RWD



RM-C2
Veterinary Capnograph

User Manual **A**

RWD Life Science Co.,Ltd

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1 Introduction

1.1 Overview

Thank you first for choosing the RM-C2 Veterinary Capnograph manufactured by the RWD Life Science Co., Ltd (hereinafter referred to as the RWD)!

For better use of this product, please read the supplied instructions carefully before the initial installation and use of this product.

RWD Life Science Co., Ltd. is endeavored to improve the product function and service quality. RWD reserves the right to change or alter the contents of user manual without prior notice.

If you would like the latest product information, you are welcome to call us or visit our website (http://www.rwdstco.com/). If you find any discrepancy between the instruments and this manual during the practical use of our product, or if you have any questions or suggestions, you are welcome to contact us.

1.2 Comprehensive description

The RM-C2 Capnograph is a mainstream Veterinary Capnography Monitor comprised of a Sensor Body that fits on top of a disposable Airway Adapter.



Figure 1-1

1.3 Working principle

The Capnograph measures the concentration of CO_2 in the breathing gas based on the NDIR technology. Different gases absorb infrared light of a specific wavelength.

The stationary infrared light source emits a beam of invisible infrared light through the airway adapter, and the respiratory airflow flows in the airway adapter. As the beam passes through the airway adapter, some light is absorbed by the gas mixture. The absorbed beam reaches the infrared detector fixed at the other end. The infrared detector is equipped with two filters of different wavelengths, one of which has very strong absorption of CO_2, and the other one has no absorption of CO_2.

The infrared detector converts the beam into an electrical signal, which is converted to a digital value and sent to the microprocessor. The microprocessor then calculates the CO_2 concentration in the breathing gas mixture using the ratio of the light of the two measurement channels.

1.4 Application

Capnograph measures, displays and monitors CO_2 partial pressure and respiratory rate during anesthesia, recovery and respiratory care.

1.5 Product List

Note: This list is for reference only due to differences between various versions of the manual. When receiving the goods, please check the delivered parts against the packing list that enclosed in the package. If any inconsistency is found, please contact RWD service personnel immediately.

Configuration	Items	Qty.	Description
Standard	RM-C2	1	Main unit
Standard	Power cord	1	Power supply
Standard	Disposable airway adapter-big	2	Airway adapter for using with animals
Standard	Disposable airway adapter-small	1	Airway adapter for using with animals

2 Safety

2.1 Warnings



Indicates a potentially harmful condition that can lead to personal injury.

- **WARNING!** RM-C2 should only be used for the purpose and in the manner described in this manual.
- **WARNING!** RM-C2 is intended for use by authorized health care professionals only.
- **WARNING!** RM-C2 must not be used with flammable anesthetic agents. Use of the RM-C2 in such environment may present an explosion hazard.
- **WARNING!** No modification of the RM-C2 probe or the RM-C2 Airway Adapters is allowed.
- **WARNING!** RM-C2 Airway Adapters shall not be reused. Reuse of single use Adapters can cause cross infection. Used Airway Adapters shall be disposed of in accordance with local regulations for medical waste.
- **WARNING!** Measurements can be affected by mobile phones and RF communications equipment. It should be assured that RM-C2 is used in the specified electromagnetic environment.
- **WARNING!** RM-C2 is intended only as an adjunct in animal assessment. It shall be used in conjunction with the assessment of clinical signs and symptoms.
- **WARNING!** If RM-C2 is used with a respirator or with harmful gases such as N_2O, always perform a pre-use tightness check of the animal breath circuit.
- **WARNING!** Light transmission can be affected by secretions and moisture pooling on the RM-C2 Airway Adapter windows. When using heated humidifiers special care should be paid to position the Airway Adapter in a vertical position and to change Airway Adapter if necessary.
- **WARNING!** Do not use RM-C2 with nebulized medications as this may affect the light transmission of the RM-C2 Airway Adapter windows.
- **WARNING!** Do not operate the RM-C2 when it is wet or has exterior condensation.
- **WARNING!** Audible alarm of any monitor may not be heard in some loud environments, such as when sirens are in use and the care provider is more distant from the alarm source. Alarm volume should be tested with the extremes of your noise environment to confirm ability or limitations to hear an alarm in all circumstances of the environment.
- **WARNING!** When the battery indicator starts to blink, charge it in time.
- **WARNING!** Lithium batteries may present a fire or chemical burn hazard if mistreated. Do not disassemble, heat above 100 ℃ or incinerate. Dispose of used cell promptly. Keep away from children.
- **WARNING!** RM-C2 are not designed to be in contact with animal.
- **WARNING!** Follow instructions in this Manual for maintaining BASIC SAFETY and ESSENTIAL PERFORMANCE with regard to ELECTROMAGNETIC DISTURBANCES for the EXPECTED SERVICE LIFE.
- **WARNING!** Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this

equipment and the other equipment should be observed to verify that they are operating normally.

- **WARNING!** Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.
- **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 RM-C2 Capnograph, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.
- **WARNING!** Using HF SURGICAL EQUIPMENT near RM-C2 may cause interference and result in incorrect measured values.
- **WARNING!** The RM-C2 is not suitable for use in a magnetic resonance imaging (MRI) environment.
- **WARNING!** Don't near active HF SURGICAL EQUIPMENT and the RF shielded room of an ME SYSTEM for magnetic resonance imaging, where the intensity of EM DISTURBANCES is high.
- **WARNING!** Using non-specified batteries will cause the device to work improperly or to be damaged.

2.2 Cautions

Indicates a condition that may lead to equipment damage or malfunction.

- **CAUTION!** Use only approved accessories.
- **CAUTION!** If RM-C2 is used in a manner other than that for which it was intended, unpredictable behavior could result.
- **CAUTION!** The RM-C2 Airway Adapters are non-sterile devices. Do not autoclave the devices as this will damage them.
- **CAUTION!** Never sterilize or immerse RM-C2 in liquid.
- **CAUTION!** Do not operate RM-C2 at ambient temperatures less than 0 ℃ or greater than 40 ℃.
- **CAUTION!** DO not store the RM-C2 at temperatures less than -40 ℃ or greater than 70 ℃.
- **CAUTION!** DO not clean the RM-C2 and accessories except as directed in this guide.
- **CAUTION!** Federal law restricts this device to sale by or on the order of a physician.
- **CAUTION!** When not in use for a long time, it is recommended to charge the battery every 60 days.

2.3 Notes

A point of particular interest or emphasis intended to provide more effective or

- **NOTE!** A trained medical professional must determine the proper RM-C2 Airway Adapter model for each animal application. No hardware or software configuration

changes result from the RM-C2 Airway Adapter model selected.

- **NOTE!** The RM-C2 contains no user serviceable parts. Refer service to qualified service personnel.
- **NOTE!** This product and its accessories are latex free.
- **NOTE!** After the life cycle of the RM-C2 and its accessories have been met, disposal should be accomplished following national and/or local requirements.
- **NOTE!** The alarm limits will be reset to default values after power off.
- **NOTE!** Always carry spare batteries in the RM-C2 pouch.
- **NOTE!** The presence of ambient air (0% CO_2) in the RM-C2 Airway Adapter is of crucial importance for a successful Zeroing. Special care should be taken to avoid breathing near the RM-C2 Airway Adapter before or during the Zeroing procedure.

2.4 Symbol description

Symbol	Title
	Date of manufacture
	Serial number
	Batch code
	Catalog number
	Refer to instruction manual
	Manufacturer
	Symbol for CE mark. This symbol certifies that a product has met European Union consumer safety, health or environmental requirements.
	Authorized representative in the European Community
	Symbol for temperature limitation/temperature range
RxOnly	Caution (U.S.): Federal law restricts this device to sale by or on the order of a licensed healthcare practitioner.
	Separate collection for waste electric and electronic equipment, Dispose of this product according to local regulations.
	WARNING
	Alarm Mute button

	Menu button
	Power button
	Radio transmitter
	Breath per minute
	Need zero calibration
	Single use
	MR Unsafe

3 Preparations for use

3.1 Setting Up

Unpack and inspect the RM-C2 Capnograph for external damage. Please contact your local distributor in case of damage.

Attention! Packaging waste should be disposed of in accordance with local regulations. Packaging cartons are treated as recyclable waste, and plastic film and buffer foam are treated as non-recyclable.

3.2 Starting up

1. Insert the airway adapter into the RM-C2 Capnograph. When inserted correctly, you will hear a clear “click” sound.

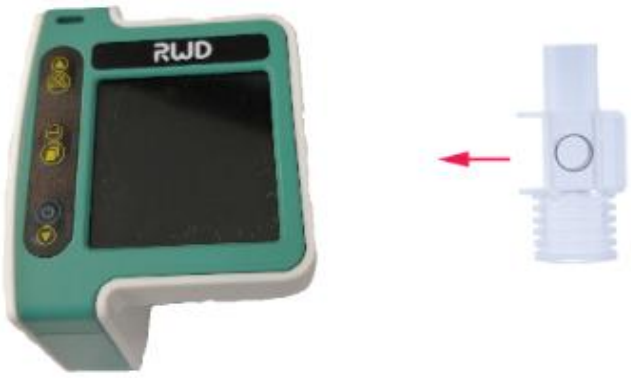


Figure 3-1 Connect Capnograph with airway adapter

2. Press the Power button. After startup, the buzzer makes a short beep sound and then the screen lights up.



Figure 3-2 Power on Capnograph

3. When the Capnograph is ready the $ETCO_2$ Value indicates “0” and the Respiratory Rate Value indicates “- -“.



Figure 3-3 Normal monitor interface

If the $ETCO_2$ Value is non-zero, ensure that there has not been an accumulation of CO_2 between the Capnograph Sensor Body and the Capnograph Airway Adapter by removing and reattaching the Capnograph Airway Adapter. If the $ETCO_2$ Value still displays a non-zero value after this procedure, perform a Zeroing procedure as described in Chapter 5.3 prior to using the Capnograph with an animal.

3.3 Shut down

When the screen not shows the menu interface, long press the power button for more than 3 seconds, the Capnograph will shut down.

The Capnograph switches off automatically during following conditions:

- After 2 minutes if No Breath condition is detected and the Alarm Silence is activated.
- After 60 seconds if the Airway Adapter is removed.

When shutting down, the screen shows a 2s countdown for shutdown, and then the buzzer emits a prolonged beeping sound.

3.4 Connecting to the Capnograph

The Capnograph can be connected to an animal in different ways. The following pictures illustrate two methods of connection.



Figure 3-4 Capnograph connected to an endotracheal tube



Figure 3-5 Capnograph connected to a mask

4 User interface

4.1 Buttons

Capnograph has three multi-function buttons with different functions in different display interfaces:

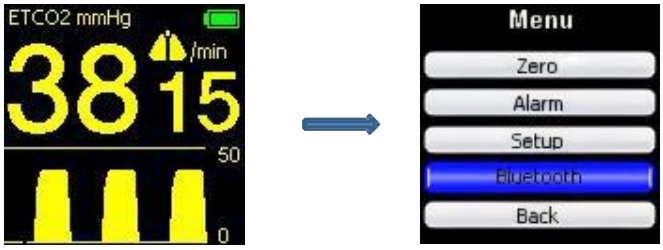
Screen display	Alarm Mute button 	Menu button 	Power button 
Monitoring	Mute/Clear Mute	Enter Menu	Long press 2s to power off
Menu	Up/ Plus	Confirm	Down/ Minus
Bluetooth	Enable Bluetooth	Back	Disable Bluetooth

4.2 "Capnograph" Software (Only available for Android system)

If you want to operate the device using the Capnograph software, please refer to Section 4.2.1 for the Bluetooth settings and Section 4.2.2 for the download, installation and settings of the Capnograph software on the Android system.

4.2.1 Bluetooth Settings for Device

When the Capnograph device is powered on, the Bluetooth is initially in a disabled state. After powering on, please follow the steps below to set up the Bluetooth.



1) Enter Menu：Press the menu button to enter the menu in the monitoring interface.
2) Enter Bluetooth Menu：Press the alarm mute button (▲) or the power button (▼) to select the Bluetooth menu and press the menu button to confirm.
3) Press the mute button (▲) to turn on the Bluetooth module. Press the power button (▼) to turn off the Bluetooth module.
4) After the Bluetooth module is successfully connected, the monitoring interface will automatically return in 2 seconds.



BLE Disable



BLE Connecting



BLE Connected



BLE Connected (monitoring)

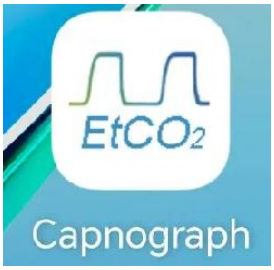
Note！ If the connection is disconnected during use, the power of the Bluetooth module remains on, and the Bluetooth icon on the monitoring interface flashes. The host can connect again.

4.2.2 Software Installation & Setup

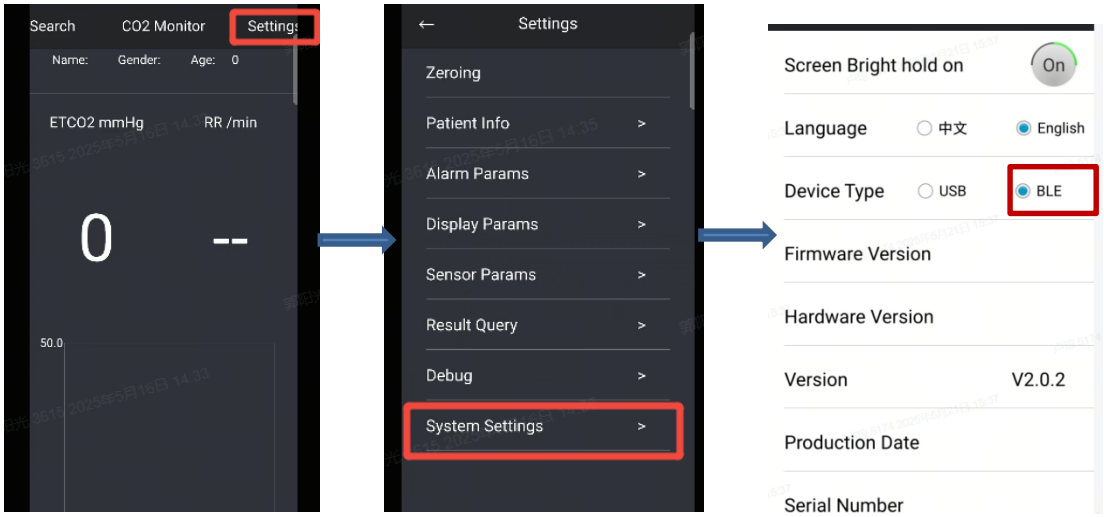
Scan the QR code below, click on “Download”, and follow the prompts on the interface to download and install the software.



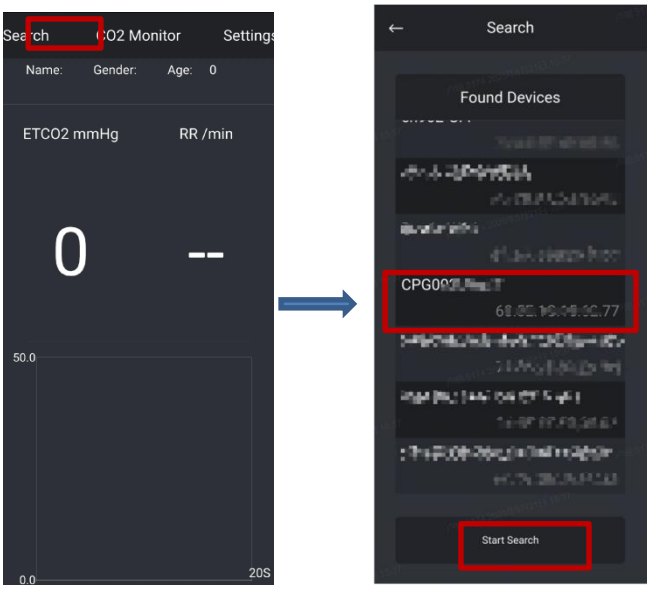
After the installation is completed, the icons displayed on the phone’s home screen are as follows. Click on the icons to launch the software.



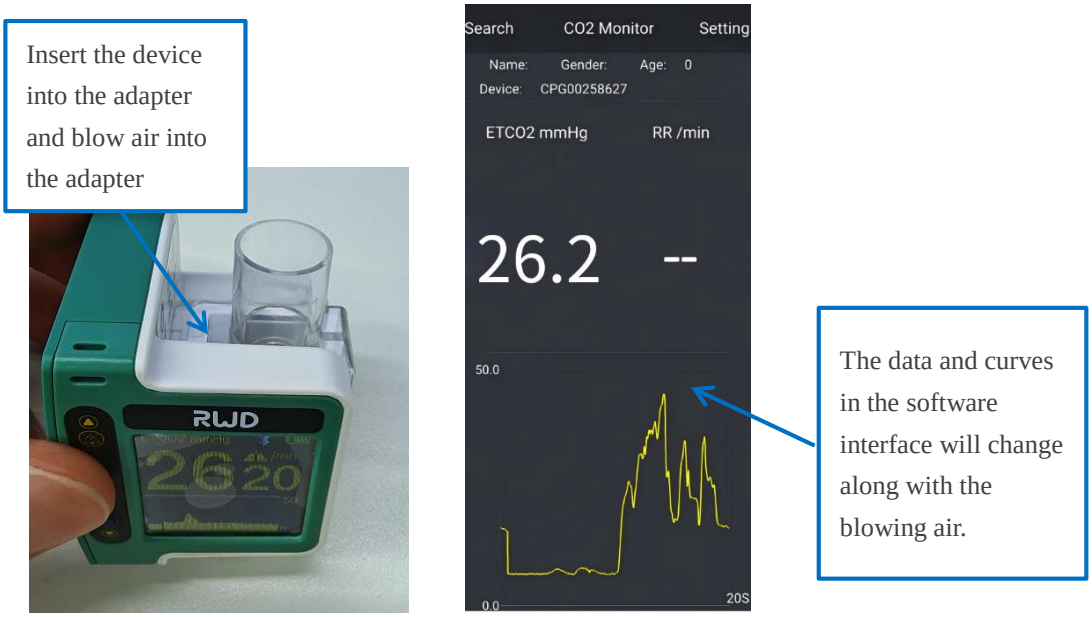
Refer to the sequence shown in the following pictures and set the device type to “BLE” (Bluetooth) in “Settings”. After changing the device type, the software will automatically close. Please then click the icon on the home screen of your phone to open it to enter the home page.



Click on “Search”, make sure that the Bluetooth of the device is correctly turned on. At this point, the software interface can successfully search for this device. Select this device from the available devices and the connection can be completed. If the device does not appear, you can repeatedly click the “Start Search” button below.



Use as follows:



Requirement:

1) The data and curves in the software interface will change along with the blowing process.
2) The data in the software interface is consistent with the data displayed by the equipment (the decimal places of the data on the software side are rounded off).

4.3 Monitoring

The RM-C2 Capnograph is equipped with a 128×128 pixel graphic TFT display that shows the end-tidal carbon dioxide value, respiratory rate value, and the capnogram.

4.3.1 $ETCO_2$

The unit of $ETCO_2$ defaults to millimeters of mercury (mmHg) and can be set to kPa or volume percent (%) by menu. The $ETCO_2$ value is shown after one breath and the averaged value is updated every breath.

The display range is as follows:

CO_2 Unit	Value Range	Monitoring shows
mmHg	0~99 mmHg	
kPa	0~9.9 kPa	
%	0~9.9 %	

4.3.2 Respiratory Rate

Respiratory Rate (RR) is displayed as breaths per minute (bpm). RR is displayed after three breaths and the value is updated every breath.

4.3.3 CO_2 Capnogram

The horizontal scanning speed and the scale of the capnogram can be set via the menu. The default values are as follows:

- Default scan speed: 2mm/s
- Default display scale: 0~50mmHg

4.3.4 CO_2 Settings

The CO_2 display unit, CO_2 waveform scale and scan speed can be set on the setup menu.

1) Enter the main menu: Press the "menu button" in the monitoring interface to enter the menu.
2) Enter the setup menu: Press the alarm mute button (▲) or the power button (▼) to select the setup menu, press the menu button to confirm.
3) Select the setting item: Press the alarm mute button (▲) or the power button (▼) to select items.
4) Enter editing mode: press menu button to enter editing mode.
5) Adjust the setting value: Press the alarm mute button (▲) or the power button (▼) to adjust

the values.

6) Exit the edit mode: press the menu button to exit the edit mode.
7) Settings save: CO_2 Settings and alarm threshold Settings are saved after power failure.
8) Default Settings: CO_2 Settings and alarm Settings will be set to default values.



Parameters		**Options**	**Default**
CO_2 Unit		mmHg; kPa; %	mmHg
CO_2 Scale	mmHg	50; 60; 75	50
	kPa	6.7; 8.0;10.0	6.7
	%	6.6; 7.9; 9.9	6.6
Waveform Speed		4mm/s; 2mm/s; 1mm/s	2mm/s

4.4 Indicators and alarms

The RM-C2 Capnograph is equipped with an Alarm Status Indicator and an audible alarm that may be silenced for a period of 2 minutes. The operator should face the display screen of the monitor directly and operate and observe within a distance of 0.3 m to 2 m.

4.4.1 Alarm signals

When an alarm is triggered, an Alarm Status Indicator in the lower right corner of the display is lit with a steady or blinking yellow light depending on alarm priority, together with an audible alarm beep according to the following table:

Alarm Priority	**Indicator**	**Audible**	**Alarm**
Low	Yellow, steady	One beep tones, repeated every 20s	Zero point adjustment
			No Adapter
			Clogged Adapter
			System Fault
Medium	Yellow, Blinking 0.5Hz	Three beep tones, repeated every 15s	$ETCO_2$ Low
			$ETCO_2$ High
			RR Low
			RR High
			Apnea
			Battery Low

Active alarms are further displayed according to the following table：

Alarm	**Screen**	**$ETCO_2$ Value**	**RR Value**	**Inherent delay**
Apnea		value steady	"- -" flashing	1s
$ETCO_2$ Low		value flashing	value steady	1s
$ETCO_2$ High		value flashing	value steady	1s
RR Low		value steady	value flashing	1s
RR High		value steady	value flashing	1s
No Adapter		n/a	n/a	1s
Clogged Adapter		n/a	n/a	1s
System Fault		n/a	n/a	1s
Battery Low		Depend on other alarm signal		1s

Note:

1) After power-on, if no breathing is detected, the RR value will display as a stable "--", and the $ETCO_2$ value will show as an instantaneous value.
2) When it is necessary to generate the zero-point alarm signal for calibration, the zeroing operation should be carried out according to Section 5.3.

4.4.2 Default limits for alarms

The default Apnea alarm duration is 20 seconds and cannot be changed by the user. The default factory settings for the alarm are as follows:

	Lower Limit	**Upper Limit**
$ETCO_2$	25mmHg	50mmHg
RR	5bpm	30bpm

Note: The default alarm settings cannot be changed by the user.

4.4.3 Alarm silence



By pressing the mute button, the audio alarm can be muted for 2 minutes. When the alarm is muted, the yellow alarm mute indicator is located in the Lower right corner of the display, indicating the alarm status silence indicator will light.

Pressing the alarm mute button again during 2 minutes of silence will reactivate the audible alarm.



If Apnea alarm is muted by pressing the Alarm Silence button, the RM-C2 Capnograph will automatically switch off after 2 minutes provided that no new breaths are detected.

If the alarm signal disappears when the audible alarm is muted, the alarm icon will turn green. Pressing the alarm mute button during no alarm will also show a green mute alarm indicator in the Lower right corner of the display.

4.4.4 Battery Status Indicator

There is a battery status indicator in the upper right corner of the screen. The display status of the indicator changes according to the battery power:

- When the battery is normal, the battery status indicator lights up with a steady green light
- When the battery is low, the battery status indicator begins to flash.



Battery Normal



Battery Low

4.4.5 Adjusting the alarm limit

1) Enter the main menu: press the menu button in the monitoring interface to enter the menu.
2) Enter the alarm setting menu: Press the alarm mute button (▲) or the power button (▼) to select the Alarm menu, and then press the menu button to enter the selected menu.
3) Select the alarm setting item: Press the alarm mute button (▲) or the power button (▼) to select.
4) Enter editing mode: press menu button to enter editing mode.
5) Adjust the alarm limit: Press the alarm mute button (▲) to increase or the power button (▼) to decrease the limit value.
6) Exit the edit mode: press the menu button to exit the edit mode.
7) Settings save: CO_2 Settings and alarm threshold Settings are saved after power off.
8) Default Settings: CO_2 Settings and alarm Settings will be set to default values.



The adjustment ranges for the $ETCO_2$ and RR alarm limits are as follows:

Alarm item	Lower range	Upper range	Resolution
$ETCO_2$ displayed in mmHg	0~99mmHg	5~99mmHg	2mmHg
$ETCO_2$ displayed in kPa	0~9.9kPa	0.7~9.9kPa	0.4kPa
$ETCO_2$ displayed in %	0~9.8%	0.7~9.9%	0.4%
RR	3~149bpm	4~150bpm	1bpm

4.4.6 Sound Features

Signal / Alarm	Frequency	Duration
ON	2700Hz	250ms
OFF	2700Hz	500ms
Low	532Hz	250ms
Medium	532Hz	200ms - mute for 200ms, repeat 3 times

5 Maintenance

5.1 Cleaning and Disinfection

RM-C2 Capnograph and its accessories do not require sterilization treatment, but the products and accessories should be kept clean. If there is any contamination, the instrument should be cleaned and disinfected promptly.

- When cleaning and disinfecting, do not immerse the instrument and its accessories in the liquid. Do not allow the liquid to enter the connection sockets and the casing of the product to prevent damage to the instrument.
- Cleaning steps:
  1) The instrument must be turned off before cleaning.
  2) Soak a soft and clean cloth in mild soap water or a diluted cleaning agent without corrosive properties in a small amount.
  3) Use the cloth dipped in the soap solution to clean the surface of the instrument and accessories.
  4) Dry it with a clean and dry soft cloth.
  5) When cleaning, please note:
     a) During the cleaning process, only the external surface of the instrument needs to be wiped, and the interior should not be touched. After cleaning, the cleaning agent should be removed and no residue should remain on the surface.
     b) When cleaning the exterior surface and display screen of the instrument, non-corrosive cleaning agents should be used.
     c) Most cleaning agents must be diluted before use.
     d) Do not use abrasive materials for cleaning.
- Without any special circumstances, the cleaning frequency is once a week.
- Disinfection process:
  1) It is recommended to soak a clean dry cloth in a 70% ~80% (by volume ratio) ethanol disinfectant solution, and then wipe the surface to be disinfected with this cloth twice for 3 minutes.
  2) After disinfection, allow it to air dry naturally or wipe off the remaining disinfectant with a clean, dry cloth.
  3) When disinfecting, please note:
     a) Ethanol is flammable. Please keep away from fire sources when using ethanol disinfectant.
     b) People allergic to alcohol should use ethanol disinfectant with caution.
     c) Rubber and plastic products will become hard when exposed to alcohol disinfectant for a long time. Remove any remaining disinfectant promptly after disinfection.
     d) Do not use radiation or steam for disinfection.
- Sterilization process: Not applicable. This product does not provide sterilization.

CAUTION! DO NOT immerse RM-C2 in any liquid.

5.2 Airway Adapter

- The RM-C2 Airway Adapter is a disposable product and cannot be reused. Otherwise, it

may lead to cross-infection.

- RM-C2 Airway Adapters shall be disposed of in accordance with local regulations for bio-hazardous waste.

5.3 Zeroing procedure

Zeroing is recommended after replaced airway adapter or whenever an offset in gas readings is discovered. Zeroing of the RM-C2 Capnograph is performed by the following procedure:

NOTE! When perform zeroing on the monitor, make sure that the gas inside the adapter is air with a CO_2 concentration close to 0. Ensure that no one breathes near the adapter before and during the zeroing operation

1) Start the RM-C2 Capnograph by pressing the Power button ().
2) Make sure that a new airway adapter is properly installed.
3) Press the menu button () to enter the menu interface.
4) Press the alarm mute button () or the power button () to select the Zero menu, when the zero countdown shows “0”, the zero operation is completed.
5) Press the menu button () to start zeroing. When “Zeroing” and countdown digits are displayed on the screen, it means that zero is being executed. If Zero fails, “Zero failed” will be displayed on the screen.
6) When the zero countdown shows “0”, the zero operation is completed.



Zeroing



Zero failed

7) RM-C2 will automatically return to normal measurement mode after zero completion.

5.4 Gas span check

The RM-C2 Capnograph does not require any routine calibration. A gas span check is recommended at regular intervals to make sure the measurement is within accuracy levels. The suggested interval for gas span check is once every year.

To perform a gas span check of RM-C2 you will need:

1. A gas flow regulator with a plastic tube and a 15mm connector
2. Calibration gas (5% CO_2, Balance N_2)
3. Two Airway Adapters



Figure 5-1 Gas span check connection

The process is as follows:

1) Connect the flow regulator to the calibration cylinder. Ensure that the valve is completely closed.
2) Install a new airway adapter to the RM-C2.
3) Turn on the RM-C2 and make sure the $ETCO_2$ reading is zero. Otherwise conduct a zeroing procedure according to Section 5.3 above before proceeding.
4) Insert the 15mm connector into one end of the airway adapter, and connect a second airway adapter to the other end of the first airway adapter (refer to Figure 5-1).
5) Turn on the regulator flow.
6) After 30 seconds, record the $ETCO_2$ reading.
7) Turn off the flow.
8) Determine and record the estimated ambient atmospheric pressure in mmHg.
9) Use the following table to determine if the device is reading within the specified limits.

Barometric Pressure mmHg	**RM-C2 Capnograph $ETCO_2$ readings should be between**		
	%	**mmHg**	**kPa**
660~679	4.7~5.3	31~36	4.1~4.8
680~699	4.7~5.3	32~37	4.3~4.9
700~719	4.7~5.3	33~38	4.4~5.1
720~739	4.7~5.3	34~39	4.5~5.2
740~759	4.7~5.3	35~40	4.6~5.4
760~779	4.7~5.3	36~41	4.8~5.5
780~799	4.7~5.3	37~42	4.9~5.6

If the reading of the device is within the above range, then your RM-C2 has been successfully verified.

If the device is not reading within the above range, disconnect the airway adapter from the cylinder and perform a Zeroing procedure according to the instructions in Section 5.3 above, and then repeat the gas range check procedure in Section 5.4. If verification still fails, contact RWD after-sales personnel for more information.

The verified gas can be discharged directly into the air.

5.5 Troubleshooting

Error	**Possible causes**	**Recommended Solutions**
The unit does not turn on	Low battery Wrong battery type	Charge the device in time through the Type-C charging port
The unit does not complete the turn on sequence	Low battery	Charge the device in time through the Type-C charging port
The measured values of $ETCO_2$ are out of specified accuracy	Incorrect zero reference	Perform a Zeroing procedure and verify the measurement with reference gas
No adapter	Not connected to the adapter	Replace the new adapter and perform a zeroing operation.
Check adapter	Clogged adapter	Replace the new adapter and perform a zeroing operation.
System Error	Hardware fault	Contact RWD team for service

6 Specifications

6.1 General specifications

Structure and composition	The CO_2 monitor consists of a host (measuring unit, display unit, rechargeable lithium battery), an airway adapter, and CO_2 monitor software.
Measurements	CO_2 partial pressure and respiratory rate
Measuring principle	2 channel NDIR type gas analyzer，No moving parts
Warm up	Waveform displayed within 4 seconds, meets specifications within 2 minutes (at 25℃ room temperature)
Calibration	No routine calibration required
CO_2 Range	0~99 mmHg 0~9.9 % 0~9.9 kPa
CO_2 Resolution	1mmHg or 0.1kPa or 0.1%
CO_2 Accuracy*	0~40mmHg ±2 mmHg，41~99mmHg ±8% of readings 0~5.3% ±0.26 %， 5.4~9.9% ±8% of readings 0~5.3kPa ±0.3 kPa，5.4~9.9kPa ±8% of readings When respiratory rate higher than 80 BPM, the end-tidal CO_2 accuracy. * The CO_2 accuracy is maintained at: RR<80 bpm and I/E ratio (inspiratory/expiratory time ratio) <2:1 * Note: Gas temperature at 25℃
Drift of CO_2 measurement accuracy	Short drift: Less than 1 mmHg offset in 4 hours Long drift: Meet measurement accuracy requirements within 120 hours
CO_2 Noise	Noise RMS less than 1mmHg at 5% CO_2
CO_2 Rise Time	Less than 120 ms
CO_2 Response Time	Less than 500ms
Recovery time after defibrillator test	Unaffected
Respiratory rate	0~150 bpm
Respiratory rate accuracy	±1 bpm
Breath detect	Adaptive threshold method
$ETCO_2$ Calculation Method	Peak of the expired CO_2 waveform
Compensation	Built-in atmospheric pressure sensor, automatic pressure compensation
Display	128×128 pixels 1.44 inch TFT color display
Dimensions	51mm × 43mm × 45 mm
Weight	<68 g (Included batteries)
Mechanical robustness	Withstands repeated 1 m drops. Meets the shock and vibration requirements for transport of EN ISO 80601-2-55:2011 clause 201.15.3.5.101.2 and EN 1789:2007 clause 6.3.4.2 and 6.4.1.

Operating conditions	Temperature：0~40 ℃ Humidity：<90% (non-condensing) Atmospheric pressure：50~120 kPa
Storage conditions	Temperature：-20~70 ℃ Humidity：<95% (non-condensing) Atmospheric pressure：50~120 kPa
Transport conditions	Temperature：-20~70 ℃ Humidity：<95% (non-condensing) Atmospheric pressure：50~120 kPa
Alarms	No Breath, Low $ETCO_2$, High $ETCO_2$, Low RR, High RR, Clogged Adapter, No Adapter, Zero point adjustment, Low Battery, system error
Sound Intensity Level	≥ 50 dB(A); ≤ 67 dB(A)
Batteries	Rechargeable lithium battery (1100mAh/3.7V), Tpye-C
Battery life	≥ 6 hours
Bluetooth data output data rate	50Hz
Heat power	1W, Built-in heating element, rapid preheating of the detector window
Mains input	Interface: USB Type-C Input Voltage: 5V Input Current: Max 2A

Interfering gas and vapor effects

Gas or Vapor	Gas Level (%)	Quantitative Effects*
Nitrous oxide	60	±1 mmHg
Oxygen	60	±1mmHg
Halothane	4	±1 mmHg
Enflurane	5	±1 mmHg
Isoflurane	5	±1 mmHg
Sevoflurane	5	±1 mmHg
Xenon	80	-4mmHg
Helium	50	±1 mmHg
Metered dose inhaler propellants	Unspecified	Unspecified
Desflurane	15	±3 mmHg
Ethanol	0.1	No Additional Effect
Isopropanol	0.1	No Additional Effect
Acetone	0.1	No Additional Effect
Methane	1	No Additional Effect

Adverse effects on stated performance due to the following:

- **Quantitative effects of gas sample humidity or condensate:**

The partial pressures and volume percentages of carbon dioxide on the vapor content in the breathing gas. When the water vapor in the breathing gas reaches saturation (BTPS) at body temperature, the concentration of air in the alveoli is 6.2% lower than that of the same mixture gas after removing all the water vapor (ATPD).

- **Leaks of sampled gas:**

Leaks of sample gas may cause Abnormal of Patient respiratory function.

- **Cyclical pressure of up to 10 kPa (100 cmH_2O):**

When the cyclical pressure up to 10kPa will Increases CO_2 readings may by 20%.

6.2 Bluetooth message

Bluetooth LE wireless technical information	
modulation mode	GFSK
maximum power output	-1 dBm
frequency range	2402 MHz~2480 MHz
Antenna peak gain	0 dBi
Recommended service distance	Visual distance 3m
Radio compliance	
Radio type	Bluetooth LE
USA	FCC ID: 2ABN2-RFBMS02A FCC parts 15.207 and 15.247
Europe	ETSI EN 300 328, ETSI EN 301 489-1, ETSI EN 301 489-17

6.3 Classifications

Standard of Classification	**Classification**
Category AP/APG	AP - This device is not suitable for use in the presence of a flammable anesthetic mixture with air or nitrous oxide
The Type of Protection Against Electric Shock	Internally Powered Equipment (Battery Power)
Mode of Operation	Continuous Operation
Sterility	No part of RM-C2 is sterile

7 Warranty

The warranty of this equipment starts from the date of leaving the factory. During the warranty period, the equipment cannot be used normally due to problems such as materials and process defects. RWD undertakes after-sales service such as equipment maintenance and parts replacement.

Any damage caused by improper use or over-range use is not covered by the warranty. If repair or replacement of parts is required, the cost will be borne by the user.

If the reworked equipment was found to have been unauthorised disassembly, RWD will not provide after-sales service such as warranty, free maintenance and parts replacement.

The warranty statement (including its restrictions) is exclusively issued by RWD and covers all other warranties.

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