R409 Plus

Veterinary Ventilator Machine

User Manual v1.2

CONTENTS

1 User/Owner Responsibility

PLEASE READ THIS MANUAL BEFORE OPERATING THE VENTILATOR.

This equipment is designed to function, as mentioned in this manual, when operated and maintained in accordance with supplied instructions. This equipment must be periodically checked, maintained, components repaired and replaced when necessary for equipment to operate reliably. Parts that have failed, in whole or in part, exhibit excessive wear, are contaminated, or are otherwise at the end of their useful life, should not be used and should be replaced immediately with parts supplied by RWD or parts which are approved by RWD. Equipment that is not functioning correctly should not be used. This equipment and any of its accessories or component parts should not be modified.

The user/owner of this equipment shall have the sole responsibility and liability for any damage or injury to patients or property (including the equipment itself) resulting from operation not in accordance with the authorized maintenance instructions, unauthorized repair or modification of the equipment or accessories, or from the use of components or accessories that have either been damaged or not authorized for use with this equipment by RWD.

2 Warnings and Cautions

Personnel operating the ventilator must become thoroughly familiar with the instruction manual before using this equipment with patients.

- ELECTRIC SHOCK HAZARD - DO NOT remove any of the ventilator covers or panels. Refer all servicing to a certified service technician.
- DANGER - Possible explosion hazard if the unit is used in the presence of flammable anesthetic agents.
- Before using the ventilator, check that all connections are correct, and verify that there is no leak.
- Any problems arising from an improperly functioning scavenging system is solely the user's responsibility.
- All warranties and specifications should be voided if personnel open the control unit unauthorized automatically.

3 Warranty

RWD offer one year limited warranty for this equipment (battery included) from invoice date of original purchase, refer to the following instructions for more details:

During the warranty period, the defects in material and workmanship are free to be repaired and replaced by RWD.

This warranty does not cover unit damaged by abuse or where unit is operated outside the normal operating conditions. User/owner should pay for related costs if the damaged parts need to be repaired or replaced outside the warranty.

All conditions of this warranty become null and void if personnel open the control unit unauthorized automatically.

The warranty stated herein (including its limitations) is the only warranty made by RWD, and is lieu of all other warranty.

Prices, terms, and product specifications are subject to change without notice.

4. Introduction

R409 Plus veterinary ventilator is designed specifically for research and veterinary use only.

The device, an electronically controlled, time-cycled and pressure-limited ventilator for animal laboratories, pet hospitals, clinics etc, is designed to control the respiration of animals within 100 kg including rabbits, dogs, monkeys, pigs, sheep etc. Also, it can be connected to an anesthesia machine for the supply of anesthetic agent to animals. Multiple parameters including volume control, airway pressure trigger, adjustable respiratory rate, I:E ratio and alarm detection etc. are available in this unit.

R409 Plus veterinary ventilator utilizes medical oxygen as gas source, the oxygen can be from oxygen tank or central gas supply system. R409 Plus contains lithium battery, which is able to support ventilator operation for over 4 hours during power cut. Operating parameters is shown on the LCD color display, including gas source

pressure, battery charge status, respiratory rate, I:E ratio and airway pressure etc., which is useful to know the operating status of ventilator.

Features:

- Two different sizes of bellows (50-300ml and 300-1500ml) are available to interchange.
- The tidal volume can be regulated with two controllers (coarse and fine tune), which allow operator to adjust tidal volume very fast.
- The tidal volume output range is between 0 and 1500ml, adapt to animals with different body weight.
- Effective intermittent positive pressure ventilation (IPPV) is available.
- Equipped with color 4.3’ LCD screen, operator can directly read all the information in real time.
- Operator can quickly set parameters of respiratory rate, I:E ratio and PIP etc. with a shuttle knob or quick select buttons.
- The airway and gas source pressure is shown in real time, which is conducive to monitoring.
- Both LED and sound alarm, and intelligent trigger are setup to release the proximal airway pressure which is monitored in real time.
- Containing lithium battery, which is able to support ventilator operation for over 4 hours during power cut.

5 Unpacking

Inspect the packing for any signs of damage that may occurred during shipping, if damage has occurred, make a damage claim to the carrier and contact with RWD or local dealer immediately.

Remove all components from the shipping carton. Save all the boxes and packing materials for future shipments.

Check the packing list to ensure all components ordered are included. In case there is any doubt or need any help, contact RWD or local dealer immediately.

All ventilator models include and are shipped with the following:

- R409 Plus controller
- Bellows and bellows cover, 300ml
- Bellows and bellows cover, 1500ml
- 1.2 m corrugated tube for connection of ventilator to gas filter canister
- 0.9 m reusable corrugated tube for connection of ventilator to anesthesia machine
- Airway pressure connecting tube with 22 mm luer
- Silicon power tube, ID 15mm
- Power cord
- Warranty card
- Operating manual

Numerous other optional parts may also have been shipped with your order. Please refer to the packing list for details.

System standard illustration:

No.	Description	No.	Description
①	Bellows and bellows cover, 1500ml	⑦	Silicon power tube, ID 15mm
②	R409 Plus controller	⑧	Rare panel
③	Front panel	⑨	0.9 m reusable corrugated tube
④	Bellows and bellows cover, 300ml	⑩	Gas source connection hose with tee connector (optional)

⑤	Corrugated tube connector, 30-22 mm	⑪	Power cable
⑥	Airway pressure connecting tube with 22 mm luer	⑫	Operation manual

6 Schematic diagram of system setup

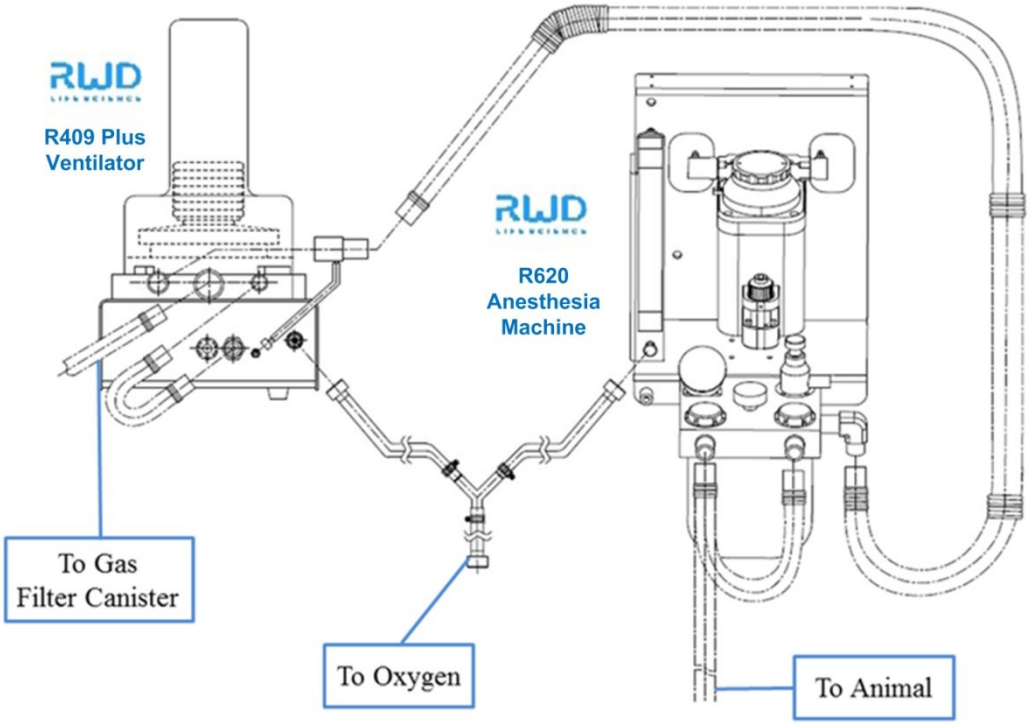


Figure 6- 1

7 Setup procedure

7.1 Inspect the control unit for debris from shipping. Inspect all three ports, the 35-65 psi SUPPLY GAS, DRIVING GAS and EXHAUST ports on the back of the ventilator and remove any obstructions that may have become lodged inside during shipping and unpacking.

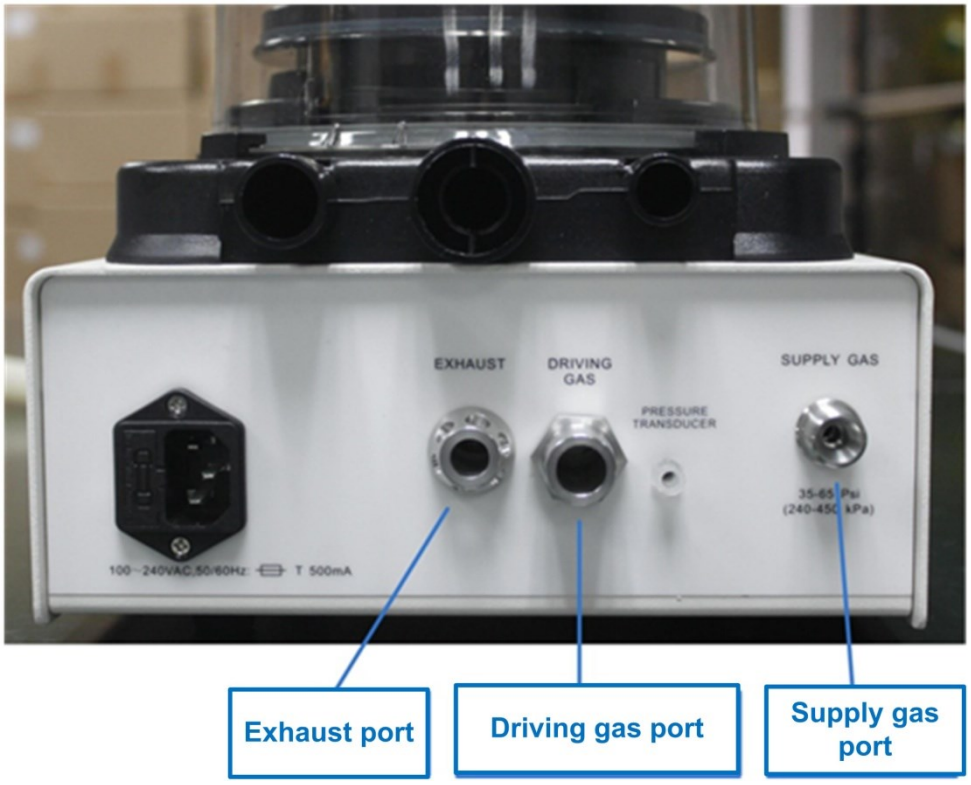


Figure 7- 1

7.2 Inspect the bellows components for debris from shipping.

Components of 0-300 ml

Components of 300-1500 ml

Figure 7- 2

7.3. Assemble the bellows components. Install the bellows with its first convolution over the bellows-mounting ring. Carefully hold the outer edge of the bellows disk (top of bellows): lift and lower it quickly several times to puff out and remove any folds in the convolutions. Place the bellows cover over the bellows, gently press the cover down, twisting the cover clockwise at the same time until the tabs engage with the bayonet locks. The bellows base is now reassembled.

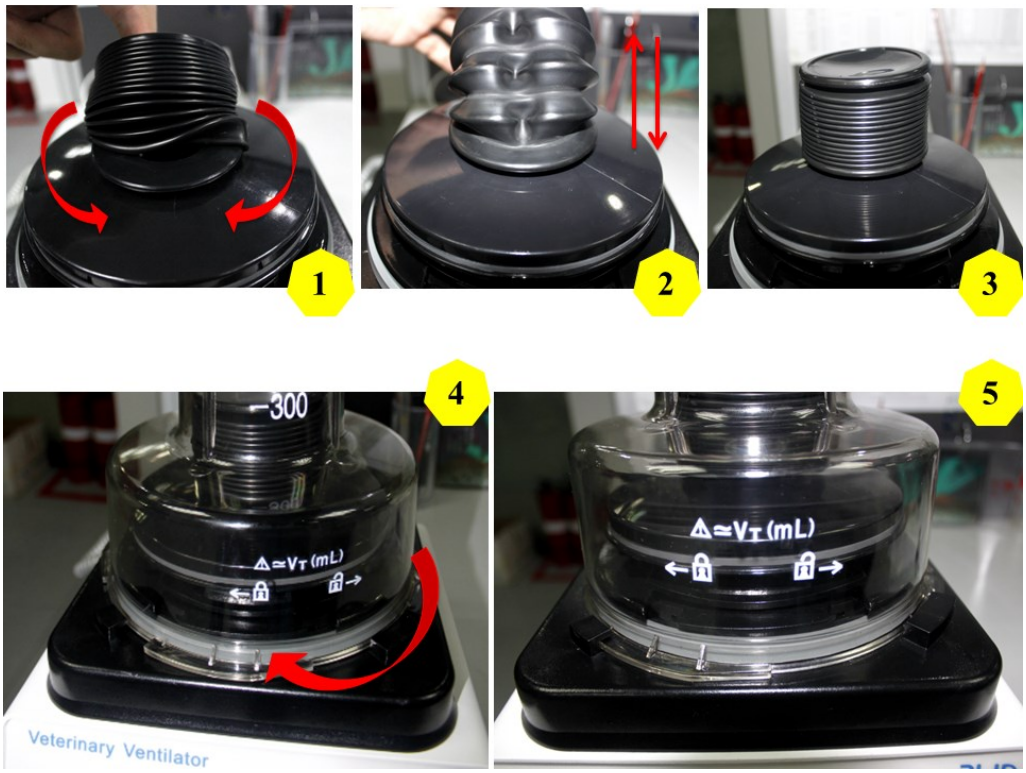


Figure 7- 3

7.4 Connect the driving gas tube. Connect the two DRIVING GAS ports located on bellows base and control unit with silicon power tube.

Figure 7- 4

7.5 Install the airway pressure connecting tube. Install the luer connector to PRESSURE TRANSDUCER port on the rear panel. Connect airway pressure connecting tube to the 22 mm inhale port of the bellows base.

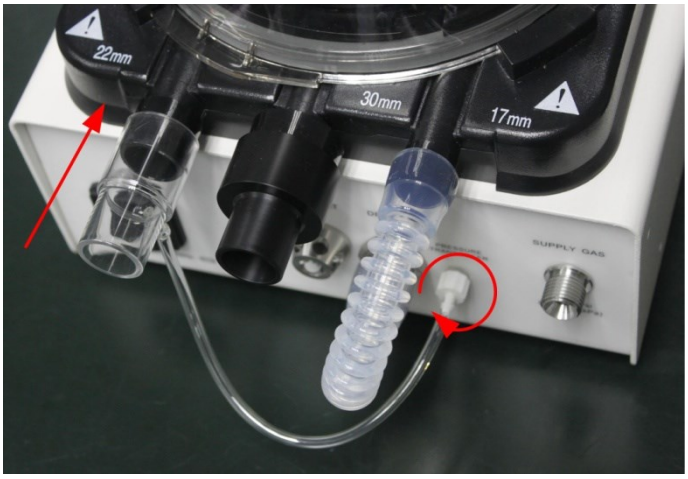


Figure 7- 5

7.6 Connect ventilator to anesthesia system. Remove the breathing bag from bag connector of anesthesia machine. Connect the 22 mm inhale port of bellows base to bag connector with a 0.9 m reusable corrugated tube.

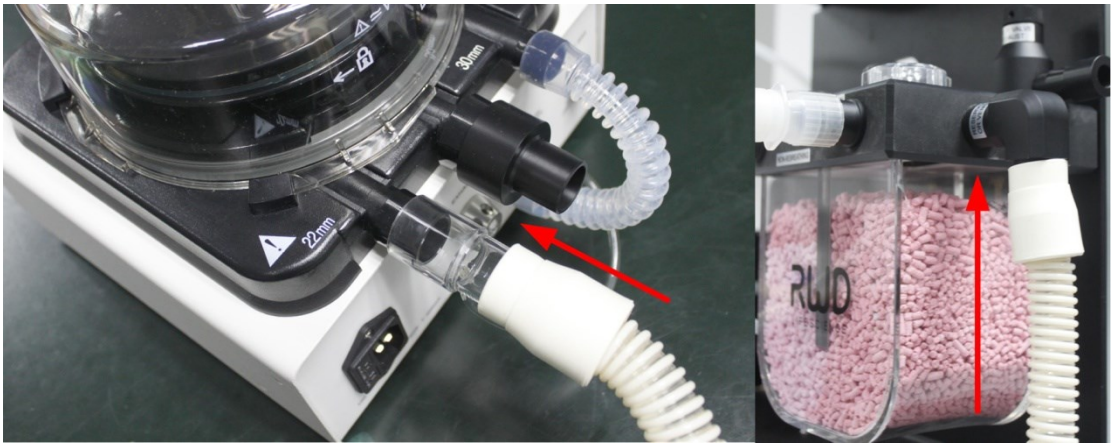


Figure 7- 6

7.7 Connect the ventilator to a scavenger. Connect the corrugated tube with a 30-22 mm connector to the 30 mm port of the bellows base to a gas scavenger system (optional).

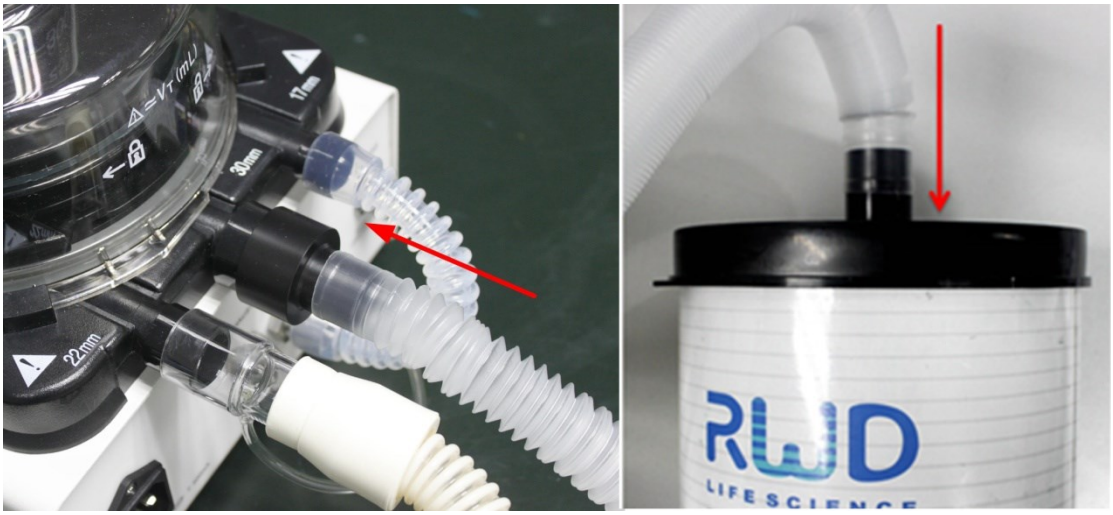


Figure 7- 7

7.8 Connect the supply gas. Connect the the 35-65 psi SUPPLY GAS port on the rare panel to a supply gas tee (optional) with a supply gas hose (optional), and the other two ports of tee are connected to anesthesia system and supply gas source, respectively.

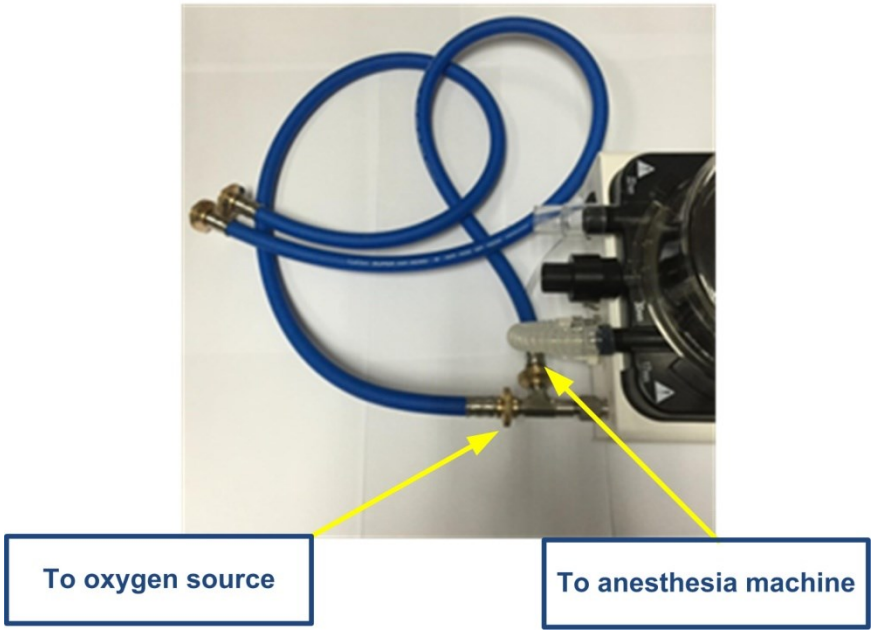


Figure 7- 8

7.9 Connect the electrical power. This device is suitable for the supply voltage range of 100-240 V, meets the need of users from different locations.

8 Operation interface

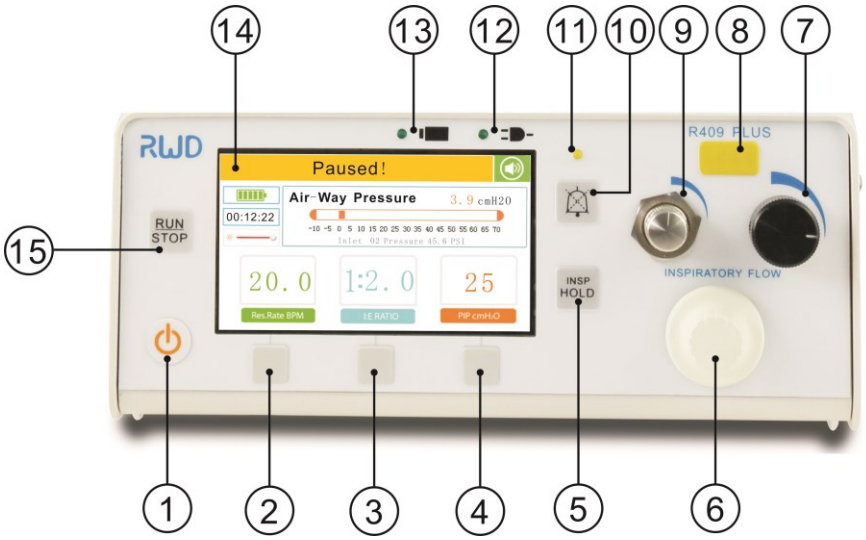


Figure 8-1

① **Power button:** press for 1 second to turn on the ventilator, and press for 1 second again to turn off.

② **Quick selection button of respiratory rate:** press for quick selecting "respiratory rate pane".

③ **Quick selection button of I:E ratio:** press for quick selecting "I:E ratio pane".

④ **Quick selection button of peak inspirtory pressure (PIP):** press for quick selecting "PIP pane".

⑤ **Inspiration hold button:** use to pause breathing cycle at the end of current inspiration, it works only during the button is held.

⑥ **Shuttle knob:** turn to change pane selection, and press to confirm selection.

⑦ **Tidal volume adjusting knob (coarse tune):** use to adjust the tidal volume of animal with large adjustment range.

⑧ **Alarm indicator:** the yellow LED will flash in the case of alarm.

⑨ **Tidal volume adjusting knob (fine tune):** use to adjust the tidal volume of animal with minor adjustment range.

⑩ **Silence button:** click once to silence the alarm sound for 30s, and press for 3s to silence the alarm sound for 120s. it can only silence alarm sound, cannot clear the alarm information showed on screen and the alarm indicator.

⑪ **Silence indicator:** the yellow LED will illustrate after silence button is pressed.

⑫ **AC power supply indicator:** the green LED will illustrate after ventilator is connected to AC power supply.

⑬ **Battery supply indicator:** the green LED will illustrate if ventilator is on battery.

⑭ **LCD screen:** the running information and parameters are showed on the screen.

⑮ **Run/stop button:** press to run ventilator and start the timer, press again to pause ventilator and timer.

9 Power on self test

Connect anesthesia machine and R409 Plus to oxygen source. Open oxygen source, adjust the output pressure of regulator up to 50 psi, and make sure vaporizer is closed.

Connect anesthesia machine to R409 Plus according to figure 6-1. Open the flowmeter of anesthesia system, set flow rate to be about 1 L/min. Press the power button when bellows go up to the top of cover, all the indicators will flash for 3 times, and ventilator will run self test automatically.

Power on self test information description:

a) Voltage: AC power and battery supply self test, it will show OK after test qualified.

b) Air-way Pressure (cmH_2O): leaks detection in ventilator and breathing circuit, it will show OK after detection qualified.

c) Gas Source Pressure (PSI): gas source pressure detection, it will show OK after detection qualified.

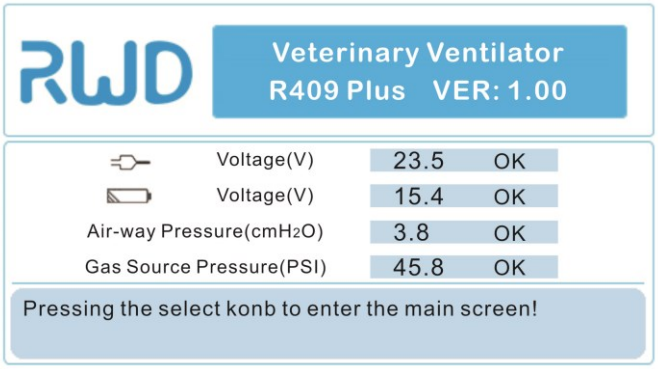


Figure 9- 1 picture of power on self test

Message “Pressing the select knob to enter the main screen!” will be showed on the screen after R409 Plus passed self test, and operator can press shuttle button to enter into the main screen (Figure 9-2).

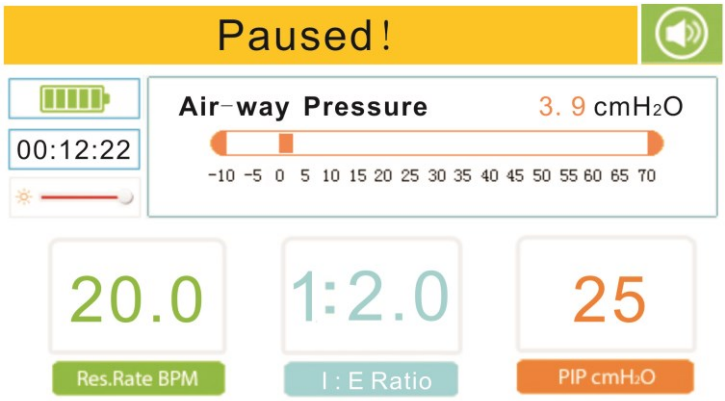


Figure 9- 2 Main screen

If message “Low Gas Source Pressure! Adjust to 36-65 psi.” is showed on the screen, operator needs to check the leaks and blockage of oxygen hose (Figure 9-3).

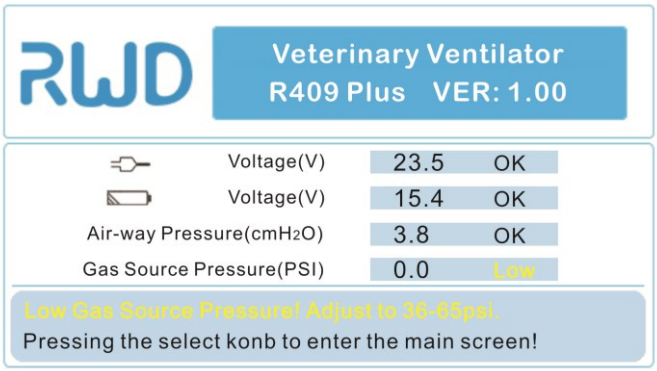


Figure 9- 3

If message “Air-way Pressure (cmH$_2$O) Low” is showed on the screen, operator needs to check the leaks and blockage of breathing circuit (Figure 9-4).

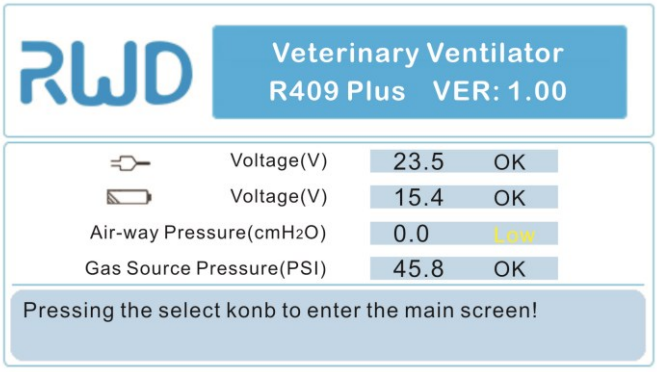


Figure 9- 4

If message “High Gas Source Pressure! Adjust to 36-65 psi.” is showed on the screen,

operator needs to check the oxygen regulator setting (Figure 9-5).

Caution: R409 Plus will not enter into the main screen at this condition before operator adjusts gas source pressure back to 36-65 psi range.

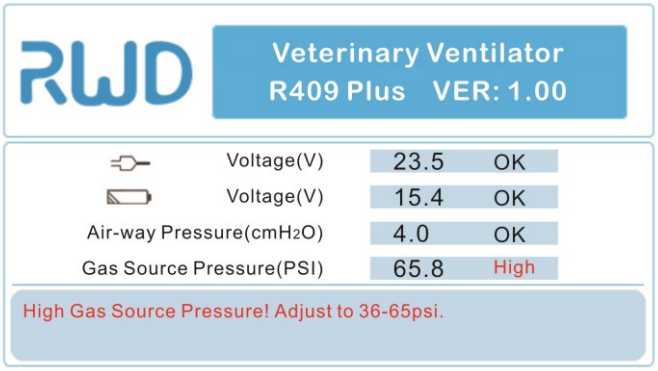


Figure 9- 5

If message “Low Battery! Connect Power Supply.” is showed on the screen, operator needs to connect ventilator to AC power supply, and charge the battery (Figure 9-6). If it still does not work, contact with RWD or local dealer for service.

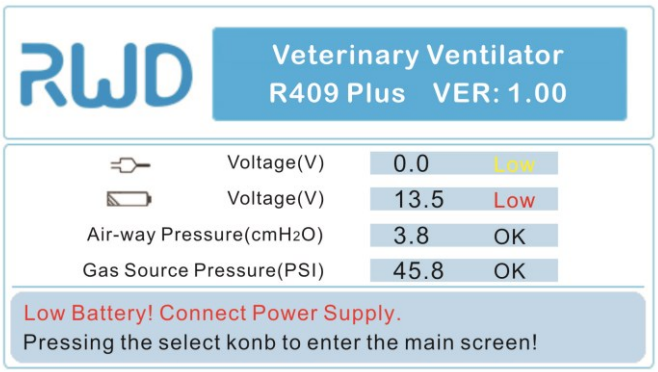


Figure 9- 6

If message “High Voltage! Disconnect Power Supply.” is showed on the screen, operator needs to cut AC power supply, and stop charging the battery (Figure 9-7). If it still does not work, contact with RWD or local dealer for service.

Caution: R409 Plus will not enter into the main screen in the situation before the voltage of battery is adjusted to a suitable range.

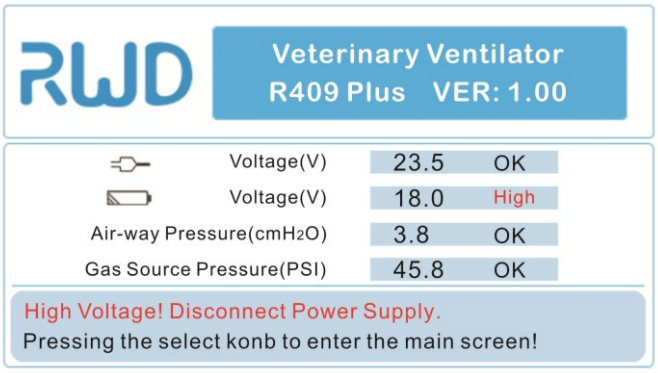


Figure 9- 7

10 R409 Plus main screen operation

Operator can set parameters including respiratory rate, I:E ratio and PIP after R409 Plus has entered into main screen. And operator can also adjust brightness of LCD screen and reset the timer.

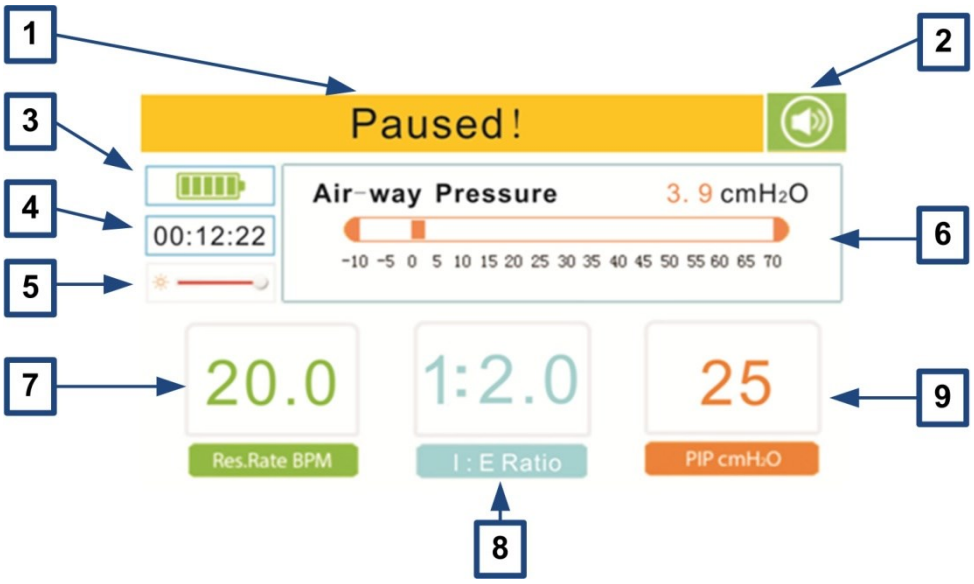


Figure 10- 1 Main screen

[1] Device operating status display:

There are 3 kinds of operating status: “Ventilating”, “Paused” and “Check Ventilation Hose Components”.

2 Sound alarm status display:

 This icon indicates sound alarm is activated, ventilator will alarm with sound once emergency occurs.

 This icon indicates sound alarm is not activated if silence button is pressed, all the alarm sound is silenced at this status.

3 Charge status of battery:

 This icon indicates charge of battery is full. And it will display with flickers when the charge is less than 20%.

Caution: it will alarm with light and sound for 1 time per 3s when the charge of battery is less than 20% and ventilator is not connected to AC power supply, and it will turn off automatically if the alarm lasts for 15 minutes.

4 Timer:

The timer will start when R409 Plus enters “Ventilator” mode, and timer will pause if the device is changed to “Pause” mode.

Operator can use shuttle knob to select the timer pane, and press knob to clear the timer under the “Pause” mode.

Caution: the timer will be reset after device restarts.

5 Brightness of LCD screen:

Operator can use shuttle knob to select the brightness pane, and press knob to adjust the brightness of LCD screen (5 grades) under the “Pause” mode.

6 Airway pressure display:

Operator can directly read the airway pressure from this pane, it shows the pressure with numbers and histogram in real time.

7 Respiratory rate setting pane:

Operator can use shuttle knob to select this pane, press knob to set respiratory rate from 1 to 60 breaths per minute, and press shuttle knob again to confirm the setting.

Operator can also press “Quick selection button of respiratory rate” to select this pane to set respiratory rate.

8 I:E ratio setting pane:

Operator can use shuttle knob to select this pane, press knob to set I:E ratio from 1:1.0 to 1:4.0, and press shuttle knob again to confirm the setting.

Operator can also press “Quick selection button of I:E ratio” to select this pane to set I:E ratio.

9 PIP setting pane:

Operator can use shuttle knob to select this pane, press knob to set PIP from 5 to 60 cmH_2O, and press shuttle knob again to confirm the setting.

Operator can also press “Quick selection button of PIP” to select this pane to set PIP.

Operator can set and change the parameters including respiratory rate, I:E ratio and PIP etc. at “Ventilating” and “Pause” mode. R409 Plus will run with the new parameters immediately after setting.

11. Alarm information and processing

11.1 Ventilation hose components shedding alarm information

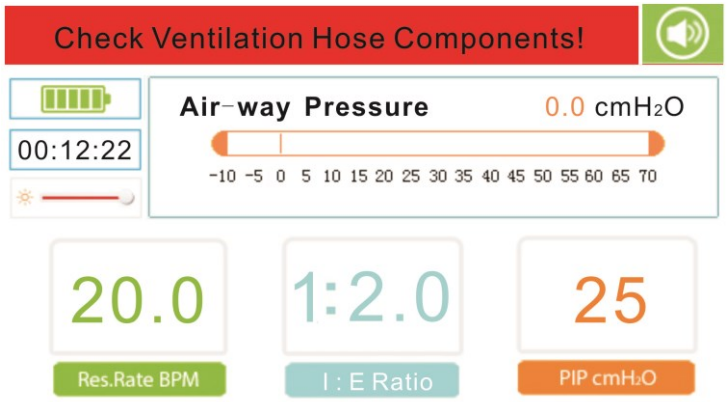


Figure 11- 1

If the operating status pane shows information of “**Check Ventilation Hose Components!**” with consequent alarm sound and flashing, it indicates that the tube connecting anesthesia machine to ventilator is shed, broken, or the flowmeter of anesthesia machine is not turned on. In this situation, operator needs to check all the tube connections, make sure all the tubes in a right connection (according to Figure

6-1). Turn on the flowmeter of anesthesia machine, and make sure bellows of ventilator are on the top of bellows cover.

This alarm information may display in the “Pause” and “Ventilation” mode.

Caution: operator always needs to make sure bellows of ventilator are on the top of bellows cover before ventilator changes to the “Ventilation” mode.

11.2 Gas source pressure alarm

Figure 11- 2

If the operating status pane shows information of “Low Gas Source Pressure**!**” or “High Gas Source Pressure**!**” with consequent alarm sound and flashing, it indicates that the gas source pressure is not between 35 and 65 psi. Operator needs to check the oxygen source, the hose connection and the connectors of oxygen regulator for damage. Make sure the pressure of oxygen tank is more than 50 bar and output pressure of oxygen regulator is between 35 and 65 psi.

This alarm information may display in the “Pause” and “Ventilation” mode.

Caution: operator needs to check the oxygen tank pressure before ventilation. If the pressure is less than 50 bar, we suggest you to change another full one for enough ventilating time.

Open the oxygen tank first, and close it, check the manometer needle of regulator. If the needle maintains its position, there is no leak in the system. If the needle drops, there are leaks in the system.

Method of checking leaks in system:

1) Prepare soap water with no aromatizer;
2) Infiltrate all the connections in system with soap water, and bubbles will generate at the leak point.
3) Reconnect or replace all the leak components, contact with RWD or local dealer for servicing if leaks can’t be excluded.

11.3 Power supply disconnected alarm

Figure 11- 3

If the operating status pane shows information of “Power Supply Disconnected!”, operator needs to check the AC power supply connection.

This alarm information may display in the “Pause” and “Ventilation” mode.

11.4 Low battery alarm

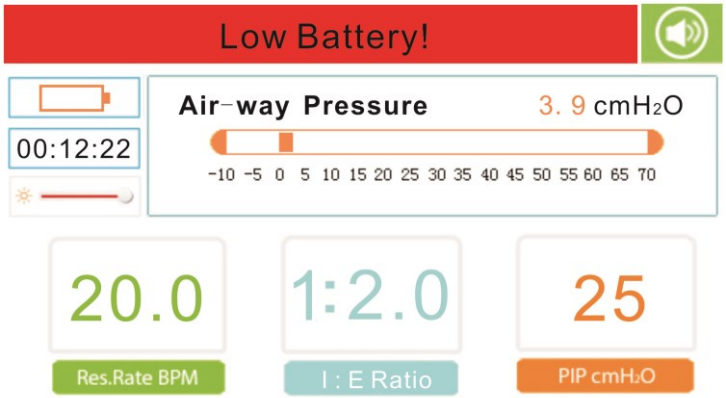


Figure 11- 4

If the operating status pane shows information of “Low Battery!” with consequent alarm sound and flashing, it indicates that the charge of battery is low and ventilator will turn off automatically in this situation.

This alarm information may display in the “Pause” and “Ventilation” mode.

Caution: the battery is prepared for a sudden power failure or emergency, it can last for over 4 hours in the case of full power. Operator needs to complete the surgery before battery is no power.

11.5 High air-way pressure alarm

Figure 11- 5

If the operating status pane shows information of "High Air-way Pressure!" with consequent alarm sound and flashing, ventilator will adjust itself automatically, stop current breathing cycle to keep air-way pressure in the setting range, and start next breathing cycle. This alarm information will cancel automatically if air-way pressure gets back to the setting range. Operator needs to check whether the circuit connection, tidal volume setting and PIP setting is suitable for the animal when this alarm happens.

This alarm information may display in the "Pause" and "Ventilation" mode.

Caution: PIP must be set by experienced veterinarian according to the animals. It will cause inadequate animal inspiration if the PIP setting is too low, and it will cause lung hyperinflation, and hurt lung tissue if the PIP setting is too high.

11.6 Air-way occlusion alarm

Figure 11- 6

If the operating status pane shows information of "Air-way Occlusion!" with consequent alarm sound and flashing, ventilator will start abnormal working condition. In this situation, the bellows will go down to the bottom, and press all the gas out of

ventilator. Operator needs to pause ventilator, and check the breathing circuit for occlusion, bending or shedding immediately. Operator also needs to check the flow rate of flowmeter, and makes sure it is in a suitable range.

This alarm information may display in the “Ventilation” mode.

Caution: Make sure the bellows go up to the top of cover before restart ventilator. Otherwise, it may cause damage to the ventilator.

11.7 Inspiration hold alarm

Figure 11- 7

If operator holds the “Inspiration hold” button, animal breath will be paused, and the information of “Inspiration Hold” will be showed on the operating status pane with consequent alarm sound and flashing. In the situation, the lung of animal can keep the pressure until the button is released.

This alarm information may display in the “Ventilation” mode.

Caution: hyperinflation may hurt the lung tissue of animal!

12 Test preparation

12.1 Preparation

The device is a volume control ventilator with an adjustable pressure limit.

Read this section before the use of your veterinary ventilator machine to understand of the ventilator, and learn what it will change with different settings.

You need to be familiar with the incubation if this is the first time for you to use ventilator. It will introduce the common settings and operating principle followed.

12.2 Making initial settings:

When you bag a patient, you're careful not to over inflate the lungs. You have a feeling as to how hard to squeeze the bag. Your feelings have grown out of experience: checking the chest wall excursion and correlating that with a reading from the airway pressure manometer on the anesthesia machine. In general, for a healthy patient, the peek inspiratory pressure should be kept in the range of 15-20 cmH_2O.

After induction and intubations, when it is time to start IPPV, set the tidal volume adjusting knobs (coarse and fine tune) fully clockwise to the minimum setting, you will deliver no or a very small tidal volume at this statement. Set the PIP to about 20 cmH_2O. The airway pressure will not exceed this setting regardless of what you do with the other controls. Connect the ventilator to the breathing system as discussed in the set-up procedure, fill the bellows by turning up the fresh gas flow until the bellows reaches the top of the bellows cover. Turn the ventilator on. Set the respiratory rate to an appropriate rate (BPM) for the patient.

There will be a pause before the first inspiration. Watch the chest wall excursion and the airway manometer as you would when you bag. Now, turn the tidal volume adjusting knob counterclockwise, a little at a time, until the chest wall excursions and PIP reach levels that you would seek to achieve while bagging.

12.3 Set respiratory parameters:

12.3.1 Adjust the tidal volume and respiratory rate

At this point the ventilator is delivering an inspiratory flow, determined by your setting of the tidal volume and respiratory rate.

The flow is first delivered to bellows base to make the bellows expanded, displacing the mixed gas within to the patient. This delivery to the patient, these tidal volumes at the set rate, results in the overall minute ventilation (MV). It is the proper MV that must be delivered to the patient in order to maintain proper blood gas and pH levels. This MV can be delivered in many ways from a few large tidal volumes to a lot of small tidal volumes. The most optimum combination is up to you to determine just as you would while bagging.

The respiratory rate will NOT change when you change the tidal volume by adjusting the tidal volume knob. In this condition, ventilator will deliver different volume of gas of with the same rate, it follows that the PIP will be different. This different PIP may be fine or it may be unnecessarily high or low. In the high extreme the PIP alarm will sound, a short steady tone, and the PIP will be limited to the set value.

12.3.2 Adjust the I:E ratio

User can change the ratio of inspiratory and expiratory time by adjusting the I:E ratio knob, and the ventilator will automatically control the I:E ratio after it is set. The recommend I:E ratio is a consistent 1:2, there will be enough time for inspiration and expiration. For special control condition, we offer an adjustable ratio from 1:1.0 to

1:4.

12.4 Detailed operating instructions:

Output of the ventilator is mainly adjusted by two controls: respiratory rate (breaths per minute) and tidal volume. Make sure that the safety valve is fully closed in anesthesia system before operating.

1. When the patient is ready, reconnect the ventilator to breathing system.

2. ALWAYS set the tidal volume adjusting knob to its minimum setting before turning on the ventilator. The tidal volume adjusting knob must be fully clockwise set to the minimum setting.

3. Turn on the ventilator, set the PIP and I:E ratio.

4. Set the respiratory rate according to the desired breaths per minute.

5. Press “Run/Stop” button to start ventilator. Turn the tidal volume adjusting knob (coarse and fine Tune) counterclockwise to increase the tidal volume delivered. Read the approximate tidal volume by noting the displacement of bellows in milliliter as indicated on the bellows cover scale. The selection of coarse and fine tune is according to the needs of user, the tidal volume will change largely with coarse tune, and slightly with fine tune.

6. Slight changes in the respiratory rate and tidal volume can be made as the procedure continues, but never make any gross adjustments to these controls with the patient connected.

7. “INSP. HOLD” is used to pause the breath cycle at the end of current inspiration, the patient will not continue to breath until the button is released. This function is usually used in surgery operation of suturing chest, to help the chest of patient to maintain the state of filling.

8. When the experiment is completed, tidy all lines and turn off the power.

Warning:

Under no circumstances should the flush button on the anesthesia machine be used during the inspiratory phase of the breathing cycle. There is the extreme danger of rupturing a lung. The flush button introduces 10-50 LPM, perhaps more, of oxygen flow into the breathing system. During inspiration the discharge valve in the control unit is closed so that flush flow is added to the inspiratory flow generated by the ventilator and has no where else to go except to the patient's lungs. It is recommended that the flush feature on the anesthesia machine NEVER be used with patient connected. The oxygen flow valve can be opened further than normal providing a more controllable high flow of oxygen.

13 Cleaning and maintenance

13.1 Cleaning and sterilization

A majority of the ventilator components do not come in contact with the breathing gas, consequently, they require cleaning with only a damp cloth.

Cleaning the ventilator surfaces: the outer surface of the ventilator may be cleaned simply by using a clean, soft and slightly damp cloth. A mild detergent solution may be used to remove persistent surface dirt or grime. Be sure to use only a mild detergent, if necessary, and use care to ensure that the cloth is only slightly damp.

Cleaning the bellows cover: twist the cover counterclockwise until the tabs at the base of the cover clear the bayonet locks. (This may require some degree of force because of a tight o-ring fit.) Lift the bellows cover off vertically. Since it does not come in contact with the breathing gas, it needs only occasional cleaning with a clean, soft slightly damp cloth, or by immersion in a mild detergent bath, followed by rinsing. Moreover, DO NOT attempt to steam-sterilize the bellows cover, it may warp or deform the cover rendering it useless.

Warning:

Clean bellows and bellows cover only with water and a mild detergent. Use a soft cloth. Avoid abrasives and aromatic spirits. (USE NO ALCOHOL.)

13.2 Battery maintenance

When the batteries are used for the first time, the user should maintain at least two full optimization cycles, in which the batteries are fully charged continually, and then discharged until the device power is terminated. It is recommended that optimize the batteries every two months or when the operating time is significantly reduced.

Please refer to the following steps for the optimization:

1) Disconnect the device and animals;

2) Connect the device to AC power, charge the batteries continuously for more than 10 hours;

3) Cut the AC power supply, and make the device run powered by batteries until it is shut down;

4) Reconnect the device to AC power, charge the batteries continuously for more than 10 hours;

5) The optimization is completed.

Please refer to the following steps for checking battery capability:

1) Disconnect the device and animals;

2) Connect the device to AC power, charge the batteries continuously for more than 10 hours;

3) Cut the AC power supply, and make the device run powered by batteries until it is shut down;

4) Battery capability is related to lasting time of battery supply.

5) If the lasting time is significantly less than rated time, contact RWD or local dealer for advice.

The battery life depends on the use frequency and time. The life of lithium battery is approximately 3 years if it is maintained and stored properly. It is recommended to replace the lithium batteries every 3 years.

If the battery is visibly damaged, or its capacity is exhausted, it should be replaced, and the correct recycling. When disposing of used batteries, it should follow the appropriate regulations.

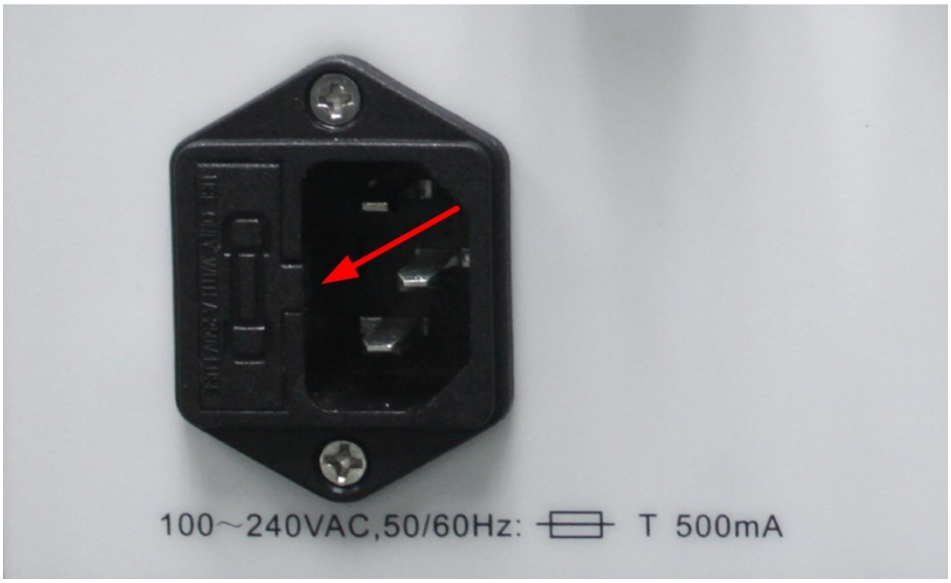
Warning:

Do NOT disassemble the battery or threw it into the fire, or short circuit. Battery combustion, explosion, leakage may result in bodily injury.

14 Troubleshooting

14.1 Fuse replacement

Generally, the problems (ventilator don't start and power failure once started etc,) are in result of blown fuse. For the solution, take out and check the fuse first (lever out the lock directed by the red arrow with a flathead screwdriver). If it is broken, replace fuses ONLY with the same size and rating as listed on the rear panel below the power inlet.



14.2 Problem-Solution matrix

Table 14-1 contains problems that may occur during operation of your R409 Plus veterinary ventilator and their corrective actions. If you continue experiencing a problem after trying the suggested corrective actions, please contact RWD or local dealer for support.

Table 14-1 R409 Plus Veterinary Ventilator problem-solution matrix

Problem	Potential Cause	Possible Solution
Ventilator sounds as though it is cycling. I can hear the valves clicking but nothing happens. Ventilator hums with each inspiration.	■ No supply gas pressure. ■ Inspiratory flow control is set at its minimum. ■ Supply gas pressure at the ventilator inlet is low.	■ Unkink the supply gas hose. ■ Increase the tidal volume setting. ■ Replace empty tank. ■ Anesthesia machine power outlet is incapable of supplying the required flow. Bypass it. Switch to a new supply gas source.

Table 14-1 R409 Plus Veterinary Ventilator problem-solution matrix (continued)

Problem	Potential Cause	Possible Solution
Nothing happens when the ventilator is turned on. No valves are clicking, green LED not lit.	■ No electrical power.	■ Plug ventilator into the proper power source. ■ Check the outlet. ■ Check the fuse.

Nothing happens when the ventilator is turned on with no electrical power. Green LED not lit.	■ Battery fault.	■ Contact RWD or local dealer for servicing.
The ventilator operation sounds normal but the tidal volume delivered is incorrect and or inconsistent.	■ Internal fault.	■ Contact RWD or local dealer for servicing.
Bellows dislodges from mounting ring.	■ Partially detached or improperly mounted bellows.	■ Reattach or replace the bellows.
Everything seems normal, but the bellows pro--gressively becomes less full.	■ Breathing system gas is leaking from the system. ■ Inadequate fresh gas supply from anesthesia machine. ■ Hole in Bellows ■ Partially detached or improperly installed bellows. ■ Anesthesia machines pop-off valve is not completely closed.	■ Remove obstruction. ■ Increase flow. ■ Replace Bellows. ■ Reattach Bellows to the mounting ring. ■ Check all tubes and tubing connections for leaks. ■ Close, repair or replace valve.
Ventilator can’t be turned on with pressing the power button for several seconds	■ No electrical power. ■ Low battery. ■ Power button fault.	■ Check power inlet. ■ Contact RWD or local dealer for servicing.
No action with turning the shuttle knob	■ Shuttle knob fault.	■ Contact RWD or local dealer for servicing.

15 Returning for service

No RWD products or accessories can be accepted for repair or return without a Return Authorization from RWD.

To obtain a return authorization, please have the following information ready and available:

1) The serial number of the item to be returned, if applicable.

2) The nature of the problem, reason for return and action requested.

3) The name, phone number and extension of the party to contact should we have future questions.

4) The billing name, address, phone number and PO number of the responsible party.

5) If the item is to be returned, such as with a repair, the name of the party to whom we should ship the item, the shipping address and receiver's PO number if needed for acceptance.

Please keep packaging to the device and component need repairing to avoid the secondary damage in transit.

Notes

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