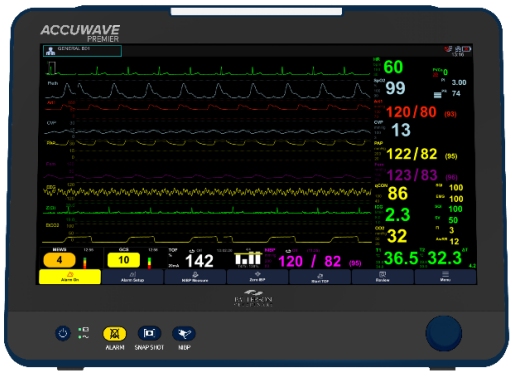
PATTERSON VETERINARY

Veterinary Multiparameter Monitor Series

ACCUWAVE PLUS / ACCUWAVE PRO / ACCUWAVE PREMIER

Operation Manual



ACCUWAVE PLUS **ACCUWAVE PRO** **ACCUWAVE PREMIER**

Ver. 1.00

2024. 04. 03

PATTERSON VETERINARY

www.pattersonvet.com

REVISION HISTORY

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1.00	2024.04.03	1. First Written	ALL

Contact

If you have any questions or comments relating to our products or purchasing, please contact the telephone numbers or E-mail below. You can talk to our sales people. Patterson always welcomes your enquiries. Please contact us.

Distributed by	**Patterson Veterinary Supply, Inc.** 2915 Rocky Mountain Avenue, Suite 400, Loveland, CO, United States Tel : 866-825-6076 Email : hotline@pattersonvet.com Website : www.pattersonvet.com
Manufactured by	**Bionet Co., Ltd.** 5F, 61 Digital-ro 31-gil, Guro-gu, Seoul 08375, REPUBLIC OF KOREA Tel : +82-2-6292-6410 / FAX: +82-2-6499-7789 Email : service@ebionet.com Website : www.ebionet.com
Representative of manufacturer	**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 Emai l: support@bionetus.com Website : www.bionetus.com

※ In the event of a malfunction or failure, please contact Patterson's Anesthesia & Monitoring Hotline at 866-825-6076 or hotline@pattersonvet.com. Please include model name, serial number, date of purchase and explanation of failure.

Table of Contents

Introduction

* The terms of veterinary multiparameter monitoring device or veterinary multiparameter monitor used in this manual refer to ACCUWAVE PLUS / ACCUWAVE PRO / ACCUWAVE PREMIER.

1) Intended Use

The veterinary multiparameter monitors are intended for monitoring, displaying, reviewing, storing, notifying, and transferring multiple physiological signs of animals, such as ECG (3-Lead, 5-Lead selectable), Arrhythmia detection, ST-Segment analysis, Heart Rate (HR), Respiration rate (Resp), Temperature (Temp), Pulse Oxygen Saturation (SpO2), Pulse Rate (PR), Non-invasive Blood Pressure (NIBP), End-tidal Carbon Dioxide Concentration (EtCO2), Invasive Blood Pressure (IBP) and Dual Gas .

2) Indications for Use

The veterinary multiparameter monitors are indicated for use by clinicians in hospital environments and are for prescription use only.

The veterinary multiparameter monitors are not indicated for helicopter transport, hospital ambulance, or home use.

They should only be used by persons who have received adequate training in their use.

The patient monitors continuously display multiple physiological signs. All the parameters could be monitored on single dogs, cats, horses, and other small animals.

3) Contraindications

The following bullet lists describe when and where the veterinary multiparameter monitors are not Intended for Use:

- As therapeutic device
- Home use
- In transport situations within hospital environments
- During MRI
- As apnea monitors

- ECG measurements are not intended to be used for diagnosis of rhythm and morphology of cardiac complexes.

4) Functional Safety

The essential function of the veterinary multiparameter monitors is to provide the healthcare practitioner with meaningful parameter values.

An alarm occurs if the parameter values are out of the specified range or when they are not provided properly.

Patterson has assessed the risks associated with the use of the veterinary multiparameter monitors in consideration of the main functions and has mitigated the risks threatening their product life, provided that they are used in compliance with service recommendations and regular maintenance.

5) Warnings, Cautions and Notes

Read the "Warnings, Cautions and Notes" thoroughly to ensure safety and to prevent product damage before using the veterinary multiparameter monitors. Be sure to follow the "Warnings, Cautions and Note" indicated below, as these are important messages related to safety.

Specifications or functions described in this manual are subject to change without notice for product improvement.

Warning	**[Warning] Failure to follow this message may cause severe injuries, casualty, or physical damage to patients.**
Caution	**[Caution] Failure to follow this message may result in non-life-threatening injury or damage to the equipment**.
Note	**[Note] Indicates some important information and tips, which are not dangerous, about installation, operations, and maintenance.**

6) Definition of Groups

Patterson defines user groups of the veterinary multiparameter monitors as Users and Service representative.

All defined groups should read this operation manual very carefully before starting to use the veterinary multiparameter monitors and should be trained in their use, installation, reprocessing, maintenance, and repair.

The veterinary multiparameter monitors can be used, installed, reprocessed, maintained, and repaired by the defined groups only.

User

Users shall use the veterinary multiparameter monitors for their intended use.

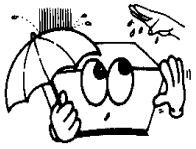
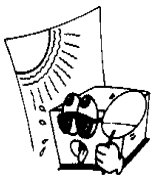
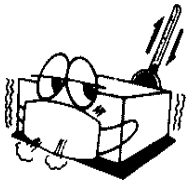
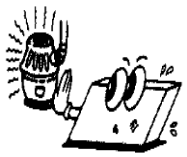
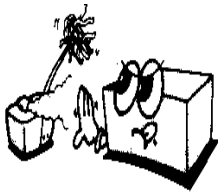
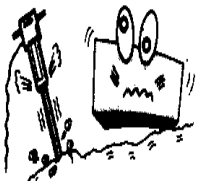
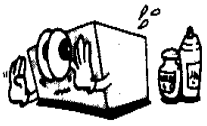
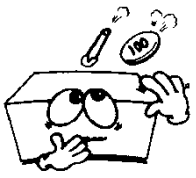
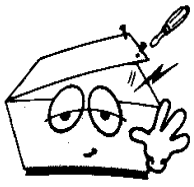
Service Representative

Service representatives are responsible for the maintenance of the veterinary multiparameter monitors.

They shall be trained in the installation, reprocessing, and maintenance of them.

General Precautions on Environment

DO NOT store or operate the equipment in the places listed below.

	A place exposed to moisture. (DO NOT touch the equipment with wet hands.)		A place under direct sunlight.
	A place in areas with high fluctuating temperatures.		A place in the vicinity of electric heater.
	A place with excessive humidity rise or poor ventilation.		A place with sources that cause excessive shock or vibration.
	A place exposed to chemicals or at risk of gas leakage.		Avoid the invasion of small objects/ particles such as dust, and especially avoid metallic material.
	Do not disjoint or disassemble the equipment. (Patterson is not liable for broken products caused by attempted disassembly).		DO NOT connect power until the product is completely installed. It may cause damage to the product.

7) Electromagnetic Compatibility

The veterinary multiparameter monitors have been designed and tested for compliance with current regulatory standards as to their capacity to limit electromagnetic emission (EMI), and as to their ability to block the effects of EMI from external sources.
They comply with the following standards pertaining to EMI emissions and susceptibility: EN60601-1-2.

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

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

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

8) Electronic Device Connection Precautions

SHOCK HAZARD — Improper use of this equipment may cause electric shock. Strictly observe the following guidelines. Failure to do so may endanger the lives of the patient, user, and bystanders.

To disconnect the equipment from the power line, first remove the power plug from the wall outlet before disconnecting the cables from the equipment; Otherwise, there is a risk that metal parts inadvertently inserted into the power cord socket comes into contact with line voltage.

Additional devices connected to medical electrical equipment shall comply with the respective IEC or ISO standards (e.g., IEC 60950 for data processing equipment).

Additionally, all configurations must comply with the requirements for a medical electrical system. (See IEC 60601-2 or Clause 16 of IEC 60601-1 edition 3.2.)
Anyone who connects additional devices to medical electrical equipment is in the position of configuring the medical system and is responsible for complying with the requirements of the medical electrical system.
Keep in mind that local legislation takes precedence over the above-mentioned requirements.
If in doubt, consult your local representative or the technical service department.

POWER REQUIREMENTS— Before connecting the equipment to the power line, check that the voltage and frequency ratings of the power line are the same as those indicated on the equipment's label. If this is not the case, do not connect the equipment to the power line until you adjust it to match the power source.

In the USA, if the installation of this equipment uses 240V instead of 120V, the source must be center tapped, 240V single-phase circuit.

This equipment is suitable for connection to public mains as defined in CISPR 11.

Equipment connected to the ECG system and in the patient's, environment must be powered from a medically isolated power source or must be a medically isolated device. The equipment powered from a non-isolated source can result in chassis leakage currents exceeding safe levels. Chassis leakage current created by an accessory or device connected to a non-isolated outlet may add to the chassis leakage current of the ECG system.

PART 1. Basic

1) Electric Safety Precautions

Warning	**The veterinary multiparameter monitor must be connected to an appropriate power source before use.** **Before using the veterinary multiparameter monitor, check whether its power supply line is appropriate (AC100 - 240V).**
Caution	**Please check the following before using the veterinary multiparameter monitor:** ● **Ensure that the power source is supplied from Patterson.** ● **Use only parts and accessories specified in this manual.** ● **Ensure that the entire connection of the veterinary multiparameter monitor cables is properly and firmly fixed.** ● **Each monitor requires an independent circuit and a stable ground. When using the same power supply with other electrical devices, inaccurate measurements may occur.** ● **The veterinary multiparameter monitor should be distanced from generators, X-ray equipment, broadcasting equipment, or transmitting wires to prevent electrical noises from being generated during the operation, producing inaccurate measurements. For ACCUWAVE monitors, both independent circuit and stable grounding are required. Sharing the same power source with other electronics can also produce inaccurate outputs.**

Warning	**Avoid physical contact with the patient during defibrillation, as it may cause serious injury or death. When using the defibrillator, follow standard safety precautions and only use the supplied cable.**

Warning	**In case the medical equipment does not operate normally, or if it has been damaged, do not use it on any patient; Contact the medical equipment technician in your hospital or the equipment supplier.**

Warning	• **To reduce the hazard of burns during high-frequency surgical procedures, ensure that the cables and transducers of the veterinary multiparameter monitor never come into contact with the high-frequency surgical units.** • **The neutral electrode of the electro-surgery unit (ESU) must properly contact the patient, to prevent accidental burning of the patient.**

Note	**The veterinary multiparameter monitor is classified as follows:** • **It is classified as Class I, BF & CF concerning electric shock.** • **It is classified as IPX2 for waterproofing, and according to KS C IEC 60529, it does not have a harmful effect from vertically falling water drops when inclined within 15 degrees.** • **Noise level is A class regarding IEC/EN 60601-1 and the subject of Noise is A level concerning IEC/EN60601-1-2.**

Note	**Waterproof Precautions** • **It is not proper to operate the veterinary multiparameter monitor around combustible anesthetics or dissolvents.** • **If you spill liquid on the veterinary multiparameter monitor, battery, or accessories, or if they are accidentally soaked in liquid, contact your service representative or the equipment supply division. Do not operate them before they have been tested and approved for further use.**

2) Equipment Connection

Caution	● **Doctors and patients in hospitals are exposed to the risk of uncontrollable currents. These currents are caused by a potential difference between the veterinary multiparameter monitor and conductive objects, which may come into the monitor. To solve this problem, make sure that the auxiliary equipment connected to the veterinary multiparameter monitor satisfies EN60601-1.** ● **Unsecured equipment may fall on the patient. Fix the equipment securely during installation.**

Note	**For measurements in or near the heart, it is recommended to connect the veterinary multiparameter monitor to a potential equalization system. Use a potential equalization cable to connect to the pin marked with the equipotential symbol.**

Note	**The veterinary multiparameter monitor uses a main plug as isolation means to the mains power. Do not place it in a place difficult to access the mains plug.**

3) Biocompatibility

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

4) Product Configuration

Basic components

1. Main body of ACCUWAVE PLUS / PRO / PREMIER ----------1 EA
2. 3-Lead ECG extension cable ----------1 EA
3. 3-Lead ECG patient cable ----------1 EA
4. Esophageal probe (Medium) ----------1 EA
5. Temperature extension cable ----------1 EA
6. NIBP extension tube ----------1 EA
7. NIBP Infant Cuff ----------1 EA
8. SpO2 extension cable ----------1 EA
9. Reusable animal SpO2 probe Y clip ----------1 EA
10. Reusable animal SpO2 probe transflectance---------- 1 EA
11. Operation manual ----------1 EA
12. Printer module ----------1 EA
13. Printer Paper(2 rolls) ----------1 EA
14. Rechargeable Battery, Standard 3250mAh ----------1 EA
15. Temperature probe ----------1 EA
16. Veterinary NIBP Cuff (#1~#5)----------1 EA
17. Power Cord 110V----------1 EA
18. Wi-Fi Dongle TP Link TL-WN725N ----------1 EA

Optional components

1. Reusable temperature probe
2. Sidestream EtCO2 module (Respironics)
3. Mainstream EtCO2 module (Respironics)
4. Sidestream EtCO2 sample lines
5. Mainstream EtCO2 airway adapters
6. 5-Lead ECG extension cable
7. 5-Lead ECG patient cable
8. IBP extension cable
9. IBP transducer set (Disposable/Reusable)
10. Dual Gas module

11. Dual Gas water trap
12. Dual Gas sample line
13. Dual Gas airway adapter

Warning	**To avoid electrical shock, do not open the cover. Disassembling the veterinary multiparameter monitor should be done only by service representative authorized by Patterson.**

Warning	**• Use only installation accessories specified by Patterson.** **• Connect only approved devices to the veterinary multiparameter monitor.** **Devices connected to the veterinary multiparameter monitor must meet the requirements of the applicable IEC standards (e.g. IEC 60950 safety standards for information technology equipment and IEC 60601-1 safety standards for medical electrical equipment). The system configuration must meet the requirements of the IEC 60601-1 medical electrical systems standard.** **Any personnel who connect devices to the signal input/output port of the veterinary multiparameter monitor are responsible for providing evidence that the safety certification of the connected devices has been approved in accordance with the IEC 60601-1. If you have any questions, please contact Patterson.** **• If it is not evident from the device specifications whether a particular combination with other devices is hazardous, for example, due to summation of leakage currents, please consult the manufacturer or an expert in the field. A determination must be made that the proposed combination does not negatively affect the devices themselves or the patient's safety.**

Note	**All Patterson hardware drawings and screen shots in this operation manual are for illustrative purposes only. The actual product may differ slightly from drawings and screenshots used herein.**

Product Feature Information

*Basics: ●

*Option: O

Function	ACCUWAVE PLUS	ACCUWAVE PRO	ACCUWAVE PREMIER
Display	8″	12.1″	15.6″
ECG 3-Lead	●	●	●
ECG 5-Lead	O	O	O
Respiration	●	●	●
Bionet SpO2	●	●	●
Suntech NIBP	●	●	●
2CH IBP	●		
4CH IBP		●	●
EtCO2	O	O	O
2 Temp	●	●	●
Dual Gas	O	O	O
Battery(3250mAh)	●	●	●
Battery(6500mAh)	O	O	O
HL7	●	●	●
Full disclosure	●	●	●
Wi-Fi	●	●	●
Printer	●	●	●

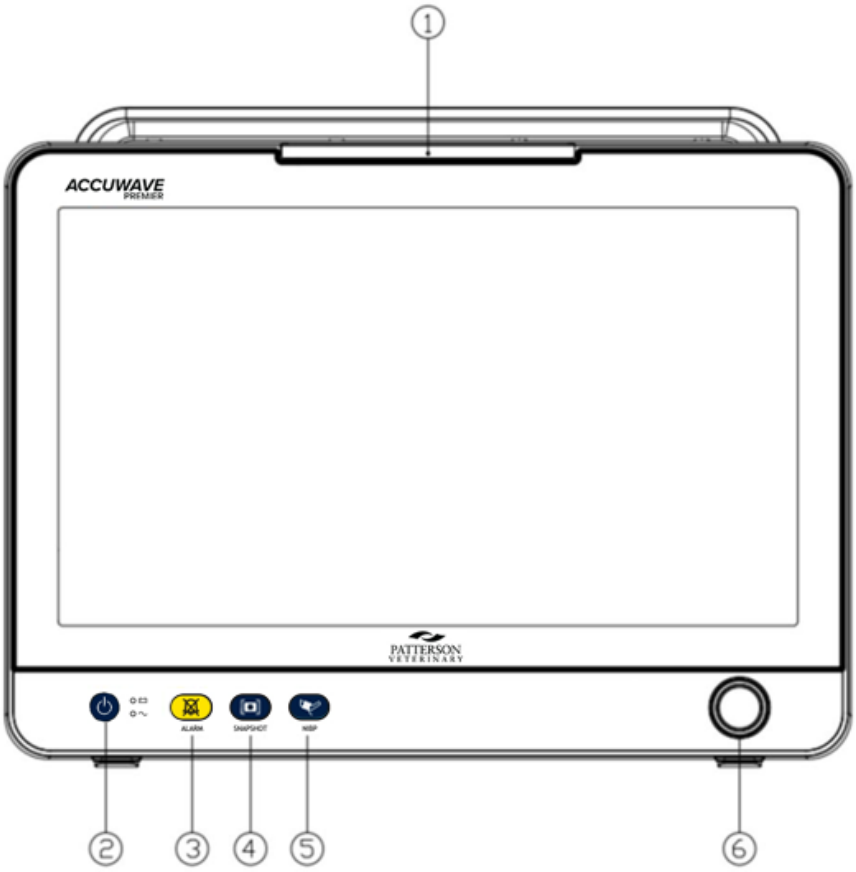
5) Basic Unit

Front view

ACCUWAVE PLUS

ACCUWAVE PRO

ACCUWAVE PREMIER



① Alarm lamp

② Power ON/OFF Key

③ Alarm control key

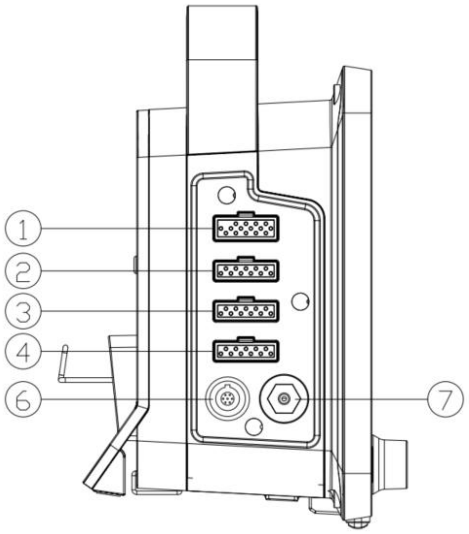
④ Screen shot key

⑤ Blood pressure measurement key

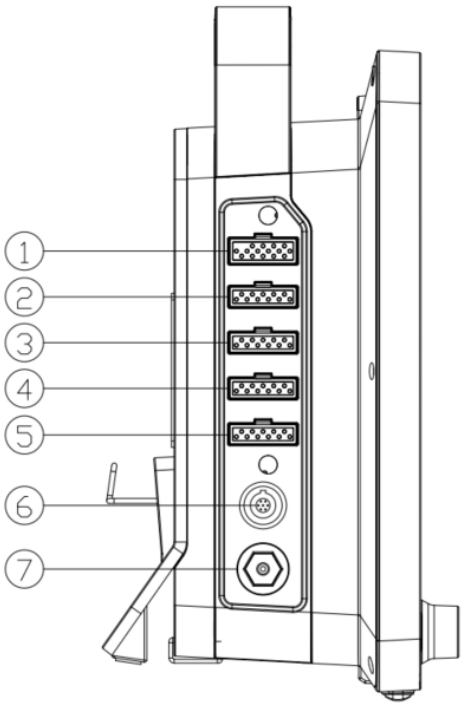
⑥ Rotary knob

Left side view

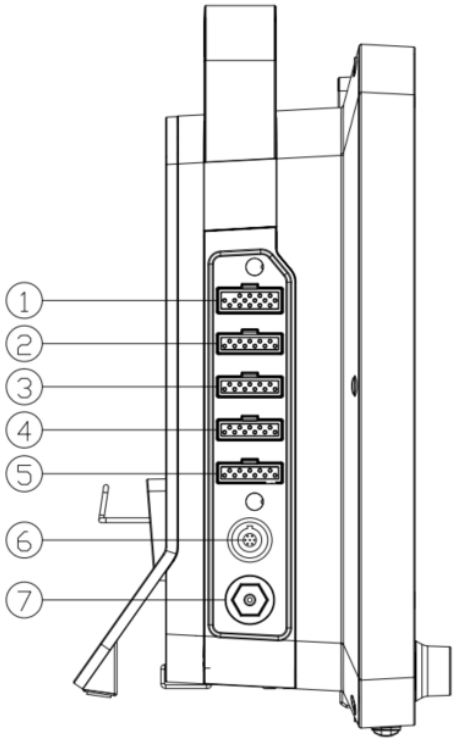
ACCUWAVE PLUS



ACCUWAVE PRO



ACCUWAVE PREMIER



① ECG connector

② SpO2 connector

③ Temperature connector

④ IBP connector

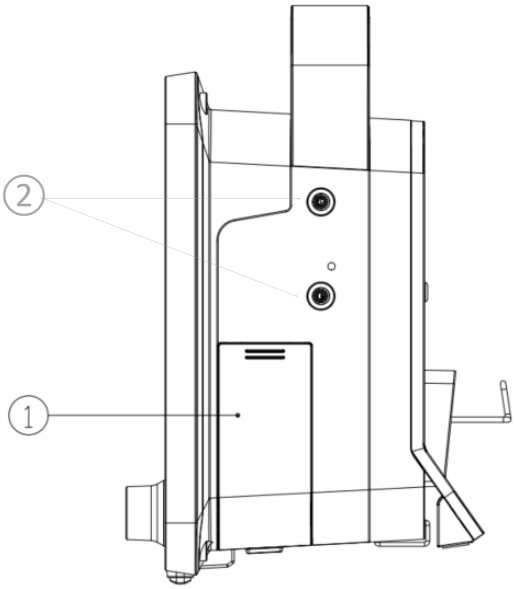
⑤ IBP connector2

⑥ EtCO2 / Dual Gas Module Connector

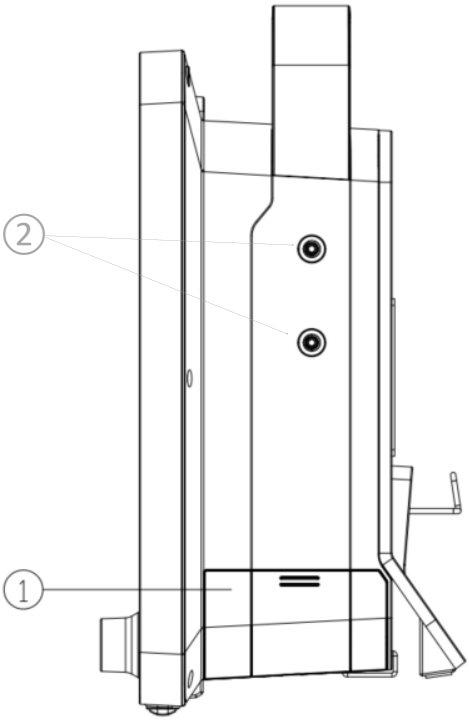
⑦ Blood pressure tube connector

Right side view

ACCUWAVE PLUS



ACCUWAVE PRO



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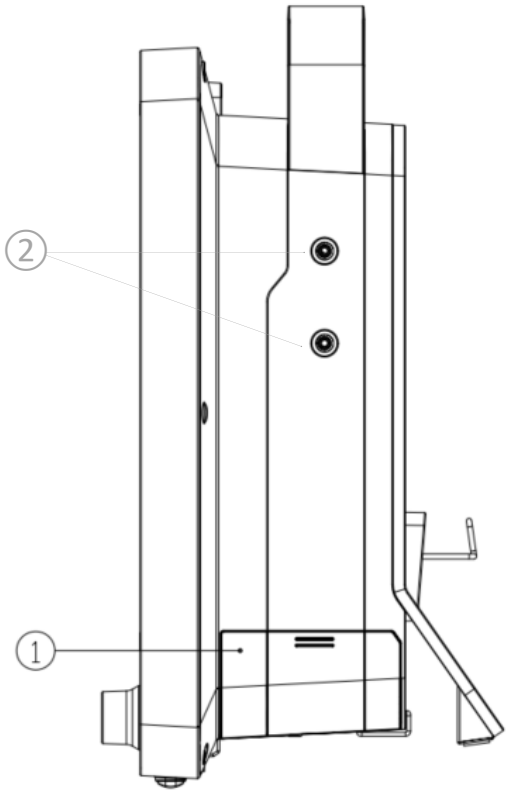
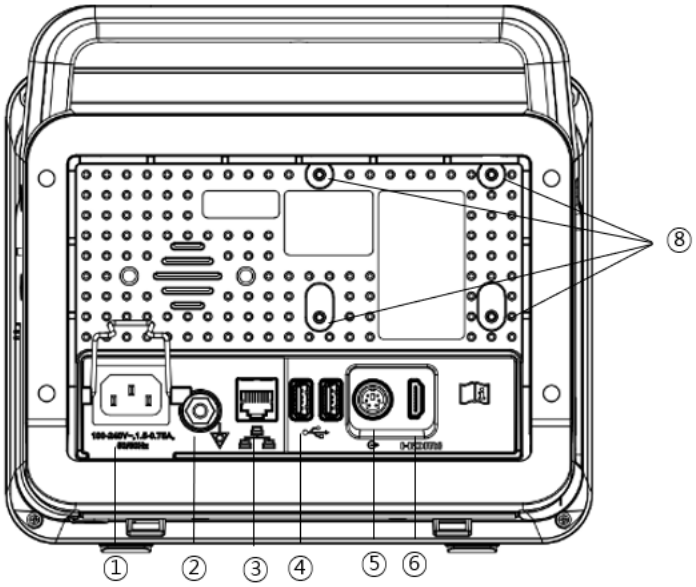


① Battery cover

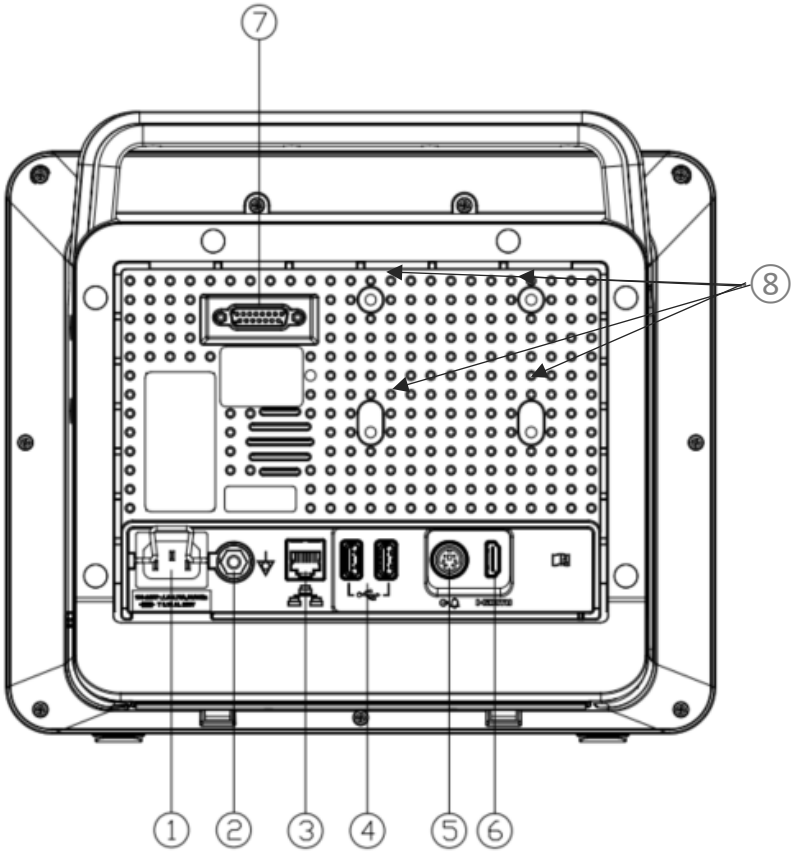
② Printer bracket

Back side view

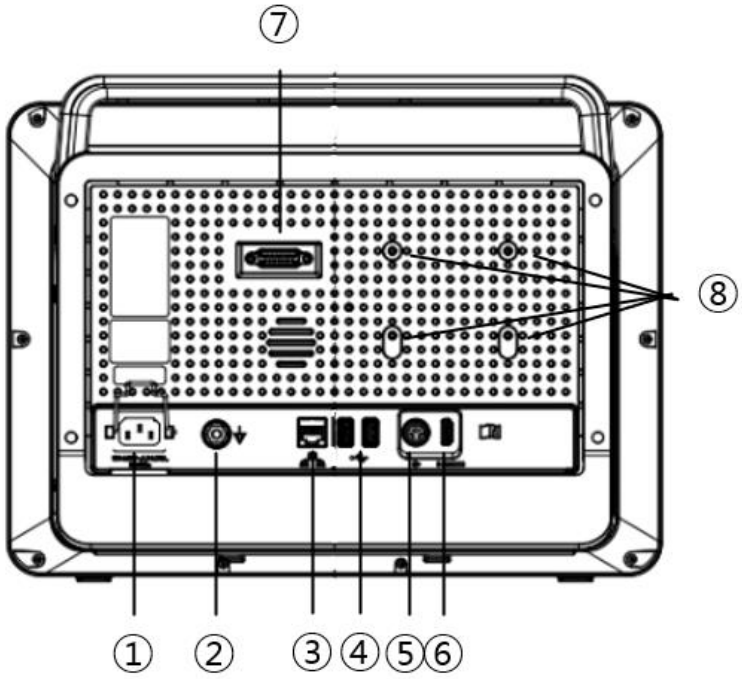
ACCUWAVE PLUS



ACCUWAVE PRO



ACCUWAVE PREMIER



① AC input connector

② Equipotential Grounding Terminal

③ LAN port

④ USB port (USB 2.0 5Vdc / Max. 500mA)

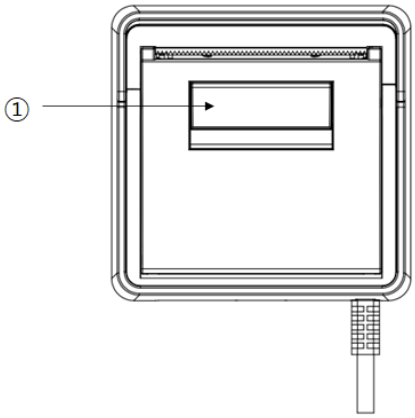
⑤ Printer connector

⑥ HDMI output port

⑦ External module connector (not used)

⑧ Dual gas module Bracket

Printer module



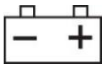
① Printer door lever

Warning	**USB compatible** ● **The veterinary multiparameter monitor is compatible with external USB memory drives up to 64GB.** ● **We recommend the products of the brands listed in the manual (Sandisk, PNY, Transcend, Samsung).** ● **When using a product with high power consumption, such as an external hard drive, be sure to use the adapter dedicated to it for suitable power supply. (You can't use it with the veterinary multiparameter monitor's power supply alone.)** ● **It is recommended to save the data of the connected devices before connecting any additional devices. Patterson recommends backing up data on an existing storage device before connecting a new storage device.** ● **Some high power USB devices may not be supported.**
Note	**The HDMI output of ACCUWAVE PLUS , ACCUWAVE PRO , and ACCUWAVE PREMIER is 1024x600 @60Hz, 1280x800 @60Hz. and 1366x768 @60Hz, respectively.** **Depending on the specifications of the veterinary multiparameter monitor, the**

	screen may not display the output, so please check beforehand.

Note	**When using the veterinary multiparameter monitor together with other devices, connect their equipotential grounding terminals together to eliminate the potential difference between them.**

6) Device Markings

	Caution: Consult accompanying documents		Type BF applied part
	Type CF applied part		ECG
	IP (Ingress Protection)		NIBP
	Temperature	SpO2	SpO2
	EtCO2		Grounding terminal
IBP	IBP		LAN port
	Printer connector		Snapshot
HDMI	HDMI external port		USB port
	Alarm Key		Date of manufacture
	NIBP Key		WEEE (Waste Electrical and Electronic Equipment)
	Power ON /OFF Key		Battery charge indicator
	AC Power		Safety Sign: It indicates that you should read the user manual. Read the user manual before starting work or operating the equipment.
	Consult instructions for use. This symbol advises the reader	MD	Medical device

	to consult the operating instructions for information needed for the proper use of the device.		
	This way up		Fragile
	Use no hooks		Keep dry
	Recycle		Manufacturer

7) Power

The veterinary multiparameter monitor uses AC power (100 -240VAC, 1.5~0.75A, 50/60Hz). In the event of a power outage or cable shortage, the monitor automatically switches to battery power to continue veterinary multiparameter monitoring without data loss. The built-in battery is intended for back-up use only during a power-outage.

When the power cable is connected to the back of the monitor, the AC input LED on the front lights up in green. When you press the power key, the monitor is powered on and ready to use.

Warning	**The veterinary multiparameter monitor must be connected to a protective earth grounded power supply.**
Caution	**Do not position the veterinary multiparameter monitor in a space that creates difficulty in unplugging its power supply cord.** **The veterinary multiparameter monitor can only be used with AC power (100 ~ 240VAC, 1.5 ~ 0.75A, 50/60Hz), and no other power source should be used.** **Do not connect AC power with wet hands.**

Battery Power

The veterinary multiparameter monitor uses battery power when there is a power-outage, or

during portable use scenarios.

When the AC power supply is cut off, the monitor immediately switches to battery power and continues to operate.

The battery is attached to the side of the monitor.

Caution	**For a monitor without batteries, sudden interruption of AC power, such as a power outage, may result in loss of stored data or data corruption.**

Operation

1. The battery is automatically charged when connected to AC power. The battery charge indicator LED on the front lights up in orange while the battery is being charged and turns green when charging is complete. While being charged, the battery icon is shown as charging in the upper right corner of the screen.
2. AC input LED and charging LED do not light up while the monitor is working on battery.
3. The charging status of the battery is displayed with a 5 step-diagram.

Battery Status Display		
Display	**Charging Status**	**Remarks**
	Charging	
	Fully charged.	
	80% of battery remaining	
	60% of battery remaining	If possible, connect the monitor to the AC adapter.
	40% of battery remaining	Immediately connect the monitor to the AC adapter.
	Battery is very low. (Power will turn off soon.)	Immediately connect the monitor to the AC adapter.
	No battery	Connect the battery.

Caution	**The battery status display is accurate only when the battery is functioning normally.** **Do not disassemble, modify, or heat the battery.** **Do not subject the battery to shock.** **Do not use if the battery shows signs of leakage, deformation, discoloration, or other abnormalities.** **The veterinary multiparameter monitor should only use batteries provided by Patterson**

Note	**When external power is not supplied, it takes about 2 minutes for the battery status display to reflect the actual remaining battery capacity.** **The continuous battery usage time was calculated based on the use of the equipment alone.** **If the battery is used alone, it will significantly deplete its power when operating the printer. Kindly connect to an external power source when using the printer**

Battery information

- Battery specification : Li-ion , 10.8V

  3BL3CABIO (3250mAh) (Default)
  6BL6CABIO (6500mAh) (Option)

- Battery charging time:

  3BL3CABIO : More than 3 hours
  6BL6CABIO : More than 5 hours

- Continuous battery usage time when fully charged:

  ACCUWAVE PLUS
  - 3BL3CABIO : about 3 hours
  - 6BL6CABIO : about 5 hours

  ACCUWAVE PRO
  - 3BL3CABIO : about 2 hours
  - 6BL6CABIO : about 4 hours

ACCUWAVE PREMIER

- 3BL3CABIO : about 2 hours
- 6BL6CABIO : about 4 hours

* (NIBP measured every 15 minutes with SpO2 and ECG, LCD brightness 80%)

Warning	● **Capacity or operating time of old or defective batteries is significantly compromised.** ● **Patterson recommends replacing the lithium-Ion battery after 24 months of use.** ● **Remove the battery if the veterinary multiparameter monitor is not likely to be used for an extended period of time.**

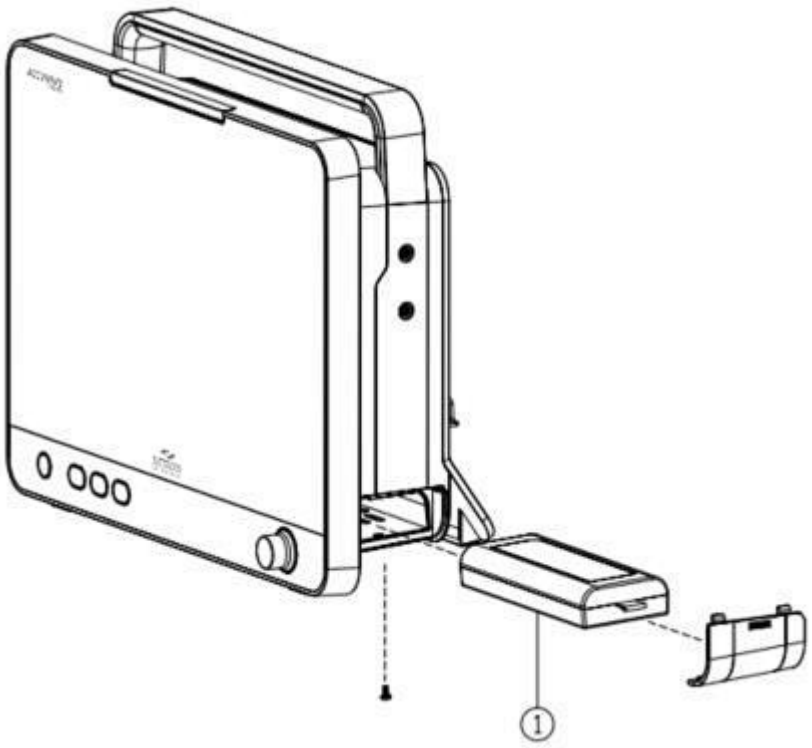
Note	**The Lithium-Ion battery is a rechargeable battery containing Lithium-Ion cells. Each battery contains an integrated electronic fuel gauge and a safety protection circuit.**

Note	**To keep the veterinary multiparameter monitor fully charged for patient transport, keep the veterinary multiparameter monitor plugged in until you are ready to transport the patient. Reconnect it to AC power immediately after transfer.** **Battery life depends on the frequency of use. Continued use by the battery power reduces the battery life and shortens the time of replacement.** **Be sure to recharge the battery before it is completely discharged.**

How to replace the battery

Replace the battery as shown below.

If the battery of ACCUWAVE PLUS doesn't fit in entirely, lay down the monitor facing up and try again.



① Standard battery

Warning	**Pay attention to the polarity when replacing the battery.** **We strongly recommend the use of battery officially supplied by Patterson.** **Ensure that the battery is properly secured to the bracket.** **Do not inflict extreme levels of impact on the battery.** **Ignoring the above warnings may cause battery explosion or other critical damages to the veterinary multiparameter monitor.**

Conditioning Guideline

Check battery performance by fully charging and completely discharging it every 6 months.

How to Recycle the Battery

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

Warning	**EXPLOSION HAZARD** **DO NOT incinerate the battery or store at high temperatures as it may explode, which may cause you serious injury.**

Warning	**Do not use a battery that has been impacted, disfigured, or submerged; dispose of it.**

8) Getting Started

Starting the monitor

Press the power key at the bottom right of the monitor's front panel.

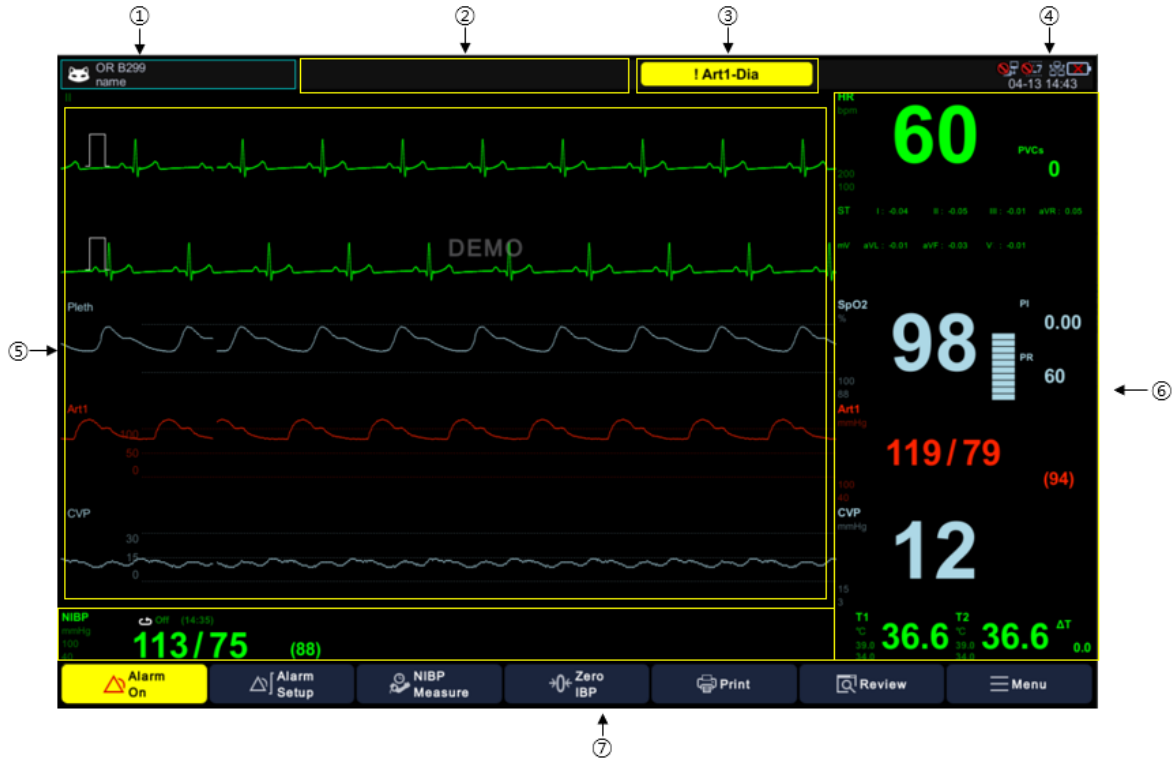
Caution	• **Check that the visual and audible alarm signals are displayed correctly when the veterinary multiparameter monitor is powered on.** • **Do not use the veterinary multiparameter monitor on a patient if you suspect it is not working properly or has been mechanically damaged. Contact your service representative or Patterson.**

Stopping the monitor

Press and hold the power key for 3 seconds, and the screen goes off.

Main screen setup

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



Veterinary multiparameter monitor Screen Layout

① Patient information: Displays patient information (patient species and name), unit name, and bed number. If you tap this area, the patient management dialog appears.

② Alarm mode information: Mode information is displayed in this area when changing the alarm mode. In Paused mode, the remaining time is also displayed.

③ Bio-signal alarm message: Displays high-priority alarms from the right.

④ System Status Information: Displays time, power status, network, and server connection status.

⑤ Parameter waveform: Displays the parameter waveform. When you select a waveform, the corresponding setting window appears.

⑥ Parameter Numerical: Displays the parameter value, alarm range and alarm status. If you select a numerical area, the corresponding setting window appears.

⑦ Menu: Displays the menu.

Rotary knob switch

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

Fixed keys

The fixed keys on the front panel of the monitor allow you to perform the frequently used functions.

Fixed key	Description
	The alarm control key switches between Normal / Audio Paused/ Alarm Paused mode. Each time you press the key, the alarm switches to Audio Paused -> Alarm Paused -> Alarm On. Press more than 3 seconds to switch to Audio Off or Alarm Off mode.
	It is the snapshot key. The data for 16 seconds right before the key is pressed is saved as a snapshot. You can view the saved snapshots in the Events menu of Review.
	This is to start or stop NIBP measurement. When the measurement is stopped, the automatic measurement cycle is also canceled.

Caution	**If the power key or fixed key is pressed hard with a fingernail, it may be torn or deformed.**

Function keys

On the right side of the monitor's front panel, you can find the touch screen icons that allow you to select frequently used functions.

Function key	Description	Function key	Description
	Alarm mode key : Switch between Normal/ Audio Paused()/ Alarm Paused ()mode		Set alarm conditions for each parameter.
	Automatic blood pressure measurement interval setting menu.		Zero the IBP. (Displayed only when the IBP parameter is on.)
	Start or stop printing when the printing is in progress. (Displayed only when a printer is connected.)		Review the stored data in the monitor, including trends, alarm events, snapshots, and full disclosure.
	It displays the setup menu.		

PART 2. Setup

1) Overview

This part describes how to configure the monitor.

2) Main Menu

Menu	Description	Available Settings
A. Change Layout	Change the monitoring screen layout.	Waveform, Large Parameter, Popup Trend
B. Demo	Activate the demo mode.	On, Off
C. Screen Lock	Enable user input lock. When input is locked, a lock icon is displayed in the center of the screen and the touch, and keystrokes are disabled. You can unlock the input by touching the lock icon.	On
D. Display Setup	Parameter View Settings	
D-1. Waveform Parameters	Waveform Layout parameter setting Decide whether to display and select parameter colors.	* Parameters : ECG, Resp, SpO2, IBP1,2, EtCO2, Gas, NIBP, Temp * Option Parameters : IBP 3,4 * Large Parameters only : Time * Color: Refer to the parameter color
D-2. Large Parameters	Set parameters of Large Parameter Layout. You can select a parameter to be placed on the split screen. The time parameter displays the current time and patient information in large format. When you select a time, the parameter next to it is	

	automatically turned off.	table below
E. System Information	System Information If the information cannot be read, “Not Ready” is displayed.	
E-1. License	License information	
E-2. MAC address	MAC address	
E-3. SW, ECG, ITS, NIBP	S/W or F/W version information	
E-4. EtCO2	EtCO2 Module Details	
F. System Setup	System Settings	
F-1. General	General Settings Menu	
F-1-1. Unit Name	Monitoring group settings The unit name is displayed in the patient information area. When USER DEFINE is selected, you can directly input the unit name.	ICU OR USER DEFINE
F-1-2. Bed Number	Bed number setting The bed number is displayed in the patient information area.	1~300
F-1-3. Language	Language settings	English, Korean French, Bulgarian Polish, German Chinese, Portuguese Hungarian, Czech Romanian, Italian Turkish, Spanish Russian, Greek Japanese, Dutch
F-1-4. Touch Volume	Touch sound settings	Off ~ 100%
F-1-5. Screen Brightness	Screen brightness setting	10~100%
F-1-6. Hospital Name	Hospital name	
F-1-7. Doctor Name	Doctor name	
F-1-8. Date Format	Set date format	YYYY-MM-DD, MM/DD/YYYY, DD/MM/YYYY
F-1-9. Patient Setup > Patient Display	Set patient information to be displayed in the patient information	Unit + Bed ID

	area.	
F-1-9-1. Patient Setup > Barcode ID Length	Limit the number of characters when entering an ID with a barcode. The set number is entered as an ID. If the length of the characters entered into the barcode is longer than the set number, the excess characters are entered as the patient's name. When set to blank, all entered characters are entered as ID.	Blank (no input restrictions) 1-20 characters
F-1-9-2. Patient Setup > When Entering Barcode ID	Set Admit action when entering ID with barcode. Auto Admit: Admit immediately. Manual Admit: The patient management window appears, and you can directly admit after confirmation.	Manual Admit, Auto Admit
F-1-9-3. Patient Setup > Default setting at Admit	Set default settings when admitting patients. When On, alarm and parameter settings are applied as manufacturer settings for the current patient species. When off, the last setting of the current patient species is applied.	On, Off
F-1-9-4. Patient Setup > Default setting at Discharge	Set default setting when patient is discharged. When On, the alarm and parameter settings are applied as the manufacturer's settings for a dog. When off, the last setting for a dog is applied.	On, Off
F-1-10. AC Filter	AC filter setting	Off, 50Hz, 60Hz

F-2. Units	Unit Setting Menu	
F-2-1. Weight	Weight measurement unit	kg lbs
F-2-2. Height	Height measurement unit	cm inch
F-2-3. Blood pressure	Blood pressure measurement unit	mmHg kPa
F-2-4. ST	ST measurement unit	mm mV
F-2-5. Temperature	Temperature measurement unit	°C °F
F-2-6. Gas > CO2	CO2 unit selection	mmHg kPa %
F-2-7. Gas > N2O	N2O unit selection	
F-2-8. Gas > O2	O2 unit selection	
F-2-9. Gas > Anesthetic gas unit	Anesthetic Gas unit selection	
F-3. Date & Time	Date Time Settings	
F-3-1. Date & Time	Date Time setting	Year, Month, Day, Hour (24H), Minute, Second
F-3-2. Apply	Apply entered date and time	
F-4. Network	Network Settings	
F-4-1. Wireless	Whether to use wireless	On, Off
F-4-2. AP Search	Execute the AP setting menu window. The SSID of the currently connected AP is displayed.	
F-4-2-1. AP List	Scanned AP list The SSID, signal strength, security information and connection status are displayed.	
F-4-2-2. Connect	Selected AP connection	
F-4-2-3. Refresh	AP list update	
F-4-2-4. Add AP (+)	Add network. Use if you manually add and connect to hidden networks.	
F-4-3. DHCP	Auto IP allocation setting menu	On, Off

F-4-4. IP	IP manual Settings The set IP is displayed. It can be entered when DHCP is Off.	XXX.XXX.XXX.XXX
F-4-5. Subnet Mask	Subnet mask manual setting The set subnet mask is displayed. It can be entered when DHCP is Off.	XXX.XXX.XXX.XXX
F-4-6. Gateway	Gateway manual setting The set Gateway is displayed. It can be entered when DHCP is Off.	XXX.XXX.XXX.XXX
F-4-7. MAC Address	Display Ethernet MAC address	
F-5. Communication	Server Settings	
F-5-1. BT-Link > Protocol Version	The BT-Link protocol version information is displayed.	1.4.0
F-5-2. BT-Link Next	BT-Link Next activation	On, Off
F-5-3. BT-Link Next IP	BT-Link Next server IP address setting	XXX.XXX.XXX.XXX
F-5-4. BT-Link Mobile	BT-Link Next Mobile activation	On, Off
F-5-5. BT-Link Mobile IP	BT-Link Next Mobile server IP address setting	XXX.XXX.XXX.XXX
F-5-6. HL7 > HL7	Enable HL7 integration.	On, Off
F-5-7. HL7 > Server IP	HL7 Server IP Address Settings	XXX.XXX.XXX.XXX
F-5-8. HL7 > Port	Remote PC Port Address	XXXX
F-5-9. HL7 > Period	Message transmission cycle setting menu.	10sec, 30sec, 1,3,5,10,15,30min, 1hour, 6 hour
F-5-10. HL7 > Check Response	Setting up server response verification for sent HL7 messages. An exclamation mark is displayed on the HL7 icon if the HL7 message transmission fails only when set to On.	On, Off
F-5-11. HL7 > Labels Edit	Execute parameter LABEL edit menu window.	
F-5-11-1. Parameter 1	Enter the default parameter label.	ECG, SpO2, Resp, NIBP, EtCO2 (EtCO2, FiCO2, AwRR label is used with Gas/EtCO2)

F-5-11-2. Parameter 2	IBP parameter label input	IBP
F-5-11-3. Parameter 3	Dual Gas label input	AG
F-5-11-4. Parameter 4	Temp label input	Temp
F-5-11-5. Unit	Unit label input	Percent, mmHg, kPa, bpm, rpm, 'C, 'F, mm, mV
F-5-11-6. Alarm Priority	Alarm priority label input	High, Medium, Low
F-6. Alarm	Alarm Setting	
F-6-1. Alarm Sound	Alarm sound type	IEC60601 Patterson
F-6-2. Alarm Paused Time	Alarm paused time setting	1, 2, 3, 5, 10, 15 min
G. Calibration	Touch screen and Parameter Calibration.	
G-1. Touch Screen	Touch screen calibration 1) Access the [Calibration] menu from the main menu, then select [Touch Screen Calibration]. 2) Press the cross markers on the Touch Calibration Screen in chronological order. 3) Once the calibration is complete, the screen disappears.	
G-2. Parameter Calibration	Chapter 2-3) Parameter Calibration Reference	

Warning	**Do not use keys or menu navigation key (rotary knob) on the touch screen calibration screen.**

Note	**If the device's time does not match the current time, set the current time in the Date Time menu.**

Parameter colors

Selectable Colors			
green, light blue, magenta, yellow, blue, sky blue, white, coral, scarlet, purple, orange, pale green, pink, pale yellow			
Parameter	**Color**	**Parameter**	**Color**
ECG (ST)	Green	SpO2	Light Blue
RESP	Yellow	NIBP	Magenta
TEMP	Green	ETCO2	Yellow
IBP1	Scarlet	IBP2	Light Blue
IBP3	Yellow	IBP4	purple
Gas(AG)	Yellow		

3) Parameter Calibration

Select Parameter Calibration from the Calibration menu. Manufacturer certification is required.

Menu	Description	Available Settings
A. ECG	ECG Parameter Calibration Menu	
A-1. ECG Calibration	ECG calibration and last calibration time is shown.	10mm/mV Input calibration indication
A-2. Resp Calibration	Resp calibration and last calibration time is shown.	1ohm 1mm
B. IBP	IBP Parameter Correction Menu	
B-1. IBP1~4 Zero	IBP# Zeroing and last zeroing time is shown.	
B-2. IBP1~4 Calibration	IBP# Calibration and last calibration time is shown.	
C. NIBP	NIBP Parameter Correction Menu	
C-1. Zero Calibration	NIBP Zero Calibration Menu	Air Pressure Zero Calibration
C-2. Gain Calibration	NIBP Gain Calibration Menu	
C-3. Pneumatic Pump	NIBP Pump Adjustment Menu	On, Off
C-4. Pneumatic Valve	NIBP Valve Adjustment Menu	Close, Open

4) Maker Service

Here are the functions used by manufacturers. Execute the Maker Service menu in the main menu. Manufacturer certification is required.

Menu	Description	Available Settings
1. Write MAC	Save the MAC address. Enabled only if there is no stored MAC.	
2. MAC Address	MAC address display	
3. SD Card Format	SD Card Format Clear and initialize all data and settings except for parameter calibration values, account information, and network settings.	
4. Factory Reset	Factory Reset Erase and initialize all data and setting values.	
5. Erase Data	Erase data. Clear trends, alarm events, and full disclosure data.	
6. Reset Settings	Reset setting values.	
7. Reset Admin	Initialize the Admin password, which is the default account.	
8. eMMC Info	View eMMC status information.	
9. Export Settings	Export system and alarm setting files to USB memory.	
10. Import Settings	Import system and alarm setting files in USB memory to the device.	
11. F/W Download	Upgrade the firmware.	

Note	**When using the export settings, import settings, and F/W download menus, be sure to connect only one USB memory device.**

PART 3. Network

1) Overview

When the veterinary multiparameter monitor is connected to the network, it can be accessed remotely through other veterinary multiparameter monitors or the central station.

BT-Link Next connects multiple veterinary multiparameter monitors to the central station and allows the remote control of the connected veterinary multiparameter monitors for various settings as well as patient data management.

The functions that can be remotely controlled from BT-Link Next are as follows.

- Patient admit and discharge
- Alarm condition setting
- Alarm status
- Display settings
- Start or stop NIBP measurement

Warning	**BT-Link Next cannot act as a primary alarm device and cannot rely on alarm notifications. There may be no audible or visible indications other than what is displayed on the screen, and the data displayed may be delayed.**

2) Network Connection

In a network, data can be transferred over wired or wireless connection.

All data interfaces (e.g., LAN, USB interface) follow the standard network procedure. ACCUWAVE monitors can exchange patient data with other ACCUWAVE monitors through the network during operation and support the following functions.

- Display waveform and parameter data
- Alarm signals

- Remote control (e.g., alarm management)
- Device setup and patient data transmission

When ACCUWAVE monitors are connected to the network with other devices, if there are any changes in the network, it could impose risks to patients, users, and third parties. These risks must be identified, analyzed, and evaluated before the monitor is connected to the network or before the network is changed, and appropriate measurement must be carried out.

Subsequent changes to the network examples are:

- 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** ● **The veterinary multiparameter monitor connected to the network could vary depending on wireless AP (Access Point) performance.** ● **When using a general AP, it is recommended to connect no more than 8 units to the same network.** ● **Due to the characteristics of wireless connection, the connectivity might not be stable depending on the environmental interferences.**

Note	**Supported USB Wi-Fi Dongle** **The veterinary multiparameter monitor supports the following USB VID and PID dongles.**

USB VID:PID
2357:0120
2357:011e, 2357:0122
2357:011f

0bda:0811, 0bda:0821, 0bda:8822, 0bda:a811
2357:010d
148f:761a
0e8d:7650
148f:7601
0bda:8176

The veterinary multiparameter monitor has completed the testing of the USB Wi-Fi dongle as follows.

TP-Link

Model	USB VID:PID	Chipset
TP-LINK T2U nano	2357:011e, 2357:0122	Realtek 8821a
TP-LINK T2U v3	2357:011f	Realtek 8821a
Etc 8821A MODEL	0bda:0811, 0bda:0821, 0bda:8822, 0bda:a811	Realtek 8821a
TP-LINK T2UHP	2357:010d	MediaTek 7650u
TP-LINK T2U	148f:761a	Ralink 7610u
TP-LINK T2UH	148f:761a	Ralink 7610u
TP-LINK T2U v2	0e8d:7650	MediaTek 7650u
TP-LINK AC600 archer T2U	2357:011f	Realtek 88XXau
TP-Link TL-WN727N v4	148f:7601	Ralink 7601U
TP Link TL-WN725N	0bda:8179	Realtek RTL8188EUS

ip Time

Model	USB VID:PID	Chipset
ipTime N150UA	148f:7601	Ralink 7601U
ipTime N100mini (N300U / Ncubic)	0bda:8176	Realtek 8188CU/8192CU

	Even if the USB VID and PID dongles are listed above, Wi-Fi dongles that have not been tested by the company may not be supported.
Note	**Intermittently, the USB Wi-Fi dongle may not be recognized, the AP list may not appear, or communication may be interrupted. In this case, remove the dongle from the device and reconnect it.** **If the problem persists even though the network settings are normal, replace the Wi-Fi dongle.**

Note	**The veterinary multiparameter monitor is compatible with BT-Link Next v4.00 or higher version.**

3) IT Network Connection

Only the authorized personnel can connect the veterinary multiparameter monitor to the network. Consult with the IT staff in the hospital at the time of installation.
Please refer to the following documents to proceed with the installation.

- Documents attached to this unit
- Network Interface Manual
- BT-Link Next user documentation

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

4) 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 individual VLAN networks. Configure the device's network settings according to this manual and your network specifications. LAN connection specifications are described in the following standard.

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 monitor is to be used as a layer-2-switch or layer-3-switch, the port setting must be configured on the network switch. Configure the network of Patterson devices to be compatible with the specifications of your operating organization.

The veterinary multiparameter monitor exchanges data with other medical devices over a LAN network. The network must support the following transports and protocols:

- TCP / IP
- Broadcast

5) VLAN Network

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

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

Also, you should build a network system that detects and defends against denial-of-service attacks by establishing a system dedicated to DDoS protection.

6) Inappropriate Network

If your network does not meet the requirements, the following risk factors may occur.

If the distributed alarm system is not safe:

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

If the network connection is interrupted:

- The alarm is not delivered.

If you do not have firewall and antivirus software:

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

Excessive overloading 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 and repeated rebooting may occur.

PART 4. Admission and Discharge

1) Overview

When a patient is connected to the monitor, it displays the patient's physiological data so that the patient can be monitored without hospitalization. However, since the monitor's alarm generation and trend data storage require the patient to be hospitalized, managing the patient's admission and discharge is important. The patient management menu enables you to manage the patient's admission, discharge, and patient information. The monitor displays the set unit and Bed information along with the information of a hospitalized patient and ID information.

Patient admission and discharge can be managed also from the central monitoring unit (BT-Link Next).

2) Admitting a Patient

Admit a patient to the hospital at the beginning of veterinary multiparameter monitoring.
Upon admission, set an alarm condition with the current patient species and activate the alarm.
Bio signal data is saved as trend data for the current patient.

How to admit a patient:

1.  **Press the [Patient] icon button.**
2. **Enter patient information** (Patient species, ID, name, age) on the Patient Management dialog.

   If the same patient information as the entered ID already exists, the patient information is displayed on the screen.
3. Press the **[OK]** button to confirm the admission.

When the patient is admitted, the icon in the Patient Management menu changes as the following chart.

Species	Admit	Discharge
Dog		
Cat		
Horse		
Others (small animal)		

Note	
	• **The default animal species is Dog.** • **You can change the animal species (Dog, Cat, Horse, Others) in the patient management dialog.** • **If you change the patient species, the monitor is reset to the previous set value of the selected species. To return the set value to the manufacturer's default setting, execute the "Default Settings" menu on the patient management dialog.**

3) Editing Patient Information

Correct or add additional information about hospitalized patients.

1.  **Press the [Patient] icon button**.
2. **Enter patient information** such as patient species, ID, name, and age on the Patient Management screen.
3. Press the **[OK]** button to update patient information.

Note	
	If you change an ID of a patient, the patient is discharged and readmitted with the changed ID.

4) Discharging a Patient

To terminate the monitoring of hospitalized patients, or admit new patients, discharge the current patient. Once a patient is discharged, trend data is not saved any more.

How to discharge a patient:

1.  **Press the [Patient] icon button.**
2. **Press the Discharge menu**. You can see Discharge confirm message.
3. Press the **[Yes]** button. The discharge procedure is in progress.

When the patient is discharged successfully, Patient icon () changes to Discharge status.

Warning	**You must discharge the current patient before admitting a new patient. Otherwise, the data may be associated with the wrong patient.**

Note	**Upon discharge, the patient monitor resets to the previous dog settings.**

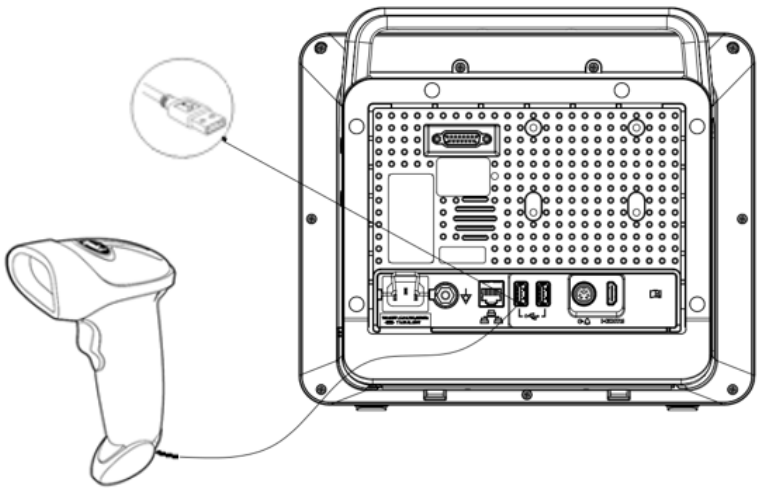
5) Patient Management Menu

Menu	Description	Available Settings
1. Species	Set the animal species (type)	Horse, Dog, Cat, Others (small animals)
2. Patient ID	Enter ID	
3. Auto	Automatic ID generation An ID is automatically generated based on the current time.	
4. Patient Name	Enter the animal's name	
5. Client Name	Enter the guardian's name	

6. Gender	Enter gender	Male, Female
7. Age	Enter age	
8. Age Unit	Age unit setting	Years, Weeks, Days
9. Weight	Enter animal's weight	XXX.XX kg (lbs)
10. Admit/Discharge	Patient admit/discharge	
11. Default Setting	Reset alarm and parameter settings to the manufacturer settings of the current animal species.	
12. Ok	Update entered patient information. The patient species and name are displayed in the patient information area.	
13. Cancel	Cancel patient information update and close dialog.	

6) Registering Patient ID Using Barcode

The monitor can register the PATIENT ID in barcode format using a USB barcode scanner. First, connect the barcode scanner to the USB port on the back of the monitor as shown below. When you hear a beep, the barcode can be used.



When you press the button on the barcode reader to scan the patient ID, the patient management dialog appears and displays the scanned ID and corresponding patient information.

PART 5. Alarm

1) Overview

The monitor displays the alarm limit (parameter threshold) and can be configured to trigger an alarm if exceeded limits are detected both in the alarm limits table and in the parameter box. If this limit is exceeded, a visual or audible alarm occurs.

Once the monitor's alarm and other parameter setting values are set, unless a separate operation is performed, they remain the same even if the monitor power is turned off. After connecting the power to the monitor and turning it back on, it starts to operate normally, and the alarm and other parameter values keep the set values.

Warning	**A potential hazard can exist if different alarm presets and default configuration settings are used for the same or similar devices in the same care area: for example, an intensive care unit or cardiac operating room.**
Note	**When the veterinary multiparameter monitor is connected to BT-Link Next, an alarm signal is expected to be delayed around 2 seconds from the veterinary multiparameter monitor to the BT-Link Next.**

2) Alarm Priority

According to the severity of the alarm, it is divided into high priority, medium priority, and low priority.

If multiple alarms occur at the same time, the monitor displays the highest priority alarm sound with a light.

- High Priority (High)

  When the patient has a life-threatening clinical condition where the risk must be managed immediately, or the monitor is in a critical failure condition and the patient's life may be at risk because the patient's fatal condition cannot be detected.

- Mid Priority (Medium)

  When the patient's physiological signs are abnormal and appropriate action or treatment is needed immediately, but not endangering to the patient's life. Or when the monitor is

severely malfunctioning and may affect the normal monitoring of key physiological parameters.

- Low Priority (Low)

  The patient's physiological symptoms are abnormal and may require appropriate action or treatment or when a specific function of the monitor is malfunctioning, but the patient's life is not in jeopardy.

- Message (Message)

  Circumstances that require notification regarding the condition of the patient or monitor

The monitor provides two patterns of alarm tone as shown below and in the following table. The user can select and use them as desired.

- IEC pattern: Compliant with 60601-1-8, **set as the default alarm pattern.**
- Patterson pattern: Provided by the manufacturer.

Audible Alarm		
Alarm Priority	**IEC**	**Patterson**
High	10 consecutive beeps every 10 seconds	1 high tone every 10 seconds
Medium	3 consecutive beeps every 15 seconds	1 high tone every 15 seconds
Low	2 consecutive beeps every 30 seconds	1 low tone every 30 seconds

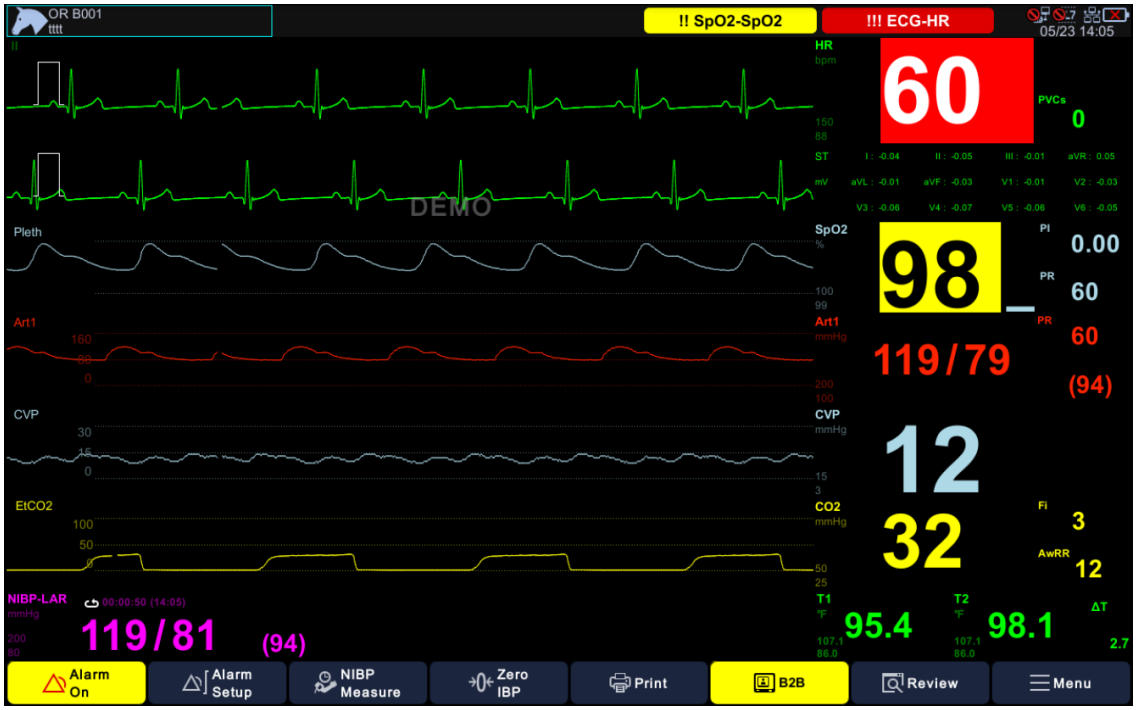
Note	- **The alarm signal sound pressure level is 55 dB (A) to 85 dB (A) within a range of 1 meter.** - **Refer to the F-6 Alarm, PART 2 about setting the audible alarm sound.**

3) Alarm Type

The alarm priority is divided into a patient status (physiological alarm) and monitor status (technical alarm).

Physiological Alarm Screen

It occurs when a patient's physiological parameters exceed the alarm limits, or the patient is physiologically abnormal. When a bio signal alarm occurs, the corresponding parameter blinks, and information is displayed in the bio signal alarm message area at the top of the screen.



The alarm indications according to its alarm priority are shown as follows :

Alarm Priority	Alarm Sound	Numeric Window	Alarm Lamp	Alarm Message
High	10	**RED** Blinking 1 time every 2 sec	R Blinking 2 times every 1 sec	**RED** Prefix : !!!
Medium	3	**YELLOW** Blinking 1 time every 2 sec	Y Blinking 1 time	**YELLOW** Prefix : !!

			every 2 sec	
Low	2	**YELLOW** Blinking 1 time every 2 sec	Y No blinking.	**YELLOW** Prefix : !

Numbers : Alarm sound indication and number of beeps

RED : Alarm indicator in red on the screen

YELLOW : Alarm indicator in yellow on the screen

R : Alarm lamp in red

Y : Alarm lamp in yellow

Technical Alarm Screen

Technical alarms are caused by improper operation or conditions that result in monitor failure or distortion of monitoring results. When a technical alarm occurs, the information is displayed in the corresponding parameter area.

Technical alarm table

Alarm Priority	Alarm Sound	Numeric Window	Alarm Lamp
Low	1	**BLUE** Blinking 1 time every 2 sec	No blinking.
Message		**BLUE** Blinking 1 time every 2 sec	

Numbers : Alarm sound indication and number of beeps

BLUE : Alarm indicator in blue on the screen

: Alarm lamp in cyan

4) Alarm Status

The monitor provides five different alarm conditions. Different icons indicate the current alarm status. You can adjust the alarm status by using the alarm status key or the alarm status menu.

Alarm Management

- Alarm Status Key

  Press the ALARM pausing key to adjust the alarm status.

  A short press of the alarm control key circulates through the Audio Paused → the Alarm Paused → the Alarm On 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.

- Alarm Status Menu

  Press  the yellow menu at the bottom left of the screen.

  Each time you press it, the status switches between Audio Paused → Alarm Paused → Alarm On.

Alarm Status Display

Alarm status is displayed in the alarm status information area at the top of the screen and in the alarm status menu.

 **Audio Paused**

The audible alarm stops for 1 minute while the visual alarm is still activated. A window notifying that the audio has paused appears on the screen, along with the remaining time of the Audio Paused. When you press the alarm button or after the timeout period has elapsed, visual and audible alarms are activated again.

 **Alarm Paused**

The visual and audible alarms stop during user defined time. Alarm Paused message and countdown timer are shown in the alarm status area on the top of the screen. When you press the alarm button for another alarm mode or after the timeout period has elapsed, visual and audible alarms are activated again.

You can set the pause time in **F-6 Alarm** in the main menu.

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 **Audio Off**

The audible alarm stops. Audio Off. Alarm window with audible sound is Off and shown on the screen. The monitor maintains Audio Off mode until you switch to another alarm mode.

 **Alarm Off**

The visual and audible alarms stop. Alarm Off. Alarm window with audible sound is Off and shown on the screen. The monitor maintains Alarm Off mode until the user switches to another alarm mode.

Warning	● **When the alarm sound is switched off, the veterinary multiparameter monitor gives no alarm tones even if a new alarm occurs. Be careful when considering switching off the alarm sound.** ● **When the alarms are off or while alarm audio is paused either temporarily or indefinitely, observe the patient frequently.**

Note	● **Alarm Paused and Off modes only stop the audible alarm sound. Touch and key sounds are still heard. To adjust the Touch or Key Sounds, use the Key Sound menu in Setup.** ● **When the connection with the central monitoring device (BT-Link Next) is cut when the alarm sound is off (Audio Off), it switches to the alarm on (Alarm On).**

5) Setting an Alarm

Press the  icon to pop up the alarm setting menu.

Changed alarm settings are maintained even if the monitor is suddenly turned off due to a power shortage, etc.

To return the alarm settings to the manufacturer's default settings, run the "Default Setting" menu on the Patient Management dialog (See **PART 4, Patient Management Menu**).

Menu	Description	Available Settings
A. Alarm	Alarm, level, action setting menu for each parameter	
A-1. Parameter List	List of Parameters Only the currently displayed parameters are displayed. Select a parameter to display the alarm. setting menu.	Parameters : ECG, SpO2, Resp, EtCO2, Temp, NIBP, IBP1&2, Gas (AG) Optional Parameters : IBP 3&4
A-2. Alarm	Set whether to detect an alarm.	On, Off
A-3. Priority	Set alarm priority.	High, Medium, Low

A-4. Low	Set alarm lower limit.	
A-5. High	Set alarm upper limit.	
A-6. Print	Set print when an alarm occurs.	On, Off
B. Arrhythmia	Arrhythmia alarm level, action setting menu	
B-1. Arrhythmia List	List of arrhythmias	Asystole, V-Tach, V-Tach/V-Fib, Bigeminy, Trigeminy, Acc Vent, Couplet, Irregular, Pause, R on T, V-Brady, Short Run, PVC
B-2. Alarm	Set whether to detect an alarm.	On, Off
B-3. Priority	Set alarm priority.	High, Medium, Low
B-4. Print	Set print when an alarm occurs.	On, Off
B-5. Off	Turn off all arrhythmia alarms.	
B-6. Lethal	Turn on Asystole, V-Tach, V-Tach/V-Fib alarms only	
B-7. Full	Turn on all arrhythmia alarms.	
C. Setup	Alarm Setting Menu	
C-1. Alarm volume	Alarm volume setting	10~ 100%

Warning	• **Check the saved alarm setting of the veterinary multiparameter monitor in advance to ensure that the current setting is appropriate for the patient.** • **Do not rely exclusively on the audible alarm system for monitoring. Adjustment of alarm volume to a low level may result in a hazard to the patient.**

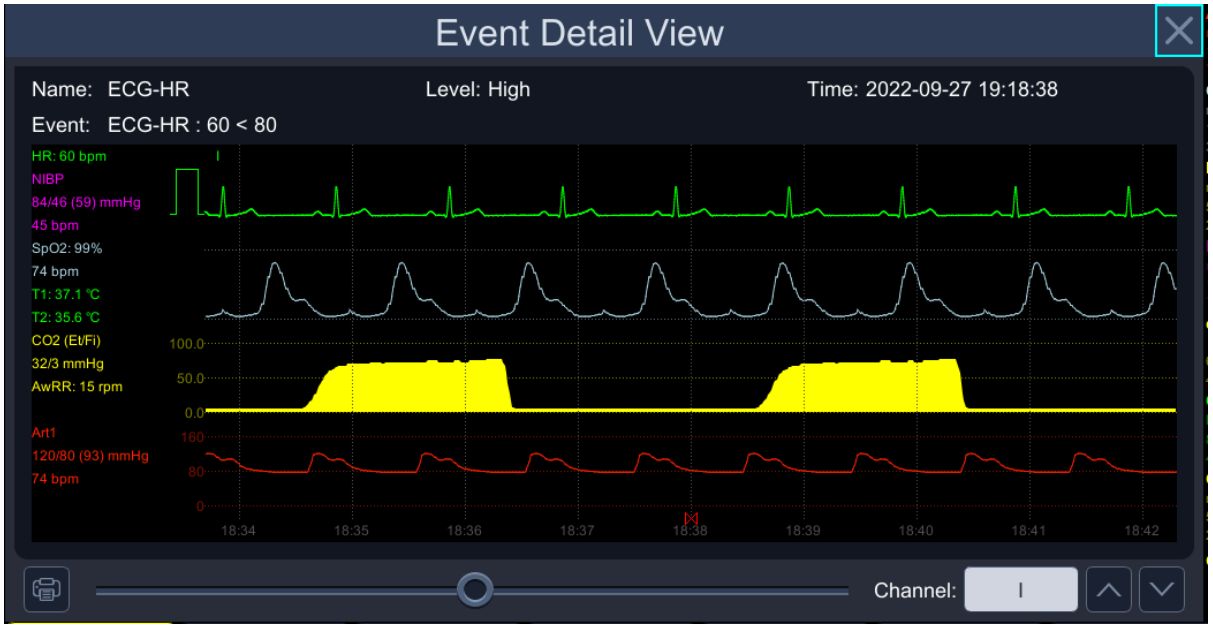
6) Alarm Events

When a bio signal alarm occurs, data for a total of 16 seconds is saved for 8 seconds before and 8 seconds after the alarm occur. You can check the alarm events in the Events screen of the "Review" menu ( ).

The Events screen shows up to 1000 alarms in chronological order with the most recent

occurrence. The list shows the alarm occurrence time, priority, and description.

You can select an item to view in detail, print, or delete.



Note	● **Alarms are saved as events and are maintained even if the veterinary multiparameter monitor is powered down. The time of powering down the veterinary multiparameter monitor is not recorded as an event and cannot be reviewed.**

	• **Earlier events are overwritten by recent events if the maximum storage of 1000 items is reached.** • **A total loss of power does not affect the events already stored.**

Manual Event

If necessary, you can manually save the event by pressing the [Snapshot] key (SNAPSHOT) on the front of the monitor. In this case, data is saved for the 16 seconds immediately before the Snapshot key is pressed. You can check the saved manual events on the Events screen of the Review menu, which are marked as Manual Event with Message priority.

Testing Alarms

In the demo mode, you can test the alarm tone and the alarm lamp by changing the alarm range and the alarm level. We recommend you to test the alarms every day.

Note	**When using the veterinary multiparameter monitor, we recommend you to operate it from the front.**

PART 6. Trend

1) Overview

The monitor stores trend data for all connected signals. Trend data can be retrieved in the form of a table or graph and printed out or exported in the form of a csv file to a USB memory.

Trends can be stored for up to 168 hours, and old data is deleted when the storage capacity is exceeded.

Two trend modes (Graphic / tabular) are available at the Review menu ( ).

2) Tabular Trend

The tabular trend tables display the trend data in an easy-to-read table format. Up to six lists are shown and updated every minute. The time stamp above each column indicates the interval at which the data in that column was saved. The displayed value is the recently acquired data during the interval, and the most recent data is shown in the right column. Alarm events that occurred within the time interval displayed on the screen are displayed as a red inverted triangle above the Timeline.

① Tabular Trend tab

② Graphic Trend tab

③ Event tab

④ Full Disclosure tab

⑤ Event List menu

⑥ Patient Information

⑦ Event List navigation button

⑧ Tabular Trend Setting button

⑨ Tabular Trend Printer button

⑩ Export Trend data

⑪ Selection navigation window

⑫ Trend Interval setting menu

⑬ Parameter select button

When you select the  Review menu in the menu screen area, the Review screen appears. Select the Tabular Trend tab.

Menu	Description	Available Settings
1. Patient information	The information of a patient admitted during the time zone where the cursor is positioned. Patient species, ID, and Name	
2. Event list	Alarm event list up When you select an event, the cursor moves to that event time.	
3. Move Prev/Next event	The cursor moves to the previous/post event.	
4. Time header	The trend table is divided into 6 columns and the time zone is displayed. In case of an alarm, an alarm marker is shown at the corresponding position.	1 column = Interval
5. Parameter List	Parameter name and unit display	
6. Parameter Table	The parameter name, unit, and numeric value of cursor position is displayed.	

7. Move first page/Prev page/Prev line, Move last page/Next page/Next line Navigation slider	Move section and update tabular trend.	
8. Page up/down	Page up/down	
9. Interval	Trend data interval	1 min, 5 min, 10 min, 15 min, 30 min, 1 hr, 2 hrs
10. Setup	Select parameters to display.	
11. Print	Print tabular trend data from the current time zone to the patient change (activated when printer is connected).	
12. Trend Export	Export the trend data.	

3) Graphic Trend

Graphic trend shows the saved trend data with individual graph type for each parameter. These graphs show that the displayed parameters are active over a significant period, five channels at a time. Confirmed color and scale meter labels and numbers are shown on the left side of the trend channel. Vertical lines show each graph, which displays the time of distribution. Alarm events that occurred within the time interval are displayed as a red inverted triangle above the Timeline.

① Tabular Trend tab

② Graphic Trend tab

③ Event tab

④ Full Disclosure tab

⑤ Event List menu

⑥ Patient Information

⑦ Event List navigation button

⑧ Graphic Trend Setting button

⑨ Graphic Trend Printer button

⑩ Export Trend data

⑪ Selection navigation window

⑫ Graphic Trends zoom menu

⑬ Parameter select button

When you select the  Review menu in the menu screen area, the Review screen appears. Select the Graphic Trend tab.

Menu	Description	Available Settings
1. Patient Information	The information of a patient admitted during the time zone where the cursor is positioned. Patient species, ID and Name	
2. Event List	When you select an event, the cursor moves to the point of alarm event	
3. Move Prev/Next event	The cursor moves to the previous/post event.	
4. Time Header	The graphic trend table is divided into 6 columns and the time zone is displayed. In case of an alarm, an alarm marker is shown at the corresponding position. In the corner, the cursor position time is shown.	
5. Parameter List	The parameter name, unit, and numeric value of cursor position is displayed.	
6. Parameter Graph	The parameter data is displayed according to the number of graphs in setting.	
7. Move first page/Prev page/Prev line, **Move last page/Next page/Next line** **Navigation slider**	Move section and update graph.	
8. Page up/down	View before/after page.	
9. Zoom	Change the resolution of the graphic trend table.	30 min, 1hr, 1.5 hrs, 2 hrs, 3 hrs, 4 hrs, 6 hrs, 8 hrs, 12 hrs
10. Setup	Select parameters to display.	
11. Print	Print the graphic trend data of the current time zone (activated when printer is mounted).	

12. Trend Export	Export the trend data.	

4) Setting Trend

Set the parameters to be displayed.

Menu	Description	Available Settings
1. Zoom	Trend resolution settings (trend time range settings)	30min, 1hr, 1.5hrs, 3hrs, 6hrs
2. Original Parameter List	Available parameter list	
3. Selected Parameter List	List of parameters to display at the trend table	
4. Add	List of parameters to add at the trend table	
4. Add All	Move all Original Param List to Selected Param List.	
5. Remove	Move selected Param item to Original Param List.	
6. Remove All	Move all Selected Param Lists to Original Param List.	
7. Move Top	Move the selected Param item to the top.	
8. Move Up	Move the selected Param items up one.	
9. Move Down	Move the selected Param items down one.	
10. Move Bottom	Move the selected Param item to the bottom.	
11. Close	Save Settings + Close Window.	

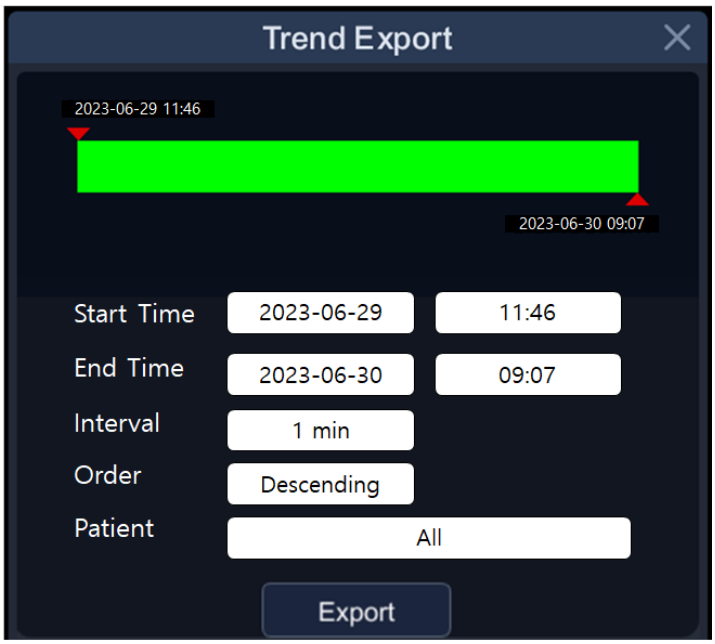
5) Exporting a Trend file

You can use the file extract function to transfer trends to a file using a USB memory device.

1. Connect a USB memory device.
2. Set a start time, end time, export time, and export order.

3. Press [Export] button.

4. A completion message is displayed when the transmission is completed.



Menu	Description	Available Settings
1. Start/ End Time	Start/end time of trend data	
2. Interval	Trend data interval	1 min, 5 min, 10 min, 15 min, 30 min, 1 hr
3. Order	Sort order	Ascending, Descending
4. Patient	Select Patient ID Used to extract trend data for a specific patient.	All, Patient ID
5. Export	Export	

Note	**The file format of USB memory supported by ACCUWAVE monitors is FAT32.**

6) Popup Trend

When selecting Popup Trend Layout from the Change Layout menu of the main menu, you can view and monitor the latest trends at the same time.

You can continue to monitor the main screen waveform and parameter box while watching the 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.

To change the popup menu window, touch the top and bottom of the popup menu with the touch key, or select it with the rotary switch. You can change the size of the popup menu by pressing and releasing the center of the popup menu for at least 0.5 second.

7) Troubleshooting

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

Problem	Solution
When the data is unable to be saved	The trend data may not have been saved. No trend data is saved when the patient is *discharged*. Make sure the patient is admitted.

PART 7. ECG

1) Overview

The monitor can calculate heart rate, detect arrhythmias, and display ECG data.

The electrocardiogram screen provides 1 channel, 2 channel and 7 channel displays.

The monitor's Analysis System is intended to acquire, analyze, display, and record electrocardiographic information from animals (Horses, Dogs, and Cats).

The ACCUWAVE monitors is intended to be used by trained personnel in hospitals or medical professional facilities under the direct supervision of a licensed healthcare practitioner.

2) ECG Precautions

Warning	• **For defibrillator protection, use only accessories specified by the manufacturer, such as electrodes, leads, and patient cables.** **Follow the instructions for use and adhere to all warnings and cautions.** • **CABLES — Keep all cables away from the patient's throat to avoid possible strangulation.** • **CONDUCTIVE CONNECTIONS — Extreme care must be exercised when applying medical electrical equipment. Many parts of the human/machine circuit are conductive, such as the patient, connectors, electrodes, transducers. It is very important that these conductive parts do not come into contact with other grounded, conductive parts when connected to the isolated patient input of the device. Such contact would bridge the patient's isolation and cancel the protection provided by the isolated input. There must be no contact of the neutral electrode and ground.** • **DEFIBRILLATION — Do not make contact with the patient during defibrillation. Otherwise, severe injury or death could result.** **To avoid the risk of serious electrical burn, shock, or other injury during defibrillation, all persons must keep clear of the bed and must not touch the patient, or any devices connected to the patient.**

	After defibrillation, the screen display recovers within 5 seconds if the correct electrodes are used and applied in accordance with the manufacturer's instructions. Patient cables can be damaged when connected to a patient during defibrillation. Check cables for functionality before using them again. **The peak of the synchronized defibrillator discharge should be delivered within 60ms of the peak of the R wave. The signal at the ECG output on the veterinary multiparameter monitor is delayed by a maximum of 30ms.** ● **If the ECG waveform on the screen is too unstable to synchronize with the patient's heartbeat 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 DEVICES — Devices may only be interconnected with each other or to parts of the system when qualified biomedical engineering personnel determined that there are no dangers to the patient, the operator, or the environment as a result. In the instances when there is any element of doubt concerning the safety of connected devices, you must contact the manufacturers regarding the concerned matters (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 veterinary**

	multiparameter monitor is used with an ESU, RF interference may affect the monitor operation. ✓ **Locate the veterinary multiparameter monitor as far as possible from the ESU. Locate them on opposite sides of the operating table, if possible.** ✓ **Connect the veterinary multiparameter monitor and ESU to different AC outlets located as far as possible from each other.** ✓ **When using the veterinary multiparameter monitor with an electrosurgical unit, its return plate and the electrodes for monitoring must be firmly attached to the patient. If the return plate is not attached correctly, it may burn the patient's skin where the electrodes are attached.** ● **During Surgery:** **Use the appropriate orange electrode ECG safety cable, or lead cable with a red connector, to measure ECG in the operating room. These cables have extra circuitry to protect the patient from burns during cautery, and they decrease electrical interference. This also reduces the hazard of burns in case of a defective neutral electrode at the HF device. These cables cannot be used for measuring respiration.** ● **Vibrations during intrahospital transport may disturb ECG measurement.**

Caution	● **The veterinary multiparameter monitor is not intended for direct cardiac application.** ● **Ensure that the conductive parts of ECG electrodes and associated connectors, including the neutral electrode, do not come into contact with any other conductive parts including earth.** ● **To minimize the hazard of burns during high-frequency surgical procedures, ensure that the veterinary multiparameter monitor's cables and transducers never come into contact with the electrosurgery unit (ESU).**

	• **To minimize the hazard of burns during use of high-frequency surgical units (ESU), the ECG electrodes should not be located between the surgical site and the ESU return electrode.**

3) Preparing the Patient

Proper skin preparation is necessary to ensure good signal quality at the electrode sites, as the skin is a poor conductor of electricity. To properly prepare the skin, choose flat areas and then follow this procedure:

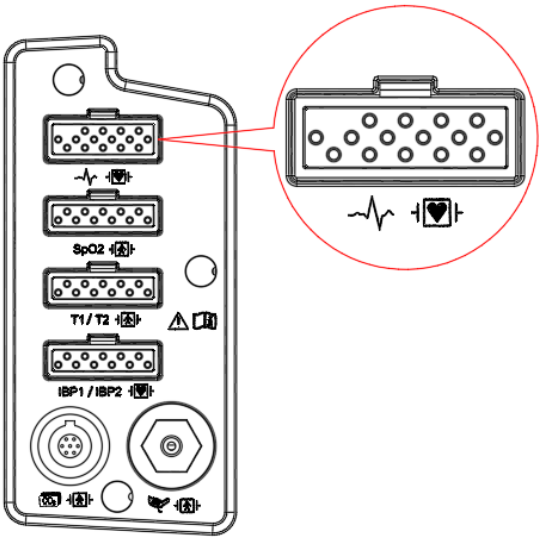
- Shave hair from skin at chosen electrode sites.
- Gently rub skin surface at sites to remove dead skin cells.
- Thoroughly cleanse the site with a mild soap and water solution. (We do not recommend using ether or pure alcohol because this dries the skin and increases the resistance.)
- Dry the skin completely before applying electrodes.

In the event of a technical alarm such as a broken lead, re-prepare the patient according to the recommendations above.

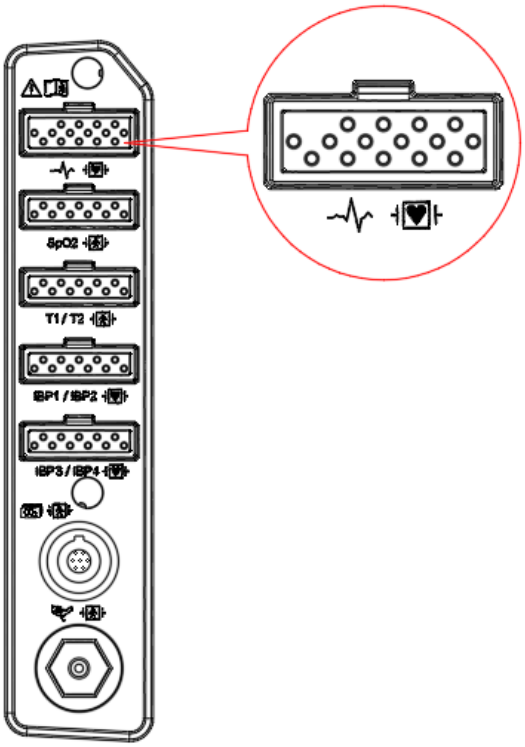
4) Connector and Measuring Cable

ECG Connector

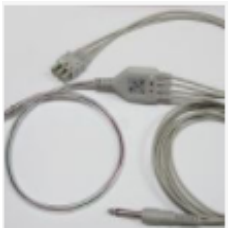
ACCUWAVE PLUS



ACCUWAVE PRO , ACCUWAVE PREMIER



ECG Measuring Cable

Number	Part	Picture	Dimension	Weight
1	ECG Extension Cable (152600-047100)		3-Lead ECG Extension Cable, AHA : 2500 ± 30 mm	163g
2	ECG Extension Cable (152600-047200)		5-Lead ECG Extension Cable, AHA : 2500 ± 30 mm	155g
3	ECG Cable (152600-002100)		3 lead ECG cable (alligator type) 1000 ± 20 mm	55g
4	ECG Cable (152600-002800)		5 lead ECG cable (alligator type 1000 ± 20 mm)	60g
5	ECG Cable (130336-001020)		Esophageal probe with 3-lead ECG and temperature, extra small size 4550 ± 100 mm	152g
6	ECG Cable (130336-001000)		Esophageal probe with 3-lead ECG and temperature, medium size 4550 ± 100 mm	152g

7	ECG Cable (152600-001900)		3-Lead ECG Lead Wires, Snab type, AHA : 1000 mm	55g
8	ECG Cable (152600-002600)		5-Lead ECG Lead Wires, Snab type, AHA	-

5) Attaching Electrodes

1. Unpack the electrode package and take out the electrodes.
2. Remove the protecting film on the surface of the electrode. Be careful not to touch the adhesive side.
3. Attach the disposable electrodes to the sterilized skin, which has been prepared as mentioned earlier.
4. Connect the lead of the electrodes to the monitor cable.
5. Fix the electrodes to the skin and secure the cable with the remaining length between the monitor and the electrode by using surgical tape. This fixation prevents the electrode from moving.

Change the electrodes every 24 to 48 hours to improve signal quality. You may need to replace them more often in the following situations:

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

There are a variety of reusable and disposable electrodes available. Choose the electrodes that best fits for monitoring the situation. Patterson recommends Ag / AgCl disposable electrodes.

If you are using a gel before attaching the electrodes, make sure that the gel is applied sufficiently on the electrodes. Never use disposable electrodes that have passed their expiration date or if the gel has dried.

Determine the electrode locations that 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, less 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:

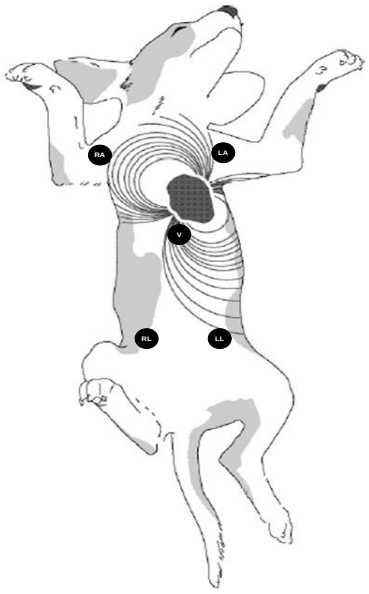
- Surgery patient - Place electrodes as far away as possible from the surgical area.
- Burn patient - Use sterile electrodes. Clean the monitor thoroughly. Follow the procedures of infection control from the hospital.

Note	• **Make sure that the contact area of the disposable electrode is not dry to maintain 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 one. Otherwise, the contacting impedance of the skin and electrode is increased, and the ECG signal is not obtained correctly.** • **If the packing condition is not proper even if the expiration date on the packaging is not reached yet, it should be replaced with a new one.** • **To get a stable ECG waveform, rub the skin with gel or benzoin tincture.**

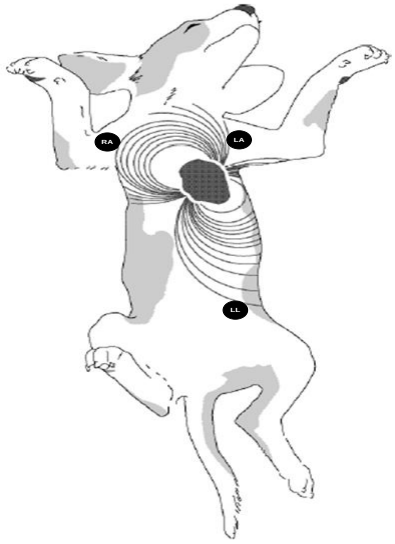
Caution	• **When using a generating electric potential equipment, it may interfere with ECG monitoring.** • **Do not rely solely on ECG for patients with epileptic tendencies. Electrical disturbances of non-cardiac circles such as seizures may interfere with the detection of specific arrhythmias.**

6) ECG Lead

5-Lead Electrode Placement



3-Lead Electrode Placement



Cable Color and Size

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

IEC: International Electro technical Commission (Europe standard)

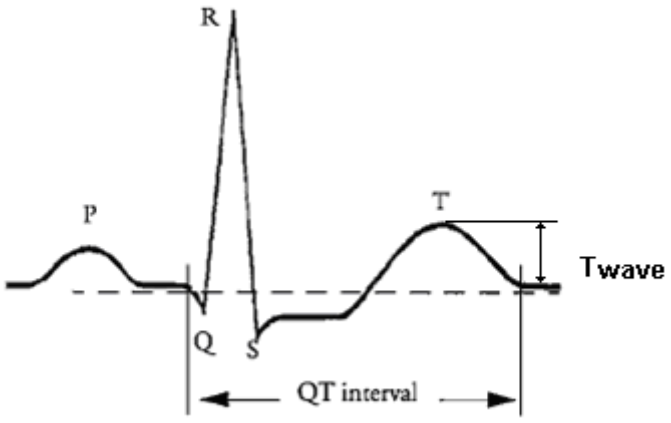
3-Lead / 5-Lead

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	V	White	C

7) ECG Signal Processing and Display

The monitor distinguishes the QRS amplitude of 0.4 to 5.0 mV (0.2-5.0 mV with a scale setting of 0.5 mV / cm or less) and a large animal with a QRS width of 70-120ms (or small animals with a QRS / ARR Select chapter). 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 area of the main screen as a result.

When using arrhythmia monitoring, when an arrhythmia alarm occurs, the name of the arrhythmia is displayed in the upper right corner of the ECG waveform area and in the vital signal alarm message area of the screen. (Refer to 8. Monitoring Arrhythmia for details on arrhythmia monitoring for details on arrhythmia monitoring.)



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

8) ST Signal Processing and Display

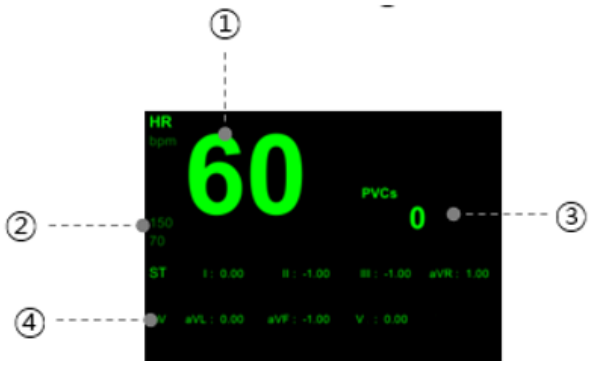
ST segment deviation is defined as movement above or below the equipotential level (mm). The difference is compared at the equipotential and ST measurement points. The isoelectric point defines the 0V point (no electrical activity, 0mm) on the horizontal axis (time) whose default position is at the F-Point (R peak) position before the ISO time setting time occurs. The ST point in the ST segment is the value of the ST time set-up time at the F-point (R peak).

The ST analysis feature examines the QRS complex that are classified as "normal" beats, from the selected ECG leads. The monitor learns each ST-lead and combines measurements and characteristics of a normal beat into a composite (or average) QRS Complex. Take the ST segment deviation from this mean. If ST monitoring is enabled, the current ST value is stored in the trend and can be reviewed in the trend display. The significance of the ST segment changes needs to be determined by a clinician.

9) Alarm and Its Status

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

10) Display



① Heart rate : Displays the heart rate per minute.

② HR Alarm limits : Displays heart rate threshold.

③ PVC count number per 1 minute

④ ST value per channel

11) Setting ECG

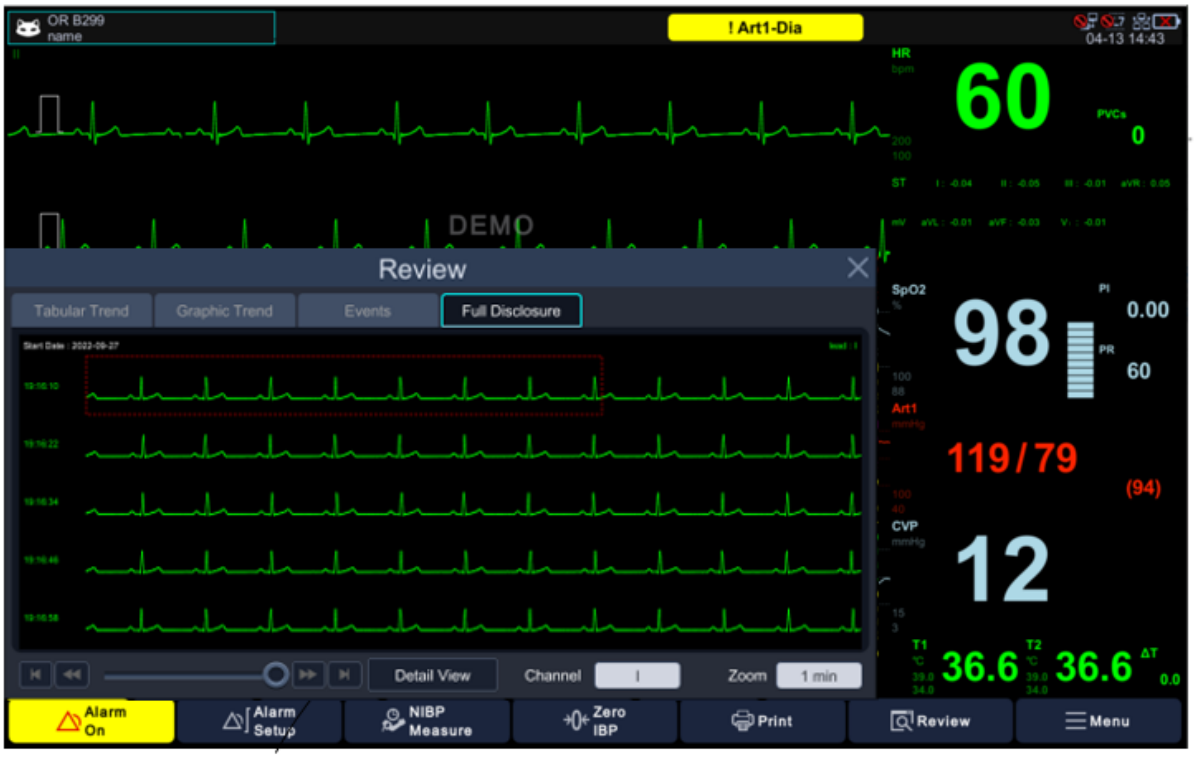
When you select an ECG value or waveform area, the setup menu appears.

Menu	Description	Available Settings
A. Alarm	ECG alarm Setting Menu	HR, ST, PVCs
A-1. Alarm	Set whether to detect an alarm.	On, Off
A-2. Priority	Set alarm priority.	High, Medium, Low
A-3. Low / High	Set alarm low/high limit value.	
A-4. Print	Set print when an alarm occurs.	
B. Setup	ECG Settings	
B-1. Speed	Set wave sweep speed.	6.25mm/s, 12.5mm/s, 25mm/s, 50mm/s
B-2. Size	Set wave size.	x0.25, x0.5, x1, x2, x4
B-3. Filter	Set waveform filter.	Diagnostic, Monitor, Surgery, ST
B-4. View Channel	The number of channels of the ECG waveform to be displayed on the screen. Menu is displayed according to the currently connected cable. The ECG waveform of 1CH is displayed in two lines.	Common: 1CH, 5-Lead : 2CH, 7CH
B-5. View Channel Trace 1, Trace 2	Select ECG Channel. Menu is displayed according to the currently connected cable. Trace2 is displayed when the View Channel is 2CH.	*3-Lead : I / II / III *5-Lead : I / II/ III/ aVR/ aVL/ aVF/ V
B-6. QRS Volume	Set QRS volume. When SpO2 pulse rate volume is	Off ~100% (10% unit)

	turned on, QRS volume is automatically turned off.	
B-7. HR Source	Select heart rate source. When it is set to Auto, if the ECG cable is not connected, the SpO2 pulse is displayed.	ECG, SpO2, Auto
C. ST/PVC	PVC and ST analysis setup	
C-1. PVC Analysis	Set PVC analysis result display. When it is set to On, PVCs are displayed.	On, Off
C-2. ST Analysis	Set ST analysis result display. When it is set to On, ST value for each channel is displayed.	On, Off
C-3. ST Template	ST Template waveform It is updated periodically (1 second).	
C-4. ST Template > Channel	Set ST analysis ECG channel. Menu is displayed according to the currently connected cable.	*3-Lead: I / II / III *5-Lead: I / II/ III/ aVR/ aVL/ aVF/ V
C-5. ST Template > Initial setup	Set ISO, ST point position initial value.	ISO: 90 ms ST: 60 ms
C-6. ST Template > ISO(R-)	Set ISO point position. It can be increased or decreased in 2ms increments.	20~160 ms
C-7. ST Template > ST(R+)	Set ST point position. It can be increased or decreased in 2ms increments.	20~160 ms

12) Full Disclosure Review

Enable to check the ECG waveform on the Full disclosure screen in the Review menu. Full disclosure data can be stored for up to 48 hours, and the old data is deleted when the storage exceeds its capacity.



Menu	Description	Available Settings
A. Full disclosure	View ECG Waveforms.	
A-1. Disclosure View	Display the ECG waveform in 5 rows according to the zoom setting. Tab the view area to move the cursor to that position.	
A-2. Page move and navigation slider	Move Section and update data.	
A-3. Channel	Select ECG channel. When it is changed, the waveform is updated with the selected channel.	I / II/ III/ aVR/ aVL/ aVF/ V
A-4. Zoom	View resolution settings.	1 min, 2 min, 3 min, 4 min, 5 min
B. Detail	Cursor Area Details	
B-1. View	Display with set waveform layout	
B-2. Waveform	Set Waveform layout.	7 ch, 3ch + 1
B-3. Rhythm Channels	Set Rhythm Channel.	I / II/ III/ aVR/ aVL/ aVF/ V

13) Troubleshooting

This section lists the problems that might occur. If you encounter some problems when using the monitor or accessories, check the table below before requesting a service representative. If the problem persists, please contact your service representative.

Problem	Solution
Noisy ECG traces	1. Check that the electrodes are not detached or dry. Replace with new ones if necessary. 2. Check that lead wires are not defective. Replace lead wires if necessary. Check that the patient cable or lead wires are not too close to other electrical devices. Move the patient cable or lead wires away from electrical devices if necessary.
Muscle Noise	Inadequate skin preparation, tremors, tense subject, and/or poor electrode placement. 1. Perform skin preparation again and re-place the electrodes. For more information, refer to **Preparing the Patient and Attaching the Electrodes.** 2. Apply new with moist electrodes. Avoid muscular areas.
Intermittent Signal	1. Check that cables are properly connected. 2. Check that electrodes are not detached or dry. Perform skin preparation again on the patient and apply new with moist electrodes. 3. Check that the patient cable or lead wires are not damaged. Change them if necessary.
Excessive Alarms: heart rate, lead fault	1. Check that electrodes are not dry. Perform skin preparation again and re-place the electrodes. For more information, see Preparing the Patient and Attaching Electrodes. 2. Check for excessive movement of patient or muscle tremors. Reposition the electrodes. Replace new with moist electrodes if necessary.
Low Amplitude ECG Signal	1. Check if the ECG gain is set too low. Adjust the gain control as required. For more information, see ECG setup menu. 2. Perform skin preparation again and re-place the electrodes. For more information, see Preparing the Patient and Attaching

	Electrodes. 3. Check electrode application. Avoid bone or muscular areas. 4. Check that electrodes are not dry or have been used for a prolonged time. Replace with new ones if necessary.
No ECG Waveform	1. Check if the ECG gain is set too low. Adjust the gain control as required. For more information, see ECG Setup menu. 2. Check if the lead wires and patient cables are properly connected. 3. Change cable and lead wires if necessary. 4. Check that the patient cable or lead wires are not damaged. Change them if necessary.
Base Line Wander	1. Check for excessive movement of patient or muscle tremors. Secure lead wires and cable. 2. Check that electrodes are not detached or dry and replace with new ones if necessary. For more information, see Preparing the Patient and Attaching Electrodes. 3. Check the ECG filter setting.

PART 8. Monitoring Arrhythmia

1) Overview

The monitor compares the received beats to the reference beats that have been recorded and stored in the reference template. Through this process, it can identify the occurrence of an arrhythmia event, classify it, and draw clinical conclusions based on the frequency and type of the signal. It observes all doubtful beats if the baseline moves beyond a defined limit. It uses QRS processing results for arrhythmia analysis. During multiple lead arrhythmia treatment, it measures the QRS Complex of each lead and compares it to the main learned beats. It classifies the beats based on information obtained from all available leads.

When an arrhythmia alarm occurs, the message below is displayed in the upper right corner of the ECG waveform area and in the bio signal alarm message area on the screen.

2) Arrhythmia Template

Template	Description	
Asystole	Ventricular asystole occurs whenever the displayed heart rate drops to zero.	
V-Fib / V-Tach	Ventricular fibrillation occurs when the ECG waveform indicates a chaotic ventricular arrhythmia.	
V-Tach	Large animal	Occurs when three or more ventricular beats greater than 100 beats per minute are detected.
	Small animal	Occurs when three or more ventricular beats greater than 150 beats per minute are detected.
Acc Vent	Large animal	Accelerated ventricular occurs when six or more ventricular beats are detected with an average heart rate for the ventricular beat between 50 and 100 beats per minute.
	Small animal	Occurs when six or more ventricular beats are detected with an average heart rate for the ventricular beat between 60 and 160 beats per minute.
Bigeminy	Occurs when two or more bigeminal cycles (a ventricular beat followed by a non-ventricular beat) are detected.	

Couplet	Occurs when two ventricular beats are detected and have non-ventricular beats before and after the couplet The coupling interval must be less than 600 milliseconds.	
Irregular	Occurs when six consecutive normal R-to-R intervals vary by 100 milliseconds or more.	
Pause	Occurs when the interval between two consecutive beats exceeds three seconds.	
PVC	Isolated premature ventricular complexes occur when a premature ventricular beat is Detected and has non-ventricular beats before and after.	
R on T	Occurs when ventricular COMPLEX is detected within the repolarization. period of the normal beat (when the RR interval is less than or equal to 360 msec).	
Trigeminy	Occurs when two or more trigeminal cycles (a ventricular beat followed by two non-Ventricular beats) are detected.	
Short Run	Occurs when three or more consecutive ventricular beats are detected and have a normal beat before/after.	
V-Brady	Large animal	Large animal
	Small animal	Small animal

Note	• **The Brady limit matches the low heart rate limit. If the low heart rate limit is changed, the Brady limit changes.** • **The Tachy limit matches the high heart rate limit. If the high heart rate limit is changed, the Tachy limit changes.**

3) Setting Arrhythmia

When you select an ECG value or waveform area, the setup menu appears. Select the Arrhythmia tab.

Menu	Description	Available Settings
1. Arrhythmia List	List of arrhythmias	Asystole, V-Tach, V-Tach/V-Fib, Bigeminy, Trigeminy, Acc Vent,

		Couplet, Irregular, Pause, R on T, V-Brady, Short Run, PVC
2. Alarm	Set whether to detect an alarm.	On, Off
3. Priority	Set alarm priority.	High, Medium, Low
4. Print	Set print when an alarm occurs.	On, Off
5. Off	Turn off all arrhythmia alarms.	
6. Lethal	Turn on Asystole, V-Tach, V-Tach/V-Fib alarms only.	
7. Full	Turn on all arrhythmia alarms.	

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.** ➢ **Lead Fault, Alarm Paused, Alarm Off, Patient Discharge**

PART 9. Respiration

1) Overview

Respiration via ECG Lead I or Lead II electrode is measured by using the changes in the resistance of skin, caused by the chest skin enlargement. In this process, the respiration value per minute is calculated and the alarm is triggered according to limit value.

The monitor can use ECG leads I or II for breath detection, regardless of the leads selected for QRS processing.

2) RESP Precautions

The safety and effectiveness of respiration measurement methods in detecting apnea have not yet been established.

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

3) Preparing the Patient

Skin preparation and electrode placement must be properly and carefully monitored in impedance breath monitoring. Refer to the **Preparing the Patient in PART 7.**

In general, the electrodes should be placed as clean as possible with the 60Hz noise minimized to

make it possible to generate a signal. The best results can be obtained when the electrodes are firmly bonded, and the electrode area is wide.

To improve the RESP signal, use a 5-lead cable set (RL as a neutral electrode). It is recommended that the electrodes be placed in the maximum expansion and contraction range of the lung, especially if deep breathing is involved.

Note	**Cables and connectors to measure respiration rate (RR) are commonly used with ECG.**

4) Display

① The number of respirations per minute

② Respiration alarm limit indicates respiration limits

5) Respiration Setting Menu

When you select the numerical or waveform area of Resp, the setting menu appears.

Menu	Description	Available Settings
A. Alarm	Set RESP Alarm.	RR, Zero RR
A-1. Alarm	Set whether to detect an alarm.	On, Off
A-2. Priority	Set alarm priority.	High, Medium, Low
A-3. Low / High	Set Alarm low/high limit value.	
A-4. Print	Set print when an alarm occurs.	
B. Setup	Setup Menu	
B-1. Speed	Set Waveform range speed.	6.25 mm/sec 12.5 mm/sec 25.0 mm/sec
B-2. Size	A menu to setup wave display	x2, x4, x6, x8, x10
B-3. Lead Selection	This is for changing the reference lead for respiration.	Lead I Lead II

PART 10. SpO2

1) 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 light and infrared light passed through capillaries at the tip of the tongue to detect pulsation components, calculate HR and oxygen saturation, and alarm according to the set alarm value. You can calibrate the patient monitor to display functional oxygen saturation.

2) Precautions

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

Warning	● **The pulse oximeter cannot be used as an apnea monitor.** ● **Ambient lighting, physical behavior, diagnostic tests, electromagnetic interference, and improper positioning of the probe may affect SpO2 accuracy.** ● **Sensor may be used on the same site for a maximum of 10 minutes provided the site is inspected routinely to ensure skin integrity and correct positioning. Because individual skin condition affects the ability of the skin to tolerate sensor placement, it may be necessary to change the sensor site more frequently with some patients.** ● **Check compatibility before using the veterinary multiparameter monitor,**

	probe, and cable specified by Patterson. ● **Use only Patterson-designated sensors. Other sensors may not provide adequate protection against defibrillation or may put the patient at risk.** ● **Disposable accessories (disposable electrodes, transducers, etc.) should be used only once. Do not reuse disposable accessories.** ● **When the monitor is connected to electrosurgical units, make sure the sensor and cables do not make contact with the electrosurgical unit. The patient lead and conducting wire must be far away from the operating table and other devices. The electrosurgical unit should be properly grounded.** ● **When the monitor is connected to high frequency electrosurgical equipment, do not allow the sensor from the monitor to come into contact with the high frequency electrosurgical equipment or its cables. Otherwise, electric leakage may occur and may cause burns to the patient.** ● **Pulse oximeters have been validated for low perfusion accuracy in bench-top tests on simulators with signal strength of 0.02% or more, and transmissions of 5% or more to standard deviations include 68% of the population.**

3) Preparing the Patient

The accuracy of SpO2 monitoring is largely dependent on the strength and quality of the SpO2 signal.

Place the sensor on the tip of the animal's tongue as a monitoring site. Only use sensors provided by Patterson and apply them according to manufacturer's recommendations on a per-sensor basis.

If the sensor is not attached correctly, the ambient light may interfere with the pulse oximetry, making the measurement irregular or causing the value to disappear. If you suspect interference from ambient light, make sure that the sensor is properly positioned and that the sensor cover with the opaque body is covered.

1. Select the sensor type and size that best suits your patient.
2. If the sensor can be reused, please wash it before use for each patient.

3. Position the sensor correctly and attach it to the patient.
4. Connect the sensor to the patient cable.
5. Check the application area of the sensor from time to time. If the sensor is too tight, it may delay blood flow or overheat the skin and damage the tissue. Do not use a damaged sensor.

Note	• **Read the documentation that came with your sensor for the best application technology and safety information. Never use a damaged sensor.** • **If the sensor does not turn on after connecting the sensor, observe that a message appears on the veterinary multiparameter monitor. If the sensor-LED does not turn on, replace the sensor.**

4) Connector and Measurement Cable

SpO2 Connector

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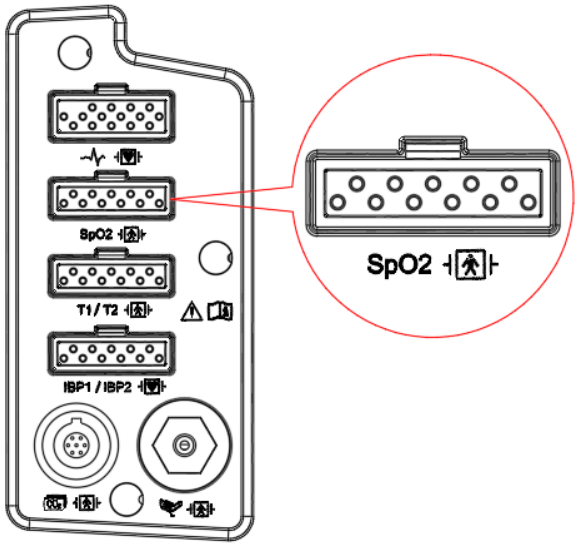

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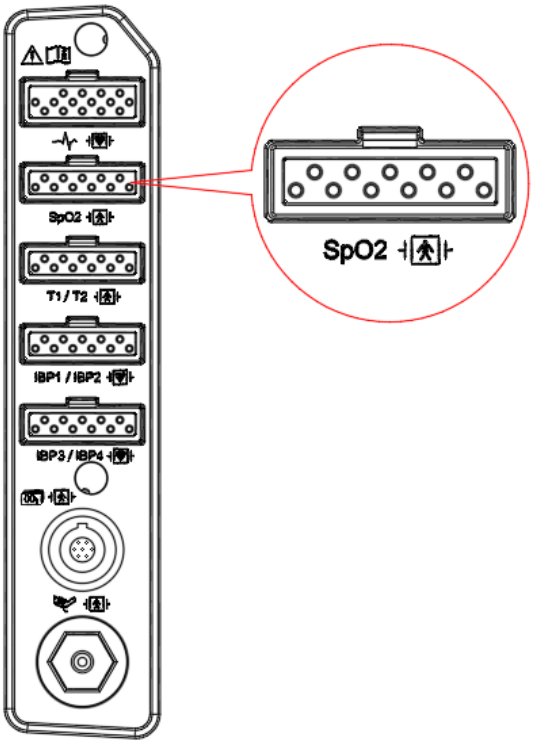


SpO2 Measurement Extension Cable

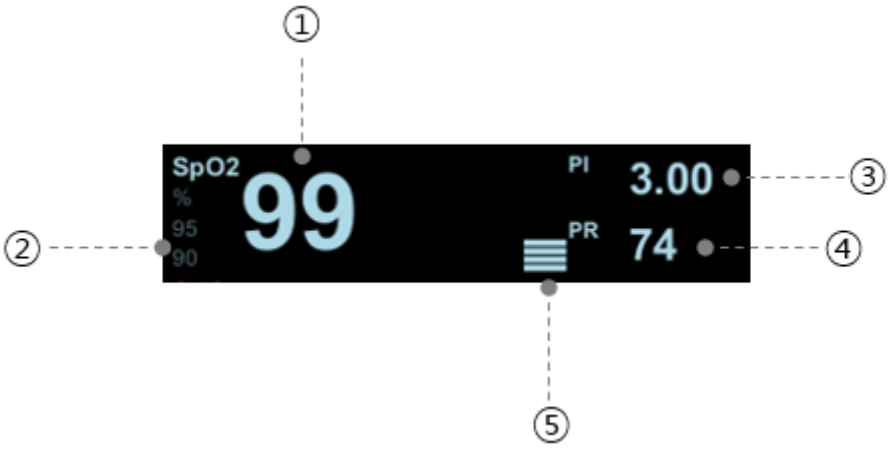
Number	Part	Picture	Dimension	Weight
1	152600-042700		SpO2 EXTENSION CABLE 2000±50mm	120g

SpO2 Sensors

Number	Part	Picture	Dimension	Weight
1	SpO2 probe (152600-032400)		Transflectance SpO2 probe for veterinary 1000 ± 50 mm	100g
2	SpO2 probe (152600-003331)		SpO2 multi-site Y sensor 1500 ± 50 mm	100g

Note	**The signal input is a high-insulation port protected from defibrillator. ( )** **The insulated input ensures patient safety and protects the veterinary multiparameter monitor during defibrillation and electrosurgery.**

5) Display



① %SpO2 Value display

② %SpO2 alarm limits display

③ SpO2 PI (Perfusion Index) measurement display

④ SpO2 pulse rate display

⑤ SpO2 strength indicator

The SpO2 measurements are averaged over a 6-second period and the monitor display is updated every second.

Note	• **SpO2 wave size is changed automatically.** • **A functional tester or SpO2 simulator (Fluke, Index 2 simulator) can be used to verify operation of pulse oximetry function.** • **A functional tester or SpO2 simulator cannot be used to assess the SpO2 accuracy.**

6) Signal and Data Validity

It is extremely important to determine that the probe is attached to the patient correctly and the data is verifiable. To make this determination, three indications from the monitor are assisted: the signal strength bar, the quality of the SpO2 waveform, and the stability of the SpO2 values. It is critical to observe all three indications simultaneously when ascertaining signal and data validity.

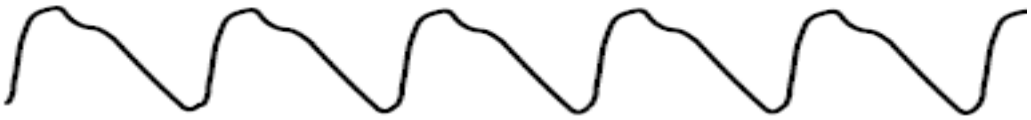
Signal Strength Bar

Pulse histogram and perfusion index (PI) are useful features that can be used to determine the reliability of readings. If the pulse bar's height is less than 30%, this indicates an inadequate signal and the displayed SpO2 or pulse rate values may be potentially inaccurate.

Quality of SpO2 Waveform

Under normal conditions, the SpO2 waveform corresponds to (but is not proportional to) the arterial pressure waveform. The typical SpO2 waveform indicates not only a good waveform, but helps you find a probe placement with the least noise spikes present. The figure below represents an SpO2

waveform of good quality.



SpO2 Waveform in Good Quality

If noise (artifact) is seen on the waveform because of poor probe placement, the photo detector may not go through the tissue. Check that the probe is secured, and the tissue sample is not too thick. Pulse rate is determined from the SpO2 waveform which can be disrupted by a cough or other hemodynamic pressure disturbances. Motion at the probe site is indicated by noise spikes in the normal waveform (See the figure below). To reduce motion noise, you should carefully look at the SpO2 waveform and check the probe position on the patient.

SpO2 Waveform with Artifact

SpO2 Wavelength and Optical Output Power

BSpO2 Oximax pulse oximetry display functional saturation.
This information can be useful to medical staff performing photodynamic therapy.

- The BSpO2 pulse oximetry sensor contains an LED that emits red light at a wavelength of approximately 660 nm and infrared light at a wavelength of approximately 905.920 nm.

Stability of SpO2 Values

The stability of the displayed SpO2 values can also be used as an indication of signal validity. You can improve the stability of SpO2 values with a little practice. SpO2 Messages are provided in the

SpO2 values window to aid you in successful SpO2 monitoring.

Warning	**In the monitoring of patients, the coincidence of adverse conditions may lead to a disturbed signal going unnoticed. In this situation, artifacts may simulate a plausible parameter reading, so that the veterinary multiparameter monitor fails to sound an alarm. To ensure reliable veterinary multiparameter monitoring, the proper application of the probe and the signal quality must be checked at regular intervals.**

7) SpO2 Setting Menu

When you select the numerical or waveform area of SpO2, the setup menu appears.

Menu	Description	Available Settings
A. Alarm	Set SpO2 Alarm.	SpO2, PR
A-1. Alarm	Set whether to detect an alarm.	On, Off
A-2. Priority	Set alarm priority.	High, Medium, Low
A-3. Low / High	Set Alarm low/high limit value.	
A-4. Print	Set print when an alarm occurs.	
B. Setup	Setup Menu	
B-1. Speed	Set waveform range speed.	6.25 mm/sec, 12.5 mm/sec, 25.0 mm/sec, 50.0 mm/sec
B-2. Rate Volume	Set pulse volume. When ECG volume is set, it is automatically set to Off.	Off ~100% (10% unit)

8) Troubleshooting

This section lists the problems that might occur. If you encounter problems when using the monitor or accessories, check the table below before requesting a service representative. If the problem persists, contact your service representative.

Problem	Solution
"---" is displayed in place of numeric.	1. Make sure the SpO2 cable is securely connected. If necessary, replace the SpO2 cable. 2. Connect the SpO_2 sensor if the alarm Probe Off appears. 3. Check the PI value. If the PI value is too low, adjust the SpO_2 sensor, or apply the sensor with better perfusion. 4. Move the sensor to a place with weaker ambient light, or cover the sensor to minimize the ambient light if the alarm Too Much Light appears.
Low amplitude SpO2 signal	1. The SpO2 sensor and NIBP cuff are placed on the same limb. Change the monitoring site if necessary. 2. Check the PI value. If the PI value is too low Adjust the SpO2 sensor or apply the sensor to a site with better perfusion.
SpO2 value is inaccurate.	1. Check the patient's vital signs. 2. Check for conditions that may cause inaccurate SpO2 readings. 3. Check the monitor, the SpO2 module for proper functioning.

PART 11. NIBP

1) Overview

The monitor uses the oscillometric method for measuring Non-Invasive Blood Pressure (NIBP). NIBP measurement is based on the principle that pulsatile blood flow through an artery creates oscillations of the arterial wall. The oscillometric device uses a blood pressure cuff to sense these oscillations that appear as tiny pulsations in cuff pressure and measure the amplitude of pressure changes in the occluding cuff as the cuff deflates from above systolic pressure. The amplitude suddenly increases as the pulse breaks through the occlusion in the artery. As the cuff pressure decreases further, the pulsations increase in amplitude, reach a maximum (which approximates to the mean pressure), and then diminish. The oscillometric method measures the mean pressure and determines the systolic and diastolic pressures.

If the pulse signal is weak due to patient movement, improper cuff positioning, or noise in the signal, deflate the cuff and try a second measurement. Refer to the status alarm message table for causes and solutions for weak pulse signals. Connect the cuff and monitor with a hose to measure contraction, dilatation, and mean blood pressure in large animal or small animal.

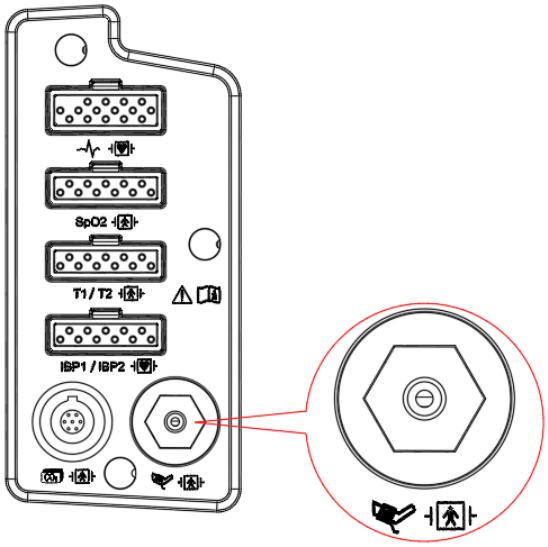
The monitor's NIBP system expands and contracts the Pneumatic Cuff wrapped around the patient's arm or leg to initiate blood pressure measurement alone based on a set interval or persistence lasting more than 5 minutes.

Note	• **The veterinary multiparameter monitor has been clinically investigated in accordance with the requirements of ISO 81060-2: 2013, and the blood pressure measurements taken with the veterinary multiparameter monitor are identical to those obtained by the intra-arterial method within the limits prescribed by the Association for Advancement of Medical Instrumentation, Electronic Automated Sphygmomanometers (AAMI/ANSI SP-10).** • **You can perform NIBP measurement during electro-surgery and discharge of a defibrillator.** • **NIBP performance may be affected by extreme temperature, humidity, and altitude. For environmental conditions, refer to PART 25. System Specifications.**

2) Connector and Cuff

Connector

ACCUWAVE PLUS



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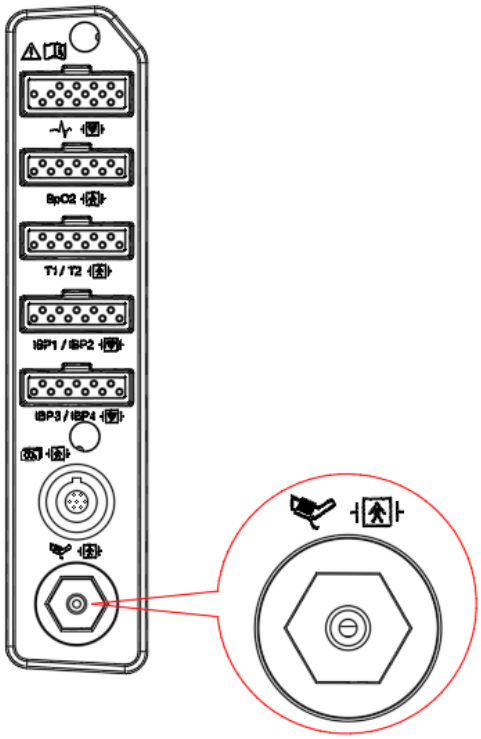


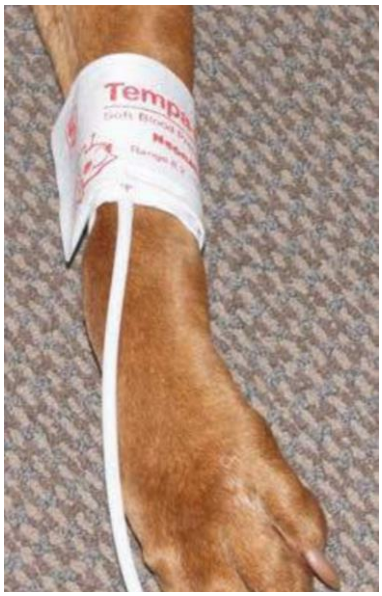
Cuff Extension Tube

Optional Accessories List

Cuff		Using Scope 3-6cm
		Using Scope 4-8cm
		Using Scope 6-11cm
		Using Scope 7-13cm
		Using Scope 8-15cm

Note	**The ESU does not cause a burn hazard through the NIBP cuff, because there is no electrical connection between the cuff and the NIBP measuring electronics.**

3) Position of Cuff



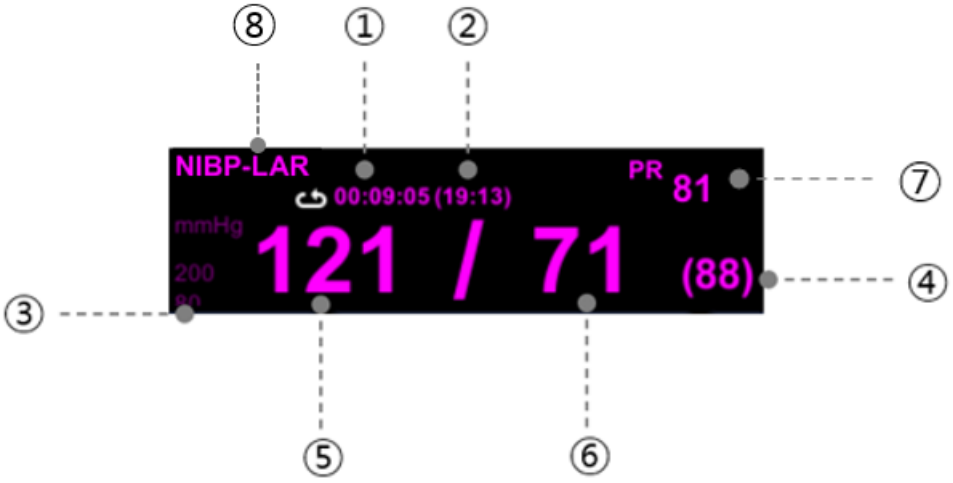
Incorrect Placement

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.

4) Display



① Measurement period or remaining measurement time: Before measurement starts, the set measurement period is displayed. When the measurement is complete, the remaining time until the next measurement is displayed.

② Measurement completion time

③ Alarm upper/lower limits for systolic or diastolic blood pressure: When the systolic blood pressure alarm is off, the alarm upper/lower limits for diastolic blood pressure are displayed.

④ Mean blood pressure: Indicates the average blood pressure

⑤ Systolic blood pressure: Indicates the maximum blood pressure

⑥ Diastolic blood pressure: Indicates the minimum blood pressure

⑦ Pulse rates: Indicates pulse rate

⑧ Set cuff size

5) NIBP Setting Menu

When you select the NIBP numerical area, the setting menu appears.

Menu	Description	Available Settings
A. Alarm	Set NIBP Alarm.	Sys, Dia, Mean, PR
A-1. Alarm	Set whether to detect an alarm.	On, Off
A-2. Priority	Set alarm priority.	High, Medium, Low

A-3. Low / High	Set alarm low/high limit value.	
A-4. Print	Set print when an alarm occurs	
B. Setup	Setup Menu	
B-1. Cuff Size	Set cuff size * When changing the cuff, be sure to match the actual cuff size with the cuff size set on the monitor.	Small (~ #3), Large (#4~)
B-2. Initial Pressure	Set initial pressure. Default settings: *Large Cuff : 170 mmHg *Small Cuff : 120 mmHg	Large Cuff : 120 – 250 mmHg Small Cuff : 60 – 120mmHg
B-3. Interval	Set the blood pressure measurement cycle. *Manual: Manual measurement *Others: Periodic measurement. After setting, press the NIBP menu to start periodic measurement.	Manual, 1min, 2, 2.5, 3, 4, 5, 10, 15, 20, 30, 1hour, 1.5, 2, 4, 8
B-4. Start Mode	Set repeat measurement method. *Clock: On-time measurement *Interval: Measure at the set interval	Interval, Clock
B-5. PR Display	Whether to display Pulse Rate	On, Off
C. Review	Review Recent Blood Pressure Measurements (up to 1000)	
C-1. Latest / Prev /Next	Go to latest/previous/after page	

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

	● **When changing the cuff, be sure to match the actual cuff size with the cuff size set in the monitor.**

Note	**Safety Considerations** **Software and Hardware for Cuff pressure Blocking** **If the measurement time exceeds 2 minutes, the cuff is automatically reduced. Extension limits are established for all patient categories to prevent over pressurization of the patient.** **The maintenance is performed every 2 years.** **Check the following list to ensure the veterinary multiparameter monitor always operates properly and safely.** **1. Check for proper cuff size.** **2. Check for residual air left in the cuff from a previous measurement.** **3. Make sure the cuff is not too tight or too loose.** **4. Make sure the cuff and heart are at the same level, otherwise hydrostatic pressure will offset the NIBP value.** **5. Minimize patient movement during measurement.** **6. Watch for pulsus paradoxus.** **7. Check for leaks in the cuff or tubing.**

6) Measurement Restrictions

The measurement may be inaccurate or impossible:

- Measurements are impossible with heart rate extremes of less than 40 bpm or greater than 300 bpm.
- With excessive and continuous patient movement such as shivering or convulsions

- If a regular arterial pressure pulse is hard to detect
- With cardiac arrhythmias
- With rapid blood pressure changes
- With severe shock or hypothermia that reduces blood flow to the peripheries
- With obesity, where a thick layer of fat surrounding a limb dampens the oscillations coming from the artery
- On an edematous extremity

7) Selecting and Placing the Cuff

The quality of NIBP monitoring depends largely on the quality of the signals received by the monitor. For this reason, it is important to select the correct cuff size for your patient. Cuff sizes are clearly marked on the cuff. Measure the circumference of your patient's limb. Use only Patterson cuffs with your monitor.

Warning	• **Non-invasive blood pressure monitors are not recommended for patients with hypotension, hypertension, arrhythmias, or extremely high or low heart rates. The software algorithm cannot accurately compute NIBP or patients with these conditions.** • **Do not apply the cuff over a wound, as this can cause further injury.** • **Since the value of NIBP may vary depending on the cuff size, the correct cuff size must be set in the measurement parameter menu setting before measurement.** • **Tubes between the cuff and the patient monitor are not kinked or blocked. Air must pass unrestricted through the tubing.** • **Pay attention not to block the connecting hose when you put the cuff on a patient.** • **Periodically check the cuff or hose connections for leaks. Air leaks can**

	cause inaccurate measurements. ● **The cuff must be placed exactly on the arterial part.** ● **Even manual methods using a sphygmomanometer and stethoscope are ineffective in unstable or active patients.** ● **Pressurization of the cuff may result in loss of function of monitoring medical electrical devices used simultaneously on the same extremity.** ● **It is necessary to check that the operation of the NIBP does not cause organ damage to the patient's blood circulation.** ● **Devices that exert pressure on tissue have been associated with purpura, ischemia, and neuropathy. Inspect the application site regularly to ensure skin quality and inspect the extremity of the cuffed limb for normal color, warmth and sensitivity. If the skin quality changes, or if the extremity circulation is being affected, move the cuff to another site or stop the blood pressure measurements immediately. Check more frequently when making automatic or STAT measurements. Auto NIBP measurements with one- and two-minute intervals are not recommended for extended periods of time.** ● **NIBP reading can be affected by the measurement site, the position of the patient, exercise, or the patient's physiologic condition. If you doubt the NIBP measurements, determine the patient's vital signs by alternative means, and then verify that the patient monitor is working correctly.**

8) Troubleshooting

This section lists the problems that might occur. If you encounter problems when using the monitor or accessories, check the table below before contacting a service representative. If the problem persists, contact your service representative.

Problem	Solution
Weak or no oscillometric	Check that the cuff is in the correct position.

signal	Check the patient. Check that the cuff is properly tightened. Check that there is no excessive clothing between the arm and the cuff. Check that the correct size cuff is being applied.
Artifact / erratic oscillometric signal	The patient may have been moving too much. Check that the cuff is in the correct position. Check that the correct size cuff is being applied.
Out of Range BP Value /Exceeded measurement time limit	The patient may have been moving too much. Check the patient. Patient may have serious BP-related issues. Check that the cuff is in the correct position. Check that the correct size cuff is being applied. Check that there is no excessive clothing between the arm and the cuff.
Pneumatic Blockage	Check that the hose has no sharp bends or is pinched. Check that the patient is not lying on the cuff. Check that the cuff is in the correct position.
Inflate Timeout, Air Leak or Loose Cuff	Check that the hose is connected to the system and the cuff. Check that the cuff is properly tightened. Check that the cuff is in the correct position. Check that the correct size cuff is being applied. Check that the cuff is not leaking air. Check that the hose connections are not damaged or loose.
Safety Timeout	Check the patient. Check that the cuff is in the correct position. The patient may have been moving too much. Take another BP reading.
Cuff Overpressure	Check that the correct size cuff is being applied. Check that the hose has no sharp bends or is pinched. Check that the cuff is in the correct position. Check that the patient is not lying on the cuff.

9) Calibration

1. Menu → Calibration → Parameter Calibration
2. Enter Password.
3. Select NIBP Tab.
4. NIBP ZERO : Press the [Zero] button with no pressure on the cuff.

   NIBP Gain : Press the Calibration button while applying a pressure of 250 mmHg for the Suntech NIBP module using the JIG.

Warning	● **Calibration procedures may only be performed by service representatives or designated trained personnel.** ● **To reduce the risk of injury, do not perform any in-use calibration procedures on the patient.** ● **Incorrect calibration values may result in patient harm.**

PART 12. Temperature

1) Overview

The ACCUWAVE monitors monitor can continuously monitor the patient's temperature via the Temp module. It uses a heat-sensitive resistor (thermistor) and is based on the principle that the electrical resistance of the thermistor changes with temperature change. The change in resistance of the resistor is used to calculate the temperature.

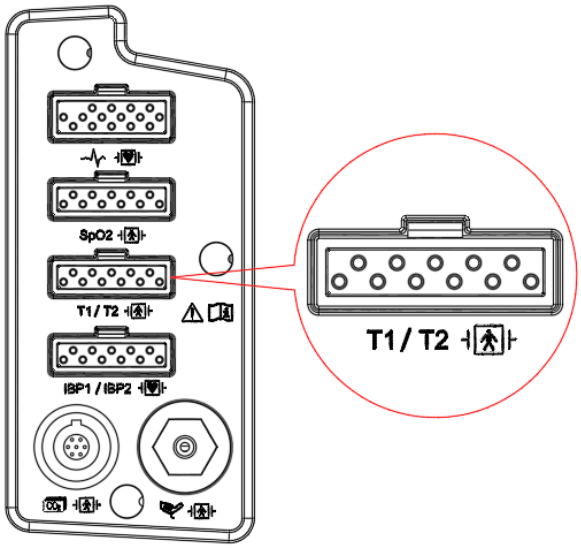
2) Preparing the Patient

Select an appropriate probe for your patient according to patient species and measured site.

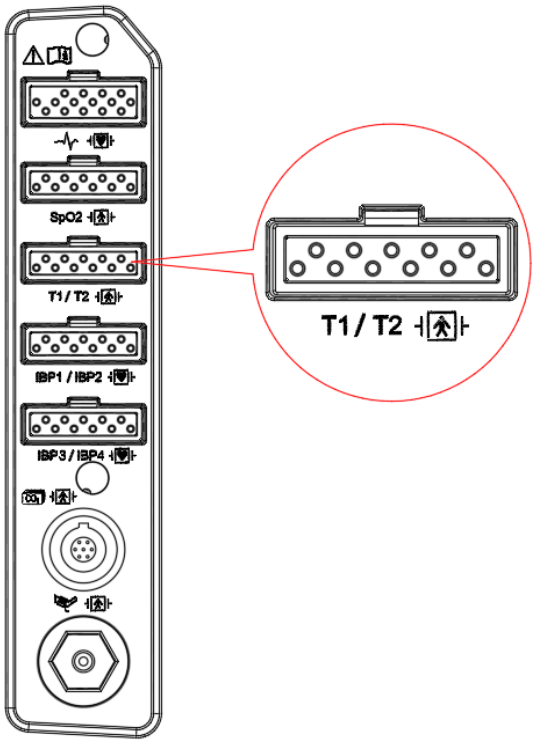
3) Connector and Measurement Cable

Connector

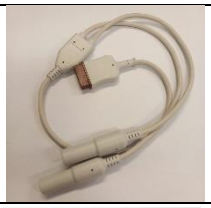
ACCUWAVE PLUS



ACCUWAVE PRO , ACCUWAVE PREMIER

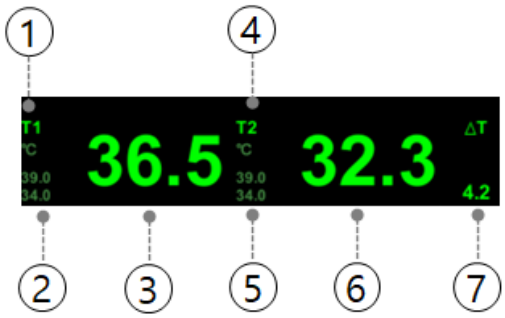


Temperature Measurement Sensor and Cable

	Temperature measurement cable
	Temperature measurement sensor (Skin)
	Temperature measurement sensor (Rectal)

Note	**Correctly position the temperature probe and fix it not to be disconnected from the patient.**

4) Display



① T1 temperature label

② T1 temperature unit and alarm limit

③ T1 temperature value

④ T2 temperature value

⑤ T2 temperature unit and alarm limit

⑥ T2 temperature value

⑦ Temperature difference

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

5) Temp Setting Menu

When you select the Temp numerical area, the setting menu appears.

Menu	Description	Available Settings
A. Alarm	Set Temp alarm	Temp1, Temp2, DT
A-1. Alarm	Set whether to detect an alarm.	On, Off
A-2. Priority	Set alarm priority.	High, Medium, Low
A-3. Low / High	Set alarm low/high limit value.	
A-4. Print	Set print when an alarm occurs.	
B. Setup	Setup Menu	
B-1. View Channels	View Channel.	T1 T2 T1, T2
B-2. Delta Display	Decide whether to display Delta Temp. Shown when View Channels is T1, T2.	On, Off

6) Troubleshooting

This section lists the problems that might occur. If you encounter problems when using the monitor accessories, check the table below before requesting service. If the problem persists, contact your service representative.

Problem	Solution
"---" is displayed in place of numeric.	Try using a known good probe in case the sensor is damaged.

PART 13. EtCO2

1) Overview

The ACCUWAVE monitors measure concentrations of end-tidal CO2 (EtCO2) when this option is enabled and the EtCO2 module is connected to your monitor. Both mainstream and sidestream measurements use infrared light. The intensity of infrared light passing through the breathing gas is measured with a photodetector. Because some of the infrared radiation is absorbed by the CO2 molecules, the amount of light passing through the gas probe depends on the measured CO2 concentration. When using a ventilator, monitor CO2 as a mainstream measurement rather than a side stream. Measurements are taken at the patient's airway at a sampling frequency of 100 Hz, so response is faster and there is less chance of erroneous, artifact data.

The EtCO2 module can perform mainstream measurements in all monitoring modes and sidestream measurements in the large animal monitoring modes.

2) EtCO2 Caution

Warning	● **The safety and effectiveness of respiration measurement methods in detecting apnea have not yet been established.** ● **Veterinary multiparameter monitors that measure CO2, anesthetics, and/or respiratory mechanics cannot be used as apnea monitoring and/or recording equipment. While these monitors provide an apnea alarm, the alarm condition begins with the elapsed time from when the last breath was detected. However, there are several physiological indications for the clinical diagnosis of real apnea events.** ● **The CO2 alarm is not activated until the first breath is detected after the veterinary multiparameter monitor is turned on or the patient is discharged.** ● **Accuracy of the CO2 and breathing rate measurements may be impaired due to improper attachment of the sensor or due to certain patient**

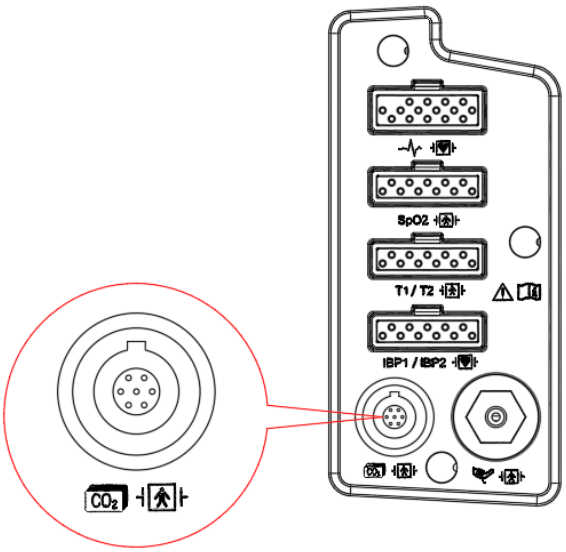
	conditions and certain environmental conditions. ● If the tube connection is faulty, loose or damaged, gas may leak and the accuracy of the measurement may be lowered, resulting in poor breathing. To prevent this, connect all components securely and check the connection according to standard clinical procedures to ensure that there are no leaks.

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

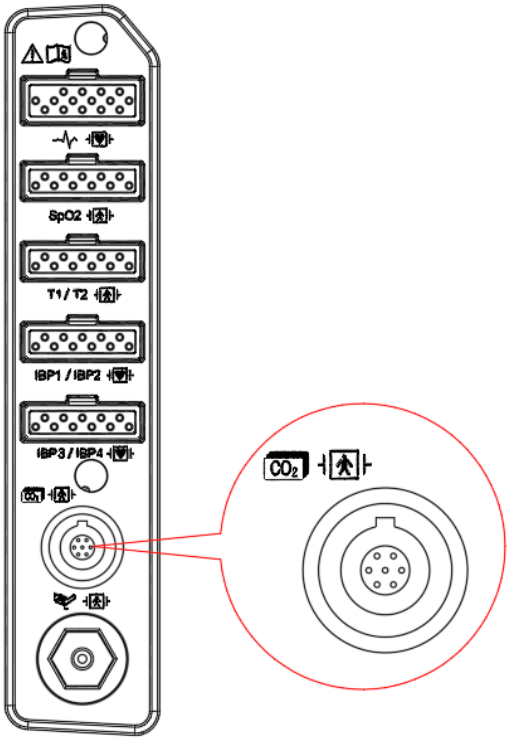
3) Connectors and Measurement Accessories

Connector

ACCUWAVE PLUS

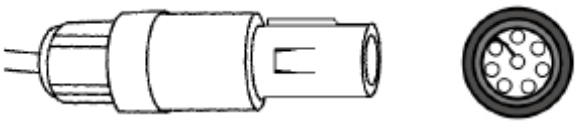


ACCUWAVE PRO , ACCUWAVE PREMIER



LoFlo Sidestrem CO2 Sensor and Connector

Sidestream sensor



Sidestream sensor connector

Sidestream EtCO2 Accessories

Non-Intubation Sidestream Accessories			
Part	**Picture**	**Description**	**type**
3468ADU-00		Nasal CO2 sampling cannula	Large animal
3468PED-00		Nasal CO2 sampling cannula	Large animal
3469ADU-00		Nasal CO2 sampling cannula w/O2 delivery	Large animal
3469PED-00		Nasal CO2 sampling cannula w/O2 delivery	Large animal
3469INF-00		Nasal CO2 sampling cannula w/O2 delivery	Small animal

Intubation Accessories			
3473ADU-00		Airway adapter kit w/ dehumidification tubing	Large animal (cat/dog/horse) (ET tube Size > 4.0 mm)

3473INF-00		Airway adapter kit w/ dehumidification tubing	Small animal (others) (ET tube size <= 4.0 mm)

CAPNOSTAT 5 Mainstream CO2 Sensor and Connector

Mainstream Sensor

Mainstream Sensor Connector

Mainstream EtCO2 Accessories

Intubation Patient Airway Adaptor		
Model	**Picture**	**Description**
6063-00		Large animal (Cat/Dog/Horse) (disposable)
6312-00		Small animal (others) (disposable)

7007-01		Large animal (Cat/Dog/Horse) (recycle)
7053-01		Small animal (others) (recycle)

Warning	**The disposable airway adapters are designed for single use only and cannot be reused. Reuse may cause inaccurate readings, erratic readings, or no readings at all. Also, reuse may cause an increased risk of cross contamination among patients.** **The reusable airway adapters can be reused but to avoid infection, it shall be reused only after being sterilized.**

4) CO2 Measurement Restrictions

The following factors may affect measurement accuracy:

- Sample gas leakage or internal emission
- Mechanical impact
- Periodic pressure of up to 10 kPa (100 cmH2O)
- High concentration of nitrous oxide gas
- Rapid temperature change
- High humidity
- Oher interference factors

Warning	**Measurement accuracy of the sidestream CO2 module may be affected by the breath rate and inspiration/expiration (I/E) ratio.**

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

5) Display

① End tidal CO2 value (EtCO2)

② Fraction of inspired CO2 (FiCO2)

③ EtCO2 alarm high/low limit value

④ Airway respiration rate

6) How to Sample

Connecting the CAPNOSTAT® 5 CO2 sensor to the host system

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

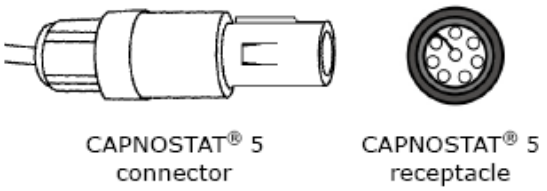


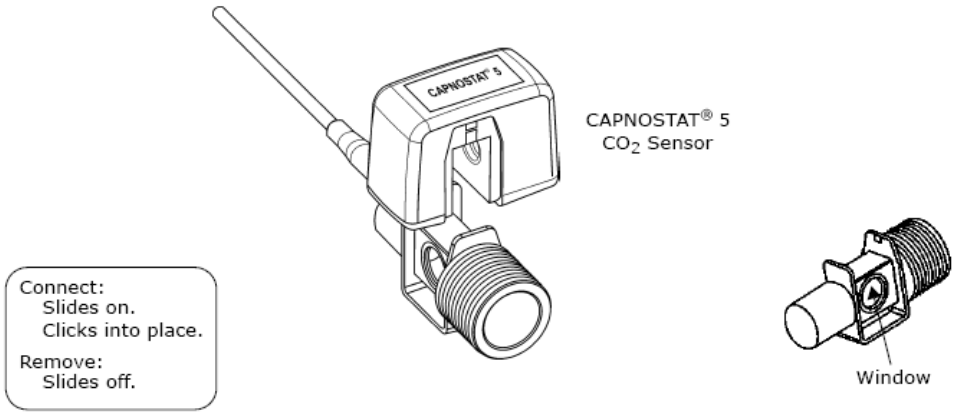
Figure 1

2. Make sure the arrows on the connector are at the top of the connector, and line up the two keys of the connector with the receptacle and insert.
3. To remove the connector, grasp the body portion of the connector back and remove.

Caution	**Do not remove by pulling cable.**

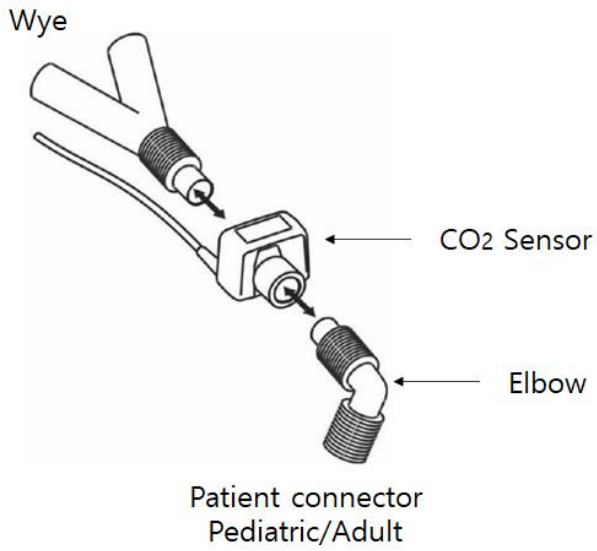
Connecting the Mainstream CO2

1. Connect the CAPNOSTAT 5 CO2 sensor to the Respironics Novametrix CO2 adapter as shown below. The airway adapter clicks into place when seated correctly.



Note	**If zeroing is required, do this step. For details, see Zero Calibration.**

2. Shown below is the CAPNOSTAT 5 CO2 Sensor with a patient circuit



Warning	● **To prevent stress on the endotracheal tube, support the sensor and airway adapter.** ● **Position sensor cables and tubing carefully to avoid entanglement or potential strangulation. Do not apply excessive tension to any cable.** ● **Replace the airway adapter, if excessive moisture or secretions are observed in the tubing or if the CO2 waveform changes unexpectedly without a change in patient status.** ● **To avoid infection, use only sterilized, disinfected, or disposable airway adapters.** ● **Inspect the airway adapters prior to use. Do not use if airway adapter appears to have been damaged or broken. Observe color coding of airway adapter for patient.**

Connecting the Sidestream CO2 (LoFlo Sample Kit)

1. The sample cell of the sampling kit must be inserted into the sample cell receptacle of the LoFlo CO2 Module as shown in Figure 1. A "click" is heard when the sample cell is properly inserted.

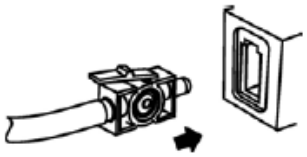


Figure 1

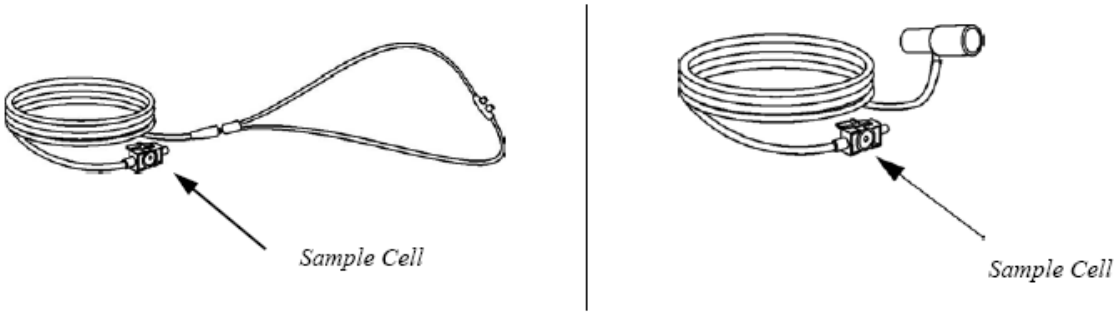


Figure 2

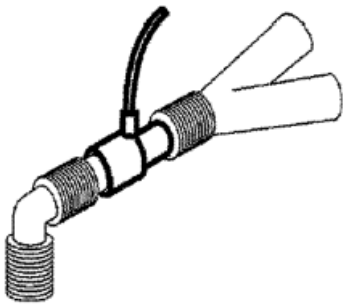
Inserting the sample cell into the receptacle automatically starts the sampling pump.

Removal of the sample cell turns the sample pump off.

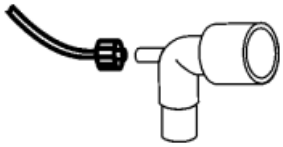
To remove the sampling kit sample cell from the sample cell receptacle, press down on the locking tab and pull the sample cell from the sample cell receptacle.

Note	**If zeroing is required, do this step. For details, see Zero Calibration.**

2. For intubated patients requiring an airway adapter: Install the airway adapter at the proximal end of the circuit between the elbow and the ventilator Y-section.



For intubated patients with an integrated airway adapter in the breathing circuit: Connect the male luer connector on the straight sample line to the female port on the airway adapter.



For non-intubated patients: Place the nasal cannula onto the patient.

For patients prone to mouth breathing use an oral-nasal cannula. For nasal or oral-nasal cannulas with oxygen delivery, place the cannula on the patient as shown. Then attach the oxygen supply tubing to the oxygen delivery system and set the prescribed oxygen flow.

Warning	• **Always connect the airway adapter to the sensor before inserting the airway adapter into the breathing circuit. In reverse, always remove the airway adapter from the breathing circuit before removing the sensor.** • **Make sure that you do not accidentally connect the luer connector of the gas sample line to an infusion link or any other links in the patient vicinity.**

Caution	**Always disconnect the cannula, airway adapter or sample line from the sensor when not in use.**

Removing Exhaust Gases from the System

Warning	• **Connect the gas outlet to the scavenging system when measuring CO2 using the sidestream CO2 module.** • **Anesthetics: When using the side streamCO2 measurement on patients who are receiving or have recently received anesthetics, connect the outlet to a scavenging system, or to the anesthesia machine/ventilator, to avoid exposing medical staff to anesthetics.**

Use an exhaust tube to remove the sample gas to a scavenging system. Attach it to the sidestream sensor at the outlet connector.

7) Zero Calibration

Perform zero calibration when you connect the CAPNOSTAT 5 CO2 sensor to the monitor for the first time or when replacing the airway adapter.

1. Expose the sensor to room air and keep it away from all sources of CO2 including the ventilator, the patient's breath and your own.

2. From the CO2 setup menu, launch the Zero menu and the CO2 waveform displays a "Zeroing" message.

3. When the "Zeroing" message disappears, zero calibration is complete, and monitoring can begin.

Caution	• **For mainstream CO2, connect the sensor to the adapter and wait 2 minutes before zeroing the adapter.** • **For sidestream CO2, connect the gas outlet to the scavenging system when calibrating the CO2 module.** • **A zero calibration is performed the first time a monitor is connected. Then do zeroing each time you install an adapter of a different style, such as changing from reusable to single use, or the system prompts you to perform zeroing. Zero calibration is not necessary when you change the type within the same adapter style.** • **The figures shown are invalidated within 30 seconds of the start of calibration/zero Calibration.**

8) EtCO2 Setting Menu

When you select the EtCO2 numerical or waveform area, the setup menu appears.

Menu	Description	Available Settings
A. Alarm	EtCO2 Alarm Setup Menu	EtCO2, FiCO2, AwRR, ZeroRR
A-1. Alarm	Set whether to detect an alarm.	On, Off
A-2. Priority	Set alarm priority	High, Medium, Low
A-3. Low / High	Set alarm low/high limit value.	
A-4. Print	Set print when an alarm occurs.	
B. Setup	Setup Menu	
B-1. Speed	Set waveform range speed.	6.25 mm/sec 12.5 mm/sec 25.0 mm/sec
B-2. Size	Set waveform size. The values that can be selected are the maximum pressure range values shown as waveforms. The size value set in the waveform area is displayed.	40 mmHg (5.0 %, kpa) 50 mmHg (6.5 %, kpa) 60 mmHg (8.0 %, kpa) 80 mmHg (10.0 %, kpa) 100 mmHg (13.0 %, kpa) 150 mmHg (20.0 %, kpa)
B-3. Fill	Choose whether to fill the waveform inside.	On, Off
C. Module Setup	EtCO2 Module Setup Menu	
C-1. Current Period	This setting is used to set the calculation period of the ETCO2 value. The end-tidal CO2 value is the highest peak CO2 value of all ends of expirations (end of breaths) over the selected time period. If less than two	1 breath, 10 sec, 20 sec

	breaths exist in the selected time period, the value is the maximum ETCO2 value for the last two breaths.	
C-2. Balance Gas	This setup mode to set up the gas in the measurement. the type of gas that is mixed with the breathing gas measuring.	Room air N2O Helium
C-3. Operating Mode	Sleep and Standby are used to conserve power when the main unit goes to standby. * Sleep stays warmed up to use Capnostat immediately upon exiting Sleep mode * Standby requires a warm-up process and there may be a delay until the system is stably ready.	Measure Sleep Standby
C-4. Barometric Pressure	Set ambient barometric pressure. *Default: 760 mmHg	
C-5. Gas Temperature	This setting is used to set the temperature of the gas mixture. This setting is useful when bench testing using static gasses where the temperature is often room temperature or below. *Default: 35.0 °C	
C-6. O2 Compensation	Use this setting to correct for the compensation of the gas mixture administered to the patient. * Default: 16%	
C-7. Anesthetic Agent	Anesthetic agent is ignored when the balance gas is set to helium.	
C-8. Zero	Zero calibration	

Note	**Set the menu only when the EtCO2 module is in monitoring status.** **If it is set when the EtCO2 module is not in a monitoring state such as Startup, Sleep, Standby, or Zeroing, it may not be applied.**

9) Troubleshooting

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

Problem	Solution
$EtCO_2$ measurements too low	1. Check the patient status. 2. Check the sample line and connectors for leakage. 3. Ventilate the room if the environmental CO_2 concentration is too high.
CO2 value is not output, or numerical error.	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.

PART 14. Invasive Blood Pressure (IBP)

1) Overview

It converts the changes in resistance components, which are caused by the changes in the blood flow in the blood vessels, into electrical signals, and measures the minimum, maximum, and average blood pressures through signal processing.

2) Precautions

The following precautions apply to IBP procedures. See the hospital's clinical guidelines for details.

Warning	● **All parts, except Transducer, should not be conductive. Otherwise discharge energy may induce a shock to operators during cardioversion.** ● **Single-use accessories are not to be reused.** ● **Use of non-approved transducers may compromise this protection.** ● **When the monitor is connected to electrosurgical units, make sure the transducers and cables do not make contact with the electrosurgical unit. The patient lead and conducting wire must be far away from the operating table and other devices. The electrosurgical unit should be properly grounded.** ● **When the monitor is connected to high frequency electrosurgical equipment, do not allow the sensor from the monitor to come into contact with the high frequency electrosurgical equipment or its cables. Otherwise, electric leakage may occur and may cause burns to the patient.**

Note	● **Check if there is a scratch on the catheter balloon before using.** ● **Do not reuse disposal parts and accessories.** ● **Do not use saline packs with passed expiration dates.**

	• **Do not use pressure measurement kits in torn packages.** • **Remove all air in the saline pack by squeezing it. Otherwise, it may cause errors in the blood pressure band and may go into the blood vessels.**

Defibrillator on a Patient

IBP transducers must comply with the requirements of IEC 60601-2-34, must be provided with defibrillator protection, have a frequency response exceeding 15Hz and contribute not more than 2 mmHg to the overall measurement error.

Warning	• **Patient signal inputs labeled with the CF and BF symbols with paddles are protected against damage resulting from defibrillation voltages. To ensure proper defibrillator protection, use only the recommended cables and lead wires. Do not reuse the single-use entropy electrodes.** • **Proper placement of defibrillator pads in relation to the electrodes is required to ensure successful defibrillation.**

3) Connector and Measurement Kit

Connector

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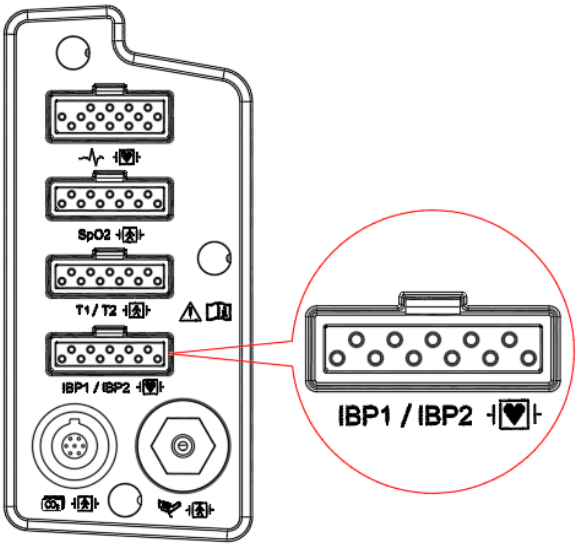

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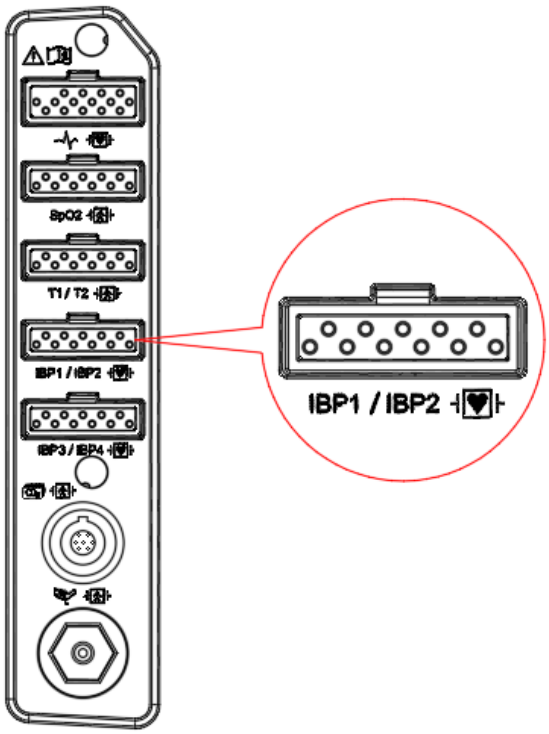


IBP Cable

Model No	Description
152600-042800	Medex/Abbott/Ace medical IBP Cable
152600-042900	Edwards/Baxter IBP Cable
152600-042400	BD/Datex Ohmeda IBP Cable
152600-043400	Medex/ Logical IBP Cable

IBP Accessories

For IBP accessories other than Ace Medical and Smiths Medical manufacturer, contact the accessory manufacturer.

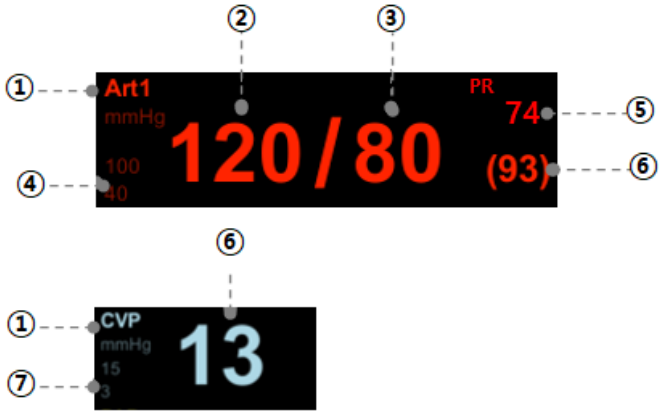
Manufacturer : Ace Medical	
Model No	**Description**
AMK 150	IBP Single Kit

AMK 250	IBP Double Kit

Manufacturer : Smiths Medical	
Model No	**Description**
MX9504T	Single Line Monitoring Kit
MX800	Modular transducer mounting plate
MX240	Pole clamp for mounting a transducer plate
MX4810	C-Fusor 1000 ml Pressure Infusor complete unit with squeeze bulb and pressure gauge

4) Display

IBP is displayed in two forms as shown in the selected label below. For label description, refer to the IBP measurement parameter label list and description.



① IBP label: Measuring Position

② Systolic blood pressure: Indicates the maximum blood pressure

③ Diastolic blood pressure: Indicates the minimum blood pressure

④ Alarm upper/lower limits for systolic or diastolic blood pressure: When the systolic blood pressure alarm is off, the alarm upper/lower limits for diastolic blood pressure

are displayed.

⑤ Pulse rate

⑥ Mean blood pressure: Indicates the average blood pressure

⑦ Alarm upper/lower limit of mean blood pressure

5) Procedures

Zeroing

1. Close the transducer stopcock on the patient's side.
2. Open the venting stopcock on the air side.
3. Press the knob switch on the monitor panel.
4. Draw a line with the current input data in the IBP area of the wave window according to the wave base line. Align the wave line with the data.
5. Zeroing is performed by executing the Zero menu of IBP Setting or the "Zero IBP" menu at the bottom of the screen. When zeroing is complete, a notification window appears.
6. Check the pressure parameter on the message window.
7. Close the venting stopcock on the air side.
8. Open the transducer stopcock on the patient side. The pressure value should be displayed on the pressure parameter screen in a few seconds.

6) List & Description of IBP Measurement Parameter Label

Parameter window, Scales menu window or Alarm limits pop-up menu appears according to the Labels.

IBP displays the measuring positions based on 10 labels shown in the below table.

Select ''User Defined' for a measuring position not in the listed positions.

Label	Description	Display Value
Art1, Art2	Arterial blood	systolic, diastolic, and mean

	pressure(alternative)	
Fem	Femoral pressure	systolic, diastolic, and mean
PAP	Pulmonary artery pressure	systolic, diastolic, and mean
CVP	Central venous pressure	mean
LAP	Left atrial pressure	mean
RAP	Right atrial pressure	mean
ICP	Intracranial pressure	mean
User Defined	Other	systolic, diastolic, and mean
UAP	Umbilical arterial pressure	systolic, diastolic, and mean
UVP	Umbilical venous pressure	mean

The table below shows the default waveform size settings by label.

Label	**Horses, Dogs, Cats (large animals) (mmHg)**	**Others (small animals) (mmHg)**
Art1, Art2	160	100
Fem	160	100
UAP	160	100
PAP	60	60
CVP	30	30
RAP	30	30
LAP	30	30
UVP	30	30
ICP	30	30
User Defined	160	100

7) IBP Setting Menu

When you select an IBP numerical or waveform area, the setup menu appears.

Menu	Description	Available Settings
A. Alarm	Set IBP Alarm.	Sys, Dia, Mean, PR
A-1. Alarm	Set whether to detect an alarm.	On, Off
A-2. Priority	Set alarm priority	High, Medium, Low
A-3. Low / High	Set alarm low/high limit value.	
A-4. Print	Set print when an alarm occurs.	
B. Setup	Setup Menu	
B-1. Label	Set measuring position.	Art1, Art2, Fem, PAP, RAP, LAP, UAP, UVP, CVP, ICP, User Defined
B-2. Speed	Set waveform range speed.	6.25 mm/sec, 12.5 mm/sec, 25.0 mm/sec, 50.0 mm/sec
B-3. Size	Set size of measurement waveform on screen.	30, 60, 80, 100, 160, 200, 300 mmHg (4.0, 8.0, 10.0, 13.0, 21.0, 27.0, 40.0 kpa)
B-4. Auto Size	Set automatic waveform size. Set to the size that best shows the current systolic or mean blood pressure	
B-5. BP Filter	Menu to set filter *Off: 0Hz ~ 40Hz *12Hz: 0Hz ~ 12Hz *20Hz: 0Hz ~ 20Hz (default)	Off / 12Hz / 25Hz
B-6. PR Display	PR Display Setup	Off / On
B-7. Zero	IBP zeroing	
B-8. Latest Zeroing Time	Last zeroing time information (date, time) display	

8) Troubleshooting

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

Problem	Solution
"---" is displayed in place of numeric.	1. Check the connection of IBP cable, IBP transducer. 2. Check that the three-way valve is turned to the correct position. 3. Check that the IBP transducer has been zero calibrated. 4. It may be outside the measurement range. Check the measurement conditions. 5. If the blood pressure transducer is damaged, replace it with a new one.
IBP readings seem unstable	1. Make sure there are no air bubbles in the transducer systems. 2. Check that the transducer is properly fixed. 3. Zero the transducer again. 4. Replace the transducer.
Zeroing of IBP channel(s) fails.	1. Ensure that the channels are open to air. 2. Perform zeroing again. Do not sway the IBP transducer and tubing during the calibration. 3. If zeroing still fails, replace the transducer.

PART 15. Dual Gas

1) Overview

The Dual Gas module extracts a gas sample from the patient's breathing gas. It continuously measures CO2 and anesthetics (Isoflurane, Sevoflurane and Desflurane) in the breathing gas. All measured values as well as derived values are passed to the patient monitor.

Patterson offers the following sidestream multi-gas solution.

- Bionet Dual Gas Sensor

2) Connectors and Accessories

Connector

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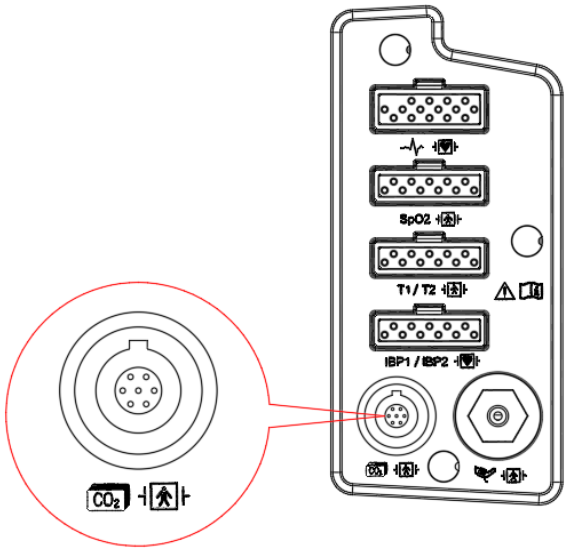

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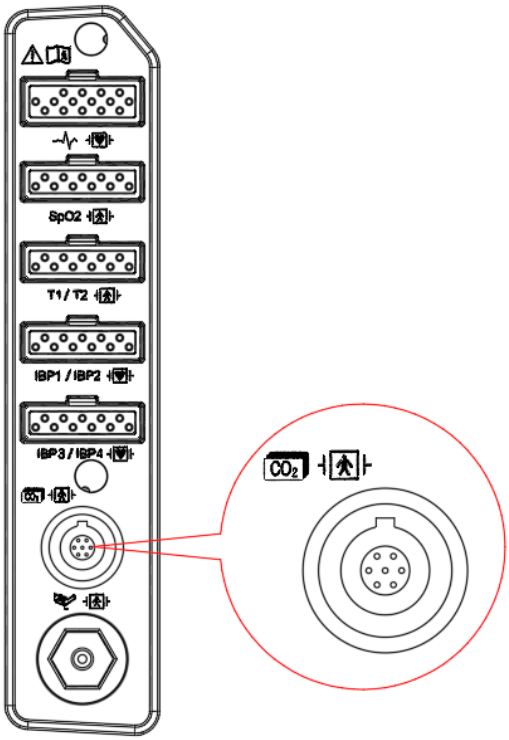


Accessories

Item Code	Item Image	Product Description
DGA-WT		Water Trap
DGA-SL		Sample Line with Luer Lock (8')
DGA-AAS		Airway Adapter (straight)
DGA-AAL		Airway Adapter (L type)

Dual Gas module

The Dual Gas module is a side-by-side multi-gas analyzer that measures end-tidal carbon dioxide (EtCO2) and manually selects one of three anesthetics (isoflurane, sevoflurane, and desflurane).

Measure Gas

- EtCO2
- Isoflurane
- Sevoflurane
- Desflurane

Benefits of Dual Gas Monitoring

- Simultaneously monitors CO2 and anesthetic gas, alarming if values are out of range.
- Monitor maintenance of anesthesia via MAC parameters.
- May help prevent overdose of anesthetic gas.
- Monitor anesthetic gas concentrations to ensure proper functioning of the vaporizer.
- Record the amount of anesthetic gas in the procedure.

Advantages and Features

- A low-cost, durable and proven sidestream technology that accurately measures both EtCO2 and anesthetic concentrations (3 anesthetics to choose from).
- 30 second warm-up time and fast response time at system startup.
- Perform system calibration to maintain accurate performance, as using an infrared (IR) light source with optical band-pass filtering technology may detract from the Dual gas system from frequent or routine high calibration (gain calibration) procedures using a calibration gas. You can get rid of the daily hustle and bustle of doing it.

- Zero calibration ensures that the system performs accurately regardless of the environment.
- Exclusive advanced pneumatic and filtering systems provide maximum system protection and safety in sidestream technology.
- Large water trap filter system allows continuous use of Dual gas modules even in wet conditions without frequent water trap replacement. Many other modules use moisture absorbing filters that require frequent filter changes.
- Water level sensing prevents excessive moisture for safe operation.
- Provides EtCO2, FiCO2, respiratory rate, anesthetic agent concentration and minimum alveolar concentration (MAC) parameters.

3) MAC value

The MAC value may be calculated and displayed by using end-tidal (ET) gas concentrations according to the following formula:

MAC = %ET(AA1)/X(AA1)

* X(AA)

	Horse	Dog, Other	Cat
Iso	1.3 %	1.3 %	1.6 %
Sev	2.3 %	2.4 %	2.6 %
Des	8.1 %	7.2 %	9.8 %

*The altitude and the patient age as well as other individual factors are not taken into account in the above-described formula.

4) Display Function

① EtCO2 alarm upper/lower limit display

② End-tidal carbon dioxide concentration value

③ Inspiratory carbon dioxide concentration value

④ Airway breathing rate per minute

⑤ Displays set Anesthetic Gas type and unit, end-stage (Et) alarm upper/lower limit value

⑥ End-tidal(Et) value of set Anesthetic Gas

⑦ MAC value

⑧ Fraction of inspired (Fi) value of the set Anesthetic Gas

5) Dual Gas setup

Menu	Description	Available Settings
A. Alarm	Dual Gas Parameter Alarm Setting	EtCO2, FiCO2, AwRR, ZeroRR, EtAA, EtAA
A-1. Alarm	Alarm detection setting	On, Off
A-2. Priority	Alarm priority setting	High, Medium, Low
A-3. Low / High	Alarm lower/high limit value setting	
A-4. Print	Print settings when an alarm occurs	

B Setup	Settings Menu	
B-1. Speed	Sweep Speed setting	6.25mm/s, 12.5mm/s, 25mm/s
B-2. Size	Waveform size setting The value that can be selected is the value of the maximum pressure range shown in the waveform. The set Size value is displayed in the waveform area.	40, 50, 60, 80, 100, 150, 300, 500, 800, 1000 mmHg (5.0, 6.5, 8.0, 10.0, 13.0, 20.0 40.0, 65.0, 100.0, 130.0 % , kpa)
B-3. Wave Fill	Select whether or not to fill in the inside of the waveform	On, Off
B-4. Waveform Type	Select Gas Waveforms to Display	CO2, Anesthetic Gas
B-5. Operating Mode	Mode setting for Anesthetic Gas module Standby mode when not in use When used, it is used in Measure mode.	Measure, Standby
B-6. Anesthetic Gas	Anesthetic Gas setting,	Iso, Sev, Des

PART 16. Printer

1) Overview

The printer mounted outside the monitor prints the observed results including trend and alarm data. Recording can be on-time or continuous and it is printed at the speed of 50 mm/s. Recordings are identified by the patient's name, ID as well as the date and time of the recording request. The monitor can automatically trigger alarm recordings for life-threatening alarms and limit violations if the Record function is enabled on the alarm limits table.

Thermal paper is used for printing. The size of the thermal paper roll is 58mm wide and 38mm in diameter. Any thermal paper of the same dimension can be used with the printer.

Caution	• **Connect the printer cable with the veterinary multiparameter monitor turned off.** • **Due to the nature of thermal paper, heat is generated under continuous operation. It is recommended to let the printer cool down for 10 minutes after every five minutes of printing.**

2) Printer Setting Menu

When you select the Print Setup from the main menu, the setup menu appears.

1. Speed	Set print speed.	25 mm/s 50 mm/s
2. Waveform1	Set the first waveform.	Off, I / II/ III/ aVR/ aVL/ aVF/ V, SpO2, Resp, EtCO2, IBP1, IBP2, Gas, IBP3, IBP4
3. Waveform2	Set the second waveform.	Same as above
4. Waveform3	Set the third waveform.	Same as above
5. Print from Time	Set the starting point of the data to be printed.	Real time Delay (5sec)

	*Real Time: Data is printed from the time you press the Print menu. *Delay (5sec): Data from 5 seconds before you press the Print menu is printed.	
6. Period	Set print time. If you do not stop manually after pressing the Print menu, printing continues for the set time.	Continue, 10sec, 20sec, 30sec

Note	**The waveforms of IBP1, IBP2, IBP3, IBP4, Gas and ETCO2 on paper look different from the waveforms on screen. This is because the waveforms on paper can be scaled while the waveforms on screen cannot.**

3) Storing the Thermal Paper

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 ran through the printer.**

- Store the paper in cool, dark locations. The 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 do not degrade thermal traces in themselves. However, these materials do not protect 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.

4) Changing the Paper

1. Open the printer window.
2. Insert the paper roll offered with the monitor 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. Improper closure may cause failure in printing.

5) Troubleshooting

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

Problem	Solution
No printing	1. Check the printer module connection status. 2. Check that the tray cover is closed properly. 3. If there is no paper, put in new paper. 4. If the print side is reversed, turn the paper over.

PART 17. Maintenance and Troubleshooting

1) Maintenance Safety Information

Warning	**Modifications to the veterinary multiparameter monitor are not permitted.**

Caution	• **To avoid electric shock, if the housing is damaged, stop using the veterinary multiparameter monitor and contact your service representative.** • **If the responsible individual hospital or institution neglects to follow the recommended maintenance schedule in the use of the veterinary multiparameter monitor, excessive equipment failure and health risks may occur.** • **The veterinary multiparameter monitor contains no user serviceable parts.** • **Safety checks or maintenance related to disassembling the veterinary multiparameter monitor must be performed by a qualified service representative. Failure to do so may result in excessive monitor failure or hazards to operators.** • **Service representatives should possess a working knowledge of the test tools and make sure that test equipment and cables are applicable.** • **The battery and AC cords must be removed for repair.**

2) Equipment Inspection

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

- Examine unit exteriors for cleanliness and general physical condition. Make sure the housings are not cracked or broken, everything is present, there are no spilled liquids, and there are no signs of abuse.
- If the EtCO2 and Dual Gas module are mounted on the monitor, make sure that they are

locked into place and do not slide out without releasing the locking mechanism.

- Inspect all accessories (cables, transducers, sensors, etc.). If any show signs of damage, do not use.
- Switch the monitor on and make sure the backlight is bright enough. Check that the screen is at its full brightness. If the brightness is not adequate, contact your service representative or your supplier.

Warning	**Using the veterinary multiparameter monitor adjacent to or stacked with other devices should be avoided because it could result in improper operation. If such use is necessary, the veterinary multiparameter monitor and the other devices should be observed to verify that they are operating normally.**

3) Cable Inspection

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

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

4) Maintenance Tasks and Test Schedule

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

Maintenance and test schedule	Frequency
Monitor tests	
Safety checks Selected tests on the basis of IEC 60601-1	At least once every two years, or as needed, after any repairs where the power supply is removed or replaced, or if the monitor has been dropped
Monitor maintenance	
Check ECG synchronization of the monitor and defibrillator (only if hospital protocol requires use of monitor during defibrillation).	At least once every two years, or as needed
Backlight replacement (integrated displays only).	35,000 - 40,000 hours (about four years) of continuous usage, or as needed
Parameter module tests	
Performance assurance for all measurements not listed below	At least once every two years, or if you suspect the measurement values are incorrect
Parameter module maintenance	
NIBP calibration	At least once every two years, or as specified by local laws
Mainstream and Sidestream CO2 calibration check	At least once a year, or if you suspect the measurement values are incorrect
Battery maintenance	
Battery	See the section on Maintaining Batteries in PART 1.

5) Troubleshooting

In case of touchscreen malfunctions

Recalibrate the screen with the following steps.

1. Access the [Calibration] menu from the main menu, then select [Touch Screen Calibration].

2. Press the cross markers on the Touch Calibration Screen in chronological order.

3. Once the calibration is complete, the screen disappears.

Caution	**Do not use keys or menu navigation key (rotary knob) on the touch screen calibration screen.**

Cyber security issues

1. If equipment is stolen or lost, immediately report it to the hospital staff or manufacturer. When reported of a loss, the hospital network administrator must take measures to prevent the device from accessing the hospital network.
2. If a cyber security threat is detected while using the equipment, immediately disconnect it from the network and contact the hospital staff or manufacturer.

※ For manufacturer contact information, please refer to the table of contents of How to contact us.

Interruption of the supply mains exceeding 30 seconds

1. Check that the visual and auditory alarm signals are presented correctly when the monitor is powered on.

2. Operate the monitor on battery power if the integrity of the protective earth conductor or the protective earthing system in the installation is in doubt.

3. If the power supply is cut off for more than 30 seconds, it returns to the default setting of the manufacturer, restores the default setting of the responsible authority, and returns to the last setting used.

If the device's time does not match the current time

Enter the current time in the System Setup > Date Time menu of the main menu and apply it. (Refer to F-3. Date Time in Chapter 2 Main Menu)

PART 18. Cleaning and Care

1) Overview

Clean the monitor and accessories daily or after each patient use according to your hospital's standard protocol or procedures below.

Patterson 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.

2) Monitor and Accessories

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

Please read the following instructions carefully before cleaning the monitor or accessories.

- Do not sterilize by autoclaving, pressure sterilization or gas sterilization.
- Do not spray any cleaning solution on the monitor or accessories. Excessive use of cleaning liquid may flow into the monitor and cause damage to internal components.
- Wipe off the cleaning solution with a damp cloth.
- Disinfect the surface with diluted alcohol gauze.
- Do not use petroleum/acetone cleaning solutions or other strong solvents to clean the monitor or accessories. These substances may damage the device and cause the device to malfunction.
- Wipe clean with a lint-free cloth.
- Do not touch, press, or rub the display panel with abrasive tools, brushes, or rough surfaces. Also, don't come close to anything that could scratch the panel.
- Do not spray detergent on the monitor or peripheral devices. Wipe it off with a damp cloth.

Caution	• **Do not wet or rinse the veterinary multiparameter monitor and accessories. Disconnect the monitor from the power source if you accidentally spill liquid on it. Contact your technician for stability before operating the veterinary multiparameter monitor.** • **To prevent damage to the veterinary multiparameter monitor, do not use sharp tools or abrasives. Never leave the electrical connector soaked in water or other liquids. When cleaning, be careful not to let the liquid stick to the edge of the screen.**

All Patient Cables

- 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 disinfectant.
- 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.

All patient cables can be wiped or cleaned with a warm, damp towel, mild soap, or isopropyl alcohol. Disinfect all patient cables with gauze moistened with diluted alcohol.

Caution	• **Do not use disinfectants that contain phenol as they can spot plastics. Do not autoclave or clean the accessories with strong aromatic, chlorinated, ketone, ether, or ester solvents. Never have the electrical connectors soaked.** • **When cleaning, do not apply excessive pressure or bend the cable unnecessarily. Excessive pressure can damage the cables.**

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 electrodes by soaking the diluted alcohol in cloth.

- Dry thoroughly with a lint-free cloth.

Reusable SpO2 sensor

Clean SpO2 sensor by wiping it with soapy water soaked 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 patient.

Reusable Temperature Probe and Cables

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

- Clean the Probe with 3% hydrogen peroxide or 70% alcohol.
- Quickly soak the cables in a detergent solution.
- Make sure the tip of the probe is firmly connected.

Capnostat Sensor

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

IBP Transducer

Handle transducers and other pressure accessories with care. Do not apply excessive pressure to the conversion board. Do not expose the transducer to water, steam, dry heat sterilization, ether, chloroform, or other similar chemicals. Always protect the connector from water.

Warning	• **For more information on cleaning, disinfecting, and sanitizing reusable accessories, refer to the accessory manufacturer's instructions for use.** • **Do not reuse disposable accessories.**

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

Caution	**Decisions on disinfection should be made by your organization in accordance with the integrity of the wires or lead wires.**

Note	**The veterinary multiparameter monitor should be inspected regularly once a year. For Inspection items, refer to this operation manual or service manual.**

Carefully inspect the monitor and sensor after cleaning the monitor. Do not use damaged or old monitor.

Clean the exterior of the monitor at least once a month using a soft cloth moistened with lukewarm water or alcohol. Do not use lacquer, thinners, ethylene, or oxidizers that could damage the monitor.

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 soak the accessories in liquid or detergent. Also prevent any fluid from seeping into the monitor 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 to protect the environment.**

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

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

If the monitor is not used for a certain period, remove the backup battery to avoid any safety hazard.

PART 19. Technical Specifications

1) Overview

The veterinary multiparameter monitor is not user installable. Qualified service representative must install it.

The veterinary multiparameter monitor is intended to be used for monitoring, recording, and alarming of multiple physiological parameters of large animals and small animals in health care facilities. The monitor is to be used by trained health care professionals.

The veterinary multiparameter monitor is intended for use in health care facilities.

2) 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) are general information about the Patterson veterinary multiparameter monitor. 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.

Warning	**Low amplitude signals such as ECG are particularly sensitive to interference from electromagnetic energy. The veterinary multiparameter monitor 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.**
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**

veterinary multiparameter monitor.

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

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

- **Use of this veterinary multiparameter monitor adjacent to or stacked with other devices should be avoided because it could result in improper operation. If such use is necessary, this monitor and the other equipment should be observed to verify that they are operating normally.**

- **The veterinary multiparameter monitor communicates over a 2.4 GHz 80211b / 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 the veterinary multiparameter monitor to communicate over a wireless network, be sure to check that it is compatible with existing or new wireless systems (e.g., 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 multiparameter monitor. For more information on wireless deployment, please contact your Patterson representative.**

3) Manufacturer's Declaration - Electromagnetic Emission

The veterinary multiparameter monitor are intended for use in the electromagnetic environment specified below. The customer or the user of the veterinary multiparameter monitor system must ensure that it is used in such as environment.		
Emission test	**Compliance**	**Electromagnetic environment - guidance**
Mains terminal disturbance voltage CISPR 11	GROUP1, CLASS A	The EMISSIONS characteristics of the veterinary multiparameter monitor make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) The veterinary multiparameter monitor might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.
RADIATED DISTURBANCE CISPR 11	GROUP1, CLASS A	
Harmonic Current Emission IEC 61000-3-2	CLASS A	The veterinary multiparameter monitors are suitable for use in all establishments other than domestic, and may be used in domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes, provided the following warning is heeded: Warning: This equipment/system is intended for use by healthcare professionals only. This equipment/ system may cause radio interference or may disrupt the operation of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the Veterinary multiparameter monitor or shielding the location.
Voltage fluctuations/Flicker IEC 61000-3-3	Complies	

4) Manufacturer's Declaration - Electromagnetic Immunity

The veterinary multiparameter monitor system is designed for use in the electromagnetic environment specified below. The customer or the user of the Veterinary multiparameter monitor system must ensure that it is used in such an environment.			
Immunity test	**IEC 60601 Test level**	**Compliance level**	**Electromagnetic Environment - guidance**
Electrostatic Discharge Immunity (ESD) IEC 61000-4-2	±8 kV/Contact ±2, ±4, ±8, ±15 kV/Air	±8 kV/Contact ±2, ±4, ±8, ±15 kV/Air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Radiated RF Electromagnetic Field Immunity IEC 61000-4-3	3 V/m 80 MHz - 2.7 GHz 80% AM at 1 kHz	3 V/m 80 MHz - 2.7 GHz 80% AM at 1 kHz	The veterinary multiparameter monitor is suitable to use in professional healthcare environment. RF communication equipment is used no closer than 30 cm to any part of the veterinary multiparameter monitor including cables specified by Bionet.
Immunity to Proximity Fields from RF wireless Communication s Equipment IEC 61000-4-3	28 V/m Max. 385-5785 MHz in according to table 9 in IEC 60601-1-2	28 V/m Max. 385-5785 MHz in according to table 9 in IEC 60601-1-2	

Electrical Fast Transient/Burst Immunity IEC 61000-4-4	±2 kV, 100 kHz repetition frequency	±2 kV, 100 kHz repetition frequency	The quality of supplied power should be suitable for a general business site or hospital environment.
Surge Immunity IEC 61000-45	Line to Line ±0.5 kV, ±1 kV Line to Ground ±0.5 kV, ±1 kV, ±2 kV	Line to Line ±0.5 kV, ±1 kV Line to Ground ±0.5 kV, ±1 kV, ±2 kV	The quality of supplied power should be suitable for general business site or hospital environment.
Immunity to Conducted Disturbances Induced by RF fields IEC 61000-4-6	3 V 0.15 MHz - 80 MHz 6 V in ISM bands between 0.15 MHz and 80 MHz 80% AM at 1 kHz	3 V 0.15 MHz - 80 MHz 6 V in ISM bands between 0.15 MHz and 80 MHz 80% AM at 1 kHz	The strength of the RF field in the frequency range higher than 150 kHz~80 MHz, the strength of the RF field is smaller than 3 V.
Power Frequency Magnetic Field Immunity IEC 61000-4-8	30 A/m 50 & 60 Hz	30 A/m 50 & 60 Hz	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Voltage dips IEC 61000-4-11	0% U_T: 0.5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0% U_T; 1 cycle and 70% U_T; 30 cycles Single phase: at 0°	0% U_T: 0.5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0% U_T: 1 cycle and 70 % U_T; 30 cycles Single phase: at 0°	Mains power quality should be that of a typical commercial or hospital environment. If the user of the veterinary multiparameter monitor requires continued operation during power mains interruptions, it is recommended that the veterinary multiparameter monitor be powered from an uninterruptible power supply, or a battery be used with the system power source.

Voltage interruptions IEC 61000-4-11:	0% U_T: 250/300 cycles	0% U_T: 250/300 cycles	The veterinary multiparameter monitor is suitable to use in a professional healthcare environment. Portable radio frequency (RF, RFID) communication devices can interfere with the medical electrical device. Therefore, do not use your mobile phone in a medical office or hospital environment.

Radiated fields in close proximity IEC 61000-4-39	65 A/m Max 30 kHz - 13.56 MHz in according to table 11 in IEC 60601-1-2	65 A/m Max 30 kHz - 13.56 MHz in according to table 11 in IEC 60601-1-2	The veterinary multiparameter monitor is suitable to use in a professional healthcare environment. Portable radio frequency (RF, RFID) communication devices can interfere with the medical electrical device. Therefore, do not use your mobile phone in a medical office or hospital environment.
Note U_T is the AC mains voltage prior to application of the test level.			

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	**Using accessories and cables other than those specified or provided by the manufacturer of the veterinary multiparameter monitor could result in increased electromagnetic emissions or decreased electromagnetic immunity of the veterinary multiparameter monitor and result in improper operation.**

5) System Specifications

Physical				
Model		**ACCUWAVE PLUS**	**ACCUWAVE PRO**	**ACCUWAVE PREMIER**
Dimension (HxWxD) (mm)		237 x 221 x 136.5	308 x 273 x 140	394 x 305 x 157
Weight (Kg)		Approx. 2.0	Approx. 3.1	Approx. 4.1
Cooling		Air flow		
Power		AC power (100-240VAC, 1.5~0.75A, 50/60Hz)		
Power consumption		< 25 Watts	< 35 Watts	
Operating Mode		Continuous		
Display	**Type**	TFT-LCD		
	Resolution	1024 x 600	1280 x 800	1366 x 768
	Size	8″	12.1″	15.6″
Measurement Parameter	**Common**	ECG, heart rate, respiration rate, EtCO2, FiCO2, airway respiration rate, temperature x2, IBP x2 SpO2, pulse rate, systolic BP, diastolic BP, mean BP		
	Option	Dual gas	IBP x 2, Dual gas	
TRACE	**Waveforms**	5 waveforms: ECG, SpO2, RR or EtCO2 or Dual Gas, IBP x 2	7 Waves: ECG, SpO2, RR or EtCO2 or Dual Gas, IBP x 4	
	Sweep Speed	Sweep speed: 6.25, 12.5, 25, 50 mm/sec		

Indicator		(Based on alarm type and priority) 3-color visual alarm lamp, SpO2 pulse pitch tone, Battery status, External power LED
Interface		AC input connector LAN port for transferring data HDMI output connector USB connector Printer module connector
Battery		Rechargeable Li-ion battery
Degree of protection against harmful ingress of water		IPX2
Thermal Printer (option)		Speed: 50 mm/sec, Paper width: 58 mm
Data Storage	**Common**	168 hours trends data
	Option	1000 alarm events (all numbers and waveforms for a total of 16 seconds, 8 seconds before and after the event)
Language		English, Korean, French, Polish, German, Chinese, Portuguese, Hungarian, Czech, Romanian, Italian, Turkish, Spanish, Russian, Japanese, Dutch
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 Altitude		Operating: 525 ~ 795 mmHg (70 ~ 106 kPa) Storage: 375 ~ 795 mmHg (50 ~ 106 kPa)

ECG Specification	
Method	Meets the requirements of IEC 60601-2-27: 2011 and IEC 60601-2-25: 2011
Lead Type	3-Lead 5-Lead

Lead Selection	3-Lead: I, II, III 5-Lead: I, II, III, aVR, aVL, aVF, V
ECG Waveforms	3-Lead: 1 channel 5-Lead: 2/7 channel
Heart Rate Range	15 ~ 350 bpm
Heart Rate Accuracy	± 1bpm or ±1%, whichever is greater
Sweep Speed	6.25, 12.5, 25, 50 mm/sec
Filter	Diagnosis: 0.05 ~150 Hz Monitoring: 0.5 ~40 Hz Surgery: 1 ~ 25 Hz Maximum: 5 ~ 25 Hz
ST Segment Detection Range	-2.0 to 2.0 mV
Arrhythmia Analysis	Asystole, V-Tach, V-Tach/V-Fib, Bigeminy, Trigeminy, Acc Vent Couplet, Irregular, Pause, R on T, V-Brady, Short Run, PVC
Protection	Against electrosurgical interference and defibrillation
Pace Pulse Rejection	When tested in accordance with the IEC 60601-2-27: 2011: 201.12.1.101.13, the heart rate meter rejects all pulses meeting the following conditions. Amplitude: ±2 mV to ±700 mV Width: 0.1 ms to 2 ms Rise time: 10 µs to 100 µs (< 10% of pulse width) No overshoot
Response to Irregular Rhythm	In compliance with the requirements in Clause 201.7.9.2.9.101 b) 4) of IEC 60601-2-27: 2011, the heart rates for the specified test signals after 20 seconds of stabilization are: Ventricular bigeminy (waveform A1): 80±1 bpm Slow alternating ventricular bigeminy (waveform A2): 60±1 bpm Rapid alternating ventricular bigeminy (waveform A3): 120±1 bpm

<table>
<tr><td></td><td>Bidirectional systoles (waveform A4): 90±2 bpm</td></tr>
<tr><td>Time to Alarm for Tachycardia</td><td>1) waveform B1:
<table>
<tr><td>Amplitude</td><td>Time to alarm</td></tr>
<tr><td>0.5 mV (1/2)</td><td>Fail – 0 bpm</td></tr>
<tr><td>1 mV</td><td>7 sec</td></tr>
<tr><td>2 mV (2)</td><td>4 sec</td></tr>
</table>
2) waveform B2:
<table>
<tr><td>Amplitude</td><td>Time to alarm</td></tr>
<tr><td>1 mV (1/2)</td><td>Fail – under 60 bpm</td></tr>
<tr><td>2 mV</td><td>2 sec</td></tr>
<tr><td>4 mV (2)</td><td>2 sec</td></tr>
</table></td></tr>
<tr><td>Respiration</td><td>
<table>
<tr><td>Sensing leads</td><td>I, II (user-selectable)</td></tr>
<tr><td>Measuring method</td><td>Impedance pneumography</td></tr>
<tr><td>Auxiliary current</td><td>≤10 uA for any active electrode</td></tr>
<tr><td>Detection threshold</td><td>1.0 Ω To 3.0 Ω</td></tr>
<tr><td>Measuring range</td><td>5 to 120 breaths per min</td></tr>
<tr><td>Accuracy</td><td>±1 breath/min or 2% of rate</td></tr>
<tr><td>Apnea detection</td><td>For all patients</td></tr>
<tr><td>Alarms</td><td>User-selectable upper/lower respiration rate</td></tr>
</table>
</td></tr>
</table>

Respiration Specifications	
Method	Thoracic impedance
Channel Selection	RA-LL / RA-LA
Measurement Range	5 ~ 120 breaths per minute
Accuracy	±1 breath per minute
Apnea Alarm	Yes

SpO2 Specifications	
SpO2 Range	0 ~ 100%

SpO2 Accuracy *The specified accuracy is the root-mean-square (RMS) difference between the measured values and the reference values.	70 ~ 100%: ±2 digits 0 ~ 69%: unspecified
Pulse Rate Range	18 ~ 450 bpm
Pulse Rate Accuracy	±2 bpm

Test methods used in 2012.12.101.2 to establish SpO2 accuracy claims

1. Connect the SpO2 sensor to the SpO2 connector on the monitor. Set THE patient category as an adult and PR source.
Go to SpO2.
2. Apply the SpO2 sensor to the ring finger of a healthy person.
3. Check the PLT waves and PR readings on the screen and ensure that the SpO2 shown is measured within the error range.
4. Remove the SpO2 sensor from the finger and verify that the SpO2 Sensor Off alarm is triggered.
Verification of measurement accuracy:
SpO2 accuracy was confirmed in human experiments compared to arteries.
Based on blood samples measured by CO-oximeter. Pulse oximeter measurements are made statistically.
Approximately two-thirds of the measurements must be within the specified accuracy range.
Compared to the CO-oximeter measurement.

NIBP Specifications	
Standard	Meets the requirements of ISO 80601-2-30: 2018
Method	Oscillometry with step deflation
Operation Mode	Manual/Automatic
Measurement Range	Systolic: 40 ~ 260 mmHg MAP: 26 ~ 220 mmHg Diastolic: 20 ~ 200 mmHg

Accuracy	Mean error: less than ±5 mmHg Standard deviation: less than 8 mmHg

Temperature Specification	
Standard	Meets the requirements of ISO 80601-2-56: 2018
Method	Thermal resistance
Operation mode	Direct mode
Measurement Range	0 ~ 50℃ (32 ~ 122℉)
Accuracy	25 ~ 45℃: ±0.1℃ Below 25℃, above 45℃: ±0.2℃
Compatibility	98ME04GA603 temperature probes

Sidestream CO2 (Option)	
Standard	Meets the requirements of ISO 80601-2-55: 2018
Warm-up Time	Full specifications within 2 minutes at an ambient temperature of 25º C. Capnogram in 15 seconds
Measurement Range	0 ~ 150 mmHg, 0 ~ 19%
Accuracy (at 760 mmHg, ambient temperature of 25℃)	0 ~ 40 mmHg ±2 mmHg, 41 ~ 70 mmHg ±5% of reading 71 ~ 100 mmHg ±8% of reading, 101 ~ 150 mmHg ±10% of reading (At respiration rates> 80 breaths per minute, all ranges are ±12% of actual.)
Respiration Rate	2 ~ 150 breaths per minute
Respiration Accuracy	±1 breath per minute
Rise Time	< 3 seconds (includes transport and rise time)
Sample Flow Rate	50 ml/min ±10 ml/min
Data Sample Rate	100 Hz

The test method used to determine the RATED respiration rate range and the corresponding effects of end-tidal GAS READING accuracy as a function of respiratory rate as required in 201.7.9.2.9 i) and j)

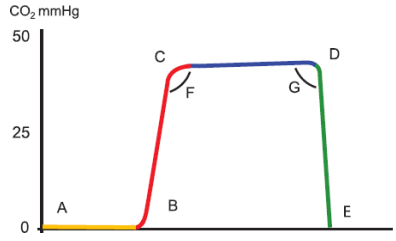
The method consists of sampling gas from two different sources connected to an electrically controlled pneumatic valve to permit rapid switching between the two sources.

During the test, the valve is set to switch gas source at several frequencies (simulating the range of specified breath rates) and for each frequency the end-tidal value presented by the CAPNOSTAT is noted.

From a diagram of end-tidal value over frequency, the frequency at which the gas analyzer is no longer able to resolve end-tidal values according to specification is identified.

The method used to calculate end-tidal GAS READINGS

Inspiratory and end tidal CO2 concentration readings are identified by CAPNOSTAT sensor using the lowest and highest values respectively of the temporal CO2-curve.



Phase I: A-B End of inspiratory phase and start of exhalation. Represents anatomical dead space with no measurable CO2.

Phase II: B-C Early exhalation. Rapid rise in CO2 concentration as anatomical dead space is replaced with alveolar gas.

Phase III: C-D Alveolar Plateau. Corresponds to alveolar emptying. In the normal capnogram the alveolar plateau has a slight rise. The end of the alveolar plateau corresponds to the ETCO2 (D).

Phase IV: D-E Inspiration begins. Rapid downward stroke corresponds to the fresh gas which is essentially free of carbon dioxide. The capnograph falls to zero and then remains at zero baseline throughout inspiration.

Mainstream CO2 (Option)	
Standard	Meets the requirements of ISO 80601-2-55: 2018

Warm-up Time	Full specifications within 2 minutes at an ambient temperature of 25º C. Capnogram in 15 seconds
Measurement Range	0 ~ 150 mmHg, 0 to 19%
Accuracy (at 760 mmHg, ambient temperature of 25°C)	0 ~ 40 mmHg ±2 mmHg, 41 ~ 70 mmHg ±5% of reading 71 ~ 100 mmHg ±8% of reading, 101 ~ 150 mmHg ±10% of reading (At respiration rates> 80 breaths per minute, all ranges are ±12% of actual.)
Respiration Rate	2 ~ 150 breaths per minute
Respiration Accuracy	±1 breath per minute
Rise Time	< 60 ms (Adult/pediatric adapters) < 60 ms (Infant/pediatric adapters)
Data Sample Rate	100 Hz

The test method used to determine the RATED respiration rate range and the corresponding effects of end-tidal GAS READING accuracy as a function of respiratory rate as required in 201.7.9.2.9 i) and j)

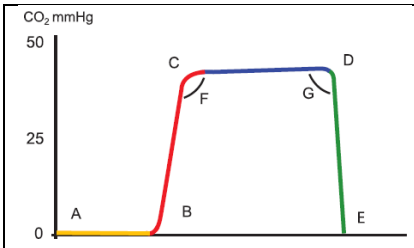
The method consists of sampling gas from two different sources connected to an electrically controlled pneumatic valve to permit rapid switching between the two sources.

During the test, the valve is set to switch gas source at several frequencies (simulating the range of specified breath rates) and for each frequency the end-tidal value presented by the CAPNOSTAT is noted.

From a diagram of end-tidal value over frequency, the frequency at which the gas analyzer is no longer able to resolve end-tidal values according to specification is identified.

The method used to calculate end-tidal GAS READINGS

Inspiratory and end tidal CO2 concentration readings are identified by CAPNOSTAT sensor using the lowest and highest values respectively of the temporal CO2-curve.



Phase I: A-B End of inspiratory phase and start of exhalation. Represents anatomical dead space with no measurable CO2.

Phase II: B-C Early exhalation. Rapid rise in CO2 concentration as anatomical dead space is replaced with alveolar gas.

Phase III: C-D Alveolar Plateau. Corresponds to alveolar emptying. In the normal capnogram the alveolar plateau has a slight rise. The end of the alveolar plateau corresponds to the ETCO2 (D).

Phase IV: D-E Inspiration begins. Rapid downward stroke corresponds to the fresh gas which is essentially free of carbon dioxide. The capnograph falls to zero and then remains at zero baseline throughout inspiration.

IBP Specifications	
Standard	Meets the requirements of IEC 60601-2-34: 2011
Channels	ACCUWAVE PLUS: 2 ch ACCUWAVE PRO, ACCUWAVE PREMIER: 4 ch
Measurement Range	-50 ~ 300 mmHg
Accuracy	±4 % of reading or ± 4 mmHg, whichever is greater
Pulse Rate Measurement Range	20 ~ 300 bpm
Zero Balancing	Range: ±200 mmHg Accuracy: ±1 mmHg Drift: ±1 mmHg over 24 hours
Transducer Sensitivity	5μV/V/mmHg

Dual Gas Specifications (Option)	
CO2	
- Range	0 – 76 mmHg; 0 – 10.1 kPa; 0-10% CO2 STPD (standard

	temperature and pressure dry
- Accuracy	± (0.2 vol% + 4% relative)
- Rise Time	- sensor only: 400 ms (average) - with water removal system: 600 ms (average)
- N2O Interference	30% N2O increases CO2 reading by 3.25mmHg at 10% CO2
Anesthetic Agents	
- Gases	Isoflurane, Desflurane, Sevoflurane
- Range	Iso., Sev.: 0 – 6% Des.: 0 – 18%
- Resolution	0 .01%
- Accuracy	± (0.15% vol% + 4% relative)
- Rise Time	- sensor only: 450 ms (average) - with water removal system: 650 ms (average)
Calibration	Factory calibrated
Power Up Time	30 sec
Delay Time	< 4 sec
Respiration	
- Range	0-150 breaths/min
- Accuracy	±1 breath/min
Flow Rate	
- Range	175 ml/min
- Accuracy	±25 ml/min

6) Default Parameter Alarm Settings

Alarm		Level	Horse	Dog	Cat, Other
NIBP – S (mmHg)		Medium	80 – 200	80 – 200	80 – 200
NIBP – M (mmHg)		Medium	50 – 170	70 – 140	70 – 170
NIBP – D (mmHg)		Medium	30 – 150	40 – 120	40 – 150
NIBP- PR		Low	60 – 150	60 – 150	90 – 200
SpO_2		Low	90 – 100	94 – 100	94 – 100
SpO_2-Rate		Low	60 – 150	60 – 150	90 – 200
Temp1 (℃/℉)		Low	36.0 – 39.4 (98.4 - 102.9)	36.0 – 39.4 (98.4 - 102.9)	36.0- 39.4 (98.4 - 102.9)
PVC Count		Low	0 – 20	0 – 20	0 – 20
ST (mV)		Low	-0.40 – 0.40	-0.40 – 0.40	-0.40 – 0.40
HR		Medium	60 – 150	60 – 150	90 – 200
Temp2 (℃/℉)		Low	36.0 – 39.4 (98.4 - 102.9)	36.0 – 39.4 (98.4 - 102.9)	36.0- 39.4 (98.4 - 102.9)
△Temp (℃/℉)		Low	0.0 – 3.4 (0.0-6.1)	0.0 – 3.4 (0.0-6.1)	0.0 – 3.4 (0.0-6.1)
RR		Low	10 – 30	10 – 30	10 – 30
ZeroRR (seconds)		Low	20	40	40
IBP1,2 (mmHg)	Art-S	Low	80 – 200	60 – 140	40 – 100
	Art-M	Low	40 – 140	40 – 100	30 – 70
	Art-D	Low	20 – 120	30 – 90	20 – 60
	Art-PR	Low	50 – 150	50 – 160	50 – 170
	Fem-S	Low	70 – 150	70 – 150	70 – 150
	Fem-M	Low	50 – 115	50 – 115	50 – 115
	Fem-D	Low	40 – 100	40 – 100	40 – 100
	Fem-PR	Low	50 – 150	50 – 150	50 – 150
	PAP-S	Low	20 – 50	20 – 50	20 – 50
	PAP-M	Low	10 – 40	10 – 40	10 – 40
	PAP-D	Low	5 – 30	5 – 30	5 – 30
	PAP-PR	Low	50 – 150	50 – 150	50 – 150
	RAP-M	Low	3 – 15	3 – 15	3 – 15
	LAP-M	Low	3 – 15	3 – 15	3 – 15
	UAP-S	Low	70 – 150	70 – 150	70 – 150
	UAP-M	Low	50 – 115	50 – 115	50 – 115
	UAP-D	Low	40 – 100	40 – 100	40 – 100

	UAP-PR	Low	50 – 150	50 – 150	50 – 150
	UVP-M	Low	3 – 15	3 – 15	3 – 15
	CVP-M	Low	3 – 15	3 – 15	3 – 15
	ICP-M	Low	3 – 15	3 – 15	3 – 15
	User-S	Low	80 – 200	60 – 140	40 – 100
	User -M	Low	40 – 140	40 – 100	30 – 70
	User -D	Low	20 – 120	30 – 90	20 – 60
	User -PR	Low	50 – 150	50 – 160	50 – 170
EtCO2 (mmHg)		Low	25 – 50	25 – 50	25 – 50
FiCO2 (mmHg)		Low	0 – 5	0 – 5	0 – 5
AwRR		Low	10 – 30	10 – 30	10 – 30
EtCO2-ZeroRR (seconds)		Low	20	40	40
IBP3		Low	Same as IBP1,2		
IBP4					
Gas(AG)-EtCO2 (mmHg)		Medium	25 – 50	25 – 50	25 – 50
Gas(AG)-FiCO2 (mmHg)		Medium	0 – 5	0 – 5	0 – 5
Gas (AG)-AwRR		Medium	10 – 30	10 – 30	10 – 30
Gas(AG)-ZeroRR (seconds)		Medium	20	40	40
EtN2O (%)		Medium	0.0 – 13.1	0.0 – 13.1	0.0 – 13.1
FiN2O (%)		Medium	0.0 – 10.8	0.0 – 10.8	0.0 – 10.8
EtO2 (%)		Medium	1.3 – 13.1	1.3 – 13.1	1.3 – 13.1
FiO2 (%)		High	2.4 – 13.1	2.4 – 13.1	2.4 – 13.1
EtDes (%)		Medium	0.0 – 2.6	0.0 – 2.6	0.0 – 2.6
FiDes (%)		Medium	0.0 – 2.6	0.0 – 2.6	0.0 – 2.6
EtEnf (%)		Medium	0.0 – 0.8	0.0 – 0.8	0.0 – 0.8
FiEnf (%)		Medium	0.0 – 0.8	0.0 – 0.8	0.0 – 0.8
EtHal (%)		Medium	0.0 – 0.8	0.0 – 0.8	0.0 – 0.8
FiHal (%)		Medium	0.0 – 0.8	0.0 – 0.8	0.0 – 0.8
EtIso (%)		Medium	0.0 – 0.8	0.0 – 0.8	0.0 – 0.8
FiIso (%)		Medium	0.0 – 0.8	0.0 – 0.8	0.0 – 0.8
EtSev (%)		Medium	0.0 – 0.7	0.0 – 0.7	0.0 – 0.7
FiSev (%)		Medium	0.0 – 0.7	0.0 – 0.7	0.0 – 0.7

7) Default Technical Alarm Settings

Bio signal Class	Technical Alarm	Level	Status & Solution
ECG	Module Error	Low	Occurs when communication is not possible due to a module failure, etc. (If the problem persists, contact your service representative.)
	Cable Off	Low	Occurs when no cable is connected. Check the cable connections.
	Lead Fault	Low	Occurs when the lead has fallen. Check lead attachment.
	Saturation	Low	Check lead attachment.
SpO2	Module Error	Low	Occurs when communication is not possible due to a module failure, etc. (If the problem persists, contact your service.)
	Probe Disconnected	Low	Occurs if the cable or probe is not connected. Check the cable connection.
	Probe Off	Low	Occurs when the reusable finger probe is removed from the patient. Check out the probe.
	Poor Signal	Low	Occurs when an interruption in the pulse is detected repeatedly. Check patient and probe location.
	Lost Pulse	Low	SpO2 data is displayed continuously, but the quality of the signal is questionable. Check the patient and probe location.
	Artifact	Low	This indicates when you have trouble breathing. Check to see if these noises are abnormal or irregular.
	Pulse Search	Message	Occurs when an interruption in the pulse is detected repeatedly. Check the patient and probe location.
	Interference	Low	The SpO2 signal has interference. Check for any possible sources of signal noise and check the patient for excessive motion.
	Wrong sensor	Low	Occurs when the wrong sensor is connected.

	Sensor Fault	Low	If the alarm persists, contact your service representative.
Resp	Module Error	Low	Occurs when communication is not possible due to a module failure, etc. (If the problem persists, contact your service.)
	Cable Off	Low	Occurs when no cable is connected. Check the cable connections.
	Lead Fault	Low	Occurs when the lead has fallen. Check lead attachment.
	Saturation	Low	Check lead attachment.
NIBP	Module Error	Low	Occurs when communication is not possible due to a module failure, etc. (If the problem persists, contact your service.)
	Over Pressure	Low	When the cuff pressure is excessive
	Overtime Pressure	Low	Occurs when pressure is applied for more than a specified time.
	NIBP Overrange	Low	The measured NIBP value exceeds the module measurement range. Check the patient's condition.
	NIBP Airway Error	Low	The air tubing may be occluded. Check the air tubing for an occlusion or kinking. If the alarm persists, contact your service representative.
	Weak Signal	Low	The patient's pulse is weak or the cuff is loose. Check the patient's condition and replace the cuff application site.
	Air Leak or Loose Cuff	Low	There is a leak in the cuff or air tubing or pump. Use a cuff of the correct type based on the patient size. Apply the cuff and connect the air tubing as instructed in the manual.
	Excessive Motion	Low	Check the patient's condition and reduce patient motion.
	System Fault	Low	If the alarm persists, contact your service representative.
Temp	Module Error	Low	Occurs when communication is not possible due to a module failure, etc. (If the problem persists, contact your service representative.)
	Temp1 Probe Off	Low	Occurs when no cable is connected.
	Temp2 Probe Off	Low	

	All Probe Off	Low	Check the cable connections.
IBP	Module Error	Low	Occurs when communication is not possible due to a module failure, etc. (If the problem persists, contact your service representative.)
	Cable Off	Low	Occurs when no cable is connected. Check the cable connections.
	Pulse Search	Message	Finding pulses.
EtCO2	Module Off	Low	Check the module connections. Disconnect and reconnect the module cable
	Sensor Over Temp	Low	Ambient temperature is too high or there is a module failure. 1. Lower the operating temperature. 2. Reinsert the module. 3. If the alarm continues, the CO2 module may have failed, contact your service representative.
	Sensor Faulty	Low	Check that the sensor is properly plugged in. Reinsert or reset the sensor if necessary. If error persists, return the sensor to the factory for servicing.
	Check Sampling Line	Low	Check that the sampling line is not occluded or kinked.
	Zero Required	Low	Check the airway adapter and clean if necessary. If this does not correct the error, perform an adapter zeroing. If you must perform zeroing more than once, there can exist an error in the hardware.
	CO2 out of range	Low	If the alarm persists, perform a zero calibration.
	Check Adapter	Low	It usually occurs when the airway adapter is removed from the module or when there is an optical blockage on the windows of the airway adapter. It may also be caused by failure to perform zeroing when the adapter type is changed. To clear, clean the airway adapter if mucus or moisture is visible. If the adapter is clean, perform zeroing.

	Sample line disconnected	Low	Check that the sampling line is not occluded or kinked.
Dual Gas	Change Water trap	Low	Replace the water trap.
	Airway Occluded	Low	1. Check if the sample line is occluded. 2. Replace the sample line. 3. Reinsert the module. If the alarm persists, contact your service representative.
	HW error	Low	When the alarm persists, contact your service representative.
	Pump error	Low	When the alarm persists, contact your service representative.
System	Low Battery	Low	The battery is very low. Immediately connect the monitor to the AC adapter.

8) Default Display Settings

Item	Default Settings
Primary ECG	II
Arrhythmia	Lethal
Print waveform1	Lead II
Print waveform2	SpO2
Print waveform3	Resp
Alarm print	Off
NIBP interval	Off
NIBP cuff size	Large
RR(Resp) lead	II
Alarm volume	50%
QRS volume	Off
Pulse volume	Off
Units for height	Inch
Units for weight	Lbs
Temperature units	℉
Blood pressure units	mmHg
EtCO2 units	mmHg
AG units	%

NIBP limit type	Systolic
ECG filter	Monitor
PVCs	ON
ST	OFF

9) List of Standard

Reference
ANSI/AAMI ES 60601-1:2005/A2:2021
CAN/CSA-C22.2 No. 60601-1 (Amendment 2:2022)
IEC 60601-1:2005/AMD2:2020
IEC 60601-1-6:2010/AMD2:2020
IEC 60601-1-8:2006/AMD2:2020
IEC 60601-2-25:2011
IEC 60601-2-27:2011
IEC 80601-2-30:2018
IEC 60601-2-34:2011
IEC 80601-2-49:2018
ISO 80601-2-55:2018
ISO 80601-2-56:2017/A1:2018
ISO 80601-2-61:2017+COR1:2018

PART 20. Abbreviations and Symbols

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

1) Abbreviations

A	amps
AC	alternating current
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
MM, mm	millimeters
MM/S	millimeters per second
MMHG, mmHg	millimeters of mercury
mV	millivolt

N

NIBP	non-invasive blood pressure

O

OR	operating room

P

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
SpO2	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)

Y

Z

2) Symbols

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

Caution	**Please read this operation manual before operating the veterinary multiparameter monitor. Keep it well for future reference.**

ACCUWAVE PLUS /ACCUWAVE PRO /ACCUWAVE PREMIER User Manual

The entire manual should be carefully read.

This manual contains information on limitations, cautions, and warnings associated with the use of the ACCUWAVE monitors.

Regardless of the complexity of the equipment, veterinary multiparameter monitoring devices should never be used to replace human care, attention, and judgement by trained health professionals.

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All other brand or product names are the property of their respective owners.

PRODUCT WARRANTY

Product Name	**Veterinary Multiparameter Monitor**
Model Name	**ACCUWAVE PLUS / ACCUWAVE PRO / ACCUWAVE PREMIER**
Serial Number	
Warranty Period	**4 years from the date of purchase**
Date of Purchase	
Customer Section	**Hospital Name:** **Address:** **Name:** **Phone:**
Sales Agent	
Manufacturer	**Bionet Co., Ltd.**

※ Thank you for purchasing our veterinary multiparameter monitor.

※ The monitor is manufactured and passed through strict quality control and through inspection.

PATTERSON VETERINARY

Patterson Veterinary Supply, Inc.

Model Name : ACCUWAVE PLUS / ACCUWAVE PRO / ACCUWAVE PREMIER