy of the CO_2 and breathing rate measurements may be impaired due to improper attachment of the sensor or due to certain animal 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, make sure all the connections are secure 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. • 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 animals. This is to ensure that the airway adapter does not interfere with the function of the suction catheter.

Sampling method

Connecting the CAPNOSTAT® 5 CO_2 Sensor to the Host System

1. Insert the CAPNOSTAT 5 CO_2 Sensor connector into the receptacle of the host monitor as shown in Figure 1.

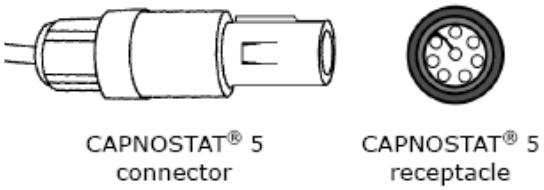
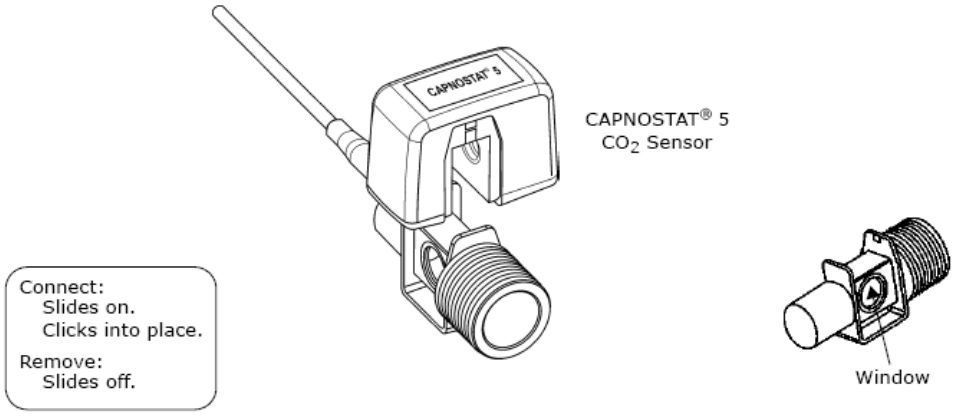


Figure 1

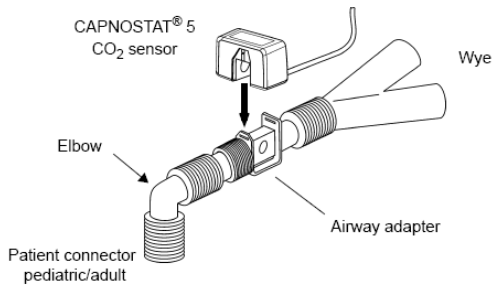
2. Make sure the arrows on the connector are at the top of the connector and line up the two keys of the connector with the receptacle and insert.

3. When unplugging the connector, grasp the connector body and pull it out to release the locking device. Be careful not to pull the sensor cable out, as this may damage the equipment

Connect the Mainstream CO2 Sensor to the Airway Adapter as shown below:



Connect the Airway Adapter to the Ventilation System as shown below, then connect the Mainstream CO2 Sensor to the Airway:



How to connect a sidestream accessory:

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.

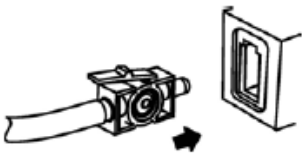


Figure 1

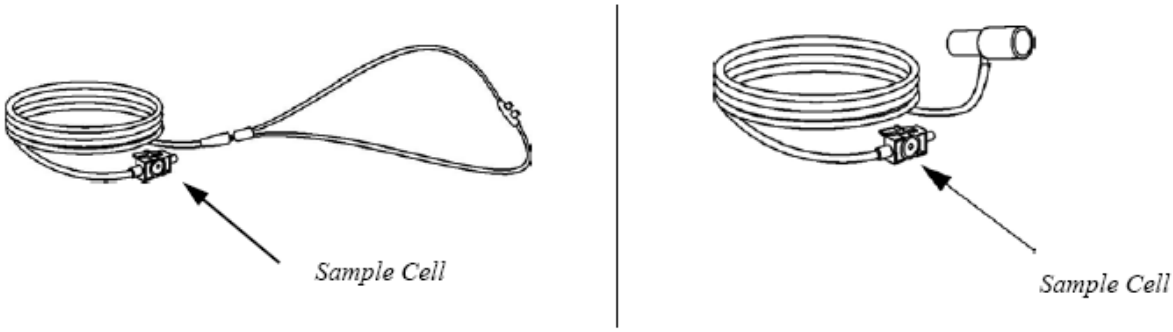


Figure 2

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 sample cell from the sample cell receptacle, press down on the locking tab and pull the sample cell from the receptacle.

Display

①	$EtCO_2$ CO_2 concentration alarm upper and lower limit value display
②	Apnea alarm set time in seconds
③	Display CO_2 concentration value at exhalation
④	Display the carbon dioxide concentration value at inhalation
⑤	Show respiratory rate per minute

$EtCO_2$ Setup

A. $EtCO_2$ menu

Menu	Description	Available settings
A-1. ALARM	$EtCO_2$ Alarm Setup Menu	
A-1-1. PARAMETER ALARM LIMIT	$ETCO_2$, 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-CHECKLINEDISCONNECT ETCO2-CO2INVALID ETCO2-OVERRANGE ETCO2-ZEROREQUIRED ETCO2-SYSTEMFAULT ETCO2-TEMPUNSTABLE	
A-2. DISPLAY OPTION	$EtCO_2$ Parameter 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(5.3vol%) 50mmHg(6.6 vol%) 60mmHg(7.9 vol%) 80mmHg(10.5 vol%) 100mmHg(13.2vol%) 150mmHg(19.7 vol%)
A-2-3. Fill	Fill on or off	ON/OFF
A-2-4. GAS PREESURE UNIT	Select gas measurement unit.	mmHg kPa vol%
A-2-5. USE ONE GAS UNIT	Select whether or not to set pressure units by gas type Unit setting menu by gas type appears when off.	ON/OFF
A-3. APNEA DETECT	APNEA detection menu	ON/OFF
A-4. MODULE INFORMATION	Module Information Menu	
A-4-1. SENSOR PN	The sensor part number	PNXXXXXX
A-4-2. OEM ID	The id is a 7-bit identifier which is set at the factory to a unique value for each OEM.	0X01
A-4-3. SENSOR SN	The serial number of the module.	
A-4-4. H/W VERSION	The hardware version of the module.	
A-4-5. TOTAL USAGE TIME	Total use time of the module.	

A-4-6. LAST ZERO TIME	This is the total time that has elapsed with the sensor in service since the last zero.	Min. display
A-4-7. PUMP TOTAL TIME	This is the total time the pump has been on. (LoFlo only)	Min. display
A-4-8. PUMP MAX TIME	This value indicates the maximum rated lifetime of the sampling pump. (LoFlo only)	Min. display
A-5. MODULE SETUP	Module Information Menu	
A-5-1. 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 $ETCO_2$ value for the last two breaths.	1 BREATH, 10SEC, 20SEC
A-5-2. 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-5-3. 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 can run immediately after exiting the sleep mode. Mode 2 will require the Capnostat to go through its warmup sequence when exiting this mode and a delay will be introduced until the system has stabilized.	NORMAL MODE TURNOFF MODE POWER SAVING
A-5-4. BARO. PRESSURE	This setting is used to set current	760mmHg

	Barometric Pressure.	
A-5-5. 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-5-6. O2 COMPENSATION	Use this setting to correct for the compensation of the gas mixture administered to the animal.	
A-5-7. ANESTHETIC AGENT	Anesthetic agent is ignored when the balance gas is set to helium.	
A-5-8. ZERO TYPE	W 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.	ROOM AIR 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 CO_2 1. Set the Host to the zeroing function. 2. Connect the CAPNOSTAT 5 CO_2 Sensor 3. Place the CAPNOSTAT 5 CO_2 Sensor onto a clean and dry CO_2 adapter that is exposed to room air and away from all sources of CO_2, including the ventilator, the animal'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	$EtCO_2$ MODULE initializing.	

Note
For best result, connect the CAPNOSTAT 5 CO_2 Sensor to an adapter and wait 2 minutes before performing the Adapter Zero procedure.

Status Message

Following is a list of some of the message that may appear on the monitor when monitoring CO_2. 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 104° F
- 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 warmup 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 zero more than once, a possible hardware error may exist.

*** CO_2 OUT OF RANGE**

- Cause: The value being calculated is greater than the upper CO_2 limit (150 mmHg)

- 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 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.	Verify module connections Service request

$EtCO_2$ measurement failure

$EtCO_2$ 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 the device in an environment of using nitrous oxide gas in high concentration 2. When using the device in an environment where there are abrupt temperature changes 3. When using the device in an environment with severely high humidity.

Caution
● The measured values may be inaccurate when using this equipment for animals that have very fast or irregular respiration. ● When measuring CO_2 from the animal under the anesthesia, check it when gas mixture comes in. Otherwise, the measured result values may be inaccurate. ● When using an anesthesia machine that uses a volatile anesthetic, CO_2 values may be inaccurate.

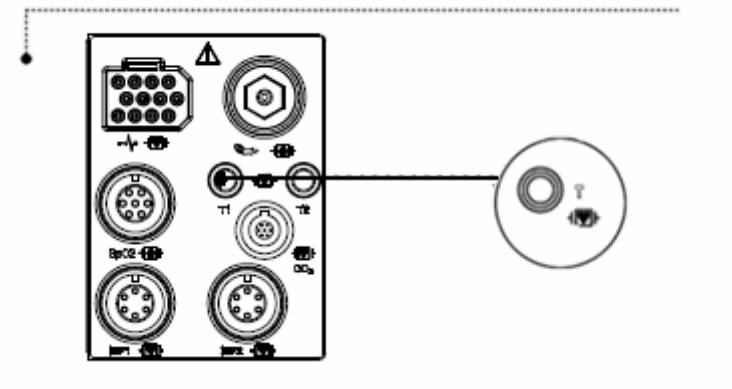
13. Temperature

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 translating the changes into electric signals.

Temperature Connector and Measuring Cable

Temperature Connector



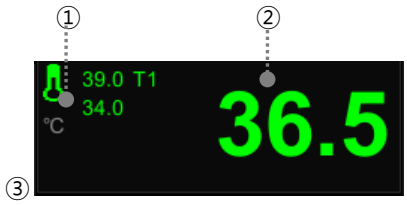
Temperature Measuring Cable

Warning
The temperature sensor must be connected in the correct position and secured so as not to be separated from the animal. The temperature cable should be attached to the monitor.

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

Warning
To measure the ambient temperature, connect the probe to the ankle or wrist. If the animal is sweaty or moving a lot, fix the temperature sensor with surgical tape

Display



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

Temperature Settings

A. Temp menu

MENU	Description	Available Settings
A-1. Alarm	Temp Alarm Settings menu	
A-1-1. PARAMETER ALARM LIMIT	TEMP1, TEMP2, DELTA TEMP 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	

14. Multi-Gas Monitoring

Overview

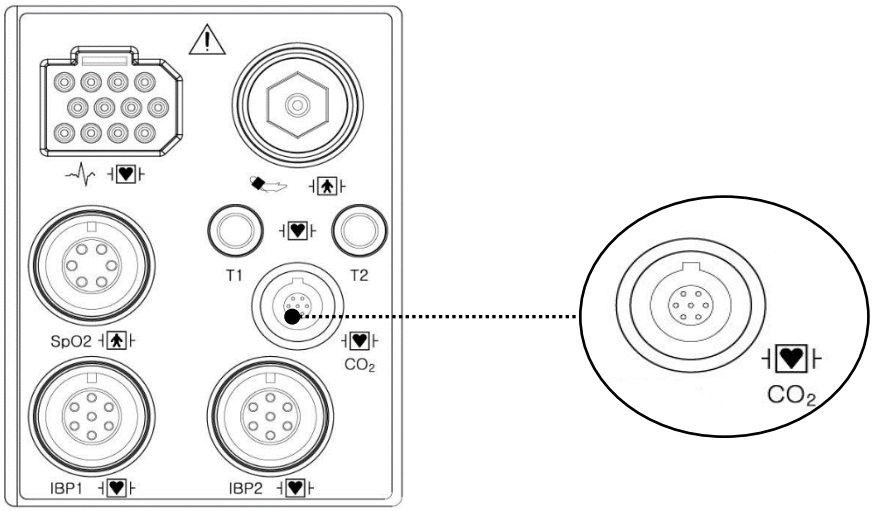
The Multi(Dual)-Gas module extracts gas from animal respiratory gases. It continuously measures the concentration of CO2, N2O and anesthetics (Halothane, Isoflurane, Enflurane, Sevoflurane and Desflurane) as well as O2 concentration (optional) in respiratory gases. All measured values as well as derived values are passed to the monitor.

BIONET offers the following Multi(Dual)-Gas modules.

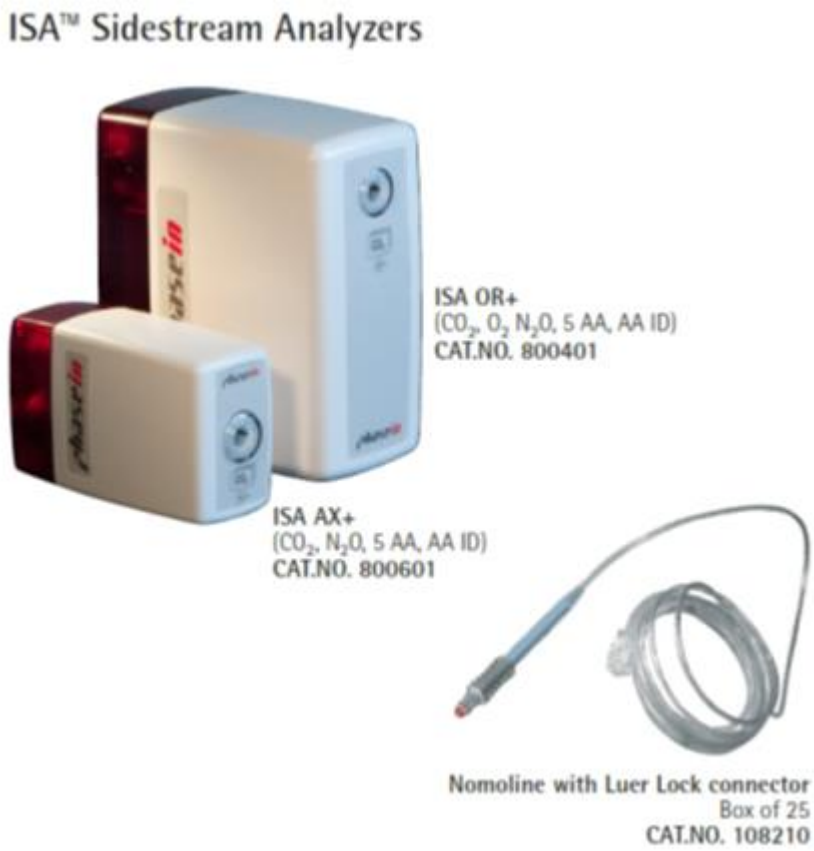
- ISA Mainstream Analyzer (Masimo)
- ISA Sidestream Analyzer (Masimo)
- BMGA Sidestream Analyzer (Bionet)

Multi gas connector position and accessory (Mainstream, Sidestream, Masimo Sweden AB)

Connector position



Accessory



ISA Analyzers

Product	Description	Catalog No.
ISA CO_2	CO_2	800101
ISA CO_2 Module	CO_2	700101
ISA AX+	CO_2, N_2O, 5 AA, AA ID	800601
ISA AX+ Module	CO_2, N_2O, 5 AA, AA ID	700601
ISA OR+	CO_2, O_2, N_2O, 5 AA, AA ID	800401
ISA OR+ Module	Includes the following: · ·One 700601 ISA AX+ Module · ·One 100835 Servomex Pm1116 Paramagnetic O_2 Sensor, calibrated	700401

	(thus requires no calibration after assembly) ・・Tubing, Y-connector and cable for connection between the Pm1116 and ISA AX+ Module.	
ISA OR+ Sprint Module	Includes the following: ・・One 700601 ISA AX+ Module ・・One 100836 Servomex Paracube Sprint O_2 Sensor, calibrated (thus requires no calibration after assembly) ・・Tubing and cable for connection between the Paracube Sprint and ISA AX+ Module.	700402

Options

Product	**Description**	**Catalog No.**
Servomex Pm1116	Paramagnetic O_2 Sensor (will be discontinued)	100835
Servomex Paracube® Sprint	Paramagnetic O_2 Sensor	100836

Consumables

Product	**Description**	**Catalog No.**
Nomoline, Box of 25	Sampling line with male luer lock connector, 2.0m. Intubated animals. Single animal use.	108210
Nomoline Adapter, Box of 25	Sampling line with female luer lock connector, 0.15m. Intubated/spontaneous breathing animals. Multi animal use.	108220
Nomoline Airway Adapter Set, Box of 20	Sampling line with straight airway adapter, 2.0m. Intubated animals. Single animal use.	108230
Nomo Extension, Box of 25	Sampling line with male luer lock connector, 2.0m. Connects to Nomoline Adapter. Single animal use.	108240

T-adapter, Box of 25	Straight airway adapter with female luer lock connector. Single animal use. Connects to Nomoline and Nomo Extension.	108250

Accessories

Product	**Description**	**Catalog No.**
ISA Analyzer Clamp Adapter	Adapter for mounting a "plug-in and measure" gas analyzer to a standard clamp or ISA Modura Holder	100845
ISA Analyzer Modura Holder	Adapter for mounting a "plug-in and measure" gas analyzer to a standard rail clamp	100840
ISA Module Tubing	5-meter polyurethane tube, ID 1.6 mm / OD 3.2 mm. (Tygothane C210-A 1.6/3.2). Pneumatically connects the ISA build-in module to the O_2 sensor. Also connects the ISA build-in module with the "ISA Gas Outlet Kit" 100803 and the "ISA Reference Gas Inlet Fitting" 100804	100801
ISA Gas Outlet Kit	Each bag is sufficient for 25 ISA built-in modules. The outlet barb (including mounting nut and O-ring) used on all ISA "plug-in and measure" analyzers to connect an ID 2.4 mm (3/32") tube for returning the gas to the breathing circuit or to the scavenger. To connect the outlet to the ISA build-in module, "ISA Module Tubing" 100801 could be used.	100803
ISA Reference Gas Inlet Fitting	Comes in pack of 25. For ISA built-in modules only. The fitting should be used to ensure that the reference air needed for the ISA's zeroing is taken from the outside of the housing that ISA is mounted in. To remove particulates and avoid water or cleaning fluids from entering the ISA, the "ISA Reference Gas Inlet Filter" 100805 should be used in combination with the fitting.	100804

	To connect the reference gas inlet fitting to the ISA build-in module, "ISA Module Tubing" 100801 could be used.	
ISA Reference Gas Inlet Filter	Comes in pack of 25. For ISA built-in modules only. The filter should be used in combination with the "ISA Reference Gas Inlet Fitting" 100804 to remove particulates and avoid water or cleaning fluids from entering the ISA during the zeroing procedure.	100805
RS-232-M, open end cable, Box of 25	Adapter cable; male RS-232 to open-end. Cable length 30 cm. Delivered in boxes of 25	100270
IRMA/ISA USB serial converter	Integration tool used to connect and power the IRMA/ISA RS-232 connector to a compatible USB port. Comes with driver routines and extension cable. Not for clinical use.	100310
Calibration Gas Regulator Kit	Gas regulator kit for ISA/IRMA/EMMA. Fits PHASEIN´s calibration gas bottles 900170, 900470; Philips´s calibration gas bottle M1662A; GE Healthcare´s calibration gas bottles REF 755583, REF 755580	900910
Calibration Gas, CO_2	For ISA CO2, IRMA CO_2 and EMMA Content: 5% CO_2, 20.9% O_2 bal N_2	900170
Calibration Gas, AX+/OR+	For ISA AX+/OR+ and IRMA AX+ Content: 5% CO_2, 2% DES, 42% N_2O, 51% O_2	900470

ISA Sidestream gas analyzers

ISA Sidestream gas analyzers are intended for the monitoring of intubated as well as spontaneously breathing animals. The ISA analyzers are available in various configurations, ranging from capnography (CO_2) only to multi-gas analyzers measuring carbon dioxide (CO_2), nitrous oxide (N_2O), oxygen (O_2), and five anesthetic agents with dual agent identification capabilities. The ISA analyzers have been specially designed to be extremely easy to integrate in any host device for display of real time and derived breathing gas data.

The ISA sidestream analyzers are available as stand-alone "plug-in and measure" analyzers or build-in modules.

ISA CO_2

The ISA CO_2 analyzers are low flow sidestream gas analyzers, designed for routine clinical use in environments that place special demands on the product's ruggedness. Its low power consumption and fast rise-time makes the ISA CO_2 ideal for any application, ranging from the OR and ICU to transport monitoring of animals.

ISA AX+ and ISA OR+

The ISA AX+ are low flow sidestream multi-gas analyzers designed to monitor respiratory concentrations of CO_2, N_2O, and gas mixtures containing any two of the five anesthetic agents Halothane, Enflurane, Isoflurane, Sevoflurane, and Desflurane in the OR and the ICU. Its low sampling flow and low agent identification threshold makes the ISA AX+ a perfect choice for animal applications, as well as for the monitoring of infant animals with low tidal volumes and high respiratory rates.

ISA OR+ sidestream analyzer offers the same features as ISA AX+, with the addition of oxygen measurement capabilities by means of an integrated paramagnetic O2 sensor.

Nomoline Family sampling lines

Nomoline Family sampling lines incorporate a unique water separation (**NOMO**isture) section, which removes condensed water. The NOMO section also incorporates a bacteria filter which protects the gas analyzer from water intrusion and cross contamination.

The design of the Nomoline Family sampling lines ensures a smooth, uninterrupted sample gas flow resulting in gas measurements with short response times.

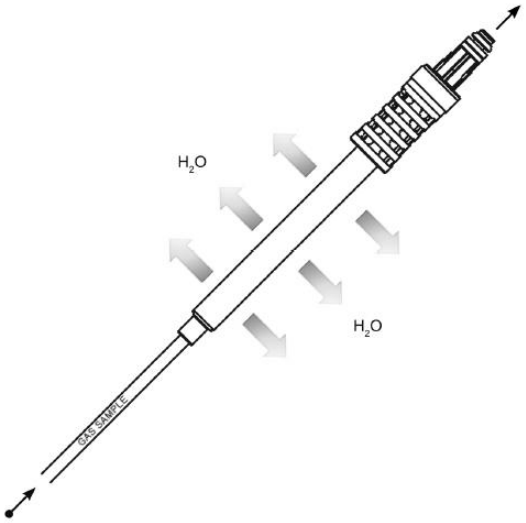
Sampling

A sidestream gas analyzer continuously removes a gas sample flow from the respiratory circuit, for example a nasal cannula, a respiratory mask or the Y-piece of an intubated animal. The gas sample is fed through a sampling line to the gas analyzer. The sampled gas is usually warm and humid and cools down in contact with the wall of the sampling line. Water therefore condenses in the form of droplets on the inner wall of the sampling line. These droplets could potentially occlude the sampling line and interfere with the gas measurement.

The Nomoline Family

To overcome the shortfalls of current gas sampling solutions, the Nomoline Family sampling lines have been developed for the ISA sidestream gas analyzers.

Unlike traditional solutions that remove water vapor and collect water in a container, the Nomoline Family sampling lines incorporates a unique water separation (no moisture) section, which removes condensed water. The NOMOsection also has a bacteria filter which protects the gas analyzer form water intrusion and cross contamination.



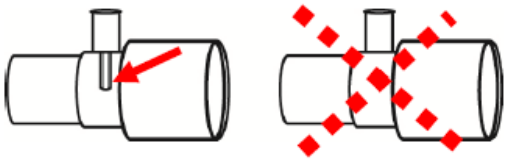
The Nomoline Family sampling lines are specially designed for 50 ml/min low sample flow applications. The Nomoline Family sample lines have a very low dead space that results in an ultra-fast rise time, making measurements of CO_2, N_2O, and anesthetic agents possible even at high respiratory rates. ISA sidestream gas analyzers are therefore suitable for small or large animals.

The Nomoline Family sampling lines are available in the following versions:

The Nomoline Family sampling lines; Nomoline Airway Adapter Set with integrated airway adapter, Nomoline

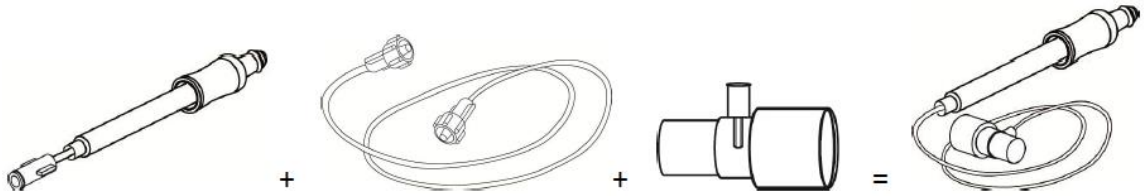
with male Luer Lock connector and the Nomoline Adapter with female Luer Lock connector.

The Nomoline Airway Adapter Set with integrated airway adapter can be used with intubated animals. The Nomoline with a male Luer Lock type connector is compatible with any normal configuration that uses a female Luer Lock connector. When connecting to a T-adapter, be sure to use a PHASEIN T-adapter that samples the gas from the center of the T-adapter (see below).



For optimal water handling, always use T-adapters with the sampling point in the center of the adapter, as shown to the left in the figure above.

The Nomoline Adapter with female Luer Lock connector connects to a standard male Luer to Luer sample line (Nomo Extension) as well as to different kinds of third-party cannulas for oral and nasal sampling. Combining the Nomoline Adapter with the Nomo Extension and T-adapter results in a similar product as the Nomoline Airway Adapter Set as show below



Combining Nomoline Adapter with the Nomo Extension and T-adapter results in a similar product

If using third-party sample tubes or cannulas, make sure that the inner diameter does not exceed 1 mm since this will increase the ISA's total system response time.

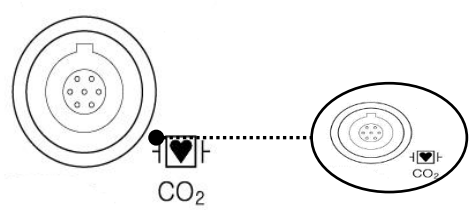
Combining Nomoline Adapter with Nomo Extension and T-adapter produces a product similar to the Nomoline Airway Adapter Set.

If you use a third-party sample tube or cannula, the internal diameter must not exceed 1 mm to increase the overall system response time of the ISA.

Note
Using sample tubes or cannulas with larger inner diameter than 1 mm will increase ISA's total system response time.

Multi-gas connector position and accessory (Mainstream, Masimo Sweden AB)

Connector



The entire IRMA Mainstream Analyzer, weighing only 25 grams, is as small as a pulse oximeter sensor. It is designed using the latest advances in miniaturized components and microprocessor technology to provide a complete mainstream monitoring system with unique versatility and design. The complete system is housed in the sensor head which does not require any hardware modifications of the host device. A clinically diverse selection of disposable airway adapters is available for all your applications.

IRMA™ Mainstream Analyzers

IRMA AX+
(CO_2, N_2O, 5 AA, AA ID)
CAT.NO. 200601

IRMA Airway Adapter
Adult/Pediatric
Box of 25
CAT.NO. 106220

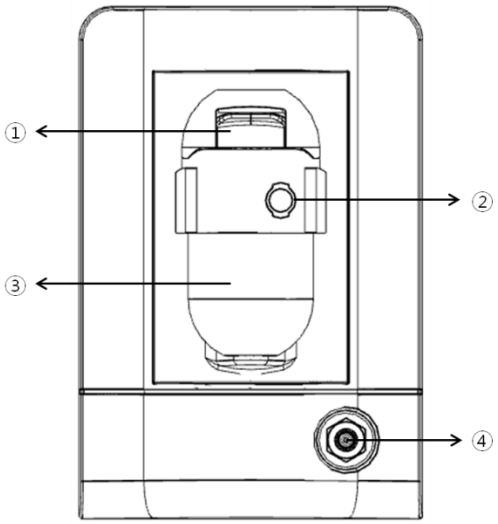
IRMA Airway Adapter
Infant
Box of 10
CAT.NO. 106260

BMGA(Bionet Multi-Gas Analyzer, Bionet)

The Binet Multi-Gas Analyzer (BMGA) is a multi-gas analyzer for analyzing respiratory gases during anesthesia and intensive care. Respiratory gases analyzed are carbon dioxide (CO2), nitrous oxide (N2O), and five anesthetic agents (HAL, ENF, ISO, SEV, DES). The BMGA can analyze oxygen (Oxygen: O2) when combined with a compact, low-power, optional electrochemical oxygen sensor. The unit also features a sampling line for gas sampling and a water trap, a device that removes moisture. The BMGA should be used with a biosignal monitoring device by a medical practitioner who can determine the condition of the animal.

Basic unit

Front view



1	Water Trap Fastening Button: Slide button to fasten the water trap
2	Gas Inlet: A tube into which gas is injected from a sampling line into a multigas analyzer for gas measurement
3	Water Trap: Apparatus for removing moisture that may affect the analysis of respiratory gases in a circle
4	Gas output: A tube exiting the multi-gas analyzer after gas measurement

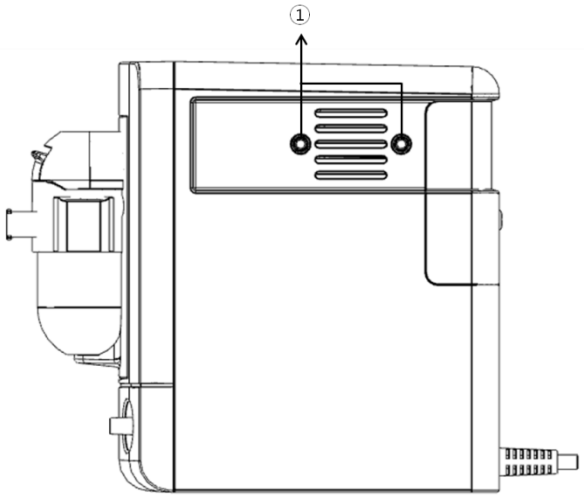
Water Trap Fastening Button: Slide button to fasten the water trap.

Gas Inlet: A tube into which gas is injected from a sampling line into a multigas analyzer for gas measurement.

Water Trap: Apparatus for removing moisture that may affect the analysis of respiratory gases in a circle.

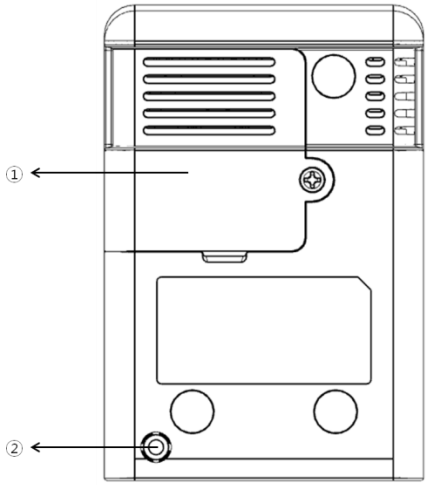
Gas output: A tube exiting the multi-gas analyzer after gas measurement

Right side view



1	Pole Mount Connection: Screw grooves to attach an instrument that can be mounted to a medical pole

Rear view



1	Electro-chemical Oxygen Sensor Cover: Open / close the screw when replacing the oxygen sensor
2	Power Line: A wire to connect power and communication from a host device

Electrochemical oxygen sensor.

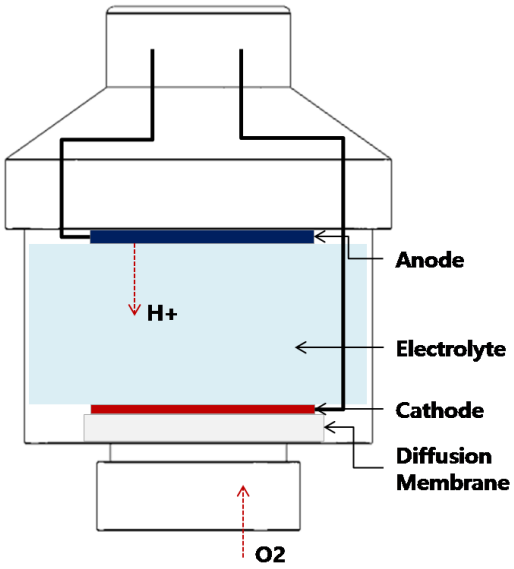
In addition to non-dispersive infrared absorption (NDIR) optical multi-gas measurement, BMGA offers an optional electro-chemical oxygen sensor as described below to provide oxygen measurement

		
OOM202	GO-04	M-04

Warning
Bionet recommends electro-chemical oxygen sensors to ensure proper operation. If you do not use our recommended oxygen sensor, we are not responsible for any problems caused by this. Please use the oxygen sensor recommended by our company.

Effect of Electrochemical Oxygen Sensor Technology

The following points illustrate the electrochemical oxygen sensor technology. The operating principle of oxygen sensor applied to Bionet is galvanic cell method. When oxygen flows from the outside of the sensor to the inside of the sensor, a current that is proportional to the oxygen concentration is generated between the anode and the cathode by the following chemical reaction



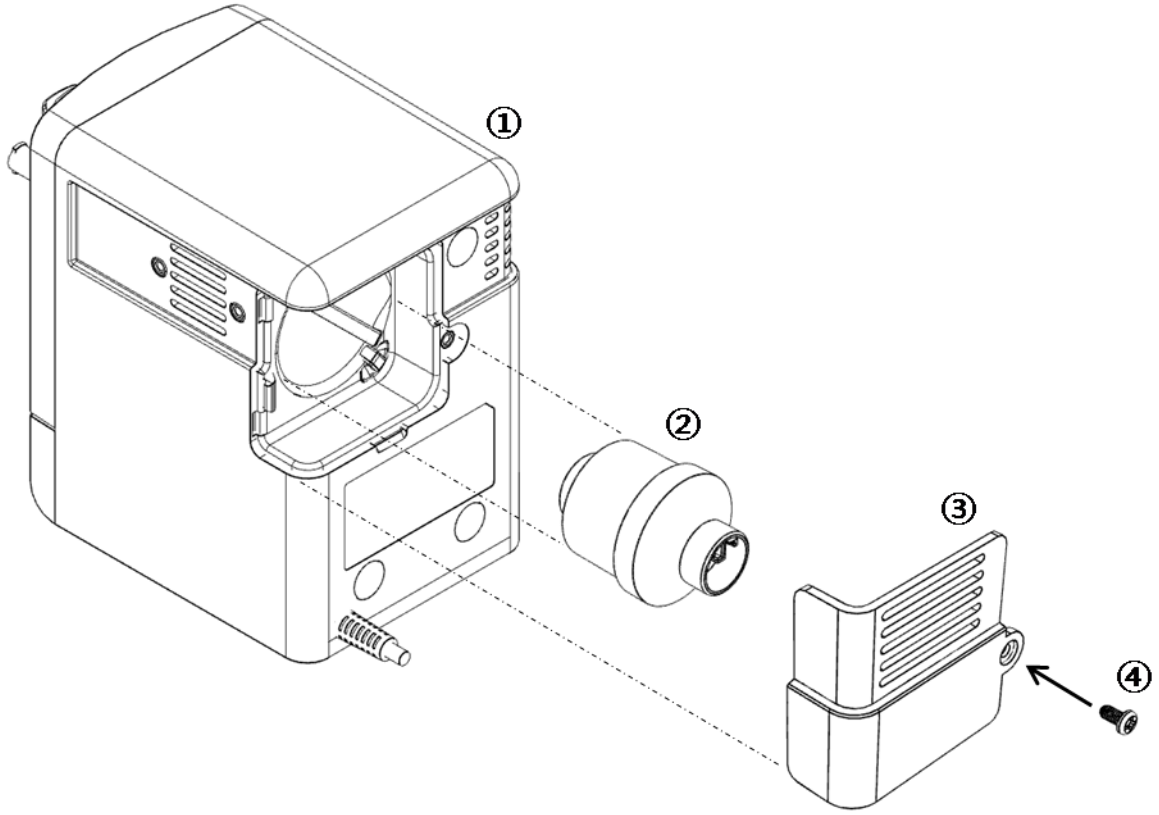
Anodic oxidation: $2Pb + 2H_2O \rightarrow 2PbO + 4H + 4e^-$

Cathodic Reduction: $O_2 + 4H + 4e \rightarrow H_2O$

Oxygen sensors have a reduced lifetime in the atmosphere. Therefore, all oxygen sensors present effective operating time or lifetime. In general, the medical oxygen sensor has an effective operation time of ~ 1000,000 Vol.% H, and the lifespan varies depending on the usage environment

Replace electrochemical oxygen sensor.

Assemble and replace as shown below.



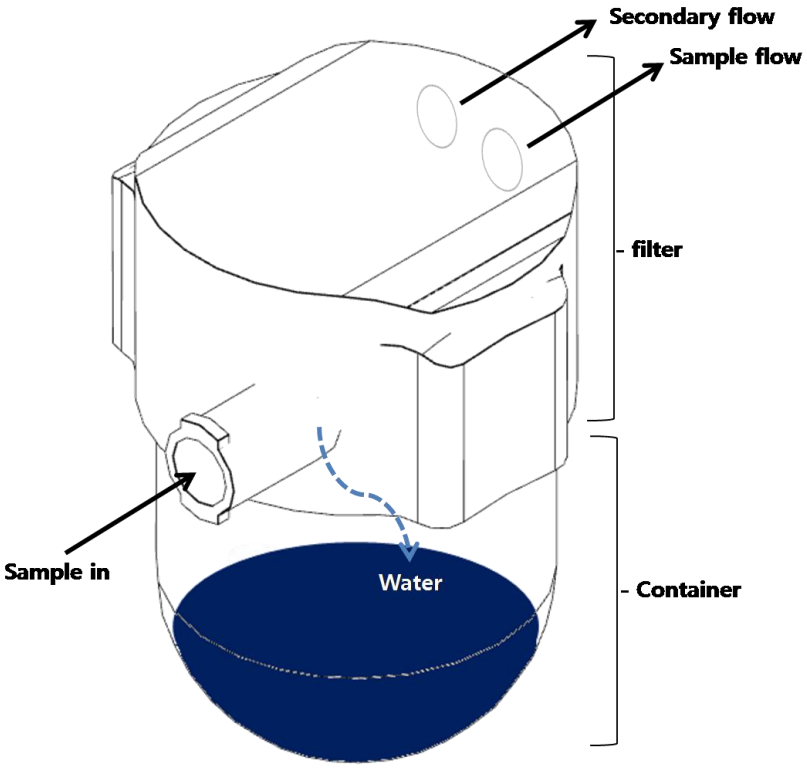
1	BMGA Body
2	Electrochemical Oxygen Sensor
3	oxygen sensor cover
4	screws (M3 * 3)

	
1. Use a screwdriver to loosen the screw on the oxygen sensor cover on the back of the BMGA.	2. Open the cover and there are spaces for oxygen sensor and oxygen sensor connector.
	
3. Connect the oxygen sensor after turning it clockwise.	4. Finally, turn the screw to close the cover.

Water trap

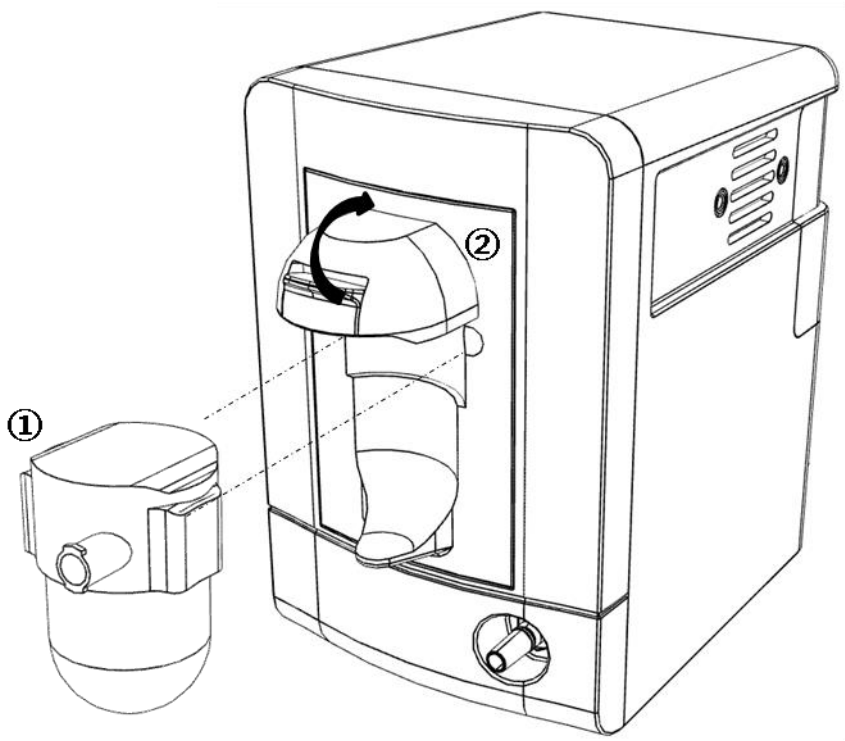
Mindray®'s DRYLINE ™ II water trap is a system that protects contaminants, including moisture, from secretions, dust and bacterial contamination from multi-gas analyzers. The system allows you to constantly monitor the state of anesthesia.

The DRYLINE ™ II water trap is divided into a watertight filter section and a container section filled with filtered water. The container can be separated to empty water, rinsed several times, reused or the entire water trap can be replaced.



Replace water trap information.

Assemble and replace as shown below.



1	Water Trap (DRYLINE™ II)
2	Water Trap Coupling (DRYLINE™ II Receptacle)

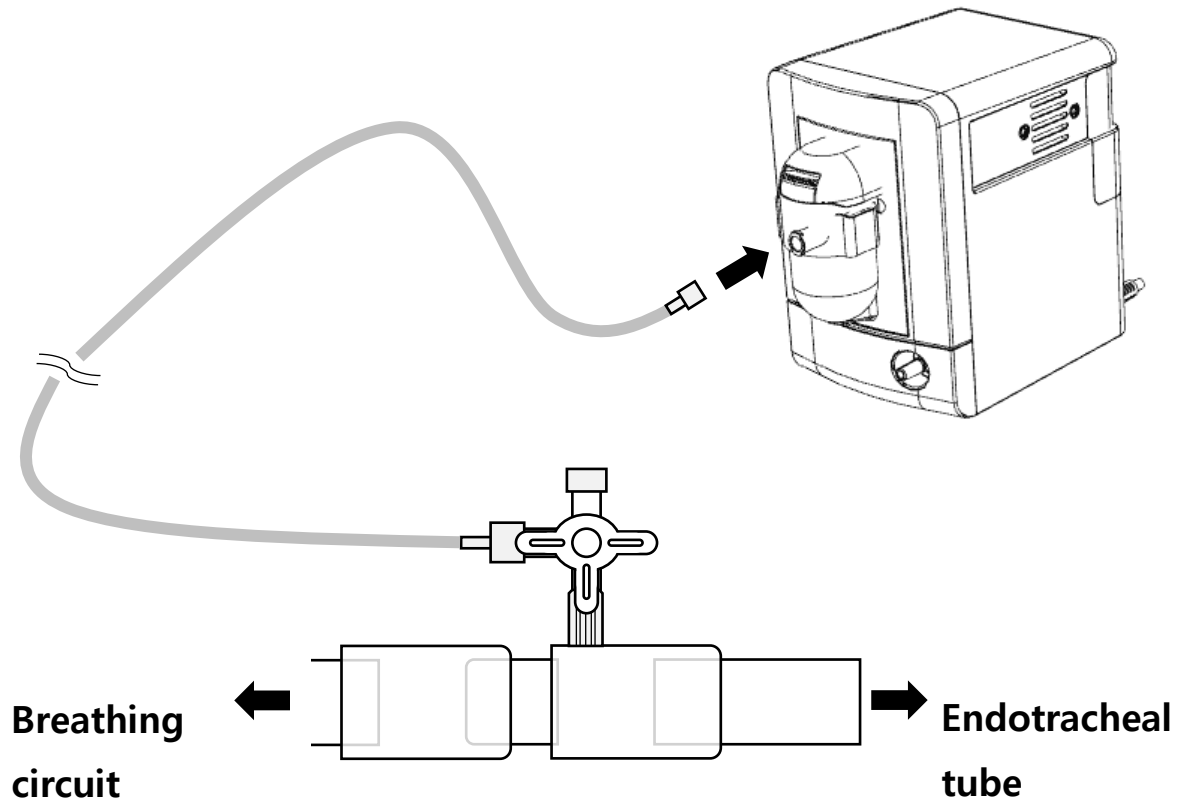
	
1. Prepare the water trap.	2. Attach the water trap to the water trap coupler on the front of the BMGA.
	
3. Insert the water trap so that the slide button on the top of the mating portion rises up.	4. When the slide button is down, the water trap is engaged with the BMGA.

Sample Collection Method.

BMGA, a sidestream multigas analyzer, continuously extracts some gas samples from the respiratory circuit, such as the nasal cannula, the respiratory mask, or the Y tube of an intubated animal. Gas samples are supplied via sampling lines.

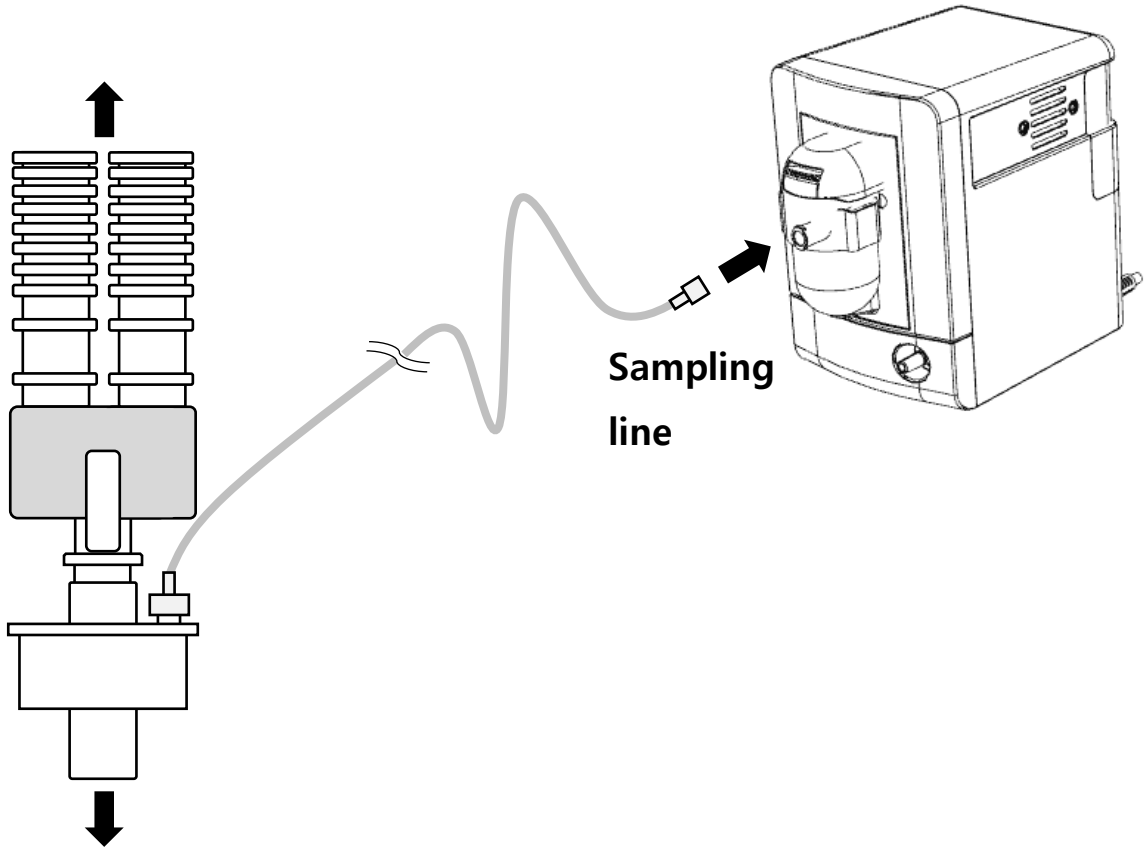
Gas sampling connection in endotracheal tube (E-tube).

Connect the gas supply line and the endotracheal tube with an adapter, then connect a three-way valve (T-type valve) to the male connector in the middle of the adapter. Fasten the sampling line to the middle part of the T-type valve and the opposite part to the BMGA.



Gas sampling connection in Y-piece.

A gas circuit is constructed by connecting the gas supply line and the Y-type pipe. Fasten the sampling line to the male type connector on the top of the HME unit (head and moisture exchange) and the opposite to the BMGA.



Trouble Shooting and Solutions

When the measurement density error is high during operation

① Check the connection of sampling line and water trap and reconnect.

② Check the connection between the water trap and the water trap holder and reconnect them.

③ Perform manual calibration in an unpolluted environment.

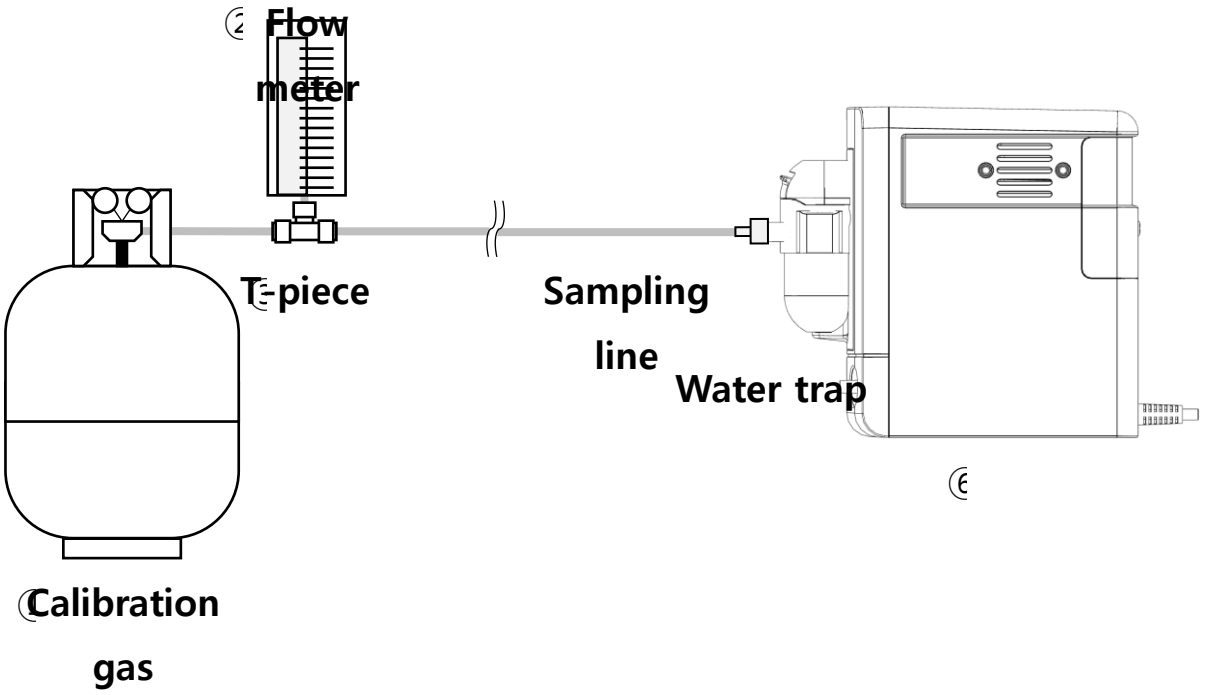
④ If you close the gas input part of the water trap by hand and operate it for a few seconds, "Occlusion" will appear on the host device. At this time, the motor operates strongly and absorbs gas from the gas input part. If the above operation does not appear, please contact our head office for inspection.

Regular inspection

As with all medical equipment, we encourage you to have your device tested regularly once a year for BMGA.

General maintenance setup.

Install for maintenance as shown below

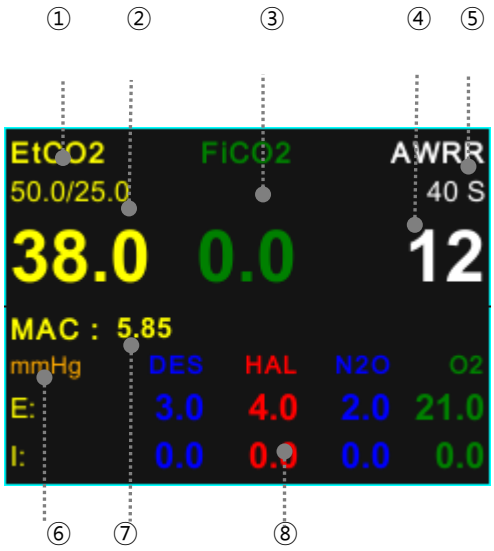


1	Calibration gases (N2O, O2, CO2, Agents)
2	T-piece
3	Flow meter for 200 ml/min
4	Sampling line (2M)
5	Water trap
6	BMGA

Caution
The calibration gas must be used in the concentration (%) range shown below ■ Nitrous oxide (N2O)> 30% ■ Carbon dioxide (CO2)> 2.5% ■ Oxygen: O2> 40% ■ Agents> 1%

Caution
The calibration gas must use gas with balance N2. (Eg 21% O 2, bal. N 2). After the calibration is finished, check the measurement accuracy of the BMGA using a calibration gas of another component.

Display



①	$EtCO_2$ alarm limits display
②	$EtCO_2$ value display
③	$FiCO_2$ value display
④	Respiration rate value display
⑤	Apnea alarm setting time in seconds
⑥	Multi-gas unit display
⑦	MAC display
⑧	Primary Agent concentration display

Multi-gas Settings

A. Multi-gas menu

Menu	Description	Available Settings
A-1. DUALGAS Parameters		
A-1-1. ALARM	Multi-gas Alarm setting menu	
A-1-2. PARAMETER ALARM LIMIT	The default setting range of alarm set values of $EtCO_2$, $FiCO_2$, AWRR, APNEA, AG-E, AG-I, N_2O-E, N_2O-I, O_2-E and O_2-I is as follows. Determine ON / OFF of alarm at time of alarm related to $EtCO_2$.	
A-1-2. TECHNICAL ALARM CONDITION	MGAS-MODULEOFF MGAS-CHECKADAPTER MGAS-ZERODISABLE MGAS-LASTSPANCAL MGAS-REPLACEO2SENS MGAS-UNSPECIFIEDACCESSORY MGAS-SENSORERROR MGAS-ROOMAIRO2CALREQUIRED MGAS-SWERROR MGAS-HWERROR MGAS-MOTORERROR MGAS-FACTORYCALLOST MGAS-O2SENSORERROR MGAS-REPLACEADAPTOR MGAS-O2PORTFAIL MGAS-WATRTRAPFULL	
A-2. DISPLAY OPTION	Multi-gas waveform display Setting	

	menu	
A-2-1. SWEEP SPEED	Sweep speed setup	6.25mm/s, 12.5mm/s, 25mm/s
A-2-2. SCALE	Waveform display 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.	40.0 mmHg (5.3 vol%), 50.0 mmHg (6.6 vol%), 60.0 mmHg (7.9 vol%), 80.0 mmHg (10.5 vol%), 100.0 mmHg (13.2vol%), 150.0 mmHg (19.7 vol%), 300.0 mmHg (39.5 vol%), 500.0 mmHg (65.8 vol%), 800.0 mmHg (105.3 vol%), 1000.0 mmHg (131.6 vol%)
A-2-3. FILL	Fill graph	ON/OFF
A-2-4. Waveform	Waveform select menu	EtCO2, O2, N2O, AG1, AG2
A-2-5. O_2 Display	Oxygen value display	ON/OFF
A-2-6. USE ONE GAS UNIT	Choose whether to set pressure unit by gas type. When OFF, each unit setting menu for each gas type is shown as below.	ON/OFF
A-2-7. GAS PRESSURE UNIT	Displayed when USE ONE GAS UNIT is ON. Select all gas units.	mmHg/kPa/vol%
A-2-8. $EtCO_2$ Unit	Displayed when USE ONE GAS UNIT is OFF. ETCO2 gas measurement unit selection	mmHg, kPa, Vol. %
A-2-9. $FiCO_2$ Unit	Displayed when USE ONE GAS UNIT is OFF. FiCO2 gas measurement unit	mmHg/kPa/vol%

	selection	
A-2-10. N_2O Unit	Displayed when USE ONE GAS UNIT is OFF. N2O gas measurement unit selection	mmHg/kPa/vol%
A-2-11. O_2 Unit	Displayed when USE ONE GAS UNIT is OFF. O2 gas measurement unit selection	mmHg/kPa/vol%
A-2-12. AGENT1 Unit	Displayed when USE ONE GAS UNIT is OFF. AG1 Select gas unit	mmHg/kPa/vol%
A-2-13. AGENT2 Unit	Displayed when USE ONE GAS UNIT is OFF. AG2 gas measurement unit selection	mmHg/kPa/vol%
A-3. APNEA DETECT	APNEA Detection setup	ON/OFF
A-4. MODULE SETUP	Module Setup Menu	
A-4-1. AGENT ID1	Primary Agent ID setup	
A-4-2. AGENT ID2	Secondary Agent ID setup	
A-4-3. GAS MODE	Gas status setup	Sleep, Measurement
A-4-4. ANESTHETIC GAS	Anesthetic Gas setup	ISO, ENF, SEV, DES, HAL
A-4-5. PUMP	Pump setup menu	ON/OFF
A-4-6. SET N2O	N2O Concentration setup menu	Vol%
A-4-7. Calibrate N2O	Calibrate Nitrogen N2O Concentration Setting Menu	Vol%
A-4-8. Calibrate CO2	Calibrate Nitrogen CO2 Concentration Setting Menu	Vol%
A-4-9. SET O2	O2 Concentration setup menu	Vol%
A-4-10. Calibrate O2	Calibrate Nitrogen O2 Concentration Setting Menu	Vol%
A-4-11. O2 MEASUREMENT	O2 Measurement setup menu	ON/OFF

A-4-12. O2 TYPE	O2 Sensor type setup menu (default: SERVOMEX)	Galvanic Servomex
A-4-13. IR O2 Delay	In seconds	
A-4-14. O2 OPTION	O2 function available setup menu	ON/OFF
A-5. MODULE INFORMATION	Module Information Menu	
A-5-1. SENSOR SN	Serial Number of Module	PNXXXXXX
A-5-2. H/W VERSION	Hardware Version of Module	1.2
A-5-3. S/W VERSION	Software Version information	X
A-5-4. COMM. PROTOCOL	Communication protocol	1.5
A-5-5. O2 COMPENSATION	O2 Concentration Compensation	Vol%
A-5-6. N2O COMPENSATION	N2O Concentration Compensation	Vol%
B-1. ZEROING	Perform M-GAS zero point	
C-1. MODULE RESET	Reset M-GAS Module	

Multi-gas Maintenance

The ISA sidestream gas analyzers are permanently factory calibrated and requires no routine user calibration. For all ISA sensor fitted with an O_2 sensor, O_2 gas span calibration instructions are described in these sections.

Calibration Gas

The gas span check and calibration require the use of a suitable calibration gas mixture. A cylinder containing such a mixture may be acquired from the vendor of your choice, provided the following gas concentrations and accuracy. Depending on your application, multi-gas calibration gas mixture shall be used.

ISA Multi-gas	
Gas	**Gas Concentration**

CO_2	4.0 to 11.0 %
N_2O	30 to 100 %
DES	2.0 to 12.0 %
O_2	45 to 100 %

Accuracy for all gases: ± 0.03 vol% or ± (0.02 vol% + 0.1% of reading), whichever is greatest.

Maintenance tasks

PHASEIN Gas Master can be used to complete the maintenance task.

Leak test

1. Connect Nomoline to the ISA gas analyzer, with the analyzer connected to PHASEIN Gas Master.
2. Tightly block the gas inlet of the Nomoline sampling line.

   The cuvette pressure ("Atm press - Cuvette press [kPa]" in PHASEIN Gas Master) will start to rapidly decrease, until the internal pump stops when the cuvette pressure is decreased to about 15 kPa below atmospheric pressure.
3. When the internal pump stops, quickly block the exhaust port tightly.

   When blocked, the cuvette pressure shall be 15 - 23 kPa below atmospheric pressure.
4. Stop the pump by sending parameter "Stop pump" under "Installation & maintenance" in PHASEIN Gas Master.
5. Wait about 10 seconds until the cuvette pressure value as shown by the PHASEIN Gas Master is stable. Note the value.
6. Wait an additional 10 seconds.
7. Check that the cuvette pressure value has not changed more than 3 kPa in 10 seconds.

8. If the cuvette pressure value changes more, troubleshoot tubing and fittings. If the problem persists, return the analyzer to PHASEIN.

Note: In step 5, if the cuvette pressure is less than 15 kPa below atmospheric pressure, repeat steps 1 to 3 blocking the exhaust port quicker.

Gas span check

Confirm the gas measurements values by performing the following sequence

1. Connect a new Nomoline sampling line to the ISA gas analyzer.
2. Warm up for at least 1 min.
3. Connect the calibration gas to the ISA gas analyzer. The calibration gas shall have an accuracy of at least ± 0.03 vol% or ± (0.02 vol% +0.1% of reading), whichever is greater.
4. Supply the calibration gas.
5. Check that the displayed gas concentration readings correspond to the calibration gas values.
6. The gas readings shall be within the following ranges:
   a. CO_2 ± (0.3 vol% + 4% of reading)
   b. N_2O ± (2 vol% + 5% of reading)
   c. Agents ± (0.2 vol% + 10% of reading)
   d. O_2 ± (2 vol% + 2% of reading)
7. If the gas readings are outside the specified range, perform a gas span calibration for the failing gases. If failing on Agents, the span calibration shall always be performed using DES.

Gas span calibration

Only perform the gas span calibration if the gas span check fails repeatedly.

Before performing the gas span calibration, ensure that the SET O2 and SET N2O values are set (if applicable for your gas analyzer model) correctly to match the corresponding calibration gas.

Span calibration can be performed using gases within the ranges:

$4.0\% \leq CO_2 \leq 11.0\%$

$45\% \leq O_2 \leq 100\%$ - for ISA Multi-gas with Servomex only

$30\% \leq N_2O \leq 100\%$ - for ISA Multi-gas only

$2.0\% \leq DES \leq 12.0\%$ - for ISA Multi-gas only

The accuracy of the individual components of the calibration gas mixture shall each have an accuracy of at least ± 0.03 vol% or ± (0.02 vol% +0.1% of reading), whichever is greater.

Note: DES shall be used for span calibration of all 5 agents (HAL, ENF, ISO, SEV, DES).

Note: Only perform span calibration for gases that failed in the Gas span check**.**

1. Warm up the ISA gas analyzer for at least 1 min
2. Send "Pre span calibration zeroing" and make sure that the surrounding gas is normal air

   (21% O_2 and 0% CO_2).
3. For each gas that failed the Gas span check, perform step 4 to 7. Always perform the span calibration with the gases in order O_2, N_2O, DES and CO_2

   Example: Span calibration of O_2 and CO_2 only, start with O_2 then CO_2.
4. Supply the calibration gas and wait for at least 30 seconds.
5. Send the corresponding span calibration command.
6. Wait until the gas span calibration is no longer in progress. The calibration gas can be turned off when "span calibration is in progress" no longer is set, but the O_2 span calibration continues for about 40 seconds with a special zeroing during which the Servomex paramagnetic O_2 sensor is sensitive to mechanical movements.

7. Verify the gas readings.

Note: If the calibration process fails, the flag SPAN_ERR is set, and will stay active until the next successful calibration is passed

15. Dual-Gas Monitoring

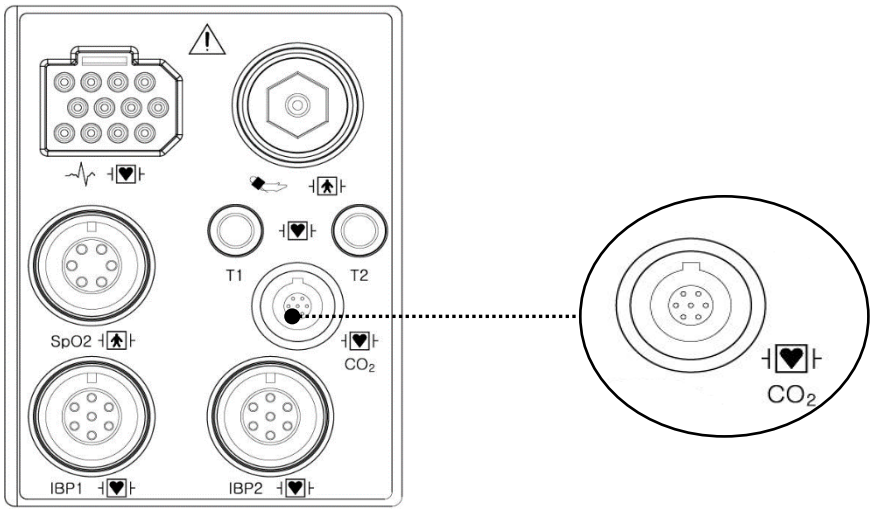
Overview

The D-GAS module extracts gas samples from animal breathing gases. It continuously measures CO2 and one of five anesthetic agents (isoflurane, sevoflurane, enflurane, halothane and desflurane) with manual selection of the specific agent type. All measured values as well as derived values are passed to the Veterinary patient monitor.

BIONET offers the following D-GAS modules. BDGA Sidestream Analyzer (Bionet).

Dual gas connector position and accessory

connector position



Accessories

Item Code	Item Image	Product Description
DG-SENSOR		Dual Gas module set - Includes Dual Gas Module 1 ea, Water Trap 1 ea, Sample Line 1 ea, Airway Adaptor (straight) 1 ea, Mounting Kit 1 set, 1 year warranty
DGA-WT		Water Trap
DGA-SL		Sample Line with Luer Lock (8')
DGA-AAS		Airway Adapter (straight)
DGA-AAL		Airway Adapter (L type)

Bionet Dual Gas Module

The Dual Gas module is a sidestream multi-gas analyzer measuring end-tidal carbon dioxide (EtCO2) and one of five anesthetic agents (isoflurane, sevoflurane, enflurane, halothane and desflurane) with manual selection of the specific agent type. The Dual Gas parameter window shows the concentration of EtCO2 and an anesthetic gas, respiration rate, and MAC (Minimum Alveolar Concentration). The Dual Gas module is designed for plug-and-play with the BM3 Vet Pro

Measuring Gases

- EtCO2
- Isoflurane
- Sevoflurane
- Enflurane
- Halothane
- Desflurane

Benefits of anesthetic gas monitoring

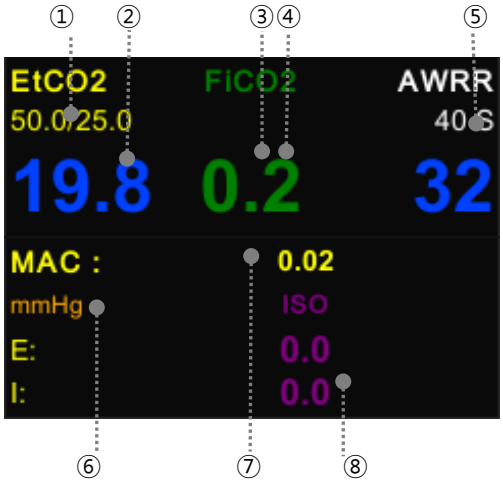
- An alarm will sound if the values are out of range, while simultaneously monitoring CO2 and anesthetic gas.
- Monitor the anesthesia maintenance through MAC parameter.
- May help prevent overdose of anesthetic gas.
- Monitor anesthetic gas concentration to help ensure proper functioning of your vaporizer.
- Records anesthetic gas volume from procedure.

Superior Advantages and Features

- Low cost, durable, and proven sidestream technology that accurately measures both EtCO2 and the concentration of the anesthetic agent (5 different anesthetic agents selectable).
- 30 seconds warm-up time upon system initiation, and offers fast response time.
- Infrared (IR) light source with optical bandpass filtering technology allows the Dual Gas system to be free from frequent or routine high calibration (gain calibration) procedures using calibration gas, eliminating routine hustle of conducting system calibration to maintain accurate performance.
- Zero calibration ensures the system performs accurately regardless of environment.
- Proprietary advanced pneumatics and filtering system offer the highest protection and safety of the system in the sidestream technology.
- Large Water Trap filtering system allows the Dual Gas system to continually run without the need to frequently change the water trap, even in highly moisturized situations. Many other systems use moisture-absorbing filters, which require frequent filter changes.
- Water level detection feature helps prevent excess moisture for safer operation.
- Provides EtCO2, FiCO2, Respiration Rate, Anesthetic Agent Concentraion, and MAC (Minimum Alveolar Concentration) parameters

Feature	Specification
CO2	
- Range	0 – 100 mmHg; 0 – 13.3 kPa; 0-10% CO2 STPD (standard temperature and pressure dry)
- Accuracy	± (0.2 vol% + 4% relative)
- Rise Time	400 ms (average)
Anesthetic Agents	
- Gases	Isoflurane, Enflurane, Halothane, Desflurane, Sevoflurane
- Range	Iso., Enf., Hal., Sev.: 0 – 6%
	Des.: 0 – 18%
- Resolution	0 .01%
- Accuracy	± (0.15% vol% + 4% relative)
- Rise Time	450 ms (average)
Calibration	Factory calibrated
Power Up Time	30 sec
Delay Time	< 4 sec
Dimensions	175mm x 85mm x 50mm (L x W x H)
Respiration	
- Range	0-150 breaths/min
- Accuracy	±1 breath/min
Flow Rate	
- Range	170 ml/min
- Accuracy	±20ml/min
Environment Condition	
- Operating Temperature	15 – 35°C
- Storage Temperature	-5 to 50°C
- Ambient Humidity	15-95% RH
- Ambient Pressure	70kPa to 106kPa (525mmHg to 795mmHg)
Weight	400g
Water Removal System	Water trap tank
Sampling Line	Anesthetic gas tolerant standard sample line
Appication	Veterinary use Only
	Species: Canine, Feline, Equine

Display



①	EtCO2 alarm high / low limit display
②	EtCO2 Exhales CO2 values.
③	FiCO2 Inhalation CO2 value display
④	Display respiratory rate value
⑤	Apnea alarm Set time in seconds
⑥	Display of multiple gas units
⑦	Alveolar concentration indicator
⑧	Display anesthesia gas concentration value

Multi-gas Settings

A. Multi-gas menu

Menu	Description	Available Settings
D-1. Alarm	Multi-gas Alarm setting menu	
D-1-1. PARAMETER ALARM LIMIT	The default setting range of alarm set values of $EtCO_2$, $FiCO_2$, AWRR, APNEA, AG-E, AG-I, N_2O-E, N_2O-I, O_2-E and O_2-I is as follows. Determine ON / OFF of alarm at time of alarm related to $EtCO_2$.	
D-1-2. TECHNICAL ALARM CONDITION	MGAS-MODULEOFF MGAS-CHECKADAPTER MGAS-ZERODISABLE MGAS-LASTSPANCAL MGAS-REPLACEO2SENS MGAS-UNSPECIFIEDACCESSORY MGAS-SENSORERROR MGAS-ROOMAIRO2CALREQUIRED MGAS-SWERROR MGAS-HWERROR MGAS-MOTORERROR MGAS-FACTORYCALLOST MGAS-O2SENSORERROR MGAS-REPLACEADAPTOR MGAS-O2PORTFAIL MGAS-WATRTRAPFULL	
D-2. DISPLAY OPTION	Multi-gas waveform display Setting menu	

D-2-1. SWEEP SPEED	Sweep speed setup	6.25mm/s, 12.5mm/s, 25mm/s
D-2-2. SCALE	Waveform display 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.	40.0 mmHg (5.3 vol%), 50.0 mmHg (6.6 vol%), 60.0 mmHg (7.9 vol%), 80.0 mmHg (10.5 vol%), 100.0 mmHg (13.2vol%), 150.0 mmHg (19.7 vol%), 300.0 mmHg (39.5 vol%), 500.0 mmHg (65.8 vol%), 800.0 mmHg (105.3 vol%), 1000.0 mmHg (131.6 vol%)
D-2-3. FILL	Fill graph	ON/OFF
D-2-4. Waveform	Waveform select menu	EtCO2, O2, N2O, AG1, AG2
D-2-5. USE ONE GAS UNIT	Choose whether to set pressure unit by gas type. When OFF, each unit setting menu for each gas type is shown as below.	ON/OFF
D-2-6. GAS PRESSURE UNIT	Displayed when USE ONE GAS UNIT is ON. Select all gas units.	mmHg/kPa/vol%
D-2-7. ETCO2 Unit	Displayed when USE ONE GAS UNIT is OFF. ETCO2 gas measurement unit selection	mmHg, kPa, Vol. %
D-2-8. FICO2 Unit	Displayed when USE ONE GAS UNIT is OFF. FiCO2 gas measurement unit selection	mmHg/kPa/vol%
D-2-9. AG1 Unit	Displayed when USE ONE GAS UNIT is OFF. ETCO2 gas measurement unit	mmHg/kPa/vol%

	selection	
D-3. APNEA DETECT	Displayed when USE ONE GAS UNIT is OFF. N2O gas measurement unit selection	mmHg/kPa/vol%
D-4. MODULE SETUP	Module Setup Menu	
D-4-1. AGENT ID1	Primary Agent ID setup	
D-4-2. GAS MODE	Gas status setup	Sleep, Measurement
D-4-3. ANESTHETIC GAS	Anesthetic Gas setup	ISO, ENF, SEV, DES, HAL
D-4-4. PUMP	Pump setup menu	ON/OFF
E-1. ZEROING	Primary Agent ID setup	
F-1. MODULE RESET	Secondary Agent ID setup	

16. Printer

Overview

The printer allows the user to 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 animal'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 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 5 minutes of output and after 10minutes of idle time.

Printer settings

	Main menu	Sub menu
	**A.** Print Setup	**A-1. Printer Setup**

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, IBP1, IBP2, LEAD I, LEAD II, LEAD III, aVR, aVL, aVF, V
A-1-4. Waveform2	Channel 2 waveform select menu	
A-1-5. Waveform3	Channel 3 waveform select menu	
A-1-6. Print From Time	In the PRINTER Key menu, press the printer key to set the output point as shown below REAL TIME: Prints the data from the point where the PRINTER key was pressed. DELAY: Prints data before 5seconds when PRINTER key is pressed	Real Time Delay (5sec)
A-1-7. Printing Period	Sets when output is printed during normal output. If you do not manually stop after pressing the PRINTER KEY, the waveform will be output for the set time.	Continue, 10sec, 20sec, 30sec

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 THE FOLLOWING:

  • Carbon and carbonless forms.

  • Non-thermal chart papers or any other products containing tributyl phosphate, 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

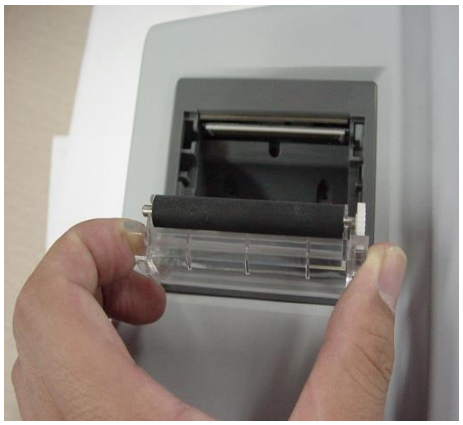
when properly imaged and stored for about 3-5 years.

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

Paper Change

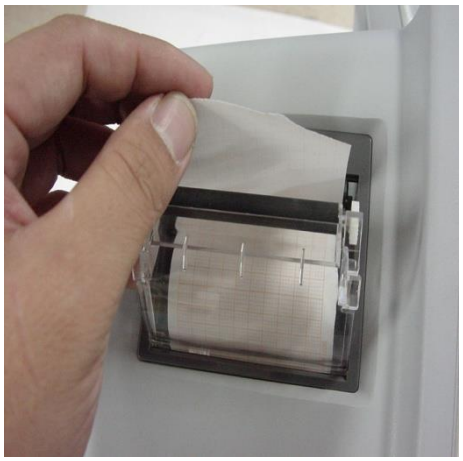
1

Open the window of the printer.



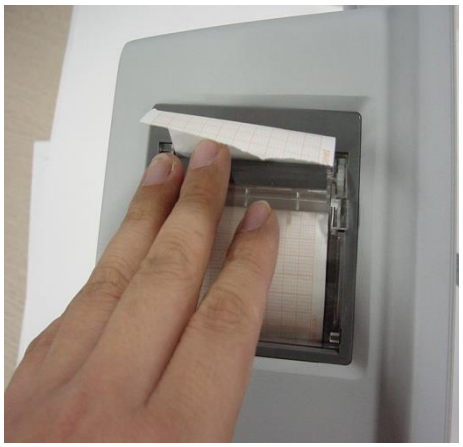
2

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

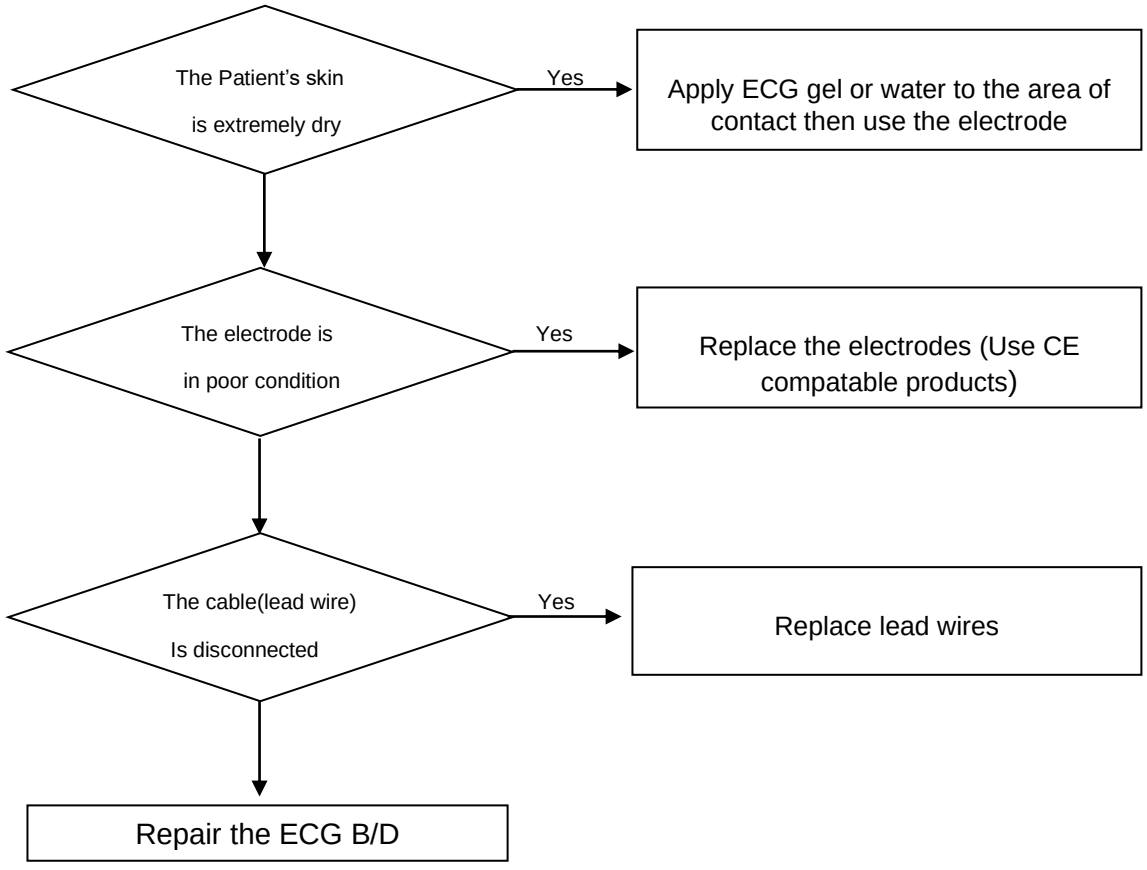
Press the printer window until it is properly shut. Inaccurate shutting may cause failure in printing.



17. Maintenance and Troubleshooting

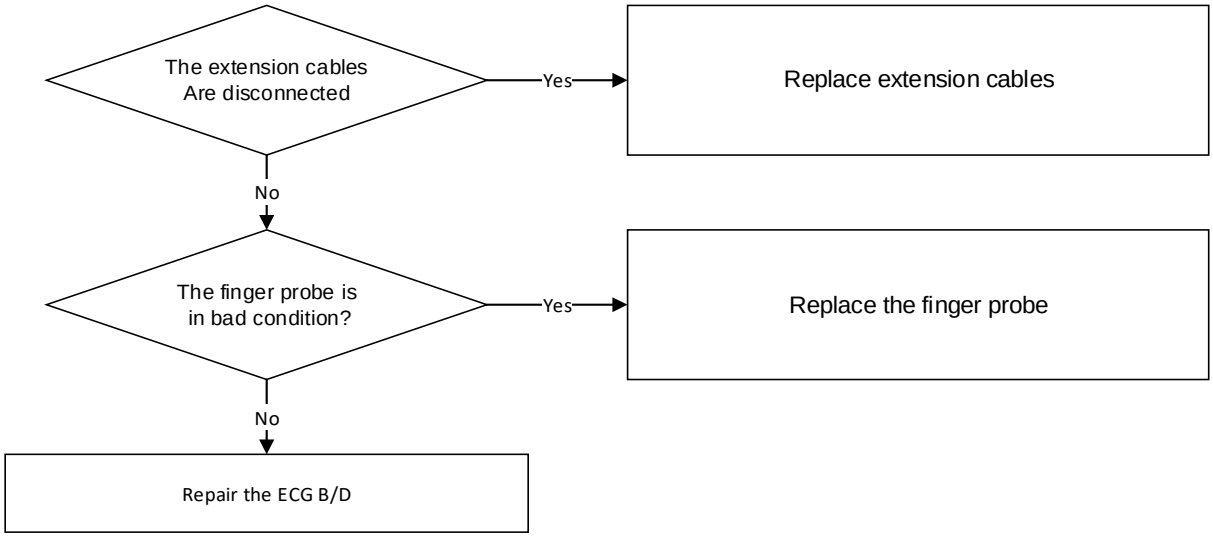
Noise in ECG

- Make sure your filter settings are appropriate
- Make sure the electrode is attached
- Make sure the gel on the electrode is not dry.



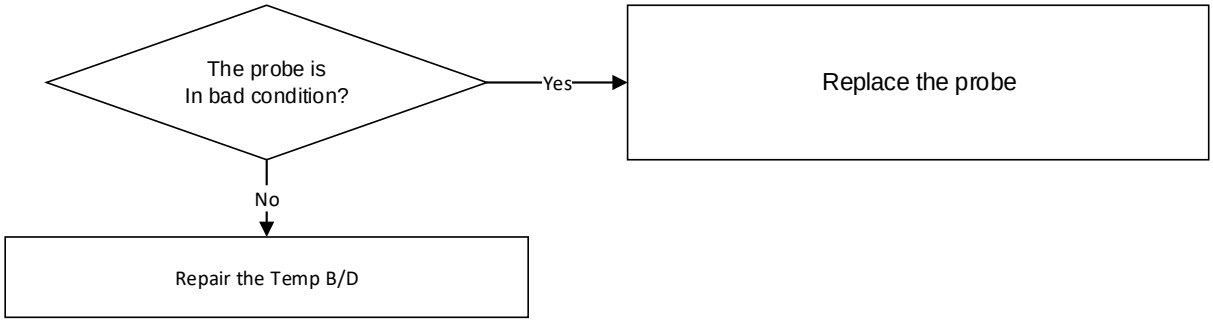
SpO_2 Malfunction

- If the connectors of the equipment are in bad condition



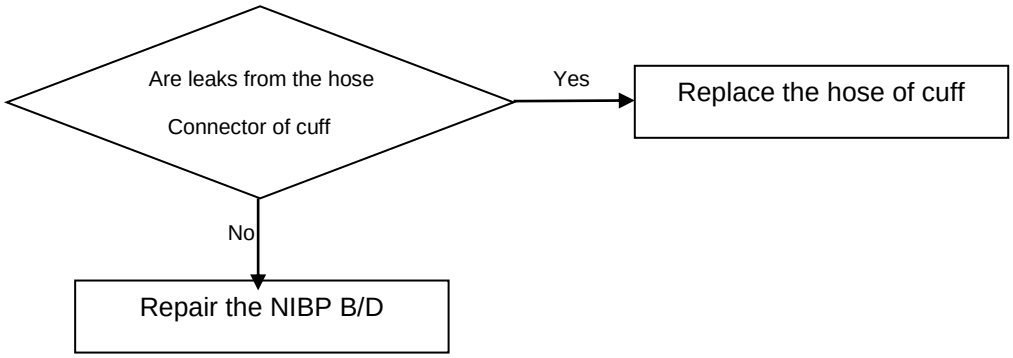
Temperature malfunction

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

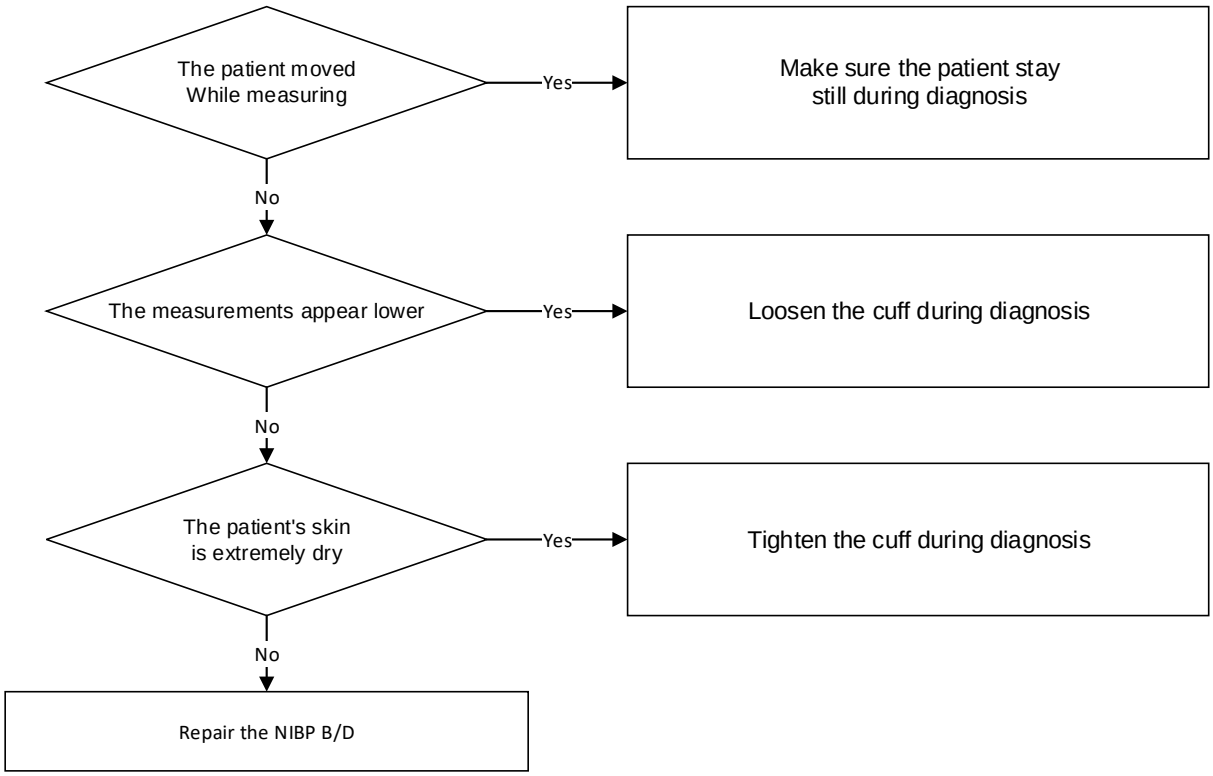


NIBP Malfunction

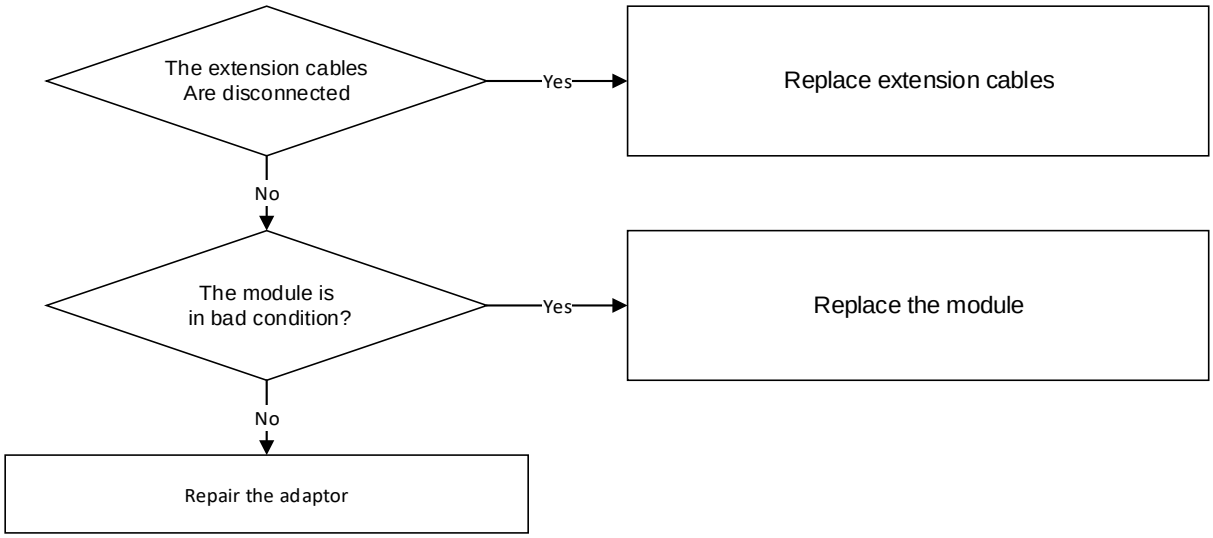
- Confirm that the hose is normally connected



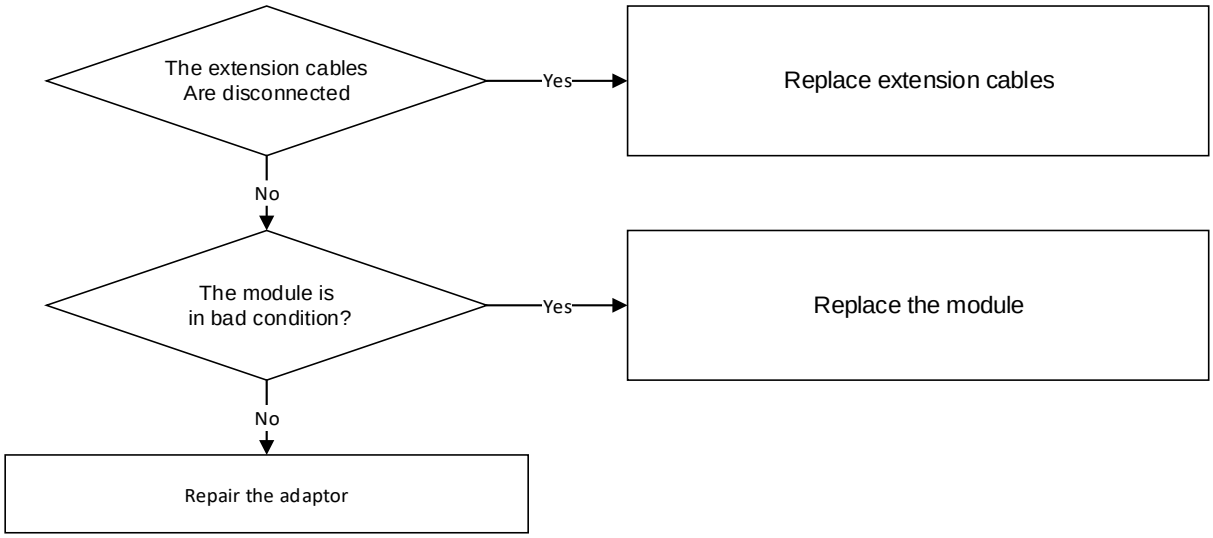
Abnormality In NIBP Measurements



Multi-gas & Dual Gas Malfunction

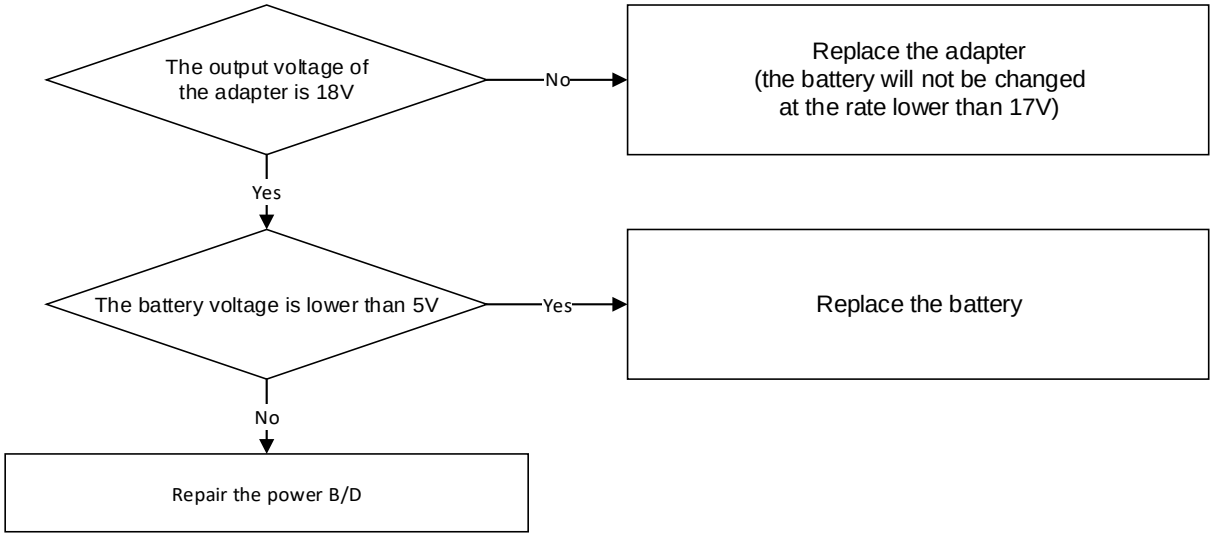


$EtCO_2$ Malfunction

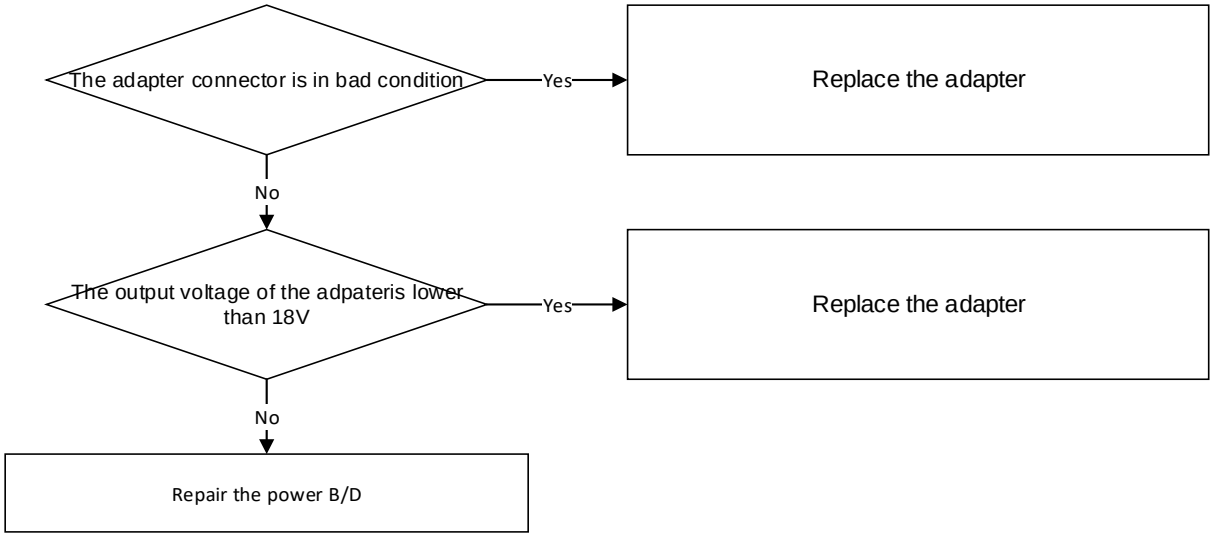


Failure In Battery Recharge

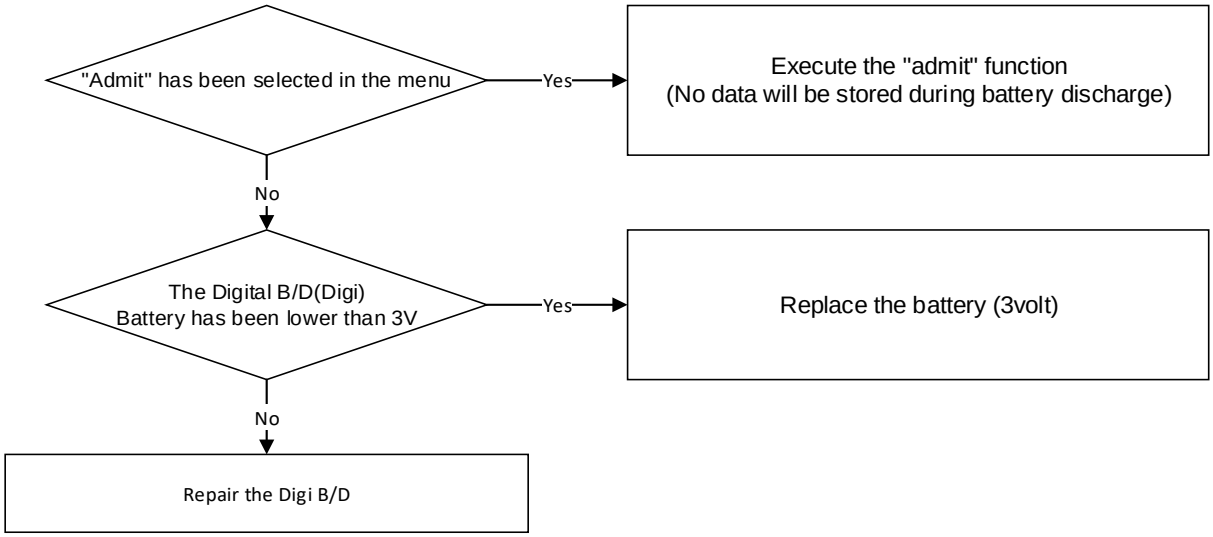
(the battery does not fully recharge in 6 hours or more)



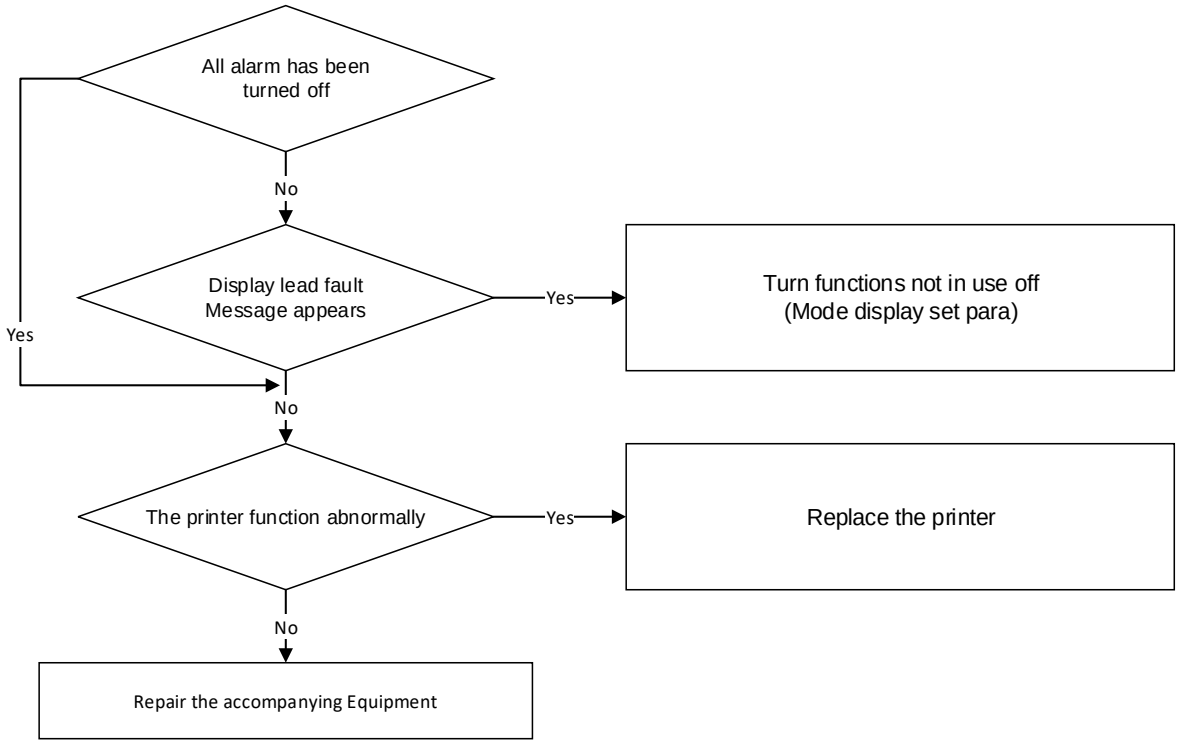
Power Failure



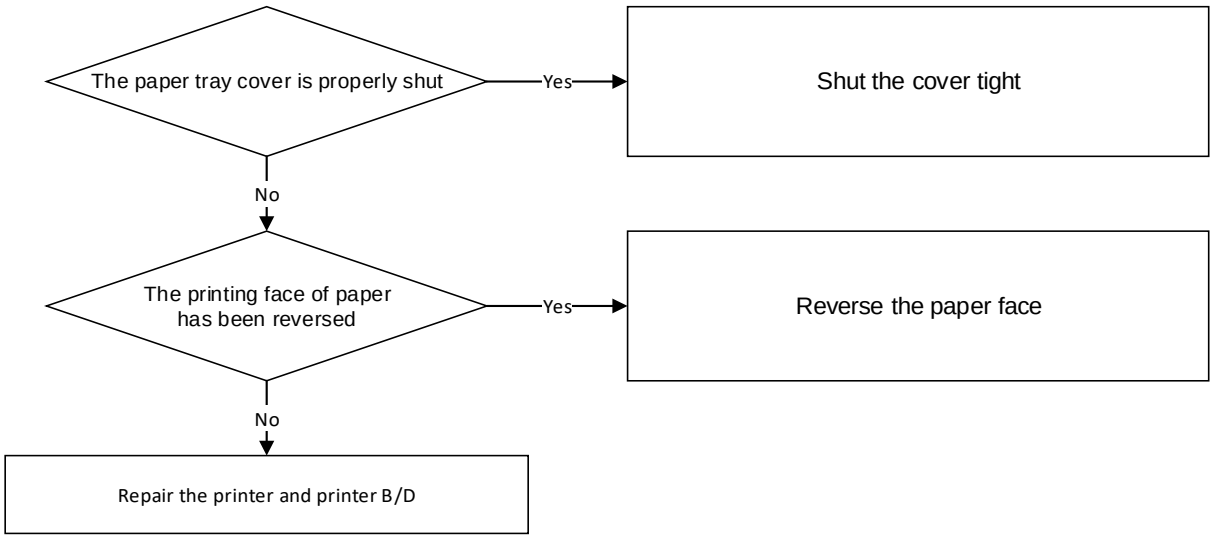
Data storage failure



Periodic Noises



Print failure



18. Clean and Care

Overview

Clean the monitor and all accessories after each animal 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 the right to 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 SpO2 sensor

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

Capnostat sensor

Wipe the sensor surface 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.

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℃ but begins to soften at around 90℃. 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 laquers, 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 accessory 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 if safety hazards do not occur.

19. 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 animals 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 Vet Pro 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 Veterinary 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 veterinary 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 veterinary 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 veterinary 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

<table>
<tr><td colspan="3">The BM3 Vet Pro system is intended for use in the electromagnetic environment specified below. The customer or the user of BM3 Vet Pro system should assure that it is used in such an environment</td></tr>
<tr><td>Emission test</td><td>Compliance</td><td>Electromagnetic environment - guidance</td></tr>
<tr><td>RF emissions
CISPR 11</td><td>Group 1</td><td>The BM3 Vet Pro system 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</td></tr>
<tr><td>RF emissions
CISPR 11</td><td>Class A</td><td rowspan="3">The BM3 Vet Pro system is suitable for use in all es tablishments other than domestic and those direct ly connected to the public low-voltage power sup plies buildings used for domestic purposes.</td></tr>
<tr><td>Harmonics emission
IEC 61000-3-2</td><td>A</td></tr>
<tr><td>Voltage fluctuation
IEC 61000-3-3</td><td>Complies</td></tr>
</table>

Manufacturer's declaration - electromagnetic immunity

The BM3 Vet Pro system is intended for use in the electromagnetic environment specified below. The customer or the user of the BM3 Vet Pro 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	6 kV Contact 8 kV Air	6 kV Contact 8 kV Air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %
Electrical fast Transient / burst IEC 61000-4-4	2kV for power supply lines 1kV 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	1 kV differential mode 2 kV common mode	1 kV differential mode 2 kV 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 Vet Pro system requires continued operation during power mains interruptions, it is recommended that the BM3 Vet Pro system 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 Vet Pro system is intended for use in the electromagnetic environment specified below. The customer or the user of the BM3 Vet Pro 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 80 MHz	3 Vrms 150 kHz to 80 MHz	Portable and mobile RF communications equipment should be used no closer to any part of the BM3 Vet Pro system, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = [\frac{3,5}{V_1}]\sqrt{P}$

Radiated RF IEC 61000-4-3	3 V/m 80.0 MHz to 2.5 G Hz	3 V/m 80.0 MHz to 2.5 G Hz	**Recommended separation distance** $d = [\frac{3,5}{E_1}]\sqrt{P}$ 80 MHz to 800 MHz $d = [\frac{7}{E_1}]\sqrt{P}$ 800 MHz to 2,5 GHz Where P is the maximum output power r ating of the transmitter in watts (W) acco rding to the transmitter manufacturer and d is the recommended separation distan ce in meters (m). Field strengths from fixed RF transmitters, as deter-mined by an electromagnetic site survey, (a) Should be less than the compliance le vel in each frequency range (b). Interference may occur in the vicinity of equipment marked with the following sy mbol: 

Note 1) Uт is the A.C. mains voltage prior to application of the test level.

Note 2) At 80 MHz and 800 MHz, the higher frequency range applies.

Note 3) These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

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 the BM3 Vet Pro system.

The BM3 Vet Pro system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The user of the BM3 Vet Pro system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the BM3 Vet Pro 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	3 Vrms, 150 kHz to 80 MHz	3 Vrms, 150 kHz to 80 MHz	3 Vrms, 150 kHz to 80 MHz
Radiated RF IEC 61000-4-3	3 V/m, 80 MHz to 2.5 GHz	3 V/m, 80 MHz to 2.5 GHz	3 V/m, 80 MHz to 2.5 GHz

Guidance and manufacturer's declaration - electromagnetic immunity

The BM3Vet Pro system is intended for use in the electromagnetic environment specified below. The customer or the user of the BM3 Vet Pro 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 80 MHz	BM3 Vet Pro 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 2.5 GHz	3 V/m 80.0 MHz to 2.5 GHz	Field strengths outside the shielded location from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than 3V/m.**a** 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 (without Battery pack)
Indicator	3 LED
Cooling	Air flow
Interface	RJ45, USB, HDMI
Power	AC 100-240V (50/60Hz) Adapter 18 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 Continuous Battery Usage Time: 3 hours or more when fully charged 3BL335-BIO-S. (measured every 5 minutes NIBP with SpO2 and ECG)
Thermal Printer (option)	Speed: 25, 50mm/sec, Paper width: 58mm
Data Storage	168hours trends, 20 cases of 10 sec 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	Horse, dog: 30 to 300 BPM, Puppy, cat: 30 to 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
S-T segment detection range	-2.0 to 2.0 mV

Arrhythmia analysis	ASYSTOLE, VTACH, VFIB
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
Apnea alarm	Yes

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
Pressure Range	0 to 300mmHg (accuracy: ±3mmHg)
Measurement range	Sytolic: 40-260mmHg, 40 – 230mmHg, 40 – 130mmHg MAP: 26-220mmhg, 26 – 183mmHg, 26 – 110mmHg Diastolic: 20-200mmHg, 20 – 160mmHg, 20 – 100mmHg
Accuracy	mean error: less than ±5 mmHg standard deviation: less than 8 mmHg

Temperature Performance	
Measurement range	0 to 50℃ (0 to 122℉)
Accuracy	25℃ - 50℃: ±0.1℃ 0℃ - 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	±1 breath 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	±1 breath per minute

Anesthetic GAS/O2 - Phasein (Option)	
Method	Infra-red absorption characteristic
Gas	CO2, O2, N2O, Des, Iso, Enf, Hal, Sev
Warm-up time	Mainstream (IRMA AX+) Iso accuracy mode: 45s Full accuracy mode: 60s Side stream (ISA OR+/ AX+): <20s
Sample flow rate (for ISA OR+/AX+)	50 ± 10 ml/min
Measuring Range	CO2: 0 ~ 15 % N2O: 0 ~ 100% Hal/Iso/Enf: 0 ~ 8% Sev: 0~10% Des: 0 ~ 22% O2: 0 ~ 100% (ISA OR+/AX+)
Respiratory Rate	0 ~ 150bpm ± 1bpm

Product Configuration

1. Main body of BM3 Vet Pro Monitor	1EA
2. 3-Lead patient Cable (MECA3(AHA) or MECE3(IEC))	1EA
3. NIBP extension tube	1EA
4. NIBP vet cuff infant reusable	1EA
5. SpO2 extension cable	1EA
6. Reusable multisite SpO_2 probe	1EA
7. DC Adaptor (BPM050S18F02 made in Bridgepower Co., Ltd.)	1EA
8. Operator`s Manual	1EA
9. Power Cable	1EA
10. Battery	1EA

Option Product

1. Reusable Temperature Probe
2. Printer
3. 5-Lead patient Cable (MECA3(AHA) or MECE3(IEC))
4. IBP Kit
5. EtCO2 MODULE
6. NIBP Large Cuff (20.5~28.5Cm)
7. NIBP Cuff (13.8~21.5Cm)
8. NIBP Cuff (9~14.8Cm)
9. Disposable NIBP Cuff1
10. Disposable NIBP Cuff2
11. Disposable NIBP Cuff3
12. Disposable NIBP Cuff4
13. Disposable NIBP Cuff5
14. Sidestream Multigas Module (Masimo Sweden)

15. Mainstream Multigas Module (Masimo Sweden)
16. Sidestream Multigas Nomoline
17. Sidestream Multigas Nomoline Adapter
18. Sidestream Multigas Nomo Extension
19. Sidestream Multigas T-Adapter
20. Mainstream Multigas IRMA Airway Adapter (Large/ Medium)
21. Mainstream Multigas IRMA Airway Adapter (Small)
22. Bionet Dual Gas Module Set
23. Water Trap
24. Sample Line Luer Lock (8")
25. Airway Adapter (Straight)
26. Airway Adapter (L type)
27. Thermal roll Paper

Arrhythmia Alarm Level and Alarm Detection On/Off

Type	Arrythmia	Alarm Level				Alarm On/Off	
		High	Medium	Low	Messge	On	Off
OFF	ASYSTOL	●					●
	VTAC	●					●
	VTACVFIB	●					●
LETHAL	ASYSTOL	●				●	
	VTAC	●				●	
	VTACVFIB	●				●	

Biosignal Level and Alarm Detection On/Off

Biosignal Class	Animal Type	Biosignal Alarm		Alarm Level				Alarm On/Off	
		Position (IBP ONLY)	Alarm	High	Medium	Low	Messge	On	Off
ECG	PUPPY	HR			●			●	
		ST				●			●
		PVC				●		●	
	CAT	HR			●			●	
		ST				●			●
		PVC				●		●	
	DOG	HR			●			●	
		ST				●			●
		PVC				●		●	
	HORSE	HR			●			●	
		ST				●			●
		PVC				●		●	
SPO2	PUPPY	SPO2				●		●	
		SPO2-RATE				●		●	
	CAT	SPO2				●		●	
		SPO2-RATE				●		●	
	DOG	SPO2				●		●	
		SPO2-RATE				●		●	
	HORSE	SPO2				●		●	
		SPO2-RATE				●		●	
RESP	PUPPY	RR				●		●	
		RR-APNEA				●		●	
	CAT	RR				●		●	
		RR-APNEA				●		●	
	DOG	RR				●		●	
		RR-APNEA				●		●	
	HORS	RR				●		●	

	E	RR-APNEA			●		●	
NIBP	PUPPY	NIBP-S		●			●	
		NIBP-M		●			●	
		NIBP-D		●			●	
		NIBP-PR			●		●	
	CAT	NIBP-S		●			●	
		NIBP-M		●			●	
		NIBP-D		●			●	
		NIBP-PR			●		●	
	DOG	NIBP-S		●			●	
		NIBP-M		●			●	
		NIBP-D		●			●	
		NIBP-PR			●		●	
	HORSE	NIBP-S		●			●	
		NIBP-M		●			●	
		NIBP-D		●			●	
		NIBP-PR			●		●	
TEMP	PUPPY	T-1			●		●	
		T-2			●		●	
		T-DT			●		●	
	CAT	T-1			●		●	
		T-2			●		●	
		T-DT			●		●	
	DOG	T-1			●		●	
		T-2			●		●	
		T-DT			●		●	
	HORSE	T-1			●		●	
		T-2			●		●	
		T-DT			●		●	
ETCO2	PUPPY	ETCO2			●		●	
		FICO2			●		●	
		AWRR			●		●	
		APNEA			●		●	
	CAT	ETCO2			●		●	

		FICO2			●		●	
		AWRR			●		●	
		APNEA			●		●	
	DOG	ETCO2			●		●	
		FICO2			●		●	
		AWRR			●		●	
		APNEA			●		●	
	HORSE	ETCO2			●		●	
		FICO2			●		●	
		AWRR			●		●	
		APNEA			●		●	
MULTI/ DUAL GAS	PUPPY	ETCO2			●		●	
		FICO2			●		●	
		AWRR			●		●	
		APNEA			●		●	
		N2OE			●		●	
		N2OI			●		●	
		O2E			●			●
		O2I	●				●	
		AG1E-DES		●				●
		AG1I-DES		●				●
		AG1E-ENF		●				●
		AG1I-ENF		●				●
		AG1E-HAL		●				●
		AG1I-HAL		●				●
		AG1E-ISO		●				●
		AG1I-ISO		●				●
		AG1E-SEV		●				●
		AG1I-SEV		●				●
		AG2E-DES			●			●
		AG2I-DES			●			●
		AG2E-ENF			●			●
		AG2I-ENF			●			●
		AG2E-HAL			●			●

		AG2I-HAL			●			●
		AG2E-ISO			●			●
		AG2I-ISO			●			●
		AG2E-SEV			●			●
		AG2I-SEV			●			●
	CAT	ETCO2			●		●	
		FICO2			●		●	
		AWRR			●		●	
		APNEA			●		●	
		N2OE			●		●	
		N2OI			●		●	
		O2E			●			●
		O2I	●				●	
		AG1E-DES		●				●
		AG1I-DES		●				●
		AG1E-ENF		●				●
		AG1I-ENF		●				●
		AG1E-HAL		●				●
		AG1I-HAL		●				●
		AG1E-ISO		●				●
		AG1I-ISO		●				●
		AG1E-SEV		●				●
		AG1I-SEV		●				●
		AG2E-DES			●			●
		AG2I-DES			●			●
		AG2E-ENF			●			●
		AG2I-ENF			●			●
		AG2E-HAL			●			●
		AG2I-HAL			●			●
		AG2E-ISO			●			●
		AG2I-ISO			●			●
		AG2E-SEV			●			●
		AG2I-SEV			●			●
	DOG	ETCO2			●		●	

		FICO2			●		●	
		AWRR			●		●	
		APNEA			●		●	
		N2OE			●		●	
		N2OI			●		●	
		O2E			●			●
		O2I	●				●	
		AG1E-DES		●				●
		AG1I-DES		●				●
		AG1E-ENF		●				●
		AG1I-ENF		●				●
		AG1E-HAL		●				●
		AG1I-HAL		●				●
		AG1E-ISO		●				●
		AG1I-ISO		●				●
		AG1E-SEV		●				●
		AG1I-SEV		●				●
		AG2E-DES			●			●
		AG2I-DES			●			●
		AG2E-ENF			●			●
		AG2I-ENF			●			●
		AG2E-HAL			●			●
		AG2I-HAL			●			●
		AG2E-ISO			●			●
		AG2I-ISO			●			●
		AG2E-SEV			●			●
		AG2I-SEV			●			●
	HORSE	ETCO2			●		●	
		FICO2			●		●	
		AWRR			●		●	
		APNEA			●		●	
		N2OE			●		●	
		N2OI			●		●	
		O2E			●			●

		O2I	●				●	
		AG1E-DES		●				●
		AG1I-DES		●				●
		AG1E-ENF		●				●
		AG1I-ENF		●				●
		AG1E-HAL		●				●
		AG1I-HAL		●				●
		AG1E-ISO		●				●
		AG1I-ISO		●				●
		AG1E-SEV		●				●
		AG1I-SEV		●				●
		AG2E-DES			●			●
		AG2I-DES			●			●
		AG2E-ENF			●			●
		AG2I-ENF			●			●
		AG2E-HAL			●			●
		AG2I-HAL			●			●
		AG2E-ISO			●			●
		AG2I-ISO			●			●
		AG2E-SEV			●			●
		AG2I-SEV			●			●

Biosignal Alarm Limits and Min/Max setting Value

Biosignal Class	Animal Type	Biosignal Alarm		Limits		Min./Max.	
		Position (IBP ONLY)	Alarm	Lower	Upper	Min.	Max.
ECG	PUPPY	HR		90.0	180.0	15.0	350.0
		ST		-0.4	0.4	-2.0	2.0
		PVC		0.0	20.0	0.0	99.0
	CAT	HR		90.0	200.0	15.0	300.0
		ST		-0.4	0.4	-2.0	2.0
		PVC		0.0	20.0	0.0	99.0
	DOG	HR		60.0	150.0	15.0	300.0
		ST		-0.4	0.4	-2.0	2.0
		PVC		0.0	20.0	0.0	99.0
	HORSE	HR		60.0	150.0	15.0	300.0
		ST		-0.4	0.4	-2.0	2.0
		PVC		0.0	20.0	0.0	99.0
SPO2	PUPPY	SPO2		90.0	100.0	0.0	100.0
		SPO2-RATE		90.0	180.0	20.0	250.0
	CAT	SPO2		90.0	100.0	0.0	100.0
		SPO2-RATE		90.0	200.0	20.0	250.0
	DOG	SPO2		90.0	100.0	0.0	100.0
		SPO2-RATE		60.0	150.0	20.0	250.0
	HORSE	SPO2		90.0	100.0	0.0	100.0
		SPO2-RATE		60.0	150.0	20.0	250.0
RESP	PUPPY	RR		15.0	100.0	4.0	150.0
		RR-APNEA		0.0	40.0	0.0	40.0
	CAT	RR		15.0	100.0	4.0	150.0
		RR-APNEA		0.0	40.0	0.0	40.0
	DOG	RR		10.0	30.0	4.0	150.0

		RR-APNEA	0.0	40.0	0.0	40.0
	HORSE	RR	15.0	100.0	4.0	150.0
		RR-APNEA	0.0	20.0	0.0	30.0
NIBP	PUPPY	NIBP-S	80.0	200.0	10.0	350.0
		NIBP-M	70.0	170.0	10.0	350.0
		NIBP-D	40.0	150.0	10.0	350.0
		NIBP-PR	90.0	180.0	20.0	300.0
	CAT	NIBP-S	80.0	200.0	10.0	350.0
		NIBP-M	70.0	170.0	10.0	350.0
		NIBP-D	40.0	150.0	10.0	350.0
		NIBP-PR	90.0	200.0	20.0	300.0
	DOG	NIBP-S	80.0	200.0	10.0	350.0
		NIBP-M	70.0	140.0	10.0	350.0
		NIBP-D	40.0	120.0	10.0	350.0
		NIBP-PR	60.0	150.0	20.0	300.0
	HORSE	NIBP-S	80.0	200.0	10.0	350.0
		NIBP-M	50.0	170.0	10.0	350.0
		NIBP-D	30.0	150.0	10.0	350.0
		NIBP-PR	60.0	150.0	20.0	300.0
TEMP	PUPPY	T-1	36.0	39.4	0.0	50.0
		T-2	36.0	39.4	0.0	50.0
		T-DT	0.0	3.4	0.0	50.0
	CAT	T-1	36.0	39.4	0.0	50.0
		T-2	36.0	39.4	0.0	50.0
		T-DT	0.0	3.4	0.0	50.0
	DOG	T-1	36.0	39.4	0.0	50.0
		T-2	36.0	39.4	0.0	50.0
		T-DT	0.0	3.4	0.0	50.0
	HORSE	T-1	30.0	41.7	0.0	50.0
		T-2	30.0	41.7	0.0	50.0
		T-DT	0.0	11.7	0.0	50.0
ETCO2	PUPPY	ETCO2	25.0	50.0	0.0	100.0
		FICO2	0.0	5.0	0.0	20.0
		AWRR	10.0	30.0	0.0	150.0

		APNEA	10.0	40.0	10.0	60.0
	CAT	ETCO2	25.0	50.0	0.0	100.0
		FICO2	0.0	5.0	0.0	20.0
		AWRR	10.0	30.0	0.0	150.0
		APNEA	10.0	40.0	10.0	60.0
	DOG	ETCO2	25.0	50.0	0.0	100.0
		FICO2	0.0	5.0	0.0	20.0
		AWRR	10.0	30.0	0.0	150.0
		APNEA	10.0	40.0	10.0	60.0
	HORSE	ETCO2	25.0	50.0	0.0	100.0
		FICO2	0.0	5.0	0.0	20.0
		AWRR	10.0	30.0	0.0	150.0
		APNEA	10.0	20.0	10.0	60.0
MULTI/ DUAL GAS	PUPPY	ETCO2	25.0	50.0	0.0	244.0
		FICO2	0.0	5.0	0.0	244.0
		AWRR	10.0	30.0	0.0	150.0
		APNEA	20.0	40.0	20.0	60.0
		N2OE	0.0	100.0	0.0	1122.0
		N2OI	0.0	82.0	0.0	1122.0
		O2E	10.0	100.0	0.0	1122.0
		O2I	18.0	100.0	0.0	1122.0
		AG1E-DES	0.0	20.0	0.0	244.0
		AG1I-DES	0.0	20.0	0.0	244.0
		AG1E-ENF	0.0	6.0	0.0	244.0
		AG1I-ENF	0.0	6.0	0.0	244.0
		AG1E-HAL	0.0	6.0	0.0	244.0
		AG1I-HAL	0.0	6.0	0.0	244.0
		AG1E-ISO	0.0	6.0	0.0	244.0
		AG1I-ISO	0.0	6.0	0.0	244.0
		AG1E-SEV	0.0	5.0	0.0	244.0
		AG1I-SEV	0.0	5.0	0.0	244.0
		AG2E-DES	0.0	20.0	0.0	244.0
		AG2I-DES	0.0	20.0	0.0	244.0
		AG2E-ENF	0.0	6.0	0.0	244.0

		AG2I-ENF	0.0	6.0	0.0	244.0
		AG2E-HAL	0.0	6.0	0.0	244.0
		AG2I-HAL	0.0	6.0	0.0	244.0
		AG2E-ISO	0.0	6.0	0.0	244.0
		AG2I-ISO	0.0	6.0	0.0	244.0
		AG2E-SEV	0.0	5.0	0.0	244.0
		AG2I-SEV	0.0	5.0	0.0	244.0
	CAT	ETCO2	25.0	50.0	0.0	244.0
		FICO2	0.0	5.0	0.0	244.0
		AWRR	10.0	30.0	0.0	150.0
		APNEA	20.0	40.0	20.0	60.0
		N2OE	0.0	100.0	0.0	1122.0
		N2OI	0.0	82.0	0.0	1122.0
		O2E	10.0	100.0	0.0	1122.0
		O2I	18.0	100.0	0.0	1122.0
		AG1E-DES	0.0	20.0	0.0	244.0
		AG1I-DES	0.0	20.0	0.0	244.0
		AG1E-ENF	0.0	6.0	0.0	244.0
		AG1I-ENF	0.0	6.0	0.0	244.0
		AG1E-HAL	0.0	6.0	0.0	244.0
		AG1I-HAL	0.0	6.0	0.0	244.0
		AG1E-ISO	0.0	6.0	0.0	244.0
		AG1I-ISO	0.0	6.0	0.0	244.0
		AG1E-SEV	0.0	5.0	0.0	244.0
		AG1I-SEV	0.0	5.0	0.0	244.0
		AG2E-DES	0.0	20.0	0.0	244.0
		AG2I-DES	0.0	20.0	0.0	244.0
		AG2E-ENF	0.0	6.0	0.0	244.0
		AG2I-ENF	0.0	6.0	0.0	244.0
		AG2E-HAL	0.0	6.0	0.0	244.0
		AG2I-HAL	0.0	6.0	0.0	244.0
		AG2E-ISO	0.0	6.0	0.0	244.0
		AG2I-ISO	0.0	6.0	0.0	244.0
		AG2E-SEV	0.0	5.0	0.0	244.0

		AG2I-SEV	0.0	5.0	0.0	244.0
	DOG	ETCO2	25.0	50.0	0.0	244.0
		FICO2	0.0	5.0	0.0	244.0
		AWRR	10.0	30.0	0.0	150.0
		APNEA	20.0	40.0	20.0	60.0
		N2OE	0.0	100.0	0.0	1122.0
		N2OI	0.0	82.0	0.0	1122.0
		O2E	10.0	100.0	0.0	1122.0
		O2I	18.0	100.0	0.0	1122.0
		AG1E-DES	0.0	20.0	0.0	244.0
		AG1I-DES	0.0	20.0	0.0	244.0
		AG1E-ENF	0.0	6.0	0.0	244.0
		AG1I-ENF	0.0	6.0	0.0	244.0
		AG1E-HAL	0.0	6.0	0.0	244.0
		AG1I-HAL	0.0	6.0	0.0	244.0
		AG1E-ISO	0.0	6.0	0.0	244.0
		AG1I-ISO	0.0	6.0	0.0	244.0
		AG1E-SEV	0.0	5.0	0.0	244.0
		AG1I-SEV	0.0	5.0	0.0	244.0
		AG2E-DES	0.0	20.0	0.0	244.0
		AG2I-DES	0.0	20.0	0.0	244.0
		AG2E-ENF	0.0	6.0	0.0	244.0
		AG2I-ENF	0.0	6.0	0.0	244.0
		AG2E-HAL	0.0	6.0	0.0	244.0
		AG2I-HAL	0.0	6.0	0.0	244.0
		AG2E-ISO	0.0	6.0	0.0	244.0
		AG2I-ISO	0.0	6.0	0.0	244.0
		AG2E-SEV	0.0	5.0	0.0	244.0
		AG2I-SEV	0.0	5.0	0.0	244.0
	HORSE	ETCO2	25.0	50.0	0.0	244.0
		FICO2	0.0	5.0	0.0	244.0
		AWRR	10.0	30.0	0.0	150.0
		APNEA	20.0	20.0	20.0	60.0
		N2OE	0.0	100.0	0.0	1122.0

		N2OI	0.0	82.0	0.0	1122.0
		O2E	10.0	100.0	0.0	1122.0
		O2I	18.0	100.0	0.0	1122.0
		AG1E-DES	0.0	20.0	0.0	244.0
		AG1I-DES	0.0	20.0	0.0	244.0
		AG1E-ENF	0.0	6.0	0.0	244.0
		AG1I-ENF	0.0	6.0	0.0	244.0
		AG1E-HAL	0.0	6.0	0.0	244.0
		AG1I-HAL	0.0	6.0	0.0	244.0
		AG1E-ISO	0.0	6.0	0.0	244.0
		AG1I-ISO	0.0	6.0	0.0	244.0
		AG1E-SEV	0.0	5.0	0.0	244.0
		AG1I-SEV	0.0	5.0	0.0	244.0
		AG2E-DES	0.0	20.0	0.0	244.0
		AG2I-DES	0.0	20.0	0.0	244.0
		AG2E-ENF	0.0	6.0	0.0	244.0
		AG2I-ENF	0.0	6.0	0.0	244.0
		AG2E-HAL	0.0	6.0	0.0	244.0
		AG2I-HAL	0.0	6.0	0.0	244.0
		AG2E-ISO	0.0	6.0	0.0	244.0
		AG2I-ISO	0.0	6.0	0.0	244.0
		AG2E-SEV	0.0	5.0	0.0	244.0
		AG2I-SEV	0.0	5.0	0.0	244.0

Technical Alarm Level and Alarm Detection On/Off

Biosignal Class	Biosignal Name	Alarm Level			Alarm On/Off		
		High	Medium	Low	Message	On	Off
ECG	CABLEOFF				●	●	
	LEADFAULT				●	●	
	CHECKELECTRODE				●	●	
	HRSEARCH				●	●	
SPO2	PROBEOFF				●	●	
	NOFINGER				●	●	
	POORSIGNAL				●	●	
	LOSTPULSE				●	●	
	ARTIFACT				●	●	
	PULSESEARCH				●	●	
	DEFECTIVESENSOR				●		●
	LOWPERFUSION				●		●
	INTERFERENCEDETECTED				●		●
	TOOMUSCHAMBIENTLIGHT				●		●
	UNRECOGNIZEDSENSOR				●		●
	LOWSIGIQ				●		●
	NOADHESIVESENSORCONNECTE				●		●
RESP	CABLEOFF				●	●	
	LEADFAULT				●	●	
	CHECKELECTRODE				●	●	
NIBP	OVERP				●	●	
	OVERTIMECP				●	●	
	INFFAILURE				●	●	
	DEFFAILURE				●	●	
	MEASERROR				●	●	
	PULSETOOWEAK				●	●	
	CHECKSENSOR				●	●	
	AIRLEAK				●	●	
	EXESSIVEMOTION				●	●	
	SYSTEMFAULT				●	●	

TEMP	TEMP-1-PROBEOFF				●	●	
	TEMP-2-PROBEOFF				●	●	
ETCO2	MODULEOFF				●	●	
	CHECKADAPTER				●	●	
	CHECKLINE				●	●	
	CHECKLINEDISCONNECT				●	●	
	CO2INVALID				●	●	
	OVERRANGE				●	●	
	ZEROING				●	●	
	ZEROREQUIRED				●	●	
	SYSTEMFAULT				●	●	
	SENSORWARMUP				●	●	
	TEMPUNSTABLE				●	●	
MULTI/DUAL GAS	MODULEOFF				●	●	
	CHECKADAPTER				●	●	
	ZERODISABLE				●	●	
	LASTSPANCAL				●	●	
	REPLACEO2SENS				●	●	
	UNSPECIFIEDACCESSORY				●	●	
	SENSORERROR				●	●	
	ROOMAIRO2CALREQUIRED				●	●	
	SWERROR				●	●	
	HWERROR				●	●	
	MOTORERROR				●	●	
	FACTORYCALLOST				●	●	
	O2SENSORERROR				●	●	
	REPLACEADAPTER				●	●	
	O2PORTFAIL				●	●	
	MIXEDAG				●	●	
	WATRTRAPFULL				●	●	
SYSTEM	LOWBATTERY				●	●	

Abbreviations and Symbols

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

Abbreviations	
A	
A	amps
AC	alternating current
ADT	adult
ARRYTHM	arrhythmia
ASYS	asystole
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,	minute, minimum
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
PVC	premature ventricular complex
Q	
QRS	interval of ventricular depolarization
R	
RA	right arm, right atrial
RESP	respiration
RL	right leg
RR	respiration rate
S	
S	systolic
sec	second

SpO_2	arterial oxygen saturation from pulse oximetry
SYNC, Sync	synchronization
SYS	systolic
T	
Temp, TEMP	temperature
U	
V	
V	precordial lead
V	volt
V-Fib, VFIB	ventricular fibrillation
VTAC	ventricular tachycardia
W	
X	
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	**Veterinary patient monitor**
Model Name	BM3Vet Pro
Approval Number	
Approval Date	
Serial Number	
Warranty Period	**1 year from date of purchase** **US & Canada: 4 years from date of purchase**
Date of Purchase	
Customer section	**Hospital Name:** **Address:** **Name:** **Phone:**
Sales Agency	
Manufacturer	

* Thank you for purchasing BM3Vet Pro

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

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

International Sales & service Contact

Bionet Co., Ltd.:

#5F, 61 Digital-ro 31 gil,
Guro-gu, Seoul, REPUBLIC OF KOREA

Tel: +82-2-6300-6418 / Fax: +82-2-6300-6454 / e-mail: sales@ebionet.com

Website: www.eBionet.com

U.S.A sales & service representative

Bionet America, Inc.:

2691 Dow Ave, Suite B

Tustin, CA 92780 U.S.A.

Toll Free: 1-877-924-6638 FAX: 1-714-734-1761 / e-mail: support@bionetus.com

Website: www.BionetUS.com

European sales & service representative

MGB Endoskopische Geräte GmbH Berlin:

Schwarzschildstraße 6

D-12489 Berlin, Germany

Tel. +49(0)306392-7000 / Fax. +49(0)306392-7011 / e-mail: sales@mgb-berlin.de

Website: www.mgb-berlin.de

BIONET CO., LTD.

Product Name: BM3Vet Pro