RWD

RWD Life Science Co.,Ltd

R640-S1 Flexible Veterinary Anesthesia Machine

User Manual V1.1

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Contents

1-Introduction

1.1 Overview

First of all, sincerely thanks for selecting the R640-S1 flexible veterinary anesthesia machine made by RWD.
Please read this instruction manual and all other auxiliary materials carefully before installing and using the product, it will be helpful to work with it better.
RWD has been always dedicated to improving the product function and the service quality, and will reserve the rights to revise the products itself and contents described in the instruction manual at any time without notice in advance.
If you find the practical situations about the supplied goods do not agree with the contents described in the manual, or have any questions or ideas about our products and service, welcome to contact us. For latest information, please visit our web site (http://www.rwdstco.com/) or contact us immediately.

This anesthesia system should be only used for veterinary clinical and research, NOT used for human clinical.

1.2 Safety

Operation of anesthesia system involves oxygen gas pressure and the use of potentially hazardous materials. In order to prevent injury to animals or operators and damage to the anesthesia system, please read ***Section 2 –Safety*** carefully before performing any of the procedures contained in this manual. If you have any safety questions or comments, please contact us for support.

This veterinary anesthesia system should only be operated by veterinary professionals qualified to administer anesthesia.

1.3 General description

R640-S1 anesthesia machine is a compact and stable equipment designed by RWD. The principle is that the anesthetic agent is transformed from liquid to gas and mixed with oxygen according to a certain proportion for inspiration of animals in order to make them anesthetized.

1.4 Product features

- Standard closed circuit breathing loop design;

- Applicable to cats, dogs, monkeys, pigs and other animals of 100kg weight or less;
- Two options available: close and semi-open anesthesia mode;
- The oxygen flow meter adjustable ranges from 0.1 to 4 L/min;
- With oxygen flush function to replace the system with pure oxygen at a speed of 10L/min;
- CO_2 absorbent canister (2100 ml) is installed in the front part of the machine that is easy to observe and dissemble for changing;
- Newly designed vaporizer provides enough flow of anesthetic gas for animal. Support both Cage Mount and Selectatec.
- The concentration of anesthetic gas from the vaporizer can be adjusted from 0 to 5 % (Isoflurane) and 0 to 8% (Sevoflurane), without effect by fluctuation of flux, temperature, flow rate and pressure. The safety locking device well prevents accidental volatilization of anesthetic agent;
- Compact and easy to clean.

1.5 Facility requirements

Table 1-1 provides the facility requirements necessary to ensure reliable operation and safety of the anesthesia system.

Table 1-1 Facility Requirements

Specification	
Work Environment	Temperature:10℃~35℃
	Humidity:15%~95% (non-condensing)
	Air pressure:57kPa~106kPa
Storage Environment	Temperature:-20℃~60℃
	Humidity:10%~95% (non-condensing)
	Air pressure:50kPa~106kPa

1.6 System standard features

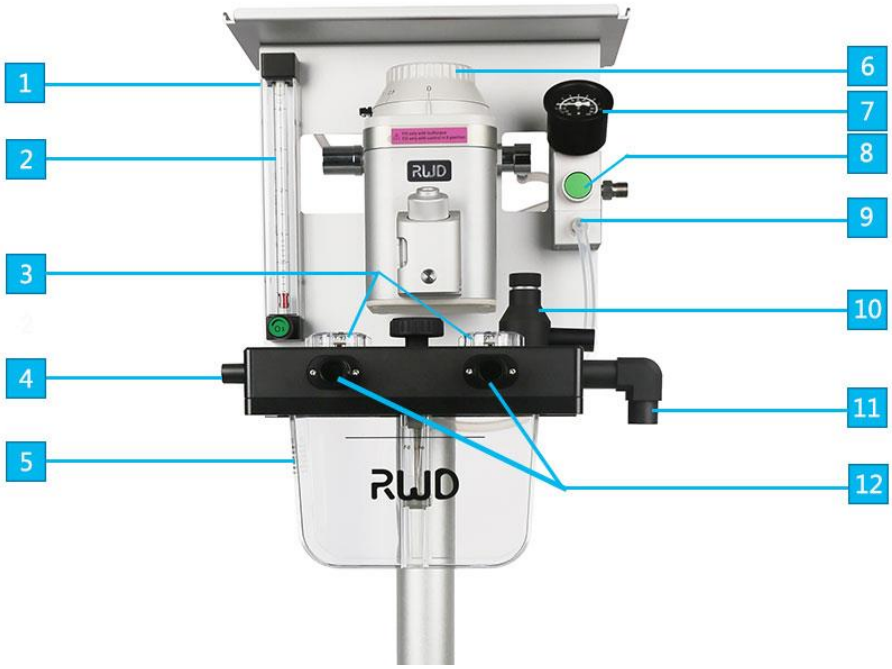


Figure 1-1 R640-S1 body

No.	Description	No.	Description
1	Main support	7	Pressure gauge (cmH2O)
2	O2 flowmeter	8	O2 flush button
3	Inspiration & expiration valve component	9	Rebreathing circuit /Non-rebreathing circuit tube socket
4	Endotracheal tube/ mask connector plug	10	Relief valve
5	CO2 absorbent canister	11	Breathing bag mount
6	Vaporizer	12	Rebreathing circuit connector

① Main support

Solid metal support for assembling of following component.

② O_2 flowmeter

Control the oxygen flow rate. Turn the O_2 flowmeter control valve to regulate the oxygen flow between 0.1~4 L/min.

③ Inspiration & expiration valve module

The one-way valve is made up with floatable discs and nickel-plated brass valve to control gas flow direction to form gas circulation in system. It makes sure the animal will not inhale the gas just exhaled. The floatable discs go up and down as animal breaths, and

operator can confirm the respiratory status with the floatable discs.

④ Endotracheal tube/ mask connector plug

Used for placing the endotracheal tube/ mask connector. Meanwhile the plug blocks the breathing circuit, it's useful for system leak detection, adjusting system pressure and flushing circuit.

⑤ CO_2 absorbent canister

The absorbent canister is filled with a granular carbon dioxide absorbent material eg. soda lime. It uses a coaxial gas flow path to provide for more efficient use of absorbent, while reducing flow resistance. The chemical reaction that takes place in the canister creates heat and humidity, which is added to the delivery of anesthesia to the animal.

⑥ Vaporizer

The vaporizer is the most complicated and expensive part of the anesthesia system. More attention should be paid to its maintenance and operation. It converts a liquid anesthetic agent into a vapor which is added to oxygen. The anesthetic vapor is measured in volume percent (vol %). A dial on top of the vaporizer allows the operator to select the amount of vapor administered to the animal. The coiled pipe design inside the vaporizer ensures the output is not affected by the fluctuation of pressure, temperature and gas flow. The inner design of the vaporizer is different according to the anesthetic agent. Please use the correct anesthetic agent following the tag on the vaporizer. The misuse may cause the damage to the equipment and animal.

⑦ Pressure gauge

Measures and displays the pressure of gas mixture in breathing circuit.

⑧ O_2 flush button

Press to deliver the oxygen directly to breathing circuit. It is generally used to flush the anesthetic gas in system or in emergency.

⑨ Rebreathing circuit /Non-rebreathing circuit tube socket

Used for connecting to a non-rebreathing circuit, which is generally applicable to animals below 7 kg.

⑩ Relief valve

Operator can determine the inspiratory pressure for ventilating the animal by adjusting the valve while observing the system's pressure gauge. When the pressure of gas mixture exceeds the setting, the gas will be expired through valve to keep the pressure stable.

Usually, the outlet of the valve is connected to a gas filter canister.

⑪ Breathing bag mount

Used for connecting to a breathing bag when using the anesthesia system in a rebreathing circuit configuration.

⑫ Rebreathing circuit joint

Used for connecting to a rebreathing circuit, which is generally applicable to animals over 7 kg.

2-Safety

2.1 Overview

This section provides basic safety information necessary for operating your R640-S1 anesthesia system. Please contact us for more support if you have any questions or comments.

2.2 Intended use

The anesthesia system is intended for veterinary use only. All the operation and maintenance should follow the instructions of this manual.
Misuse of your system may result in injury to animals and operators or damage to property. Misuse includes:

- Using inappropriate gas and anesthetic agents
- Making unauthorized modifications to the equipment
- Operating the system using gas pressure exceeding maximum ratings

2.3 Description of safety symbols

The following types of symbols are included in this manual with notes that alert the reader to potential hazards.

Personal Safety Warning. This symbol appears in a shaded text block to warn you about actions that could cause personal injury or death.

Property Damage Caution. This symbol appears in a shaded text block to warn you about actions that could cause damage to the system or the facility.

2.4 Basic safety precautions and practices

This section provides requirements necessary to ensure safe and reliable operation of your R640-S1 anesthesia system.

2.4.1 Animal and operator safety

- Always keep a backup anesthesia delivery plan in case of an emergency occur.
- Any person responsible for the installation or operation of the system should be thoroughly familiar with this operator's manual.
- To ensure proper function of your system, perform a pre-use checkout procedure in accordance with ***Section 4 – System setup*** and ***Section 5 – Operation***.
- The system must always be attended by a veterinarian or trained anesthesia technician.
- After guarantee period, annual service inspections to ensure proper operation is recommended. Only RWD-certified technicians should be permitted to service the

system or replace internal parts.

- Keep open flames and combustibles (e.g., ether and acetone) away from the anesthesia system.
- Do not place any heavy things on the anesthesia system.
- Make sure that the oxygen hose does not cross walkways and aisles. This may present a tripping hazard.
- Wearing personal protective equipments is suggested.
- Make sure the oxygen hose is securely connected to the system before starting a procedure.
- Make sure that any exhaled gas containing anesthetic is recovered or vented outside of the operating room. A waste gas evacuation system must be used.
- RWD recommends the use of an electrocardiograph, and equipment capable of monitoring the animal's pulse, oxygen (O_2) saturation, carbon dioxide (CO_2) level, and anesthetic agent level at all times when operating the system.
- Remove the system from service if any indications of improper function exist.
- Never pour water or any other fluids into the anesthetic vaporizer. Fill vaporizer only with the anesthetic agent for which it is designed.
- Avoid use of oil or grease on any anesthesia or respiratory equipment where oxygen is used. An explosion may occur.

2.4.2 Preventing system and facility damage

- Immediately contain and clean up spilled anesthetic.
- Isoflurane is very caustic and may dull the paint finish of the system if spillage occurs. If spillage should occur, allow it to evaporate. Do not attempt to wipe it with a cloth.
- Do not place heavy on top of the anesthesia equipment.
- Follow all recommended system maintenance procedures specified in ***Section 7 – Maintenance.***
- Keep appropriate distance from the wall to ensure a stable gas supply.

2.4.3 Facility environment health

- Immediately contain and clean up any spilled anesthetic agent.
- If the system is used in a confined space, ensure that there is adequate ventilation.
- Dispose of any hazardous materials and items contaminated with hazardous materials should be in accordance with local regulations.

2.5 System malfunction

If your system does not operate properly, refer to ***Section 6 – Troubleshooting*** which includes Problem descriptions, possible causes, and suggested solutions.

3-Unpacking and assembling

3.1 Overview

This section provides the unpacking and assembling procedure for your R640-S1 anesthesia system.

3.2 Unpacking the system

Your system is shipped in boxes that have been carefully packed at the factory for safe delivery of the system to you. When you receive your system, please do the following:

- Check the shipping documents to ensure that all boxes have been received.
- Examine the shipping boxes for damage. Immediately make a damage claim to the carrier if there is serious damage and contact RWD. Taking photos is suggested for keeping the evidence.
- Carefully open each box and remove each individual component. Save all boxes and packing materials for future shipments.
- Check the packing list or invoice to ensure all ordered components ordered are included. In case there is any doubt or need any help, contact RWD or local dealer immediately.

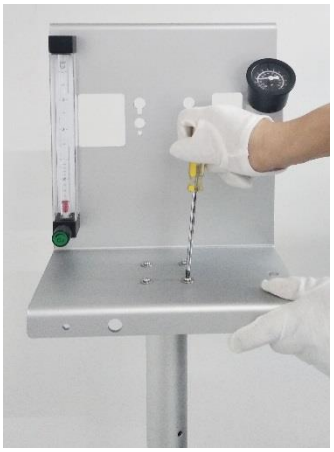
3.3 Assembling the system

3.3.1 Assembling base

Step1

Step2

3.3.2 Assembling main support and vaporizer



Step1

Step2

Step3

An example of the installing method for Cage Mount type vaporizer is showed as below:

Step1

Step2

Step3

Step4

An example of the installing method for Selectatec type vaporizer is showed as below:

Step1

Step2

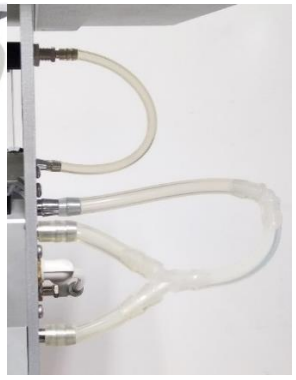
Step3

Step4

The detail picture is shown below (using the Selectatec type as an example, the Cage Mount type is also applicable):

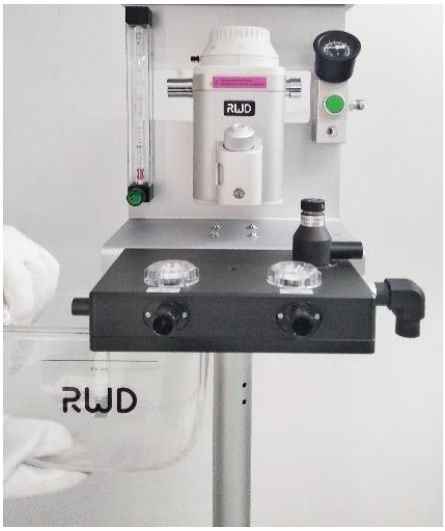
1.Tube

2.Back elevation



3.Lateral view

3.3.3 Assembling CO2 absorber canister (Push the canister to the end of the track)



Step1

Step2

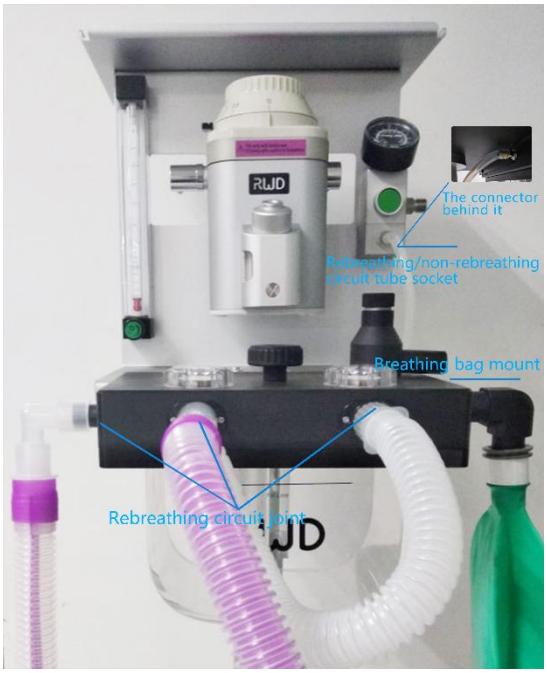
3.3.4 Assembling monitor tray and gas filter canister (Optional))

Step1

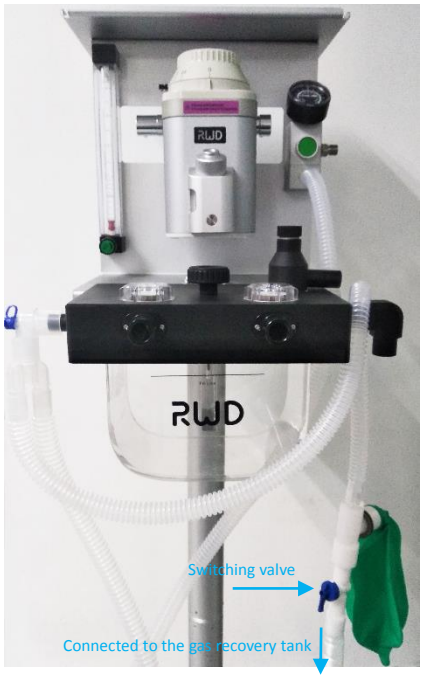
Step2

Step3

3.3.5 Assembling breathing bag, rebreathing circuit and non-rebreathing circuit



Rebreathing circuit



Non-rebreathing circuit

4-System setup

4.1 Overview

This section describes the preparation of anesthesia machines for animal anesthesia.

4.2 Materials and supplies

- Oxygen supply source
- Connection tube for oxygen source and flowmeter
- Animal breathing circuit
- Breathing bag
- CO_2 absorbent
- Anesthetic agent
- Wrench for tightening oxygen supply fitting

4.3 Initial system preparation

4.3.1 Setting up the system

1) Position the system in the area where it will be used.
2) Fill the CO_2 absorber canister with absorbent as follows:
   - Loosen the fixing knob and remove the absorber.
   - Fill the absorbent canister with CO2 absorbent. Do not exceed the maximum capacity scale.
   - Reinstall the absorbent canister and tighten the knob.
3) System leak checking

Anesthesia system must be operated with no leaks, please check system according to the following steps.

   - Close all the open end of anesthesia system.
   - Make sure volume percent dial is on the anesthetic vaporizer to the zero (0) position.
   - Close the relief valve completely by clockwise rotating regulator.
   - Open oxygen source, adjust the needle oxygen regulator between 0.3 to 0.4MPa by clockwise rotating regulator.
   - Turn on the oxygen flowmeter control valve, increase the flow rate up to 1 L/min. The system pressure will increase with oxygen flowed into system. Operator can also increase the pressure by pressing oxygen flush button. Turn

off the flowmeter control valve when the needle of pressure gauge goes up to about 30 cmH2O.

- Observe the needle of pressure gauge, there is no leak in the system if the needle drops down within 2cmH2O in 10s. On the other hand, system leaks if the needle drops down more than 2cmH2O in 10s, operator needs to check all the connection in the system. In case there is any doubt or need any help, contact RWD or local dealer immediately.

4.3.2 Filling the anesthetic vaporizer

User choose different vaporizer, the anesthetic filling method is also different. RWD supply three kinds of filling type vaporizer-Pour Fill and Easy Fill and Key Fill.

Make sure to pour the correct anesthetic agent into the filler port. Filling with the incorrect anesthetic agent could cause serious injury or death to the animal.

If anesthetic agent spills on system surfaces, allow it to evaporate. Rubbing spilled anesthetic agent with a cloth may damage the system finish.

4.3.2.1 Pour Fill

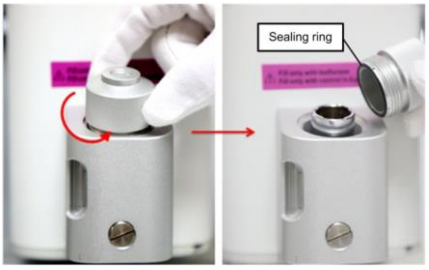
1) Turn and remove the sealing cap of the vaporizer. Do not leave any debris.

2) Carefully pour appropriate agent into the filler port. Observe the agent level sight glass on vaporizer. Keep agent level inside tube between the two marks.

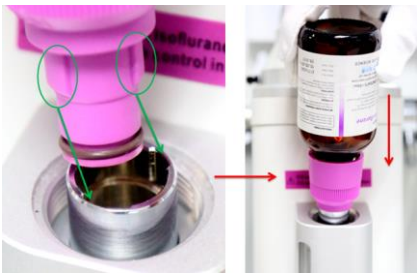
3) Tighten the sealing cap.

4.3.2.2 Easy Fill

1) Turn and remove the sealing cap of the vaporizer. Check the black sealing ring.

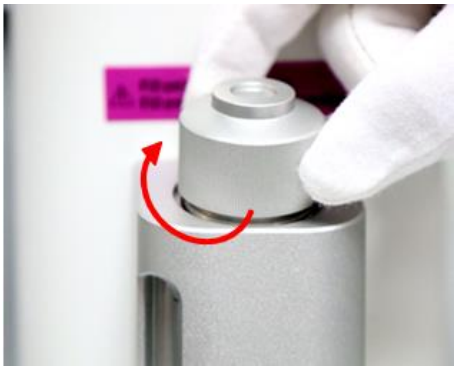


2) Mount an adaptor onto the isoflurane bottle, insert into filler port along the groove, and press it in the end.



3) Observe the agent level sight glass on the vaporizer. Keep the agent level inside the tube between the two marks.

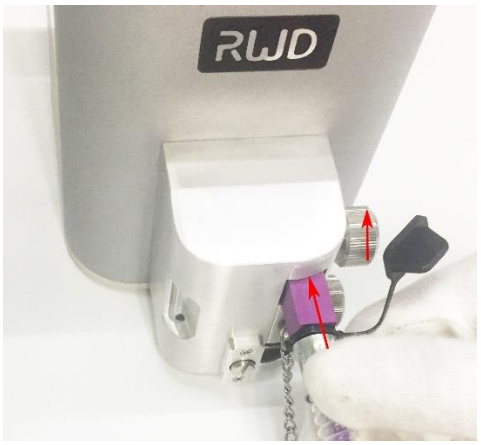
4) Tighten the sealing cap.



4.3.2.3 Key Fill

1) Rotate the upper jacking bar counterclockwise to loosen it and take out the current limiting block;

2) First, ensure that the feedback control lever is tightened, and then insert the adapter into the filer port, rotate the upper jacking bar clockwise to tighten it, and lift the anesthetic bottle up and keep upright to add the agent;



3) Upon completion of filling, loosen the upper jacking bar and take out the adapter, insert the current limiting block into the filer port and tighten the upper jacking bar.

5-Operation

5.1 Overview

This section provides the procedures and information needed to successfully operate your R640-S1 anesthesia system.

Only trained veterinary professionals should operate the anesthesia system.

5.2 Pre-use checkout

Perform the pre-use checkout procedure before each use of your anesthesia system as follows:

- Ensure anesthetic agent is filled into the vaporizer.
- Make sure the vaporizer volume-percent dial is set to zero (0).
- Ensure the oxygen source is connected with anesthesia system closely.
- Ensure the pressure of oxygen supply is between 0.28~0.6MPa and it is enough during the complete experiment.
- Make sure the O_2 control valve works properly.
- Confirm that the breathing circuit is clear and clean and check the ventilation and cleanliness of the experimental environment.

5.3 Anesthesia procedure

1) Wear anesthesia mask or do endotracheal intubation for animal after anesthesia induction;
2) Turn the O2 control valve counterclockwise and observe the position of float to set a suitable flow rate.
3) Press the dial lock key and turn the dial to set the concentration value. Pressing of dial lock key is necessary only when the concentration is set from position “0”.
4) Connect breathing circuit to endotracheal tube or anesthesia mask, and provide anesthetic gas to animal. Operator can change the anesthesia depth by changing the concentration of anesthetic gas during surgery.

5.4 Using the oxygen flush function

If the animal needs pure oxygen instantaneously, operator can activate the oxygen flush button. Once activated, the flow meter and anesthetic vaporizer are bypassed and oxygen is administered to the patient without anesthetics. As soon as the oxygen flush button is released, the preset anesthesia mixture will again be administered.

Use caution on the pressure gauge while using to avoid overpressure.

5.5 Using the rebreathing circuit and non-rebreathing circuit

It is recommended that when the animal weighs less than 7kg, the non-rebreathing circuit that can be used to supply the animal with anesthetic gas. At this time, the exhaled gas is no longer passed through the CO2 absorbent canister, but be directly exhausted into the gas filter canister or outdoor.

It is recommended that when the animal weighs more than 7 kg, a rebreathing circuit can be used to supply the animal with anesthetic gas.

5.6 Adjusting the highest pressure in system

1) Turn the relief valve counterclockwise to completely open, make sure the needle of pressure gauge has dropped down to zero;
2) Remove the breathing bag, and connect the exhaled port of rebreathing circuit to breathing bag mount;
3) Turn on the oxygen flowmeter control valve, increase the flow rate up to 1 L/min. The system pressure will increase with oxygen flowed into system.
4) Turn the relief valve clockwise to increase system pressure, and pay attention to the needle of pressure gauge. Stop rotating until it reaches appropriate pressure, which is recommended not to be over 20 cmH2O;
5) Turn off the flowmeter, and reconnect the breathing bag and rebreathing circuit.

5.7 Post-anesthesia procedure

Once the anesthesia procedure is completed, perform the following steps in order:

1) Turn off the vaporizer by turning the volume-percent dial clockwise to zero (**0**).
2) Remove breathing circuit from endotracheal tube or mask, and put the connector onto the plug on the main support of anesthesia system.
3) Press the oxygen flush button for 2-3 seconds and squeeze the breathing bag to purge the system of anesthetic gas and carbon dioxide.
4) Cut off the oxygen supply source.
5) Open the relief valve by turning it counterclockwise.
6) Record the used time of absorbent in the CO_2 absorbent canister. If the total time is over 10 h, change the absorbent as described in ***Section 4 – System Setup***.
7) If the system will be vacant for a long time, drain the anesthetic agent inside the vaporizer as described in ***Section 7 – Maintenance***.
8) Thoroughly clean the anesthesia system as described in ***Section 7 – Maintenance***.

6-Troubleshooting

6.1 Overview

This section will help you determine the origin of common problems/alarms you may experience with your R640-S1 anesthesia system and recommended corrective actions. If you experience problems are not listed in this section, or continue experiencing the problem after trying the suggested corrective actions, please contact RWD or your local dealer for support.

6.2 Safety

Some troubleshooting procedures may involve the use of hazardous materials and contact with biological hazards. Always follow all applicable local regulations and the material manufacturer's Material Safety Data Sheet (MSDS) recommendations. During the procedure, basic personal protective is necessary, such as wearing gloves, mask and eye protection.

6.3 Machine status

Unless otherwise specified, the anesthesia system may be connected to gas supplies during the performance of the troubleshooting procedures described in this manual. Make sure the gas supplies and vaporizer are turned off before the procedure.

6.4 Record keeping

A record of problems and their resolution should be kept. Such records should include the date, the nature of the problem encountered, and the actions that resolved the problem.

6.5 Problem – Solution matrix

Table 6-1 contains problems that may occur during operation of your R640-S1 anesthesia system 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 6-1 R640-S1 anesthesia system: Problem – Solution Matrix

No.	Problem	Cause	Solution
1	No or low anesthetic vapor output	a. Vaporizer is functioning properly, but machine output is not getting to animal	Check breathing system components for leaks, tears, holes. Ensure the mask/endotracheal tube makes a good seal with the animal.
		b. Anesthetic agent reservoir is empty	Fill the reservoir with appropriate anesthetic agent.
		c. Vaporizer is turned off	Press the dial lock key on the vaporizer and adjust the dial to the desired volume-percent of anesthetic.
		d. Leak around the vaporizer filler	Make sure the sealing cap on the vaporizer is fully closed.
		e. Vaporizer malfunction – internal fault	Contact RWD or local dealer for servicing.
2	Relief valve knob is hard to turn	Relief valve requires cleaning	Contact RWD or local dealer for servicing.
3	Needle on system pressure gauge is stuck and does not move	Mechanical damage	Replace pressure gauge. Contact RWD or local dealer for servicing.
4	Needle on system pressure gauge indicates a negative pressure	Inadequate fresh gas flow	Increase fresh gas flow rates.

Table 6-1 R640-S1 anesthesia system: Problem – Solution Matrix

No.	Problem	Cause	Solution
5	Animal sleep level is too light	a. Vaporizer is empty	Fill vaporizer with the appropriate anesthetic agent. ⚠ Do not fill anesthetic agent when the device is in use.
		b. Anesthetic concentration is set too low	Adjust the dial to increase the volume-percent of anesthetic.
		c. Leak in animal breathing circuit	Check breathing system components for leaks, tears, holes, etc. Ensure the mask/endotracheal tube makes a good seal with the animal.
		d. Excessive CO2 build-up	1. Check CO2 absorbent and replace if necessary. 2. Check proper function of inspiration and expiration valves.
		e. Leak around the vaporizer filler port	Make sure the sealing cap on the vaporizer is fully closed.
6	Animal sleep level is too deep	a. Anesthetic concentration is set too high	Adjust the dial to reduce the volume-percent of anesthetic.
		b. Vaporizer malfunction	Contact RWD or local dealer for servicing.
7	Breathing bag is overly distended	a. Relief valve is closed	Open the relief valve.
		b. The outlet port of relief valve is clogged up	Check and clean the outlet port of relief valve.
8	Gas is flowing , but breathing bag does not inflate	a. Breathing bag is punctured	Renew the breathing bag.
9	Gas flow is leaving through expiration port when squeezing breathing bag.	One way valve inside is broken	Contact RWD or local dealer for servicing.

Table 6-1 R640-S1 anesthesia system: Problem – Solution Matrix (continued)

No.	Problem	Cause	Solution
10	No gas flow	a. Facility or cylinder gas supply valve is closed	Open gas supply valve.
		b. Gas cylinder is empty	Replace empty gas cylinder.
		c. Gas supply hose is disconnected	1. Ensure gas supply hose is connected to the cylinder or facility gas system. 2. Ensure the gas supply hose is securely connected to the anesthesia system.
		d. Oxygen flow control turned off	Turn the flowmeter valve knob counterclockwise to increase the oxygen flow rate.
		e. Gas supply regulator malfunction	Connect the system to an alternate oxygen supply.
11	Gas flow is not sufficient	a. Oxygen flow is set too low	Turn the flowmeter valve knob counterclockwise to increase the oxygen flow rate.
		b. Leak around vaporizer inlet port	1. Make sure the sealing cap at the inlet port is fully closed. 2. Verify that inlet port is not obstructed by animal hair, etc.
		c. Leak in animal breathing circuit	Check all hoses connections, particularly around mask or endotracheal tube.
		d. CO2 absorbent canister is leaking	1. Shut down the anesthesia system. 2. Remove the absorbent canister. 3. Remove any absorbent granules that are lodged between the canister and sealing gasket. 4. Reassemble the vaporizer.
12	Oxygen flush button sticks	Valve inside malfunctions	The valve requires cleaning or replacement. Contact RWD or local dealer for servicing.
13	Float in oxygen flowmeter sticks	Dirty flow tube	Flow tube needs cleaning.
14	Oxygen flow control valve knob is hard	Dirty or damaged needle valve	Flow valve needs cleaning or replacement. Contact RWD or local dealer for servicing.
15	Oxygen flow failure	Internal fault	Contact RWD or local dealer for servicing.
16	Audible leakage around oxygen hose connector	a. Loose oxygen hose connection	Tighten the connection with a crescent wrench.
		b. Tube does not fit.	Replace the tube.

7-Maintenance

7.1 Overview

This section provides the maintenance procedures to keep your R640-S1 anesthesia system in good operating condition.

7.2 Safety

Some maintenance procedures may involve the use of hazardous materials and contact with biological hazards. Always follow all applicable local regulations and the material manufacturer's Material Safety Data Sheet (MSDS) recommendations. During the procedure, basic personal protective is necessary, such as wearing gloves, mask and eye protection.

7.3 Annual inspection

RWD recommends that your R640-S1 anesthesia system be inspected annually for proper function. Contact RWD or your local dealer for service.

7.4 Machine status

Unless otherwise specified, the anesthesia system may be connected to gas supplies during the performance of the maintenance procedures described in this manual. However, make sure the oxygen supply is OFF and the vaporizer is set to zero volume-percent.

7.5 Record keeping

A record of system service and maintenance should be kept. Such records should include service and maintenance dates, part numbers of any replaced parts, dates when consumables are replenished, and other pertinent data.

7.6 Parts and materials

Contact RWD or your local dealer if parts or materials are needed during the maintenance.

7.7 Cleaning the equipment

Maintenance of the anesthesia system involves possible contact with biological and chemical hazards. Wear gloves, mask, and eye protection during all cleaning

7.7.1 Required materials and supplies

- Germicidal cleaner
- CO_2 absorbent material
- Water and clean cloth
- Personal Protective Equipment (masks, eye protection, gloves, etc.)

7.7.2 Weekly maintenance

- Wipe all surfaces of the system with a cloth dampened with germicidal cleaning solution.
- Remove hair, dust, and debris from all vaporizer surfaces; especially around the volume-percent dial and the anesthetic fill port.
- Check the CO_2 absorber canister for exhausted absorbent. If its total use time is over 10 h, replace it as follows:
  a) Remove the canister from the bottom of the machine and shake out the spent absorbent.

Do not bang the edge of the canister on any surface. This may damage the sealing surfaces.

  b) Wash the canister in warm water, and dry thoroughly.
  c) Wipe the canister gasket, located on the underside of the machine, with a clean cloth dampened with germicidal cleaner. Make sure there is no absorbent residue remaining on the gasket surface.
  d) Fill the canister with fresh CO2 absorbent material to within 2-3 cm of the top edge.
  e) Reinstall the canister firmly.
- Perform a pre-use checkout as specified in ***Section 5 – Operation***.
- Check the cleanliness of the oxygen supply.
- Check anesthesia system leaks as specified in ***Section 4 – System setup***.

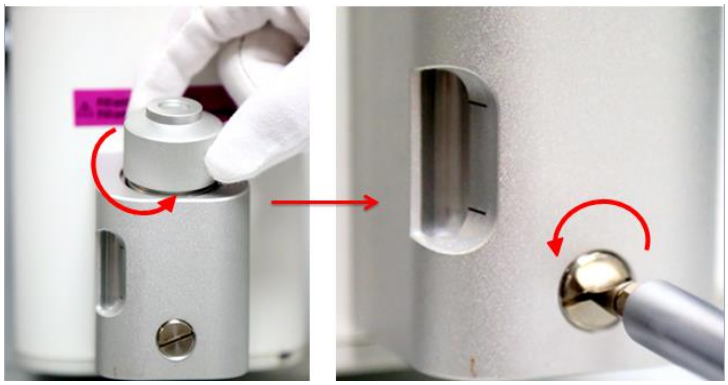
7.7.3 Draining the vaporizer

If the system will be vacant for a long time, drain the anesthetic agent inside the vaporizer.

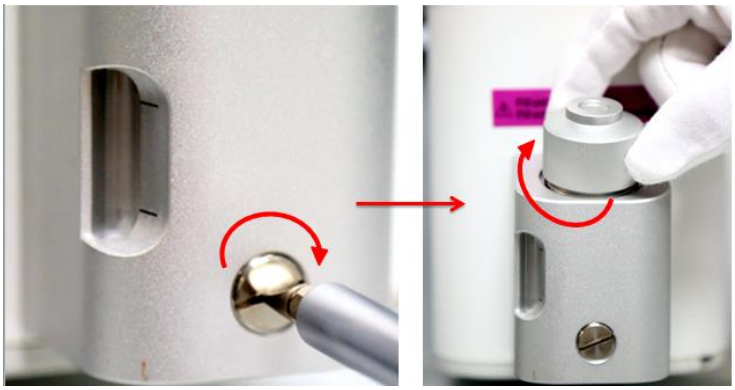
- Perform this procedure in a well-ventilated location.
- Refer to the anesthetic agent manufacturer's MSDS for required personal protective equipment and handling and disposal of waste anesthetic agent.
- Do not mix the anesthetic agent with other liquid.

Do not wipe spilled anesthetic agent from any painted surfaces or the finish may be damaged. Allow the anesthetic to evaporate.

1. Make sure the oxygen supply is OFF and vaporizer is set to zero.
2. Make sure the anesthesia system is in a well-ventilated area.
3. Attach a drain tube to the drain port. Place the other end of the tube in a receptacle to catch the drained anesthetic agent.
4. Loosen the sealing cap, then loosen the bottom screw with a screwdriver to make the anesthetic agent flows naturally.



1) When the anesthetic agent stops draining from the vaporizer, tighten the bottom screw and sealing cap.



2) Remove the drain tube and deal with the waste anesthetic agent according to the regulations.

8-Product information

8.1 Product warranty

This warranty is only applicable to those new products purchased from RWD or dealers authorized by RWD, as well as the first person to whom it extends.

8.2 Product specifications

Material	**Mainly aluminum alloy**	
Working condition	Temperature：10 ~ 35℃	Humidity：15 ~95 % (non-condensing)
Storage condition	Temperature：-20 ~ 60℃	Humidity：10 ~ 95 % (non-condensing)
Oxygen flow rate	0.2~10 L/min, 0.2~8 L/min when concentration >4 %	
Oxygen grade	Medical grade	
Concentration range	Isoflurane：0.5～5 %(v/v), Sevofluran: 0.5～8 %(v/v)	
Settable concentration point	Isoflurane: 0 ~ 0.5 ~ 1.0 ~ 1.5 ~ 2.0 ~ 2.5 ~ 3.0 ~ 3.5 ~ 4.0 ~ 4.5 ~ 5.0 %(v/v) Sevofluran: 0 ~ 0.5 ~ 1.0 ~ 2.0 ~ 3.0 ~ 4.0 ~ 5.0 ~ 6.0 ~ 7.0 ~ 8.0%(v/v)	
Perfusion volume of anesthetic agent	The recommend volume is 100 mL, as the volume between max and min visible liquid level is about 120 mL.	
Consumption of anesthetic agent	About 3 × oxygen flow rate (L/min) × set concentration value(% (v/v)) e.g. When the isoflurane concentration is set at 2 % and the oxygen flow rate is set at 600 mL/min, a bottle of isoflurane of 100 mL could be consumed for about 28 hours.	
Loss of anesthetic agent	22℃，dial at 0 %，< 0.5 mL/24h.	
Max pressure load	50 kPa	
Max inclined angle	30°	

9-Useful information

9.1 Overview

This section provides information that may be helpful to the users of R640-S1 anesthesia systems.

9.2 Pressure equivalents

1 atm = 1033 cmH_2O = 760 mmHg = 760 Torr = 1013 mb = 14.7 psi

1 psi = 70.3 cmH_2O = 51.7 mmHg = 68.9 mb = 6.9 kPa

1 mmHg = 1.36 cmH_2O = 1.33 mb

1 cmH2O = 0.736 mmHg = 0.981 mb

9.3 Pressure unit conversions

Table 9-1 Pressure unit conversions

Unit	psi	inchH_2O	kPa	millibar	cmH_2O	mmHg
psi		27.680	6.8947	68.947	70.308	51.715
inch H_2O	$3.6127x10^{-2}$		0.2491	2.491	2.5400	1.8683
kPa	0.14504	4.0147		10.000	10.1973	7.5006
millibar	0.01450	0.40147	0.100		1.01973	0.75006
cmH_2O	$1.4223x10^{-2}$	0.3937	0.09806	0.9806		0.7355
mmHg	$1.9337x10^{-2}$	0.53525	0.13332	1.3332	1.3595	

9.4 Minimum alveolar concentration (MAC) anesthetic levels

Table 9-2 MAC levels

Animal	Halothane	Isoflurane	Sevoflurane
Cat	1.19	1.63	2.58
Dog	0.87	1.3	2.34

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