



Landmark™

Veterinary Anesthesia Systems

Operator's Manual

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TABLE OF CONTENTS

1 INTRODUCTION	1-1
Overview	1-1
System Safety	1-1
General Description	1-1
Facility Requirements	1-3
System Dimensions	1-4
Basic System Features	1-7
Description of Landmark Features	1-12
2 SAFETY	2-1
Overview	2-1
Intended Use	2-1
Description of Safety Symbols	2-1
Basic Safety Precautions and Practices	2-2
Patient and Operator Safety	2-2
Preventing System and Facility Damage	2-3
Facility Environmental Health	2-3
Halothane Precautions	2-3
System Malfunction	2-3
Emergency Shutdown	2-3
Moving a Stand-mounted Landmark System	2-4
3 UNPACKING AND ASSEMBLY	3-1
Overview	3-1
Unpacking the System	3-1
Assembling the System – Stand Mount	3-2
Assembling the System – Wall Mount	3-3
4 SYSTEM SETUP	4-1
Overview	4-1
Materials and Supplies	4-1
Initial System Preparation	4-1
Setting Up the System	4-1
Filling the Anesthetic Vaporizers – Funnel Fill	4-3

Filling the Anesthetic Vaporizers – Key Fill.....	4-4
Connecting the Breathing Circuit.....	4-5
Rebreathing Circuit Installation	4-5
Non-rebreathing Circuit Installation	4-6
5 OPERATION	5-1
Overview	5-1
Pre-use Checkout.....	5-1
Inspiratory Pressure Adjustment	5-3
Rebreathing Circuit vs. Non-rebreathing Circuit	5-3
Using the Oxygen Flush Button.....	5-4
Anesthetic Vaporizer.....	5-4
Post-anesthesia Procedure	5-5
6 TROUBLESHOOTING.....	6-1
Overview	6-1
Safety	6-1
Machine Status	6-1
Record Keeping	6-1
Problem – Solution Matrix	6-2
System Pressure Leak Test – F-circuit Method	6-5
System Pressure Leak Test – Squeeze Bulb Method	6-6
7 MAINTENANCE	7-1
Overview	7-1
Safety	7-1
Annual Inspection	7-1
Machine Status	7-1
Record Keeping	7-1
Parts and Materials.....	7-1
Cleaning the Equipment	7-2
Required Materials and Supplies.....	7-2
Disposition of Breathing Circuit Components	7-2
Weekly Maintenance.....	7-3
Draining the Vaporizer	7-5
Funnel Fill Vaporizer	7-5

Key Fill Vaporizer.....	7-6
Preparing a Vaporizer for Transport.....	7-7
Preparing a Vaporizer for Transport.....	7-7
Post-Maintenance Checkout.....	7-9
Preparing the System for Storage.....	7-9
8 PRODUCT INFORMATION	8-1
Product Warranty	8-1
Payment Terms.....	8-2
Shipping	8-2
Returned Goods Policy	8-2
Limitation of Liability.....	8-3
9 USEFUL INFORMATION.....	9-1
Overview	9-1
Pressure Equivalents.....	9-1
Pressure Unit Conversions	9-1
Monitored Anesthesia Care (MAC) Anesthetic Levels	9-1
Miscellaneous Information	9-2
Definition of Terms	9-3
10 REPLACEMENT PARTS AND ACCESSORIES	10-1
Overview	10-1
Replaceable Materials and Accessories	10-1
Exploded View Drawings.....	10-2

Table of Figures

Figure 1-1 Landmark System Flow Diagram.....	1-2
Figure 1-2 Dimensions - Landmark VSA-2100 Standard Floor Model	1-4
Figure 1-3 Dimensions - Landmark VDA-4100 Double Wide Floor Model.....	1-5
Figure 1-4 Dimensions - Landmark VTAA-1100 Table Top System.....	1-6
Figure 1-5 System Features (VSA-2100)	1-7
Figure 1-6 Doublewide System Features (VDA-4100)	1-8
Figure 1-7 RTA-0011 Table Top Non-Rebreathing System.....	1-9
Figure 1-8 VWA-3100 Wall Mount.....	1-10
Figure 1-9 Dimensions - Landmark VTAA-1100 Table Top System.....	1-11
Figure 2-1 Moving a Stand-mounted Landmark Machine.....	2-4
Figure 3-1 Assembling a Stand Mount System.....	3-2
Figure 3-2 Assembling the Landmark™ Wall Mount.....	3-3
Figure 4-1 Installing O ₂ Hose and Absorber Canister	4-2
Figure 4-2 Filling the Vaporizer (Drager) – Funnel Fill.....	4-3
Figure 4-3 Filling the Vaporizer (Drager) – Key Fill	4-4
Figure 4-4 Rebreathing Circuit (Universal F-Circuit) Connections	4-5
Figure 4-5 Non-Rebreathing Circuit (Modified Jackson Rees) Connections	4-6
Figure 5-1 Valve Test Setup	5-2
Figure 6-1 Pressure Test Setup	6-5
Figure 6-2 Pressure Test Setup	6-6
Figure 7-1 Inspiration/Expiration Valve Assembly (Exploded View)	7-4
Figure 7-2 Draining the Vaporizer (Funnel Fill).....	7-5
Figure 7-3 Draining the Vaporizer (Key Fill).....	7-6
Figure 7-4 Landmark Standard - Back Cover Removed	7-7
Figure 7-5 Removing the Vaporizer.....	7-8
Figure 10-1 VSA-2100 Floor Model.....	10-2
Figure 10-2 VTA-1100 Table Top Machine.....	10-3
Figure 10-3 VDA-4100 Doublewide Machine.....	10-4
Figure 10-4 510-180A Frame Assembly	10-5
Figure 10-5 510-200A Gauge Assembly	10-6
Figure 10-6 510-170A Back Panel Assembly.....	10-7
Figure 10-7 510-100A Pole Assembly	10-8
Figure 10-8 510-175A Oxygen Flowmeter Assembly	10-9
Figure 10-9 510-570A APL / Pop-off Valve Assembly	10-10
Figure 10-10 510-103A Manifold Block Assembly.....	10-11
Figure 10-11 510-101A Absorber Canister Assembly	10-12
Figure 10-12 510-129A Flush Valve Assembly.....	10-13
Figure 10-13 510-104A Inspiratory – Expiratory Valve Assembly	10-14
Figure 10-14 510-571A Right Angle APL / Pop-off Valve Assembly	10-15
Figure 10-15 510-133A Tabletop Flush Valve Assembly.....	10-16
Figure 10-16 510-176A Oxygen Flowmeter Assembly – Table Top Only	10-17
Figure 10-17 710-102A Tabletop Frame Assembly.....	10-18
Figure 10-18 710-103A Table Top Back Cover Assembly	10-19
Figure 10-19 710-100A Tabletop Manifold Block Assembly	10-20

Figure 10-20	610-101A VDA-4100 Frame Assembly	10-21
Figure 10-21	610-100A VDA-4100 Back Panel Assembly.....	10-22
Figure 10-22	510-606A Drawer Assembly.....	10-23
Figure 10-23	Drager Vaporizer	10-24
Figure 10-24	Tec3 Vaporizer	10-25
Figure 10-25	23 Millimeter Outlet Caps.....	10-26
Figure 10-26	Ohio Vaporizer	10-27
Figure 10-27	Penlon Vaporizer	10-28
Figure 10-28	Tec4 Vaporizer – Bolt-on Type.....	10-29
Figure 10-29	Tec 4 Vaporizer – Latching Type (1 of 2)	10-30
Figure 10-30	Tec 4 Vaporizer – Latching Type (2 of 2)	10-31

Table of Tables

Table 1-1 Facility Requirements	1-3
Table 6-1 Landmark Anesthesia System: Problem – Solution Matrix	6-2
Table 7-1 Landmark Post-Maintenance Checkout	7-9
Table 9-1 Pressure Unit Conversions	9-1
Table 9-2 MAC Levels	9-1
Table 9-3 Miscellaneous Information.....	9-2
Table 10-1 Replaceable Materials and Accessories	10-1

1 Introduction

Overview

Congratulations on your choice of the Landmark™ Veterinary Anesthesia System! Your Landmark system is specially designed to be compact, well balanced, and able to withstand the rigors of everyday clinical use providing long-term safe and trouble-free performance.

This manual covers the following Landmark models:

- VSA-2100 Single Floor Model
- VDA-4100 Doublewide Floor Model
- VTA-1100 Table Top
- VWA-3100 Wall Mount
- RTA-0011 Table Top Non-Rebreathing System
- RSA-0021 Floor Model Non-Rebreathing System

It is recommended that you read the entire manual before attempting to operate your anesthesia system.

System Safety

Operation of your Landmark Anesthesia System involves oxygen gas pressure and the use of potentially hazardous materials. In order to prevent injury to patients and/or operators and damage to the anesthesia system, please review **Section 2 – Safety** before performing any of the procedures contained in this manual. If you have any safety questions or comments, please contact *Vetland* or your local distributor.



WARNING!

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

General Description

The Landmark Veterinary Anesthesia System is a device that allows for the administration of anesthetic and non-anesthetic gases to patients. If equipped with a vaporizer, the machine is also capable of delivering an anesthetic agent in the form of a vapor in conjunction with the gas or gas mixture. The vaporizer converts a liquid anesthetic into a measured amount of vapor, which is then carried to the patient by the oxygen or gas mixture. Figure 1-1 shows a diagram of how the system operates.

Before anesthesia can be administered, an oxygen (and/or other medical gas) supply is connected to the anesthesia machine, the vaporizer is filled with anesthetic agent, and absorber canister is filled with CO₂ absorbent. The breathing bag, patient breathing circuit, and all accessory tubing and bags are then connected.

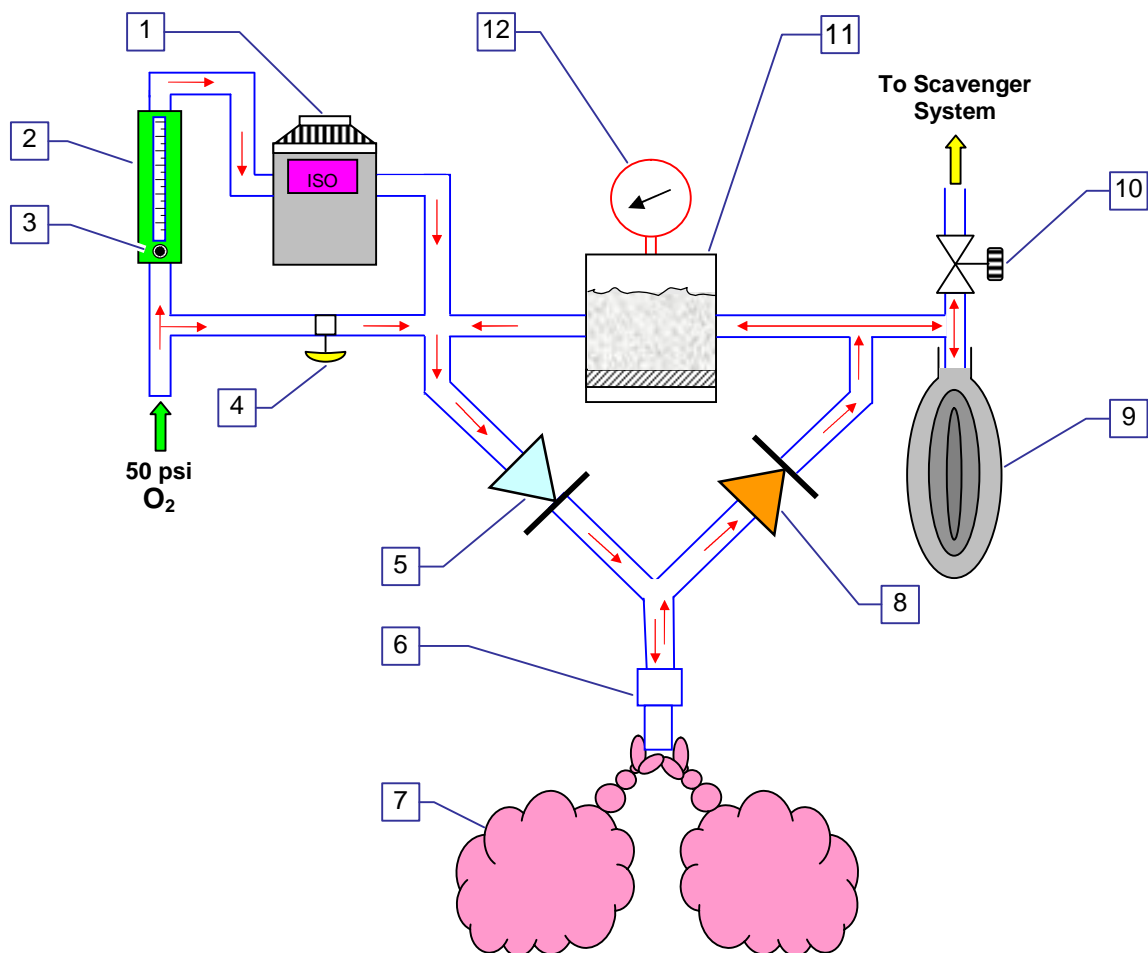
The operator increases the oxygen flow rate by turning the flow meter control valve counterclockwise until the desired rate is indicated on the meter. The breathing bag gradually inflates.

Next, the operator sets the anesthetic agent (e.g., Sevoflurane and/or Isoflurane) concentration (%) by turning the knob on the vaporizer(s) to the desired setting(s).

The wye connector of the patient breathing circuit is attached to the mask or 15 mm endotracheal tube connector. The gas mixture flows through the inspiratory valve into the patient's lungs. The patient exhales through the expiratory valve into the breathing bag where the exhaled gas mixes with the constantly flowing fresh gas.

In a rebreathing type circuit, the fresh and exhaled gas mixture is forced through the CO₂ absorber where the exhaled carbon dioxide is removed and the ventilation cycle is repeated. In a non-rebreathing circuit, the exhaled gases are vented into a waste gas scavenger system.

The operator determines the inspiratory pressure for ventilating the patient by adjusting the pop-off valve while observing the system's pressure gauge. The more the pop-off valve is closed, the higher the pressure.



Item	Description	Item	Description
1	Anesthetic Vaporizer	7	Patient's Lungs
2	O ₂ Flow Meter	8	Expiratory Valve
3	O ₂ Flowmeter Control Valve	9	Rebreathing Bag
4	O ₂ Flush Valve	10	Pop Off Valve
5	Inspiratory Valve	11	CO ₂ Absorber
6	15 mm Endotracheal Tube Connector	12	cmH ₂ O Pressure Gauge

Figure 1-1 Landmark System Flow Diagram

Facility Requirements

Table 1-1 provides the facility requirements necessary to ensure reliable operation and safety of the Landmark Anesthesia System.

Table 1-1 Facility Requirements

Characteristic	Specification
Working Area	Large enough to accommodate the anesthesia system. See Figure 1-2 to Figure 1-4.
Oxygen Supply	Delivery Options: <ul style="list-style-type: none"> • Oxygen supply hose from the facility oxygen outlet • Type E cylinder mounted to the anesthesia machine via an optional manifold and yoke assembly • Type H cylinder strapped to facility wall or a cylinder cart
	Regulated Inlet Pressure: 50–60 psi (345–380 kPa)
	Flow Rate: 20 liters per minute at 55 psi (379 kPa)
	Oxygen: Medical Grade
Pneumatic Fitting	Diameter Indexed Safety System (DISS) for Oxygen
Environment	Storage Temperature: 41 to 122 °F (5 to 50 °C)
	Operating Temperature: 59 to 95 °F (15 to 35 °C)
	Relative Humidity: 5 to 90% (non-condensing)
	Altitude: 1609 meters (5278 feet) maximum

Note: If you have any questions about facility requirements, please contact *Vetland* or your authorized distributor.

System Dimensions

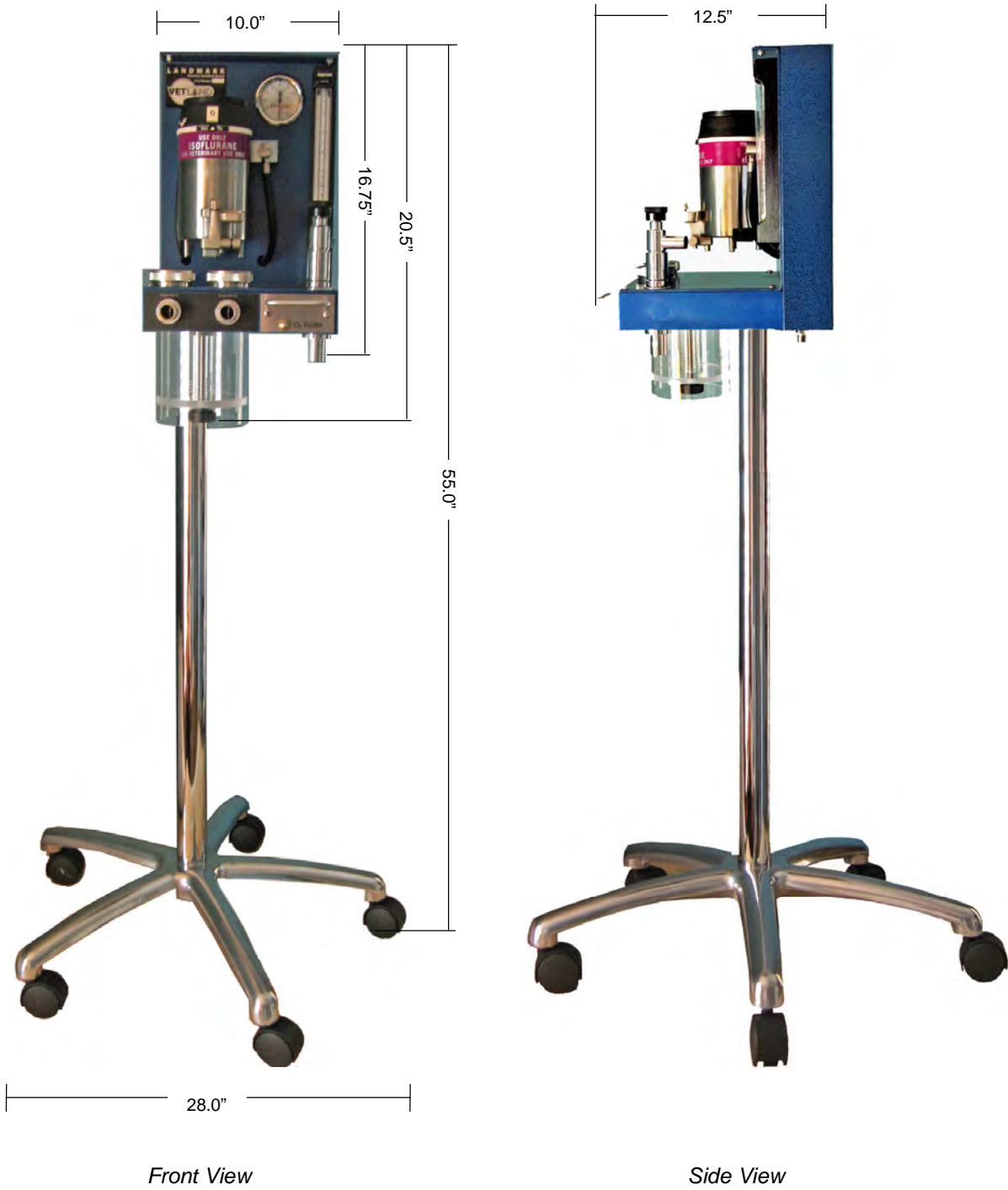


Figure 1-2 Dimensions - Landmark VSA-2100 Standard Floor Model

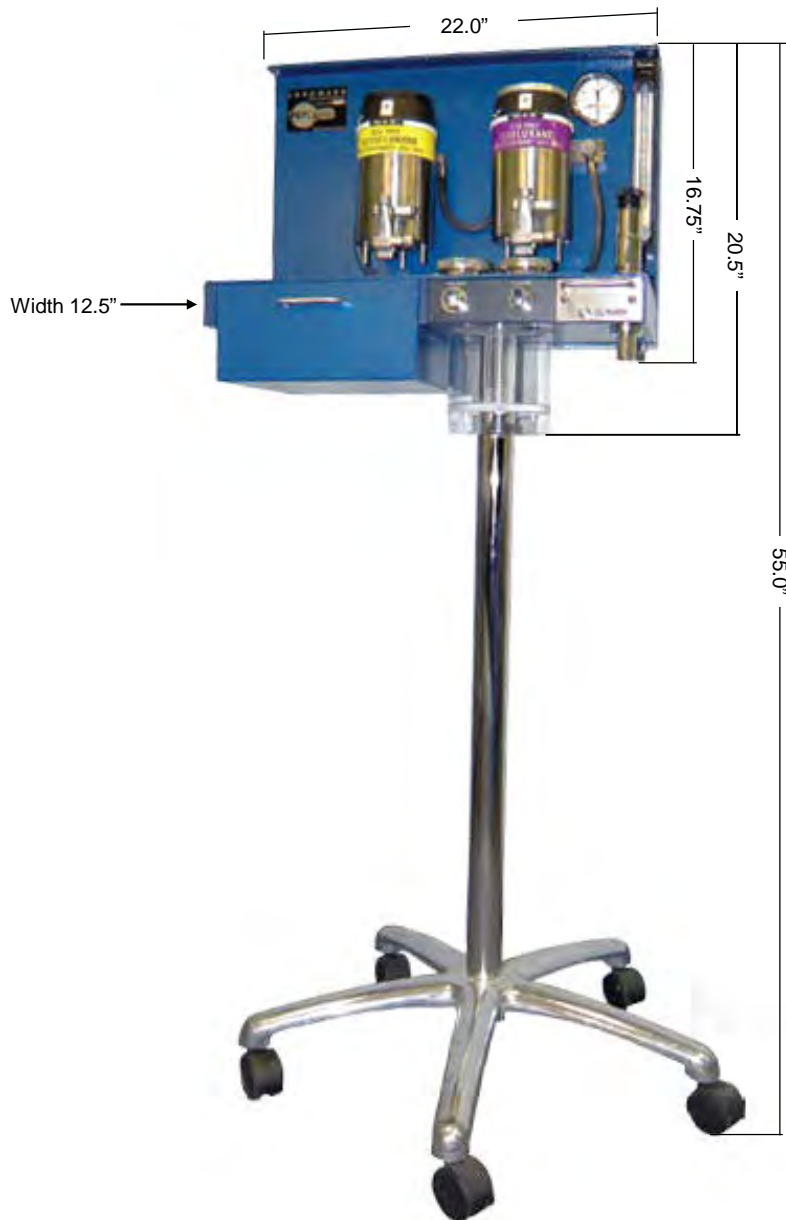


Figure 1-3 Dimensions - Landmark VDA-4100 Double Wide Floor Model

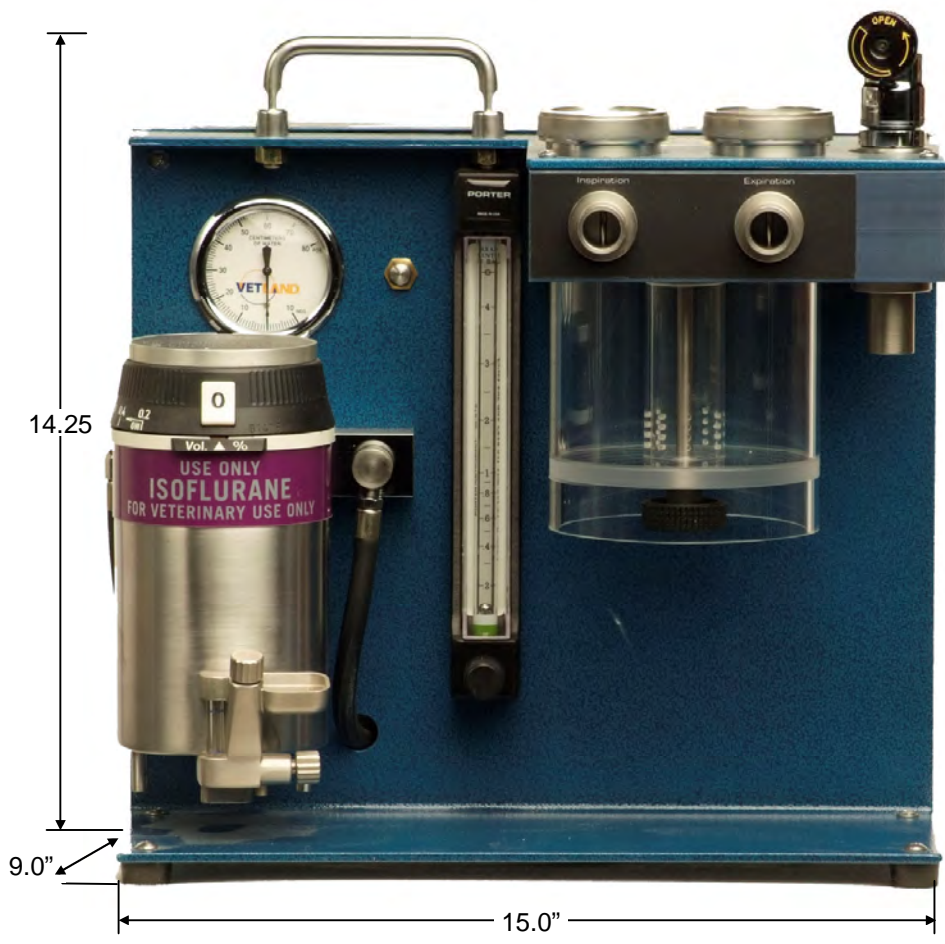
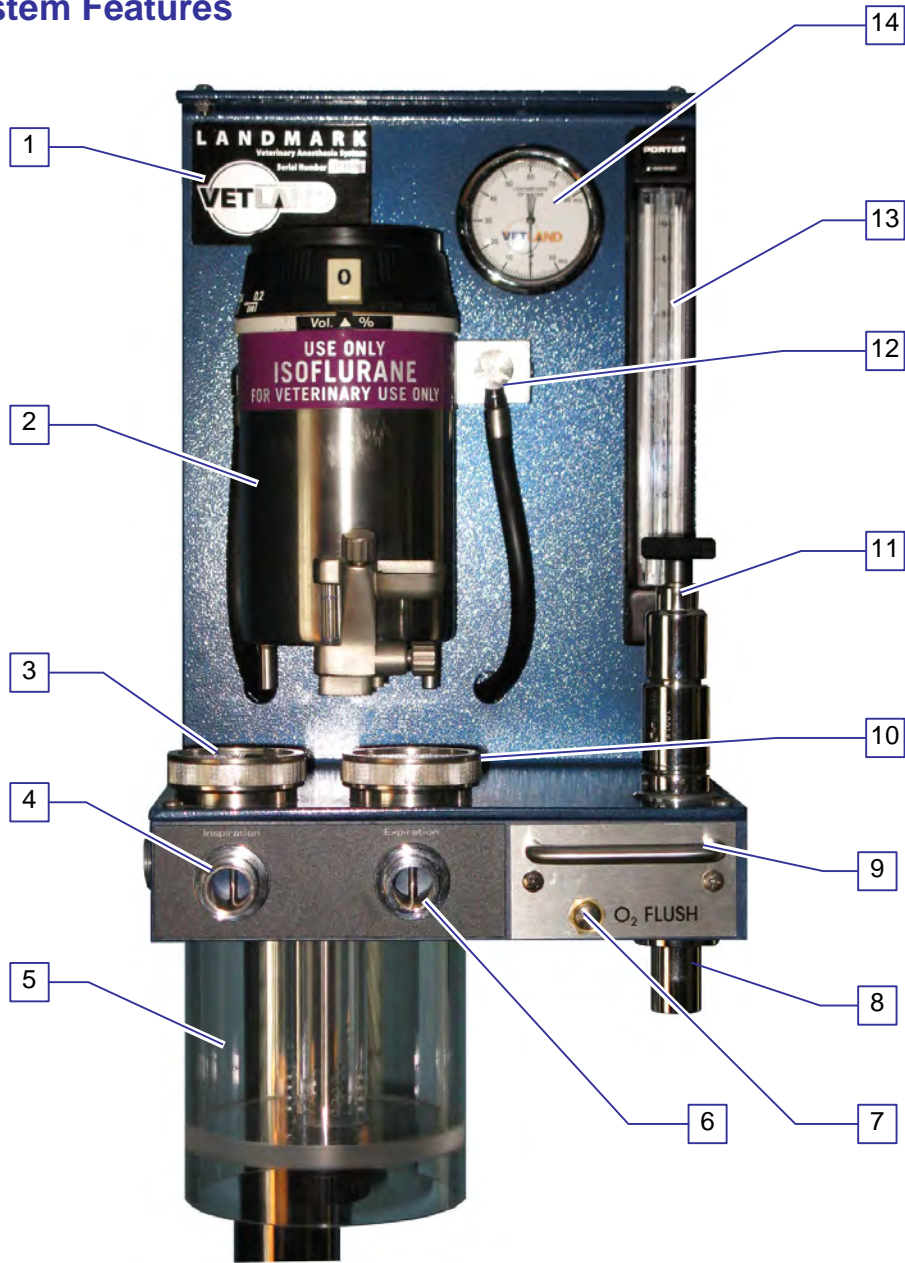


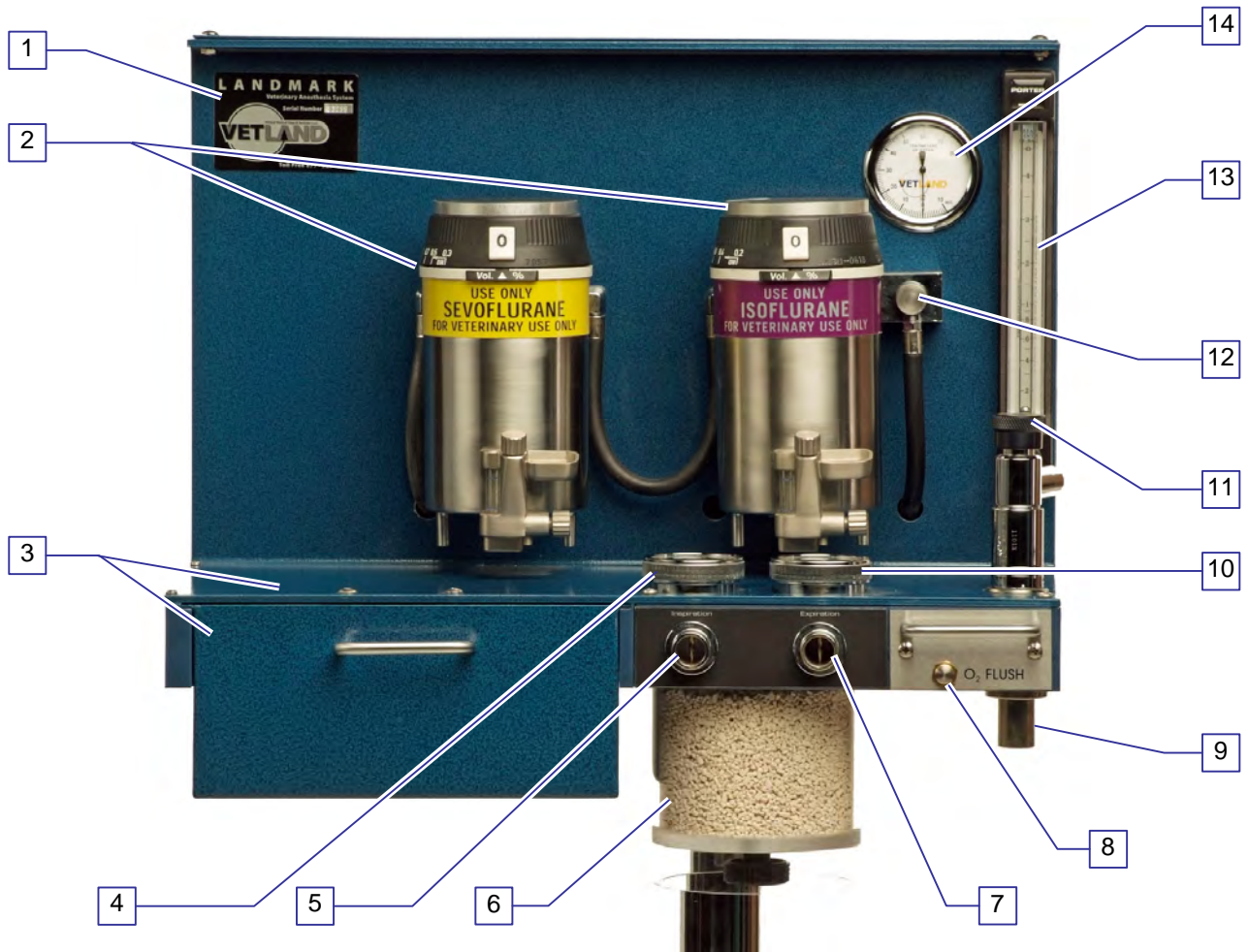
Figure 1-4 Dimensions - Landmark VTAA-1100 Table Top System

Basic System Features



Item	Description	Item	Description
1	System Name Plate	8	Breathing Bag Mount
2	Anesthetic Vaporizer	9	Loop Handle
3	Inspiratory Valve	10	Expiratory Valve
4	Inspiratory Valve Port	11	APL / Pop-Off Valve
5	CO ₂ Absorber Canister	12	Fresh Gas Connector
6	Expiratory Valve Port	13	Oxygen Flowmeter
7	O ₂ Flush Button	14	Pressure Gauge (cmH ₂ O)

Figure 1-5 System Features (VSA-2100)



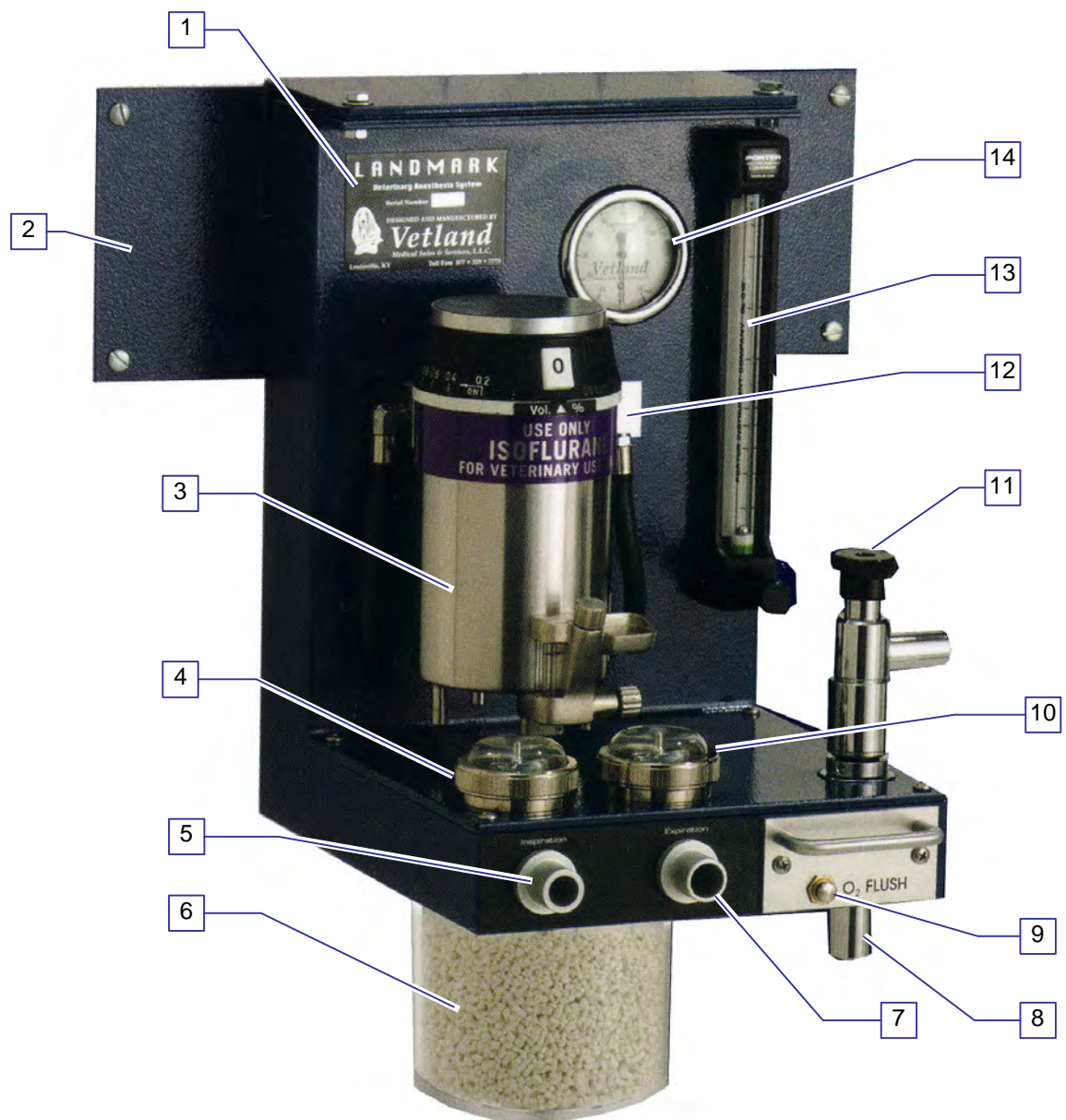
Item	Description	Item	Description
1	System Name Plate	8	O ₂ Flush Button
2	Anesthetic Vaporizers	9	Breathing Bag Mount
3	Working Area/Storage Drawer	10	Expiratory Valve
4	Inspiratory Valve	11	APL / Pop-Off Valve
5	Inspiratory Valve Port	12	Fresh Gas Connector
6	CO ₂ Absorber Canister	13	Oxygen Flowmeter
7	Expiratory Valve Port	14	Pressure Gauge (cmH ₂ O)

Figure 1-6 Doublewide System Features (VDA-4100)



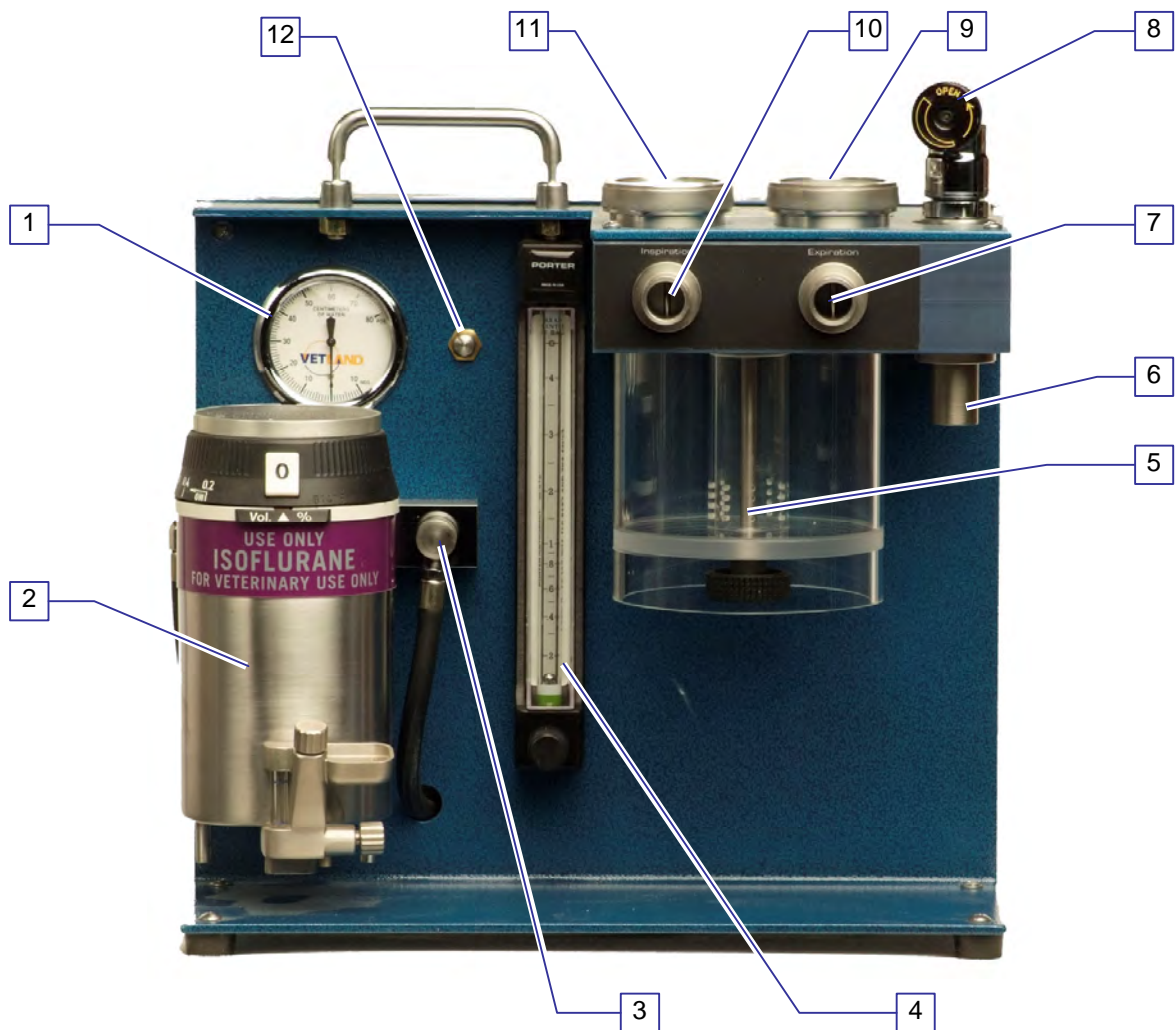
Item	Description
1	Oxygen Flowmeter
2	O ₂ Inlet (DISS)
3	System Name Plate
4	Fresh Gas Connector
5	Anesthetic Vaporizer with Key Fill Option

Figure 1-7 RTA-0011 Table Top Non-Rebreathing System



Item	Description	Item	Description
1	System Name Plate	8	Breathing Bag Mount
2	Mounting Plate	9	O ₂ Flush Button
3	Anesthetic Vaporizer	10	Expiratory Valve
4	Inspiratory Valve	11	APL / Pop-Off Valve
5	Inspiratory Valve Port	12	Fresh Gas Connector
6	CO ₂ Absorber Canister	13	Oxygen Flowmeter
7	Expiratory Valve Port	14	Pressure Gauge (cmH ₂ O)

Figure 1-8 VWA-3100 Wall Mount



Item	Description	Item	Description
1	Pressure Gauge (cmH ₂ O)	7	Expiratory Valve Port
2	Anesthetic Vaporizer	8	APL / Pop-Off Valve
3	Fresh Gas Connector	9	Expiratory Valve
4	Oxygen Flowmeter	10	Inspiratory Valve Port
5	CO ₂ Absorber Canister	11	Inspiratory Valve
6	Breathing Bag Mount	12	O ₂ Flush Button

Figure 1-9 Dimensions - Landmark VTAA-1100 Table Top System

Description of Landmark Features

Feature	Description
Anesthetic Vaporizer (Drager Vaporizer Shown)	Converts a liquid anesthetic agent into a vapor which is added to the pre-selected gas (O ₂) or gas mixture (O ₂ , nitrous oxide, air). The anesthetic vapor is measured in volume percent (vol %). A dial atop the vaporizer allows the operator to select the amount of vapor administered to the patient. A universal vaporizer mount allows mounting of all major vaporizer brands.
Breathing Bag Mount	Connection for the breathing bag when using the anesthesia system in a circle rebreathing circuit configuration.
CO ₂ Absorber Canister	The 1,030 cc absorber canister is filled with a granular carbon dioxide (CO ₂) absorbent material (e.g., Litholyme [®]) that removes CO ₂ from the breathing system. The absorber subsystem 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 that aids in the delivery of anesthesia to the patient.
Expiratory Valve	Contains a nickel-plated brass, one-way valve that utilizes a flutter disk to control the flow of gases within the patient expiratory breathing circuit.
Expiratory Valve Port	Port to which the expiratory breathing hose circuit is connected.
Fresh Gas Connector	For rebreathing circuit applications, a 15 mm tapered outlet port that routes the fresh gas mixture to the inspiratory port. For non-rebreathing applications, the male 15 mm connector is removed and the 15 mm male connector of the non-rebreathing circuit is connected.
Inspiratory Valve	Contains a nickel-plated brass, one-way valve that utilizes a flutter disk to control the flow of gases within the patient inspiratory breathing circuit.
Inspiratory Valve Port	Port to which the inspiratory breathing hose circuit is connected.
Loop Handle	Provides a hand-hold for steadying a floor model anesthesia system while it is being rolled to where it is to be used.
O ₂ Flush Button	Pushing this button actuates a valve located prior to the inspiratory port of the anesthesia apparatus which delivers approximately 15-18 l/min. of oxygen flow to the patient's breathing circuit. This provides for quick oxygenation, while by-passing the anesthetic vaporizer and any other medical gases.
Oxygen Flowmeter	Controls the flow of oxygen into the anesthesia system. By turning the O ₂ flow valve knob and monitoring the location of the ball in the calibrated tube, the operator can precisely adjust the flow of oxygen from 200 ml/min to 4 L/min. Single or dual resolution flowmeters are available.
APL / Pop-Off Valve	An Adjustable Pressure Limiting (APL) valve that allows the operator to vent the breathing circuit by adjusting the knob at the top of the valve. The valve is vented to the facility scavenging system.
System Name Plate	Displays the model number and serial number of your Landmark machine which is required when contacting <i>Vetland</i> for machine servicing or warranty issues. The nameplate also contains <i>Vetland's</i> toll-free telephone number.
System Pressure Gauge	Measures and displays the pressure in the patient breathing circuit.
Working Area/Storage Drawer	The convenient storage drawer on the VDA-4100 Doublewide model provides storage for medical or maintenance supplies. The deck on top of the drawer provides table space for surgical supplies or instruments.

2 Safety

Overview

This section provides basic safety information necessary for operating your Landmark Anesthesia System. Please contact the *Vetland's* 24-hour customer service department at 1-877-329-7775 or your local dealer for answers to your specific safety questions.

Intended Use

The Landmark Anesthesia System is intended for veterinary use only and functions as described when operated and maintained in accordance with the procedures of this manual.

Misuse of your system may result in injury to patients and operators and/or damage to property. Misuse includes:

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



WARNING!

Landmark Anesthesia Systems should only be operated by veterinary professionals qualified to administer anesthesia to animal patients.

Description of Safety Symbols

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



WARNING!

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



CAUTION!

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.

Basic Safety Precautions and Practices

This section provides requirements necessary to ensure safe and reliable operation of your Landmark Anesthesia System.

Patient and Operator Safety

- Always keep a backup anesthesia delivery plan in place should 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 5 – Operation*.
- The system must always be attended by a veterinarian or trained anesthesia technician.
- *Vetland* recommends service inspections by a *Vetland*-certified technician at regular intervals to ensure proper operation of the equipment and safety of patient and staff. Only *Vetland*-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 more than 7 lbs. (3.2 kg) on top of the Mayo tray (if installed).
- Make sure that the oxygen hose does not cross walkways and aisles. This may present a tripping hazard.
- Follow the anesthetic agent manufacturer's Material Safety Data Sheet (MSDS) recommendations for personal protective equipment, proper handling, and treatment of injury resulting from exposure.
- Make sure the oxygen hose is securely connected to the system before starting a procedure.
- Make sure that any exhaled gas containing anesthetic is vented outside of the operating room. A waste gas evacuation system must be used.
- *Vetland* recommends the use of an electro cardiograph, and equipment capable of monitoring the patient's pulse, oxygen (O₂) saturation, carbon dioxide (CO₂) level, and anesthetic agent level at all times when operating the system.
- Remove the system from service if any indications of improper function exist.
- Use only medical grade compressed oxygen which meets USP purity standards.
- 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.
- Never use pressure-reducing regulators with any gases other than those identified on the regulator. When using large G or H type cylinders, or a central medical gas supply system, make sure the supply pressure to the anesthesia system is at least 50 psi, but no more than 60 psi.

Preventing System and Facility Damage

- Immediately contain and clean up spilled anesthetic as recommended in the manufacturer's MSDS.
- 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. *Vetland* recommends using a filler attachment to add anesthetic agents.
- Do not place more than 7 pounds (3.2 kg) on top of the Mayo tray (if installed).
- Follow all recommended system maintenance procedures specified in [Section 7 – Maintenance](#).
- Make sure the system is properly secured to the wall of the facility if used as a wall-mounted system. Inappropriate fasteners may pull out and cause the system to fall to the floor.
- Make sure the gas supply is within the required rating.

Facility Environmental Health

- Immediately contain and clean up any spilled anesthetic agent as recommended in the manufacturer's MSDS.
- If the system is used in a confined space, ensure that there is adequate ventilation. If volatile organic compound (VOC) emissions exceed safe limits, facility ventilation systems must be in operation.
- Dispose of any hazardous materials and items contaminated with hazardous materials in accordance with applicable Federal, state, and local statutes and regulations, facility practice, and practices recommended by the MSDS.

Halothane Precautions

When using the anesthetic agent Halothane, the operator should be aware of any discoloration of the agent. The discoloration may be caused by Thymol, a stabilizer which is only used in Halothane. The change from a clear liquid to a yellowish/brownish color can be noticed in the sight glass. If this occurs, drain all the Halothane from the vaporizer and discard. Fill the Vaporizer with fresh Halothane. If this does not take care of the problem, the vaporizer needs to be serviced. Contact *Vetland* or your local dealer.

System Malfunction

If your system does not operate properly, refer to [Section 6 – Troubleshooting](#) which includes descriptions, possible causes, and suggested solutions.

Emergency Shutdown

In the event of a major malfunction, shut down the system as follows:

1. Turn off the oxygen supply.
2. Set the vaporizer(s) to zero percent.
3. Disconnect the facility O₂ supply line (if used).
4. Switch the patient to a backup anesthesia delivery system and continue the medical procedure.
5. Contact *Vetland* or your local dealer for service.

Moving a Stand-mounted Landmark System

1. Turn off the medical gas supply.
2. Securely stow the medical gas supply hose (if used) on the anesthesia system.
3. Grip the handle and back panel of the system firmly as shown in Figure 2-1.
4. Carefully roll the system to its new location. Use extra caution when moving the machine over uneven areas, thresholds, and other obstacles.



Figure 2-1 Moving a Stand-mounted Landmark Machine

3 Unpacking and Assembly

Overview

This section provides the unpacking and assembly procedure for your Landmark™ Anesthesia System.

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:

1. Check the shipping documents to ensure that all boxes have been received.
2. Examine the shipping boxes for damage. Immediately make a damage claim to the carrier if there is serious damage.
3. Carefully open each box and remove each individual component. Save all boxes and packing materials for future shipments.



CAUTION! Open shipping boxes carefully to avoid damaging the contents.

4. Check the invoice to make sure all ordered components are included. If not, please contact *Vetland* or your local distributor.

Assembling the System – Stand Mount

Assemble a stand-mounted Landmark™ Anesthesia System in the sequence shown in Figure 3-1.

Note: The mayo tray is optional on the Doublewide Model (VDA-4100).



WARNING!

Some components of the system are heavy. Use caution while lifting these components to avoid injury.

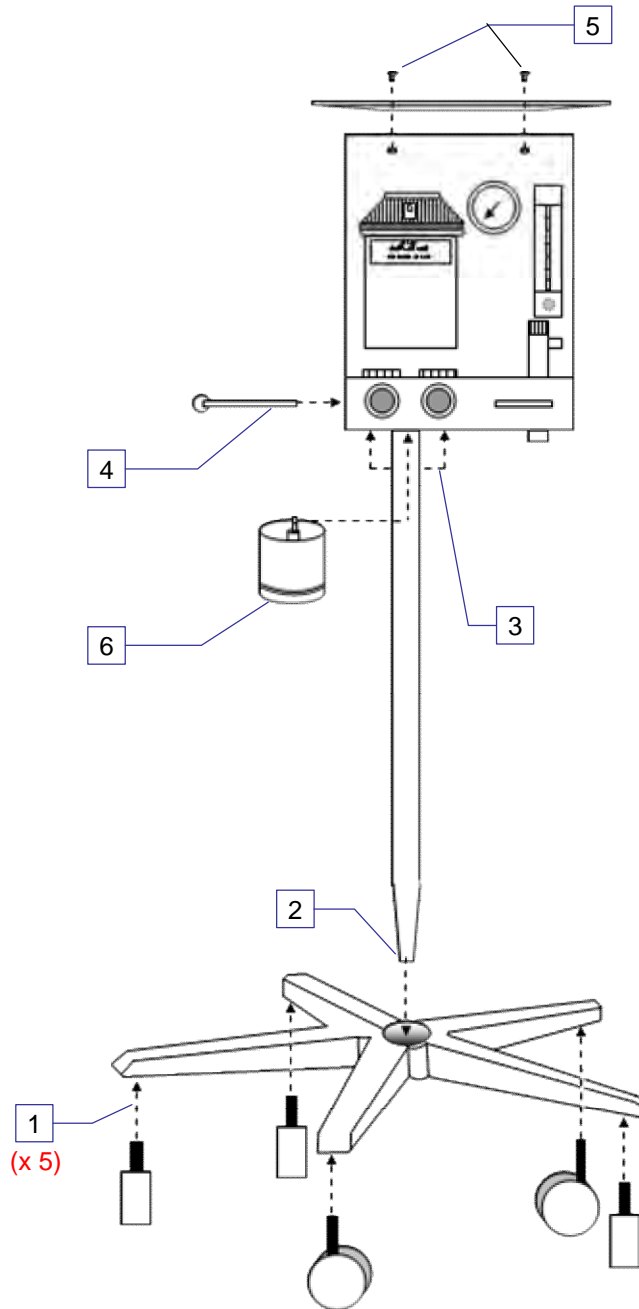


Figure 3-1 Assembling a Stand Mount System

Assembling the System – Wall Mount

Assemble a wall-mounted Landmark™ Model VWA-3100 in the sequence shown in Figure 3-2.



WARNING!

Some components of the system are heavy. Use caution while lifting these components to avoid injury.



CAUTION!

Attach the wall bracket to studs whenever possible. The bracket holes are on 16-inch centers. Use wall fasteners appropriate for supporting the weight of the fully equipped system.

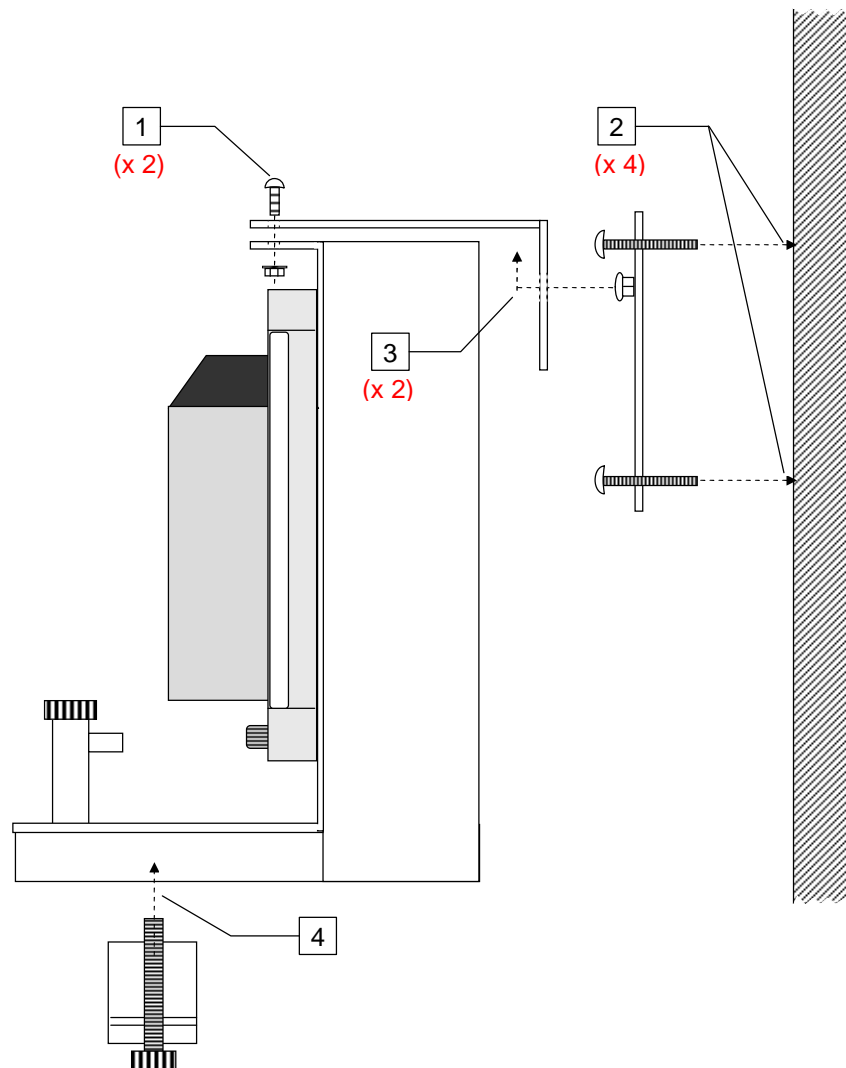


Figure 3-2 Assembling the Landmark™ Wall Mount

4 System Setup

Overview

This section provides the setup procedures required to prepare your Landmark Anesthesia System for veterinary surgical procedures.

Materials and Supplies

- Oxygen supply source [50 (+10, -0) psi, 345 (+69, -0) kPa]
- Patient breathing circuit:
 - *Rebreathing* (Universal F-Circuit) – 22 mm corrugated hoses and 15 mm wye connector, mask, or endotracheal tube with 15 mm endotracheal tube connector
 - *Non-rebreathing* (*Modified Jackson Rees*)
- Breathing bag
- CO₂ absorbent (e.g., Litholyme[®])
- Anesthetic agent (e.g., Sevoflurane, Isoflurane)
- 19 mm hose and scavenger interface, with a passive or active waste gas elimination system
- Wrench for tightening oxygen supply fitting

Initial System Preparation

Setting Up the System

1. Position the system in the area where it will be used.
2. Connect the oxygen supply hose to the DISS fitting on the oxygen inlet port (see Figure 4-1).
3. Open the APL/pop-off valve by turning the knob counterclockwise.
4. Turn the volume percent (vol. %) dial on the anesthetic vaporizer to the zero (0) position.
5. Ensure the oxygen supply valve is turned off.
6. Fill the CO₂ absorber canister with absorbent as follows:
 - a. Turn the canister fastener knob counterclockwise and remove the absorber canister (see Figure 4-1).
 - b. Fill the absorber canister with CO₂ absorbent to within 1 inch of the top of the canister. Take care that the granules do not interfere with the sealing surfaces.
 - c. Reinstall the absorber canister and turn the knob clockwise until hand-tight.



CAUTION!

Do not over-tighten the canister knob. Excessive tightening may damage the absorber canister.

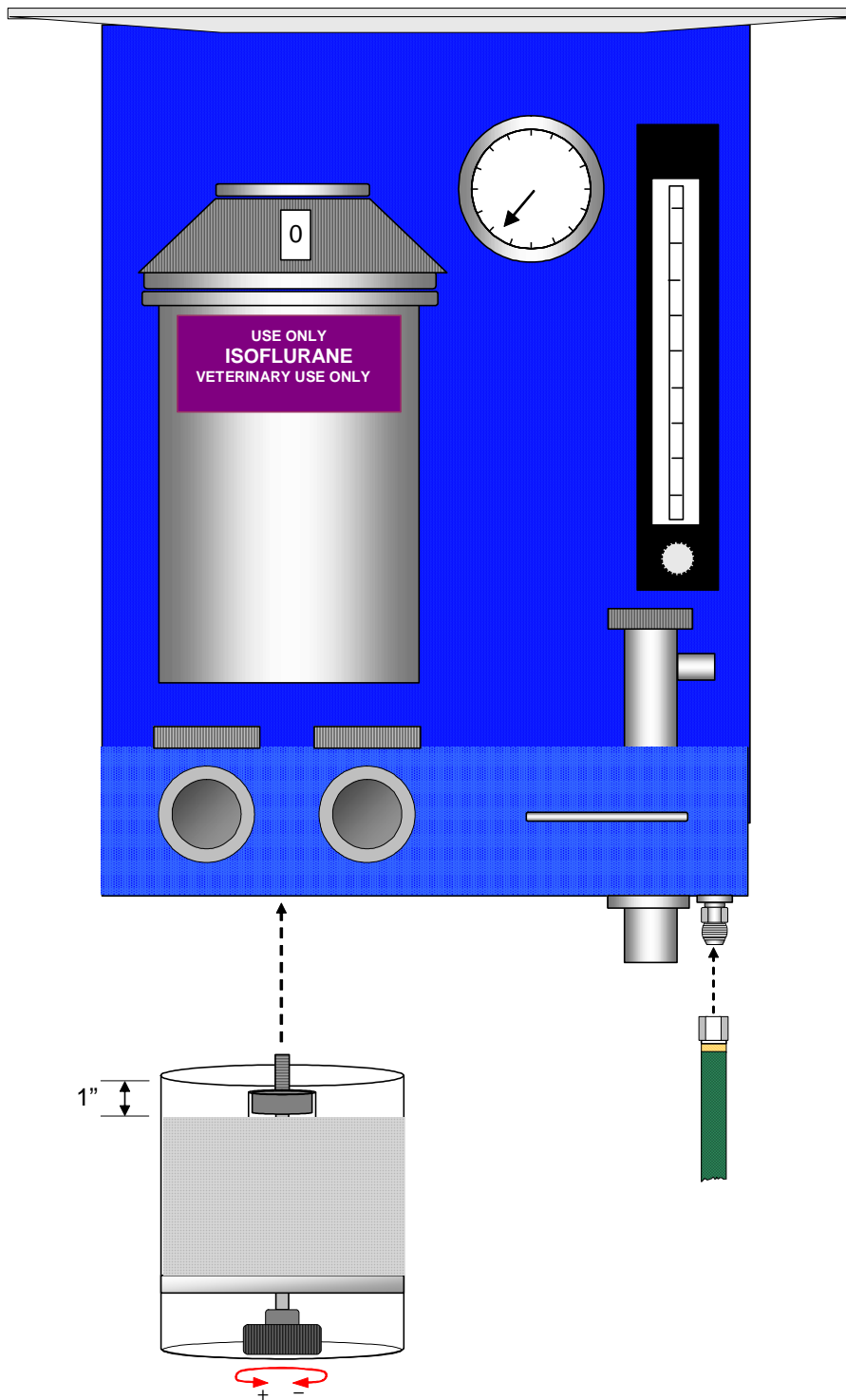


Figure 4-1 Installing O₂ Hose and Absorber Canister

Filling the Anesthetic Vaporizers – Funnel Fill

1. Clean any hair or debris from around the filler port with a clean cloth.
2. Place a clean cloth beneath the anesthetic filler port.
3. Turn the filler valve knob two turns counterclockwise to open.
4. Carefully pour the appropriate agent into the filler port using a filler tube or funnel.



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

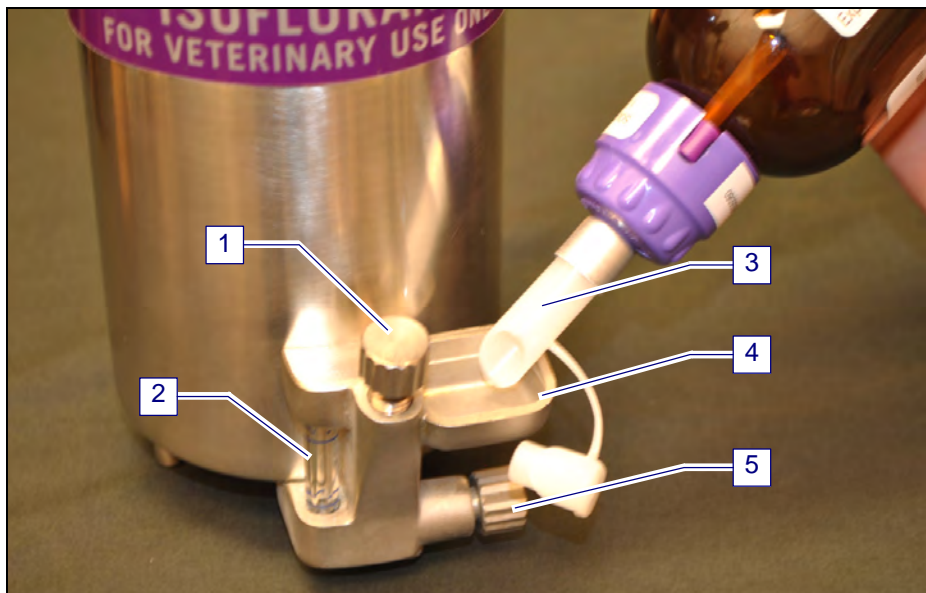


CAUTION! If anesthetic agent spills on system surfaces, allow it to evaporate. Rubbing spilled anesthetic agent with a cloth may damage the system finish.

5. Observe the agent level sight glass on the vaporizer (see Figure 4-2). Stop filling the vaporizer when the agent level inside the tube reaches the top line of the sight glass.

Note: On a new, dry vaporizer, monitor the level for several minutes and refill the reservoir as necessary until the internal wick is saturated and the level stabilizes at the top line of the sight glass.

6. Turn the filler valve knob clockwise to close.




Item	Description	Item	Description
1	Filler Valve	4	Filler Port
2	Agent Level Sight Glass	5	Drain Port Knob
3	Agent Filler Tube/Funnel		

Figure 4-2 Filling the Vaporizer (Drager) – Funnel Fill

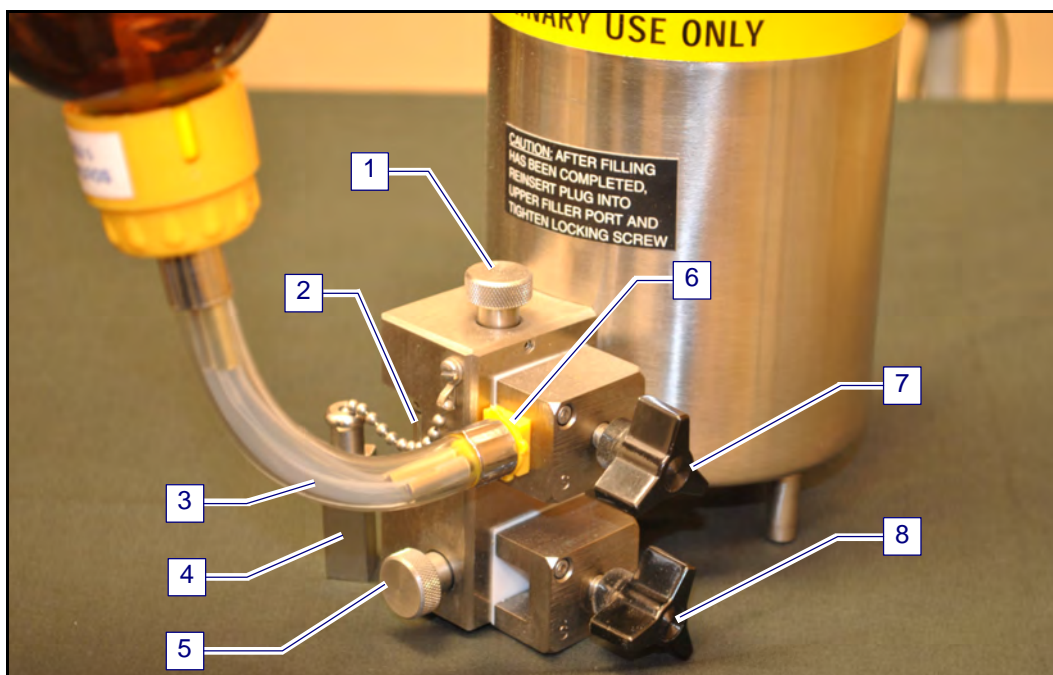
Filling the Anesthetic Vaporizers – Key Fill

Note: The optional key fill feature ensures that only the correct anesthetic agent is allowed to fill its corresponding vaporizer.

1. Clean any hair or debris from around the filler port with a clean cloth.
2. Place a clean cloth beneath the anesthetic filler port.
3. Remove plug from the keyed filler port see Figure 4-3.
4. Insert the keyed filler connector from the appropriate anesthetic container into the filler port.
5. Turn the filler valve knob counterclockwise to allow the anesthetic agent to flow into the vaporizer.

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

6. Observe the agent level sight glass on the vaporizer (see Figure 4-3). Close the filler valve clockwise when the agent level inside the tube reaches the top line on the sight glass.
7. Remove the filler connector and insert the plug into the keyed filler port.



Item	Description	Item	Description
1	Fill Port Valve	5	Drain Port Valve
2	Agent Level Sight Glass	6	Keyed Fill Port
3	Keyed Agent Filler Tube	7	Fill Key Lock
4	Fill Port Plug	8	Drain Key Lock

Figure 4-3 Filling the Vaporizer (Drager) – Key Fill

Connecting the Breathing Circuit

Rebreathing Circuit Installation

Note: The rebreathing circuit is designed to be used with animals larger than 10-15 pounds. For more information, consult a veterinary anesthesiologist at a local veterinary school/university and/or refer to the *Handbook of Veterinary Anesthesia* (William W. Muir III, DVM PhD and John A. E. Hubbell, DVM MS DACVA; Publisher: Mosby Elsevier).

Attach the rebreathing circuit to the anesthesia system as shown in Figure 4-4.

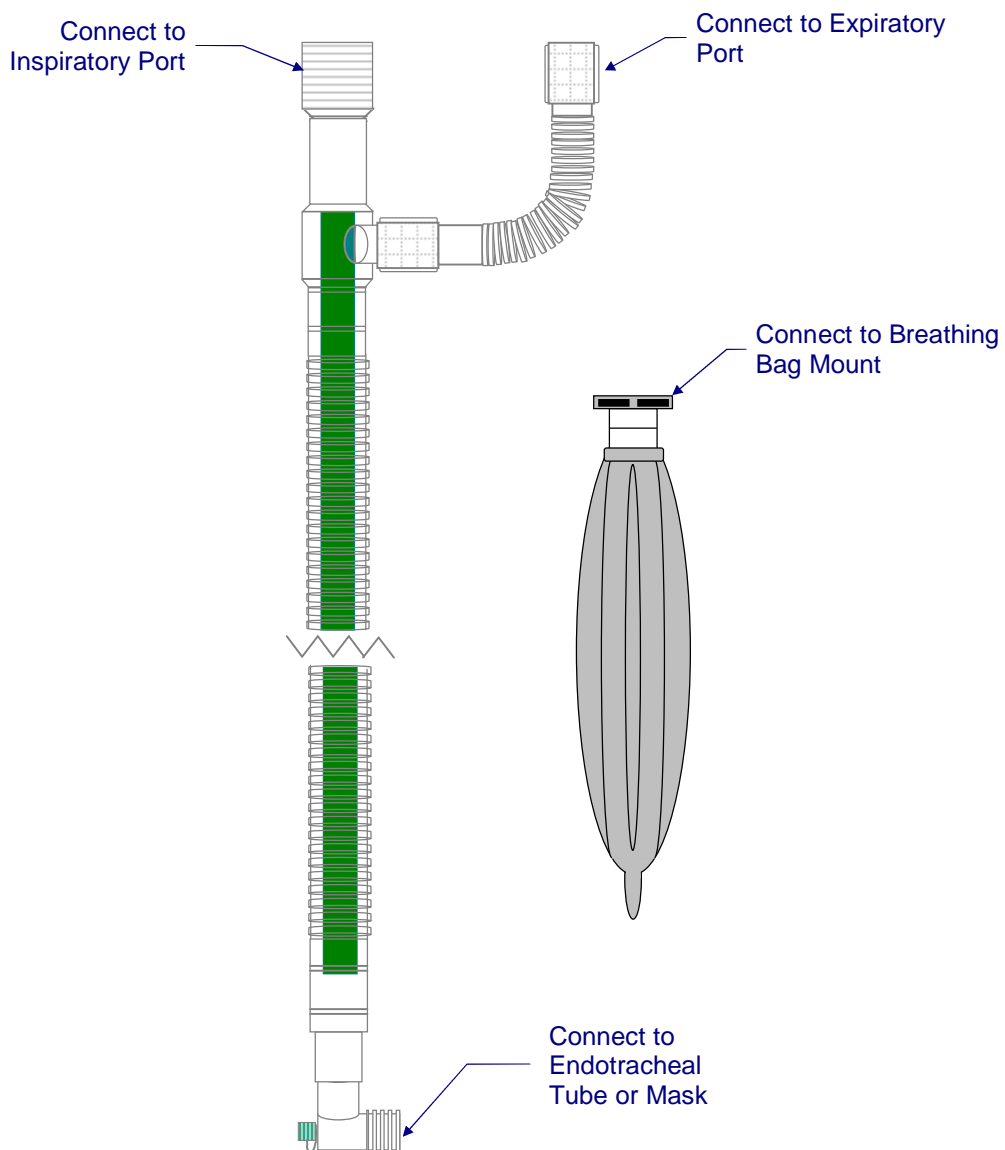


Figure 4-4 Rebreathing Circuit (Universal F-Circuit) Connections

Non-rebreathing Circuit Installation

Note: The non-rebreathing circuit (modified Jackson-Rees) is for patients less than 10-15 pounds. For more information, consult a veterinary anesthesiologist at a local veterinary school/university and/or refer to the *Handbook of Veterinary Anesthesia* (William W. Muir III, DVM PhD and John A. E. Hubbell, DVM MS DACVA; Publisher: Mosby Elsevier).

Attach the non-rebreathing circuit to the anesthesia system as shown in Figure 4-5.

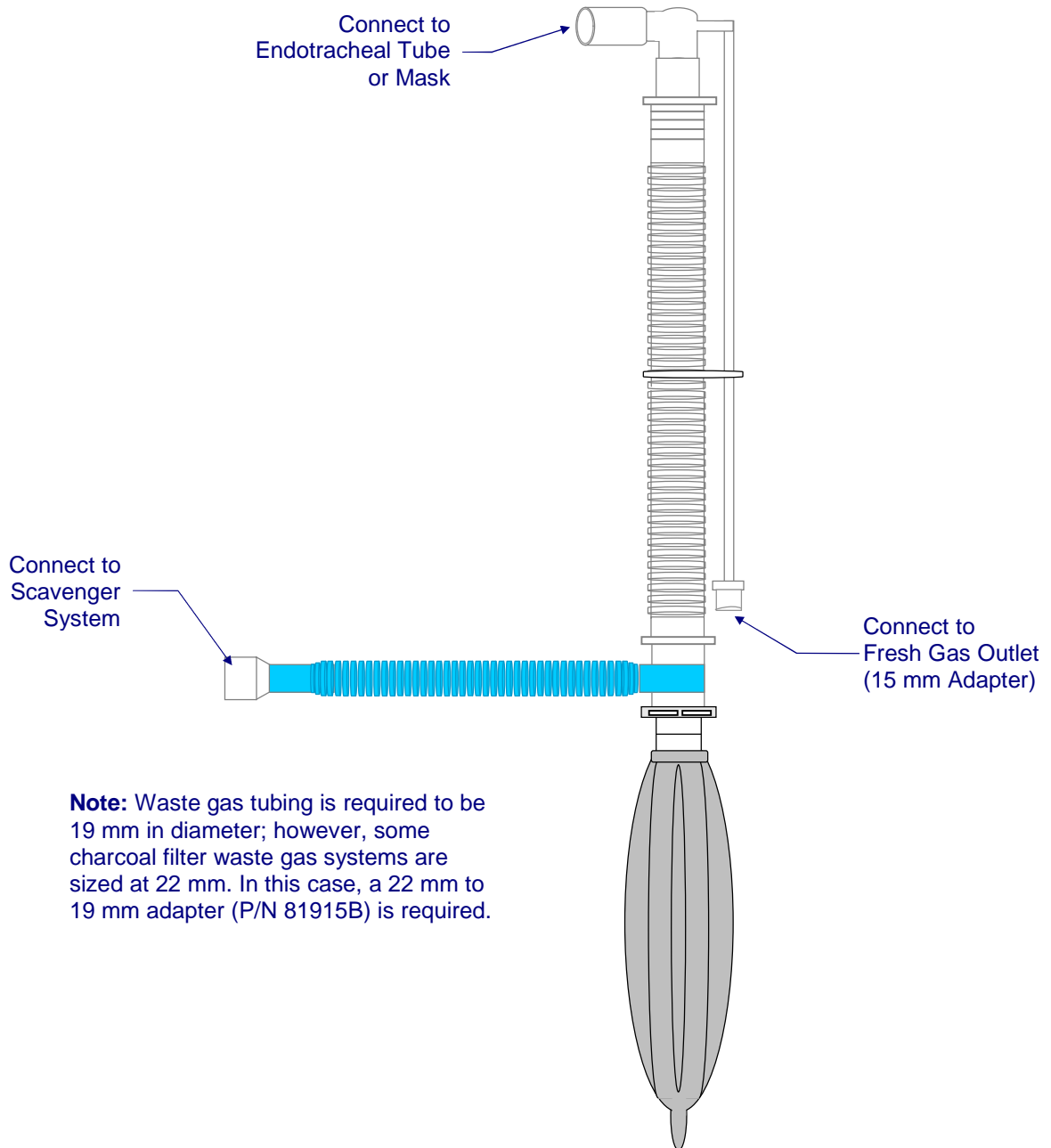


Figure 4-5 Non-Rebreathing Circuit (Modified Jackson Rees) Connections

5 Operation

Overview

This section provides the procedures and information needed to successfully operate your Landmark Anesthesia System.



WARNING!



CAUTION!

Only trained veterinary professionals should operate the Landmark Anesthesia System.

Pre-use Checkout

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

1. Fill the vaporizer as specified in *Section 4 – System Set-up*.
2. Make sure the vaporizer volume-percent (vol. %) dial is set to zero (0).
3. Confirm that the CO₂ absorbent canister is filled within one inch of the top and that absorbent has not expired (turned purple). Refill the canister with fresh absorbent if necessary.



CAUTION!

Some activated dyes can revert to a neutral color after a few days. Therefore, make sure the granules are not desiccated and are still absorbing CO₂. Quality of the absorbent in the canister can be determined by monitoring the CO₂ levels inspired by the patient. High CO₂ levels indicate the absorbent has expired. *Vetland* recommends Lytholyme[®] absorbent which has a dye that retains its color.

4. Ensure the anesthesia system is connected to a 50 psi oxygen source.
5. Confirm the oxygen supply as follows:
 - a. Ensure that the oxygen source has sufficient reserve to supply oxygen for the duration of the case.
 - b. Ensure that no other O₂ delivery device is using the same cylinder and then note the pressure level in the cylinder.
 - c. Turn the oxygen cylinder valve ON and then OFF again. The cylinder pressure gauge should not drop more than 50 psi in 2 minutes. If pressure drops, there is a leak. Immediately call for maintenance.



Figure 5-1 Valve Test Setup

6. Verify oxygen flowmeter function as follows:
 - a. Turn ON the oxygen supply.
 - b. Turn the flowmeter knob fully counterclockwise and then fully clockwise while viewing the movement of the flow ball. The flow ball should move freely throughout the length of the tube. The flowmeter knob should move easily.
7. Confirm proper function of the inspiratory and expiratory valves as follows:
 - a. Connect a breathing bag to the end of an F-circuit (Figure 5-1) to simulate a lung.
 - b. Turn the flowmeter knob counterclockwise to provide O₂ to the system and inflate the breathing bag.
 - c. Squeeze the breathing bag and observe the inspiratory and expiratory valves. Each valve should move freely and seal when pressure to the valve is applied.
8. Perform a pressure leak test as specified in *Section 6 – Troubleshooting*.
9. If using a rebreathing circuit, check the waste gas scavenging system as follows:
 - a. Connect one end of the scavenging system hose to the pop-off valve.

Note: Do not connect the scavenging hose from a non-rebreathing circuit to the pop-off valve.
 - b. Connect the other end of the scavenger system hose to an active scavenging system (e.g., vacuum pump) or passive scavenging system (e.g., charcoal filter).
 - c. Verify that exhaust gases from the anesthesia system are traveling unrestricted via the scavenger tubing to the outdoors if using an active system or to the charcoal canister if using a passive system.

- d. Verify that there is neither a positive or negative pressure being applied to the patient's breathing via the scavenging system. If so, refer to Table 6-1, Items 5 and 6 for solution.
10. Install a clean rebreathing circuit (reference Figure 4-5) and breathing bag on the anesthesia system.
 11. Check ventilator function (if used) as follows:
 - a. Verify the connection of the breathing circuit.
 - b. Check the ventilator for performance according to manufacturer's specifications.

Inspiratory Pressure Adjustment

The operator can determine the inspiratory pressure for positive pressure ventilation of the patient by adjusting the pop-off valve while observing the cmH₂O pressure gauge. The more the pop-off valve is opened, the lower the inspiratory pressure; the more the valve is closed, the higher the inspiratory pressure.

Note: The pop-off valve must never be closed completely during manual or spontaneous ventilation while using a closed patient breathing circuit. A complete closure of the valve causes an excessive build-up of pressure, which may be harmful to the patient.

During the ventilation process, the operator should monitor the pressure gauge at all times. Again, close attention must be paid to the cmH₂O pressure gauge to avoid excessively high, negative, or continuing pressures.

When fully opened (counterclockwise) the pop-off valve keeps a small 1 to 2 cmH₂O pressure in the system. This maintains a fully distended breathing bag and allows the equipment operator to bag without having to adjust the pop-off. This small pressure does not create any danger to the patient.

The pop-off valve has a 19 mm scavenger port, which must be connected to 19 mm tubing. When using a rebreathing circuit, this tubing is routed to a waste gas disposal system (such as an active scavenging system, charcoal canister, or routed passively out of the room).

During many veterinary anesthesia procedures, the patient will breathe spontaneously. In those cases, it will be much easier to determine the correct fresh gas flow and pop-off valve setting. The oxygen flow control setting and the pop-off valve should be set so that the breathing bag neither collapses during inspiration nor over-inflates during exhalation. The inspiratory/expiratory pressures should be in the low range of the cmH₂O pressure gauge.

It is often believed that when a closed patient breathing circuit is used, a patient has to exhale against a high resistance. This is not the case under normal conditions. The patient exhales via the expiratory valve into the breathing bag and bypasses the CO₂ absorber. The resistance of the expiratory valve should be 1 cmH₂O or less. Neither is it correct that a patient will rebreathe a large amount of exhaled gas due to the distance between the wye connector and the expiratory valve. The patient will only rebreathe the volume of gas between the wye connector of the breathing circuit and its mouth, nose, or endotracheal tube.

Rebreathing Circuit vs. Non-rebreathing Circuit

Except for RTA/RSA series non-rebreathing systems, Landmark Anesthesia Systems have a semi-closed circle breathing system (rebreathing circuit) or a connector for non-rebreathing applications. In a rebreathing patient breathing circuit, a portion of the exhaled breath is recycled. In a non-rebreathing system, all exhaled gases, including the anesthetic agent, are lost to a scavenging system and not recycled. The non-rebreathing circuit can be connected directly to the 15 mm fresh gas outlet located on the back panel to the right of the vaporizer. When using a non-rebreathing circuit, the fresh gas flow must be adjusted high enough to prevent the rebreathing of exhaled CO₂. It is strongly recommended that a CO₂ monitor be used to monitor proper ventilation.

The reason for using a non-rebreathing circuit instead of a rebreathing patient breathing circuit is not only to decrease the resistance during respiration, but also to control the inspired gases. Therefore, it may be desirable to use a non-rebreathing circuit for patients that weigh 10 pounds or less. For more information, consult a veterinary anesthesiologist at a local veterinary school/university and/or refer to the *Handbook of Veterinary Anesthesia* (William W. Muir III, DVM PhD and John A. E. Hubbell, DVM MS DACVA; Publisher: Mosby Elsevier).

Using the Oxygen Flush Button

If the patient should require high concentrations of oxygen instantaneously, the 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.

Note: The oxygen flush is always available to the patient as long as there is 50 psi of oxygen supply pressure. Should the system become unable to provide fresh gas mixtures, the O₂ flush can be utilized to oxygenate the patient. Use caution to avoid over pressurizing the anesthesia system/patient.

Anesthetic Vaporizer

The vaporizer is the most complex and the most expensive component of the anesthesia system. It requires special care and the understanding of some basic facts.

The vaporizer converts a liquid anesthetic agent into a vapor which is added to the pre-selected gas (oxygen) or gas mixture (oxygen, nitrous oxide, air). The output of the vaporizer, which is the anesthetic vapor, is measured in volume-percent (vol. %). A dial allows the operator to select the amount of anesthetic vapor administered to the patient.

There are several factors which influence the output of any vaporizer:

- Change of ambient temperature
- Change of flow rates
- Pressure fluctuations
- Change of delivery gas (e.g. change from oxygen to oxygen/nitrous oxide mixture)

Most vaporizers compensate for those changes as they occur. However, the greater the change, the longer it may take for the vaporizer to compensate. The operator must be aware of these vaporizer characteristics, particularly, when decreasing the volume percent concentration of the vaporizer. Also, volume percent concentrations of the anesthetic agent may vary from the selected setting, when flow rates of the delivery gas or gases are below 1.0 l/min. or above 10.0 l/min.

Vaporizers are calibrated for a specific anesthetic agent. Never use an agent other than the one for which the vaporizer is specified. The use of the wrong agent may be detrimental to the patient.

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 (vol. %) dial clockwise to zero (0). The dial clicks into place.
2. If applicable, turn off the nitrous oxide supply.
3. Close the flowmeter valve by turning the knob clockwise until the oxygen flow reads zero (0) l/min.



CAUTION!

Do not over-tighten the oxygen control knob or the needle valve will be damaged.

4. Press the oxygen flush button for two to three seconds and squeeze the breathing bag to purge the system of anesthetic gases and carbon dioxide.
5. Close the oxygen cylinder valve or disconnect the oxygen supply hose from the facility supply system to prevent unintended pressure build-up.
6. Open the pop-off valve by turning it counterclockwise. This assures that, while breathing spontaneously, the next patient can exhale freely and with no resistance.
7. Check the absorbent in the CO₂ absorber canister. If the color has turned blue or after approximately 8 to 10 hours of surgery, change the absorbent as described in *Section 4 – System Setup*. The blue dyes in the absorbent are activated when CO₂ can no longer be absorbed.

Note: Expired absorbent can change back to white overnight, unless you are using Litholyne™ absorbent available from *Vetland* which retains its color change indefinitely.



TIP

To make sure the CO₂ absorbent is fresh, change the absorbent each time anesthetic agent is added.



8. Thoroughly clean the anesthesia system with germicidal cleaning solution as described in *Section 7 – Maintenance*.

6 Troubleshooting

Overview

This section will help you determine the origin of common problems you may experience with your Landmark Anesthesia System and recommended corrective actions.

If you experience problems not listed in this section, or continue experiencing the problem after trying the suggested corrective actions, please contact *Vetland* or your local dealer for advanced fault diagnostics.

**WARNING!** **CAUTION!**
Only trained *Vetland* service technicians should perform troubleshooting not included in this section.

Safety

Some troubleshooting procedures may involve the use of hazardous materials and contact with biological hazards. Always follow all applicable Federal, state, and local regulations and the material manufacturer's Material Safety Data Sheet (MSDS) recommendations including:

- Personal protective equipment (i.e., gloves, mask, eye protection)
- Disposal of contaminated items (i.e., disposable breathing circuit components, cleaning cloths)
- Disposal of hazardous materials (such as cleaning solutions and anesthetic agents)
- Treatment of chemical injury to personnel
- Material flammability

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.

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.

Problem – Solution Matrix

Table 6-1 contains problems that may occur during operation of your Landmark Anesthesia System and their corrective actions. If you continue experiencing a problem after trying the suggested corrective actions, please contact *Vetland* or your local dealer for advanced fault diagnostics.

Table 6-1 Landmark 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 patient	Check breathing system components for leaks, tears, holes, etc. Ensure the cone/mask makes a good seal with the patient. Perform a System Pressure Leak Test as specified below.
		b. Anesthetic agent reservoir is empty	Fill the reservoir with appropriate anesthetic drug.
		c. Vaporizer is turned off	Press the white 0 button on the vaporizer and adjust the dial to the desired volume-percent of anesthetic.
		d. Leak around the vaporizer filler port	Make sure the fill and drain valves on the vaporizer are fully closed.
		e. Vaporizer malfunction – internal fault	Contact <i>Vetland</i> or your local dealer for servicing.
2	APL/Pop-off valve knob is hard to turn	Pop-off valve threads require cleaning	Contact <i>Vetland</i> or your local dealer for servicing.
3	Needle on system pressure gauge is stuck and does not move	Mechanical damage	Replace cmH ₂ O pressure gauge. Contact <i>Vetland</i> or your local dealer for instructions.
4	Needle on system pressure gauge does not read zero (0) or is fluctuating when all gases are turned off	Gauge requires adjustment	Carefully remove lens cover from cmH ₂ O pressure gauge with knife blade or screw driver and adjust set screw with jeweler's screwdriver to "0" position.
5	Needle on system pressure gauge indicates several centimeters of positive pressure after exhalation has ended	Constriction or obstruction downstream from the APL/pop-off valve	Disconnect the pop-off valve exhaust hose and monitor the pressure gauge. <ul style="list-style-type: none"> • If the pressure does not return to zero, contact <i>Vetland</i> or your local dealer. • If pressure returns to zero: <ol style="list-style-type: none"> a. Check the exhaust hose for possible obstruction due to moisture buildup or debris. b. Remove the obstruction. c. Reconnect the hose to the pop-off valve.
6	Needle on system pressure gauge indicates a negative pressure	a. Excessive scavenger system vacuum	Decrease scavenger system vacuum. Recommend a scavenger interface valve to prevent removal of patient gases. Also see items 9c and 10c.
		b. Inadequate fresh gas flow	Increase fresh gas flow rates.

Table 6-1 Landmark Anesthesia System Problem – Solution Matrix (continued)

No.	Problem	Cause	Solution
7	Patient sleep level seems too light	a. Vaporizer is empty	Fill vaporizer with the appropriate anesthetic.
		b. Anesthetic concentration is set too low	Press the white 0 button on the vaporizer and adjust the dial to the desired volume-percent of anesthetic.
		c. Leak in patient breathing circuit	Perform a System Pressure Leak Test as specified below.
		d. Excessive CO ₂ build-up	1. Check CO ₂ absorbent and replace if necessary. 2. Check proper function of inspiratory and expiratory valves.
		e. Leak around the vaporizer filler port	1. Make sure the fill and drain valves on the vaporizer are fully closed. 2. Verify that the fill and drain valve o-rings are not damaged. Replace if damaged. 3. Verify that filler and drain ports are not obstructed by animal hair, etc.
		f. O ₂ Flush Valve is Leaking/Faulty	Replace the flush valve. Contact <i>Vetland</i> or your local dealer for instructions.
8	Patient sleep level seems too deep	a. Anesthetic concentration is set too high	Reduce concentration of anesthetic (vol. %).
		b. Vaporizer malfunction	Contact <i>Vetland</i> or your local dealer for servicing.
9	Breathing bag is overly distended	a. APL/Pop-off valve is closed	Open the pop-off valve.
		b. Flow rate is set too high	Turn the flowmeter valve knob clockwise to decrease the oxygen flow rate.
		c. Scavenger system suction is set too low or is occluded	Increase vacuum flow for scavenger suction or install a scavenger interface valve vented to atmosphere.
10	Gas is flowing , but breathing bag does not inflate	a. Breathing bag is punctured	Replace breathing bag and mount the new bag securely on the bag mount
		b. APL/Pop-off valve is completely open	Turn the knob on the pop-off valve clockwise until the bag starts to inflate.
		c. Scavenger system suction is set too high	Decrease scavenger system suction. or Install a scavenger interface valve vented to atmosphere.
11	Gas flow is leaving through expiratory port when squeezing breathing bag.	Malfunctioning expiratory valve	Unscrew knurled ring from expiratory valve and check disk. Disk must be sitting flush on top of seat and move freely within the bumper check retainer.

Table 6-1 Landmark Anesthesia System Problem – Solution Matrix (continued)

No.	Problem	Cause	Solution
12	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 DISS connector 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.
13	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 filler ports.	1. Make sure the fill and drain valves on the vaporizer are fully closed. 2. Verify that the fill and drain valve o-rings are not damaged. Replace if damaged. 3. Verify that filler and drain ports are not obstructed by animal hair, etc.
		c. Leak in patient breathing circuit	1. Check all hose connections, particularly around mask or endotracheal tube. 2. Perform a System Pressure Leak Test as specified below.
		d. CO ₂ absorber canister is leaking	1. Shut down the anesthesia system. 2. Remove the absorber canister 3. Remove any absorbent granules that are lodged between the canister and sealing gasket. 4. Reinstall the absorber canister.
14	Oxygen flush button sticks	Malfunctioning flush valve	The flush valve requires cleaning or replacement. Contact <i>Vetland</i> or local dealer for service.
15	Float in oxygen flowmeter sticks	Dirty flow tube	Flow tube needs cleaning. Contact <i>Vetland</i> or local dealer for service.
16	Oxygen flow control valve knob is hard to turn	Dirty or damaged needle valve	Flow valve needs cleaning or replacement. Contact <i>Vetland</i> or local dealer for service.
17	Audible leakage around oxygen hose connector	a. Loose oxygen hose connection	Tighten the connection with a crescent wrench.
		b. Damaged oxygen DISS inlet fitting	Inlet must be replaced. Contact <i>Vetland</i> or your local dealer for service.

System Pressure Leak Test – F-circuit Method

1. Set up the anesthesia system as shown in Figure 6-1.

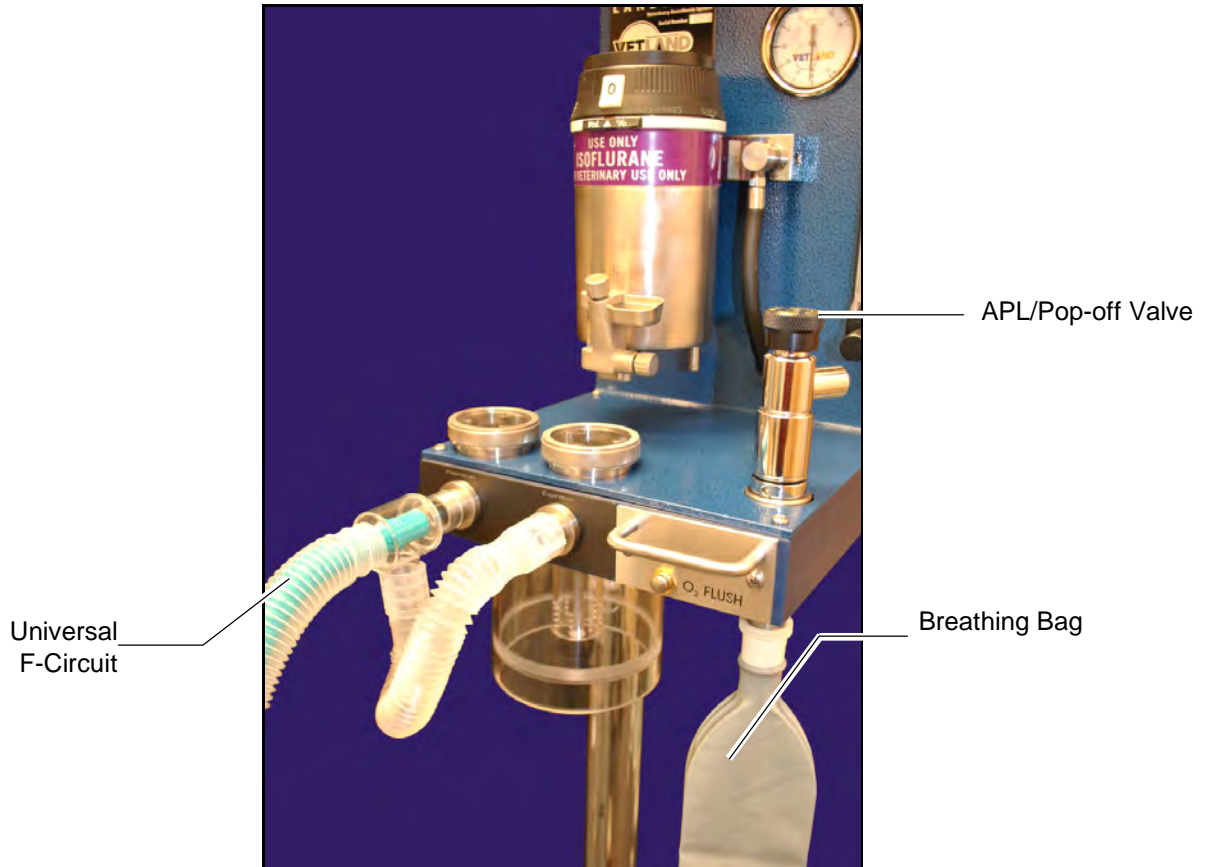


Figure 6-1 Pressure Test Setup

2. Open the O₂ supply valve and provide 50 psi O₂ to the anesthesia system.
3. Attach a rebreathing circuit to the system.
4. Attach a breathing bag to the bag mount located below the APL/pop-off valve.
5. Close the APL/pop-off valve.
6. Plug the wye piece or elbow connector of the F-circuit using your thumb.
7. Continue to plug the end of the breathing wye or elbow while pressurizing the absorber system to 30 cmH₂O using the O₂ flush valve. The system pressure should not drop more than 5 increments (30 cmH₂O to 25 cmH₂O) in 30 seconds. If a leak is present, use a soapy water solution to help find its exact location. Repair or replace the leaking component.
8. Open the APL/pop-off valve and relieve system pressure down to 10 cmH₂O.
9. On the system flowmeter, set a flow of 250 ml/min.
10. Verify that the pressure reading on the system pressure gauge slowly starts to climb past 20 cmH₂O.
11. With zero (0) inflow of oxygen, the pressure gauge should read zero. If the gauge pressure climbs, the oxygen flush valve is leaking.
12. Open the APL/pop-off valve to relieve pressure to zero (0).

System Pressure Leak Test – Squeeze Bulb Method

1. Set up the anesthesia system as shown in Figure 6-2.

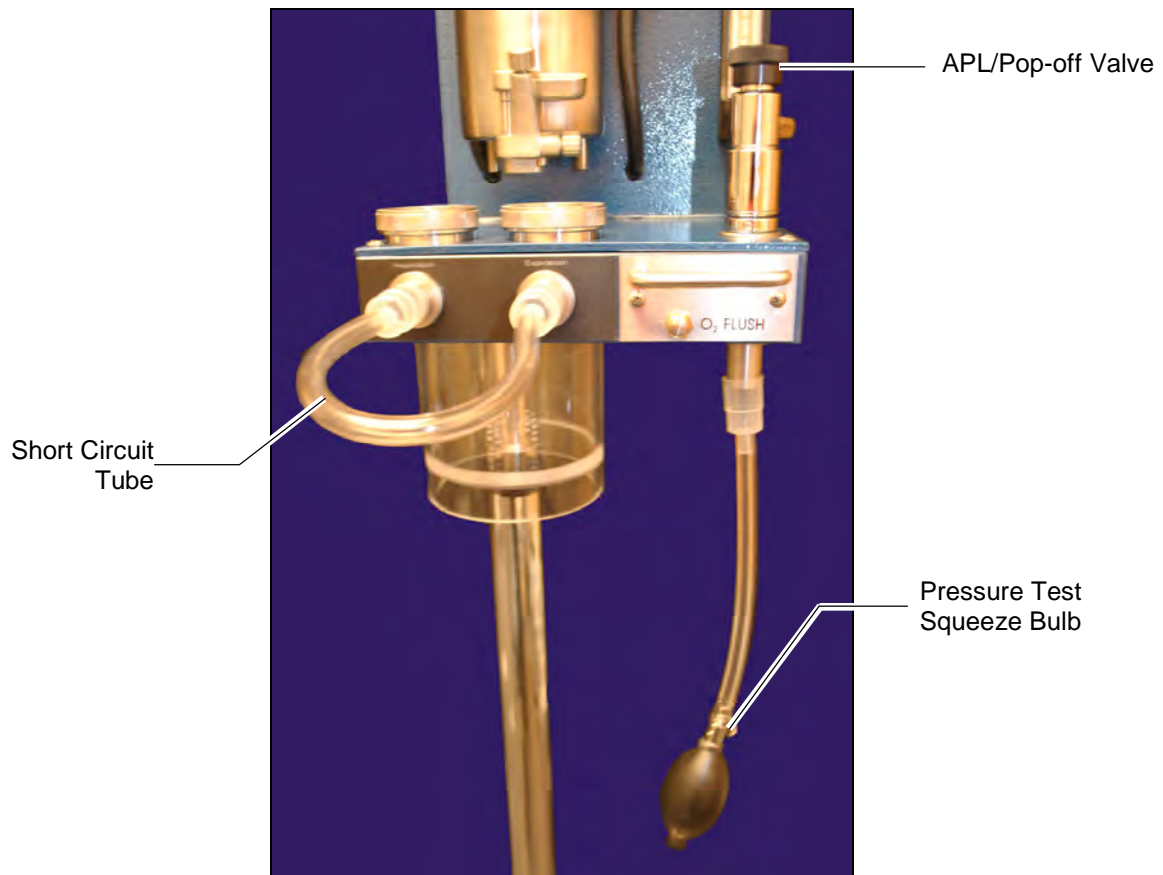




Figure 6-2 Pressure Test Setup

2. Open the O₂ supply valve and provide 50 psi O₂ to the anesthesia system.
3. Close the APL/pop-off valve.
4. Using the squeeze bulb, pressurize the absorber system to 30 cmH₂O. The system pressure should not drop more than 5 increments (30 cmH₂O to 25 cmH₂O) in 30 seconds. If a leak is present, use a soapy water solution to help find its exact location. Repair or replace the leaking component.
5. Open the APL/pop-off valve and relieve system pressure down to 10 cmH₂O.
6. On the system flowmeter, set a flow of 250 ml/min.
7. Verify that the pressure reading on the system pressure gauge slowly starts to climb past 20 cmH₂O.
8. With zero (0) inflow of oxygen, the pressure gauge should read zero. If the gauge pressure climbs, the oxygen flush valve is leaking.
9. Open the APL/pop-off valve to relieve pressure to zero (0).

7 Maintenance

Overview

This section provides the maintenance procedures to keep your Landmark Anesthesia System in good operating condition.

 **WARNING!**  **CAUTION!**
Only trained *Vetland* service technicians should perform maintenance or servicing not included in this section.

Safety

Some maintenance procedures may involve the use of hazardous materials and contact with biological hazards. Always follow all applicable Federal, state, and local regulations and the material manufacturer's Material Safety Data Sheet (MSDS) recommendations including:

- Personal protective equipment (i.e., gloves, mask, eye protection)
- Disposal of contaminated items (i.e., disposable breathing circuit components, cleaning cloths)
- Disposal of hazardous materials (such as cleaning solutions and anesthetic agents)
- Treatment of chemical injury to personnel
- Material flammability

Annual Inspection

Vetland recommends that your Landmark Anesthesia System be inspected annually for proper function by a *Vetland* certified technician. The inspection should be performed at the very minimum on a regular schedule which assures proper operation of the equipment and safety for patient and staff.

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(s) is set to zero volume-percent (vol. %).

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.

Parts and Materials

Refer to *Section 10 – Replacement Parts and Accessories* for materials and parts replacement information.

Cleaning the Equipment



WARNING!

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

Required Materials and Supplies

- Tuberculocidal, germicidal cleaning solution. *Vetland* recommends Metrex Cavicide® (P/N 550-1024)
- CO₂ absorbent material. *Vetland* recommends Litholyne™ (P/N 561-1310 or 561-1410)
- Clean container for washing and rinsing valves
- Clean cloths for wiping down surfaces and drying components
- Personal Protective Equipment (masks, eye protection, gloves, etc.)

Disposition of Breathing Circuit Components

After each use of the anesthesia system, disposition the breathing circuit components as follows:



WARNING!

To prevent the spread of infection, do not attempt to re-use disposables, masks, hoses, and bacteria filters labeled for “single use.”

1. Disconnect the used patient breathing circuit and clean or discard in accordance with the manufacturer’s recommendations.
2. Disconnect the breathing bag from the bag mount and discard in accordance with Federal, state, and local regulations.
3. Follow the manufacturer’s recommended disinfection or sterilization process for reusable hoses, masks, endotracheal tubes, etc.

Weekly Maintenance

1. Wipe all surfaces of the system with a cloth dampened with germicidal cleaning solution.
2. Remove hair, dust, and debris from all vaporizer surfaces; especially around the volume-percent (vol. %) dial and the anesthetic fill port.
3. Check the CO₂ absorbent canister for exhausted absorbent. If more than $\frac{3}{4}$ of the absorbent has changed color, replace it as follows:
 - a. Remove the canister from the bottom of the machine.
 - b. Shake out the spent absorbent.



CAUTION!

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

- c. Wash the canister in warm water, and dry thoroughly.
 - d. 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.
 - e. Fill the canister with fresh CO₂ absorbent material to within one inch (2.5 cm) of the top edge.
 - f. Reinstall the canister, turn the fastening knob clockwise until snug, and then turn the knob one-quarter turn more.
4. Perform a pre-use checkout as specified in *Section 5 – Operation*.
5. Check the cleanliness of the oxygen supply and scavenging hoses. Clean or replace as necessary.
6. With a cloth dampened with a germicidal cleaner, all surfaces of the anesthesia system. On floor model Landmark systems, also wipe down the chassis and wheels to remove hair and lint that might interfere with moving the system.

Monthly Cleaning of Inspiration and Expiration Valves

1. Make sure the oxygen supply to the system is OFF and the vaporizer volume-percent (vol. %) dial is in the zero (0) position.



CAUTION!

Do not autoclave or use abrasive substances on inspiration/expiration valve components. They will be damaged and may not function properly.

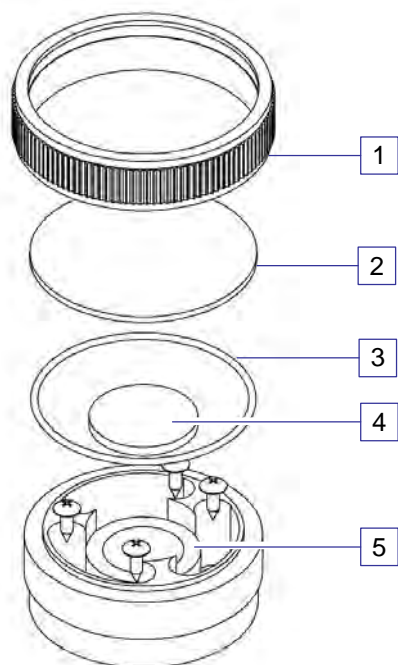
2. Remove the valve rings (see Figure 7-1) by turning them counter-clockwise.
3. Remove the valve caps, o-rings, and valve discs.
4. Immerse all of the removed parts in a germicidal cleaning solution and wipe with a clean cloth to remove all dirt, hair, etc.



WARNING!

Refer to the cleaning agent manufacturer's MSDS for information concerning safe use, personal protective equipment, and disposal.

5. Rinse the parts in clean water and dry the parts with a clean cloth.
6. Wipe the check valve seat inside and out with a clean cloth moistened with cleaning solution.
7. Reassemble the valves in the order shown in Figure 7-1.
8. Tighten the valve rings by turning them clockwise until hand-tight.
9. Perform a pre-use checkout as specified in *Section 5 – Operation*.



Item	Description
1	Valve Ring
2	Valve Cover
3	O-ring
4	Valve Disk
5	Check Valve Seat

Figure 7-1 Inspiration/Expiration Valve Assembly (Exploded View)

Draining the Vaporizer

Follow the steps below to drain standard Draeger vaporizers. For other vaporizers, follow the vaporizer manufacturer's instructions.



WARNING!

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.

Drain only one reservoir at a time. Do not drain different anesthetic agents into the same container.

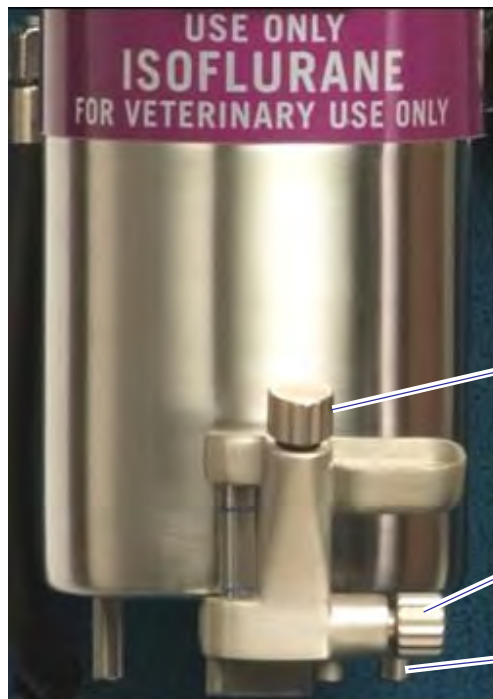


CAUTION!

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

Funnel Fill Vaporizer

1. Close the oxygen supply valve to the anesthesia system.
2. Make sure the anesthesia system is in a well-ventilated area.
3. Attach a drain tube to the drain port (see Figure 7-2). Place the other end of the tube in a receptacle to catch the drained anesthetic agent.
4. Open the fill and drain valves by turning the knobs counterclockwise.
5. When the anesthetic agent stops draining from the vaporizer, close the drain valve and then the fill valve by turning the knobs clockwise.
6. Dispose of the anesthetic agent in accordance with the manufacturer's MSDS and local regulations.

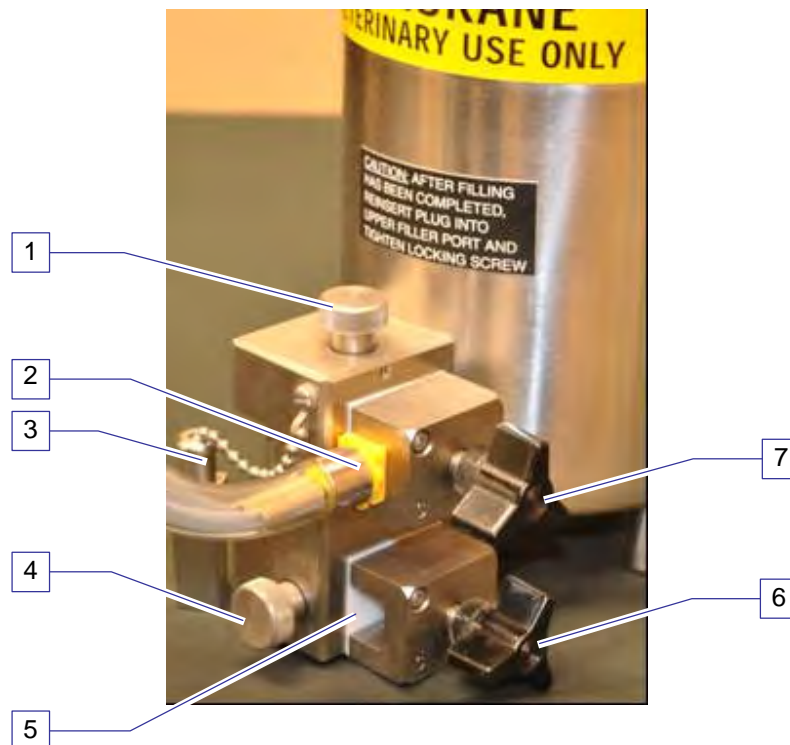


Item	Description
1	Fill Valve
2	Drain Valve
3	Drain Port

Figure 7-2 Draining the Vaporizer (Funnel Fill)

Key Fill Vaporizer

1. Close the oxygen supply valve to the anesthesia system.
2. Make sure the anesthesia system is in a well-ventilated area.
3. Insert a keyed drain tube to the drain port (see Figure 7-1) and lock it in place by turning the drain port lock knob clockwise. Place the other end of the tube in a receptacle to catch the drained anesthetic agent.
4. Loosen the fill port lock knob counterclockwise and remove the plug.
5. Open the fill valve by turning the knob counterclockwise.
6. Open the drain valve by turning the knob counterclockwise.
7. When the anesthetic agent stops draining from the vaporizer, close the drain valve and then the fill valve by turning the knobs clockwise.
8. Reinstall the fill port plug and tighten the fill port lock knob clockwise.
9. Dispose of the anesthetic agent in accordance with the manufacturer's MSDS and local regulations.



Item	Description
1	Fill Valve
2	Fill Port
3	Fill Port Plug
4	Drain Valve
5	Drain Port
6	Drain Port Lock Knob
7	Fill Port Lock Knob

Figure 7-3 Draining the Vaporizer (Key Fill)

Preparing a Vaporizer for Transport

There are no serviceable parts in the vaporizer. Should the vaporizer require service at the factory, follow these steps before packaging the vaporizer for transport:

Note: If returning a vaporizer for warranty purposes, a Returned Goods Authorization (RGA) number must be obtained. See *Section 8 – Product Information* for details.

1. In a well-ventilated area, drain the vaporizer as specified in **Draining the Vaporizer** above.
2. Turn the volume-percent dial to the maximum setting and set the oxygen flow to 40.0 l/min. for 20 minutes.
3. After 20 minutes, turn off the oxygen flow, set the volume-percent dial to zero (0) and close the fill and drain valves.
4. Unplug the 15mm elbow from the vaporizer mounting block.
5. Remove the two bolts (on top) and two screws (on bottom) attaching the back cover to the anesthesia system.
6. While supporting the vaporizer, remove the two bolts and washers on the back panel of the anesthesia system that attach the vaporizer manifold (see Figure 7-4).
7. Lower the vaporizer and allow it to rest on the anesthesia system deck (see Figure 7-5).
8. Using a hex wrench, remove the two hex screws attaching the vaporizer to the vaporizer manifold. Retain the hex screws for reinstallation.
9. Carefully package the vaporizer with appropriate padding and return it to *Vetland*.
10. Reinstall the vaporizer mounting block to the back panel of the anesthesia system.

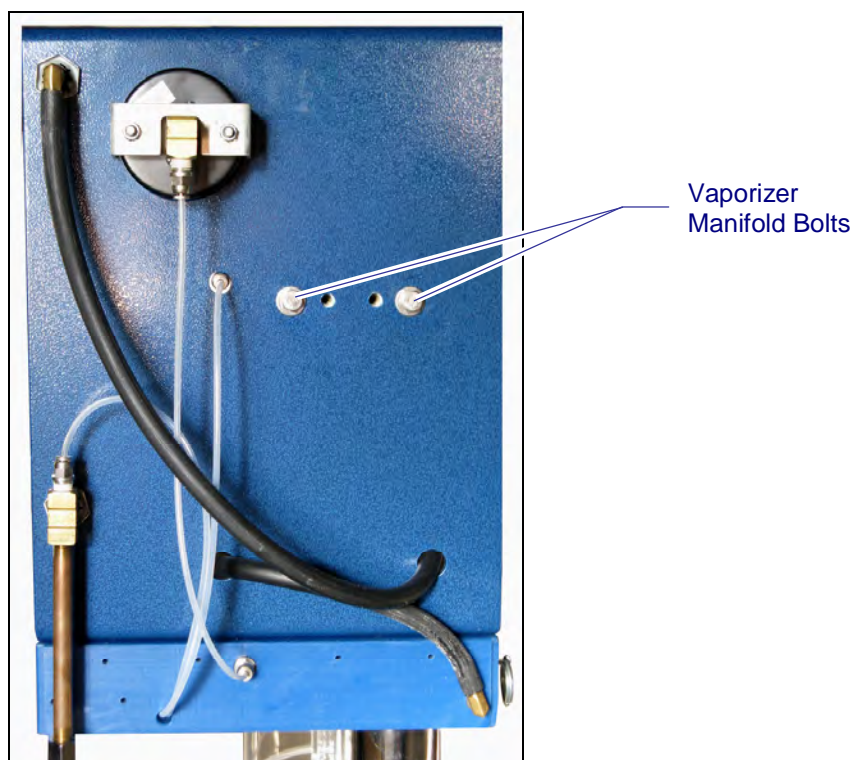
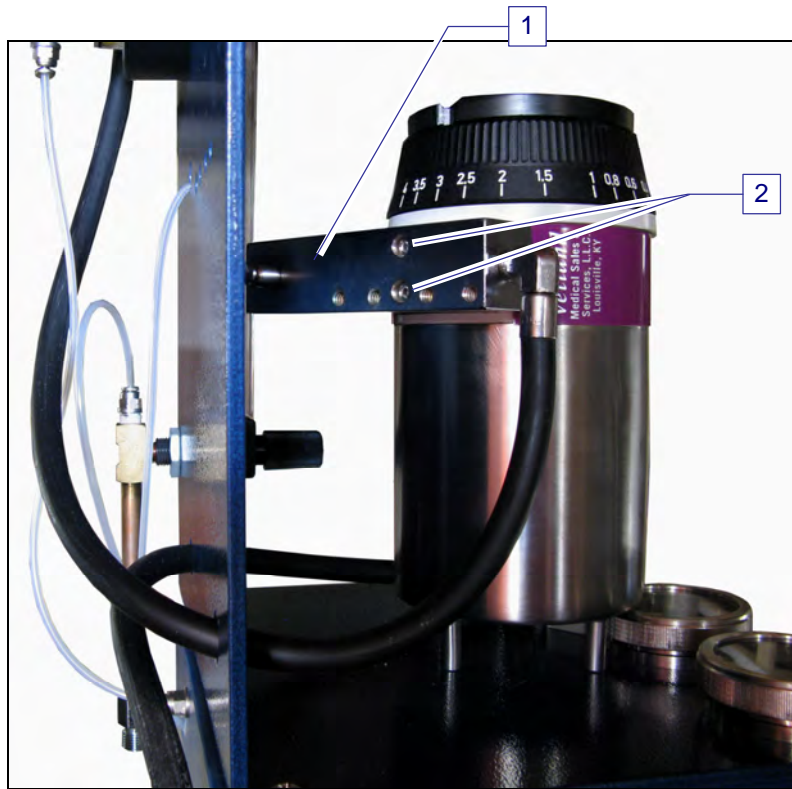


Figure 7-4 Landmark Standard - Back Cover Removed



Item	Description
1	Vaporizer Manifold
2	Hex Screws (2)

Figure 7-5 Removing the Vaporizer

Post-Maintenance Checkout

After performing maintenance on your Landmark system, perform a post-maintenance checkout as described in Table 7-1.

Table 7-1 Landmark Post-Maintenance Checkout

Verify	Test Method/ Acceptance Criteria
No pressure leaks	Perform a System Pressure Leak Test in accordance with Section 6 – Troubleshooting .
Proper O ₂ flush button operation	Verify that the button does not stick.
Proper operation of Inspiration and Expiration Valves	Visually verify that the valves move freely and do not stick.
Proper operation of the APL/Pop-Off Valve	Verify that the valve easily opens and closes and does not stick.

Preparing the System for Storage

1. Turn off the oxygen supply valve and disconnect the facility oxygen supply line (if used). Remove and safely store E-size stand-mounted oxygen cylinders (if used).
2. Remove and discard disposable breathing tubes and bags in accordance with local regulations.
3. Empty and clean the CO₂ absorber canister. Discard the absorbent material in accordance with the manufacturer's MSDS and local regulations.
4. Drain the vaporizer(s) as specified in *Draining the Vaporizer* earlier in this section.
5. Clean and disinfect all surfaces and connections as specified earlier in this section.
6. Protect the system from dust and contamination with a plastic cover or other suitable means.

8 Product Information

Product Warranty

All Vetland products are guaranteed to be free of defects for a period of three (3) years from the date of delivery and shall include workmanship and material.

The following are exceptions to this warranty:

- Defects caused by misuse, mishandling or by modifications not authorized by Vetland Medical Sales and Services, LLC.
- Rubber, plastic and consumable components and materials are warranted to be free of defects at time of delivery.
- Warranty for the various anesthetic vaporizers as follows:
 - A) For Vetland conversion of Drager Vapor[®] 19.1 – ten (10) years,
 - B) Tech3[®], Tech 4[®] and Ohio[®] Calibrated vaporizers – three (3) years from the date of delivery.
- Warranty for EX3000 electronics and all other patient monitors is **one (1) year**.
- Accessory cables, probes and sensors are for warranted for 90 days.

Any product which proves to be defective in workmanship or material will be replaced, credited or repaired at the discretion of Vetland. Vetland is not responsible for normal deterioration, wear and tear or abuse. In any case, Vetland will not be liable beyond the original selling price.

Application of this warranty is subject to the following conditions:

- Merchandise returned for warranty credit or replacement must have been purchased from Vetland within the specified warranty period or proof of installation within that time will be required.
- Vetland must promptly be notified upon detection of the defective product or material.
- If the defective product or material cannot be repaired at the customer's site, it must be returned to Vetland, shipping prepaid.
- Examination of the product or material by Vetland must confirm that the defect is covered by the terms of this warranty.
- Notification of the defective product or material must be received by Vetland no later than two (2) weeks following the expiration of this warranty.
- A Returned Goods Authorization number must be obtained from Vetland and shall accompany any equipment being returned under this warranty. Refer to the Returned Goods Policy below.

In order to assure complete protection under this warranty, the Warranty Registration Card (*if applicable*) must be returned to Vetland within ten (10) business days of receipt of the product.

The preceding information is the sole warranty provided by Vetland. No other warranty expressed or implied is intended. Representatives of Vetland or its agents are not authorized to modify the terms of this warranty without Vetland's current president's signature of approval.

Payment Terms

Merchandise is shipped pre-paid or COD. FOB Louisville, KY. Net 30 days to customers with established credit. Please contact the Customer Service Department concerning credit information.

Shipping

All merchandise is sold FOB Louisville, Kentucky. The purchaser accepts these terms upon the issuance of a purchase order. Under the terms of FOB Louisville, Kentucky, all goods become the property of the customer upon Vetland's delivery to its designated freight carrier. It is the responsibility of Vetland to convey the goods to the carrier and provide a clean Bill of Lading (when applicable) or proof of shipment. The customer is responsible for transportation costs.

Vetland will assist in any way possible in the event of loss or damage to merchandise and any subsequent claim against the carrier, but the responsibility for reporting such loss or damage and filing any claims remains with the customer.

Any shortages or errors in shipment of goods must be reported to Vetland within two (2) weeks of date of shipment in order for corrective action to be taken.

All merchandise to be returned must have prior authorization by Vetland. An authorization number will be issued by Vetland. This number must appear on the label, packing slip, and any other related documents. Goods received without authorization will be refused at Vetland's receiving dock and returned at customer's expense.

Returned Goods Policy

When requesting authorization to return merchandise, the following information should be provided:

- Customer purchase order number and date.
- Vetland shipping date and method of shipment (see packing slip or bill of lading).
- Vetland's invoice date and number.
- Reason for return.

The following are accepted reasons for return of merchandise:

- Defective goods.
- Customer order error.
- Vetland order or shipping error.

Goods returned are subject to the terms of any applicable warranty. Defective products will be accepted for return only during the warranty period and only when accompanied by a Returned Goods Authorization (RGA) number provided by Vetland.

Goods to be returned due to customer's order error must have been received by the customer within thirty (30) days prior to the request for return. They must be received by Vetland within thirty (30) days after the return authorization was issued. These goods must be returned unused in the original shipping container and are subject to a 20% restocking charge. The restocking charge will not be applied for defective goods or those shipped due to Vetland's error.

The following merchandise is not eligible for return unless proven to be defective:

- Merchandise for which no Returned Goods Authorization (RGA) was issued by Vetland.
- Merchandise specially ordered by, or manufactured for, the customer.
- Sterile or rubber goods.
- Used merchandise or products not in the original container.
- Merchandise held over thirty (30) days from day of receipt by the customer.
- Merchandise which has been altered or abused.

Upon receipt of authorized returned goods an inspection of the merchandise will be conducted and appropriate action will be taken. Vetland's decision regarding disposition of these goods is final.

Vetland products in need of factory repair do not require a return authorization.

All items to be returned should be shipped prepaid to:

Vetland Medical Sales & Services, LL.C.
2601 Holloway Road
Louisville, KY 40299
Attn: Customer Service Department
Return Goods Authorization Number (when applicable)

Limitation of Liability

All Vetland products are ONLY to be used for VETERINARY purposes. Vetland products are not designed to be used for human patients.

Vetland's liability whether arising out of or related to manufacture and sale of the goods, their installation, demonstration, sales representation, use, performance, or otherwise, including any liability based upon Vetland's Product Warranty is subject to and limited to the exclusive terms and conditions as forth above, whether based upon breach of warranty or any other cause of action whatsoever, regardless of any fault attributable to Vetland, and regardless of the form of action (*including without limitation, breach of warranty, negligence, strict liability or otherwise*).

The stated Express Warranties are in lieu of all warranties, expressed or implied, including without limitation warranties of merchantability, fitness or any particular purpose or non-infringement. Vetland shall not be liable for, nor shall buyer be entitled to recover any special incidental or consequential damages, or for any liability incurred by buyer to any third party in any way arising out of or relating to the goods.

In the unlikely event of a disagreement, the place of venue is Louisville, KY, U.S.A.

9 Useful Information

Overview

This section provides information that may be helpful to the users of Landmark Anesthesia Systems.

Pressure Equivalentents

1 atm = 1033 cmH₂O = 760 mmHg = 760 Torr = 1013 mb = 14.7 psi

1 psi = 70.3 cmH₂O = 51.7 mmHg = 68.9 mb = 6.9 kPa

1 mmHg = 1.36 cmH₂O = 1.02 mb

1 cmH₂O = 0.736 mmHg = 0.981 mb

Pressure Unit Conversions

Table 9-1 Pressure Unit Conversions

Unit	psi	inch H ₂ O	inch Hg	kPa	millibar	cmH ₂ O	mmHg	Torr
psi		27.680	2.036	6.8947	68.947	70.308	51.715	
inch H ₂ O	3.6127×10^{-2}		7.3554×10^{-2}	0.2491	2.491	2.5400	1.8683	
inch Hg	0.4912	13.598		3.3864	33.864	34.532	25.400	
kPa	0.14504	4.0147	0.2953		10.000	10.1973	7.5006	
millibar	0.01450	0.40147	0.02953	0.100		1.01973	0.75006	
cmH ₂ O	1.4223×10^{-2}	0.3937	2.8958×10^{-2}	0.09806	0.9806		0.7355	
mmHg	1.9337×10^{-2}	0.53525	3.9370×10^{-2}	0.13332	1.3332	1.3595		

Monitored Anesthesia Care (MAC) Anesthetic Levels

Table 9-2 MAC Levels

Patient	Halothane	Isoflurane	Sevoflurane
Cat	1.19	1.63	2.58
Dog	0.87	1.3	2.34
Horse	0.88	1.31	2.34

Miscellaneous Information

Table 9-3 Miscellaneous Information

Item	Description
Tidal Volume	Approximately 5 to 7 ml per pound of patient weight. <i>Example:</i> 100 pound dog x 5-7 ml per pound = 500 to 700 ml tidal volume
Breathing Bag Size	Approximately 5 times the tidal volume. <i>Example:</i> tidal volume of 400 ml x 5 = 2 liter bag
Oxygen Flow	Non-rebreathing circuits: 100 ml/pound/minute (higher flows for induction; minimum 250 ml)
	Semi-closed rebreathing system: Low Flow – 5 to 10 ml/pound/minute High Flow – 10 to 50 ml/pound/minute
Oxygen Tanks • Size E:	Height: 30 in. Diameter: 3.5 in. Volume: 651 L Initial Pressure: 1800 – 2200 psi Service Duration: Approximately 11 hours at 1.0 liter/minute Note: Does not include O ₂ flush time which exceeds the 1.0 L/min rate. Mounting: Can be mounted to a yoke on the anesthesia system stand or small cylinder cart. Advantages: <ul style="list-style-type: none"> • Easily portable to multiple usage areas • Can be mounted on the anesthesia system stand
	• Size H: Height: 54 in. Diameter: 8.5 in. Volume: 7107 L Initial Pressure: 1800 – 2200 psi Service Duration: Approximately 118 hours at 1.0 liter/minute Note: Does not include O ₂ flush time which exceeds the 1.0 L/min rate. Mounting: Mount securely to a large cylinder cart or a solid surface. Advantages: <ul style="list-style-type: none"> • Good when anesthesia system is used in a limited area • Needs fewer refills • Lower operational cost
Pressure Regulator	Must be capable of reducing tank pressure to 50-55 psi. Note: Do not use a separate flow regulator (already part of the anesthesia system).

Definition of Terms

absorbent - A chemical substance such as Litholyme™ that removes carbon dioxide (CO₂) from the breathing circuit by a chemical neutralization process which produces carbonates, water, and heat.

absorber system - The components of a rebreathing system designed to remove carbon from patient exhaled gas. This includes the inspiratory and expiratory valves, CO₂ absorbent canister, pop-off valve, breathing bag port, and related tubing.

anesthesia - Partial or complete loss of sensation with or without loss of consciousness induced by an anesthetic agent.

anesthetic agent - A drug that induces anesthesia.

anesthetic vaporizer - A device that converts a liquid anesthetic into a gas or vapor.

APL valve - See *pop-off valve*.

breathing bag - A reservoir in which fresh gas and exhaled gases including CO₂ are stored during exhalation.

breathing circuit - A system that delivers anesthetic gases from the anesthesia apparatus to the patient and also transfers exhaled patient gas to the breathing bag; corrugated hoses with 22 mm inner diameter connections must be used for patient breathing circuits.

cc - cubic centimeter - 1/1,000 of a liter; also equal to 1 ml (milliliter).

check valve - A valve used in pneumatic systems that opens to allow gas flow only in one direction.

cmH₂O - Centimeters of water pressure - A relatively low pressure which is used to measure inspiratory and sometimes expiratory pressures in the breathing circuit (1 psi = 70.3 cmH₂O).

CO₂ - carbon dioxide

directional valves - The inspiratory and expiratory valves present in the patient breathing system.

DISS - Diameter Index Safety System - A threaded connector system for medical gases, which prevents the incorrect connection of medical gas supply lines to medical gas equipment.

endotracheal adapter - A 15 mm tapered adapter which connects the endotracheal tube to the wye connector of the patient's breathing circuit.

endotracheal tube - A tube inserted into the patient's trachea for ventilation purposes (e.g. the act of breathing in and out).

expiratory flow rate - The rate at which a gas is exhaled (l/min).

expiratory time - The time that is required to exhale all of the inhaled gas (tidal volume).

expiratory valve - A unidirectional valve with a 22 mm outer diameter hose connector which opens only when the patient exhales.

flush button - A valve located prior to the inspiratory port of the anesthesia apparatus which delivers approximately 15-18 l/min oxygen flow (on *Landmark Veterinary Anesthesia Systems*) to the patient's breathing circuit for quick oxygenation, while by-passing the anesthetic vaporizer and any other medical gases.

fresh gas - The mixture of medical gases and anesthetic vapors to be delivered to the patient
hyperventilation - increased ventilation which results in lower CO₂ levels.

inspiration - The act of breathing in or drawing gas into the lungs.

inspiratory flow rate - The rate at which gas is inhaled (l/min).

inspiratory valve - A unidirectional valve with a 22 mm outer diameter hose connector which opens only when the patient inhales.

liter - Equals 1,000 milliliters or 1,000 cubic centimeters.

L/min - Liters per minute (e.g. total gas flow during one minute).

Litholyme™ - Material which retains exhaled carbon dioxide (used in absorber canisters). Product of Allied Healthcare Products, Incorporated.

milliliter (ml) - 1/1000 of a liter, also equal to cc (cubic centimeter).

mmHg - Millimeters of mercury - A unit of measure for pressure.⁷

N₂O - Nitrous oxide

O₂ - Oxygen

O-ring - An “O” shaped device that creates a seal between two adjoining surfaces

pop-off valve - An adjustable pressure relief valve that releases excess gas to the scavenger system. Also known as an adjustable pressure limiter (APL) valve.

pressure gauge - A device used to measure pressure. Pressure gauges used for measuring medical gas supplies are calibrated in psi. Pressure gauges used to measure pressures in the breathing system are calibrated in cmH₂O.

pressure regulator - A device used to reduce the pressure of a gas to the required safe working pressure.

psi - (pounds per square inch) - A unit of measure used to measure the pressure of medical gas supply systems such as cylinders or central piping systems.

respiration - The process of gas exchange within the body.

respiratory cycle - The time interval from the beginning of inspiration to the beginning of the next inspiration.

respiratory rate - The number of inspiratory/expiratory cycles per minute.

scavenger system - A system that safely removes waste gases from the breathing system. Flexible hoses with 19 mm inner diameter connections must be used for scavenger systems. Also known as a *waste gas elimination system (WGES)*.

unidirectional valve - A valve in the patient’s breathing circuit which opens only in one direction to gas flow and remains closed to gas flow in the opposite direction.

ventilation - The movement of gas in and out of the lungs.

ventilator - A device that provides mechanical assisted or controlled ventilation.

wye connector - A ‘Y’ shaped connector which connects the two corrugated 22 mm hoses of the patient breathing circuit to the 15 mm tapered endotracheal adapter.

yoke - A device to mount E-size medical gas cylinders (or smaller) to certain medical gas supply systems.

10 Replacement Parts and Accessories

Overview

This section contains information for ordering replacement materials and parts for your Landmark Anesthesia System. Contact *Vetland* (phone: 1-877-329-7775, fax: 1-502-671-1019) or your local distributor to order the materials, parts, and accessories described in this section.

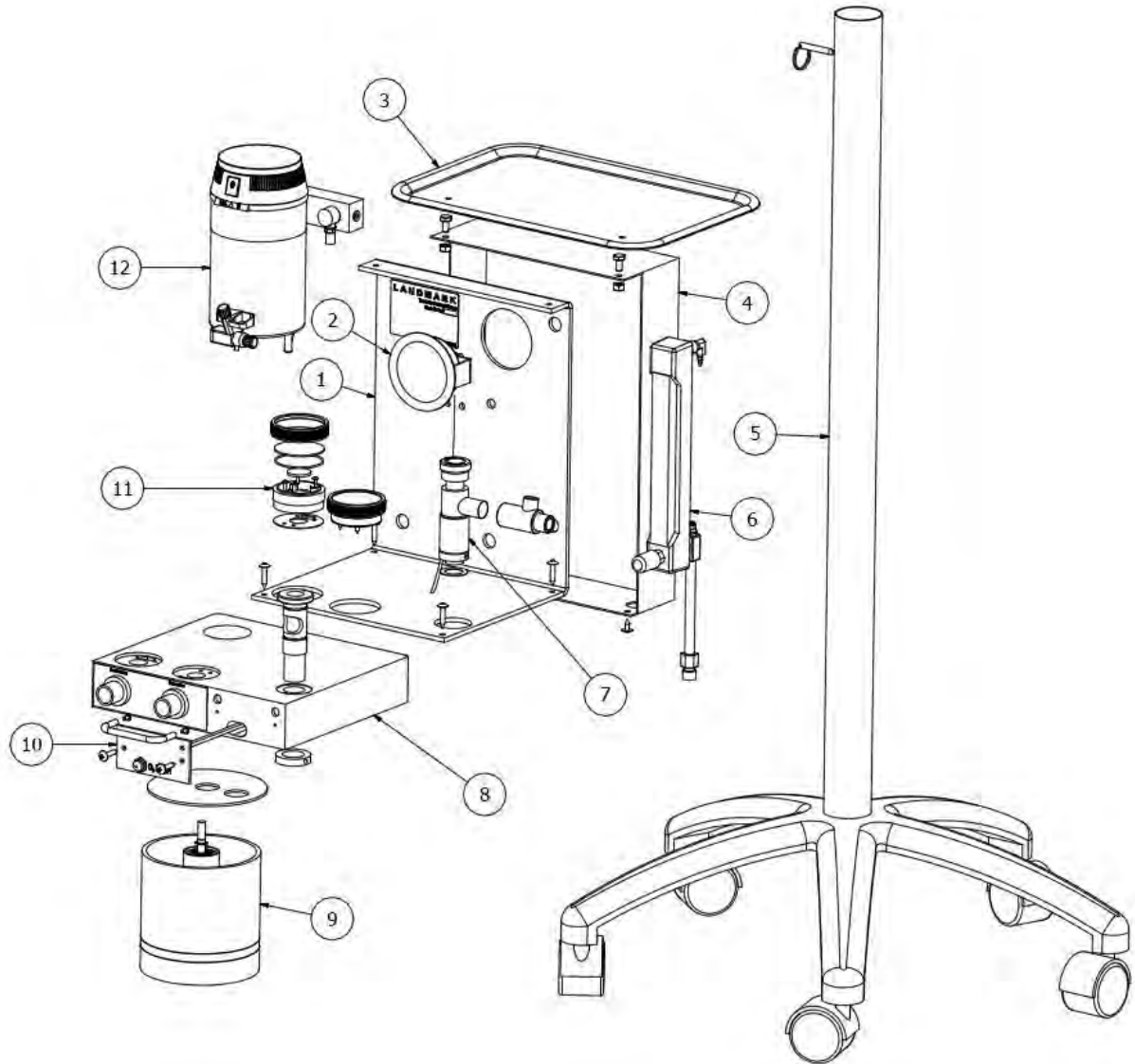
Replaceable Materials and Accessories

Table 10-1 Replaceable Materials and Accessories

Item	Order No.
Apnea Sensor – Pack of 3	410-083A
Battery, Reserve	410-013
Breathing Bag, 0.5 Liter, Latex Free, Disposable	563-2800
Breathing Bag, 1 Liter	563-2801
Breathing Bag, 2 Liter	563-2802
Breathing Bag, 3 Liter	563-2803
Breathing Circuit, Unilimb F – 40" with 3 Liter Bag	567-1340
Breathing Circuit, Pediatric Wye	567-2300
Breathing Circuit, Pediatric Unilimb	567-1370
Cleaner, Cavicide® – 24 oz. Spray	550-1024
F/Air Charcoal Filter Canister	580-1250
Filler Anti-spill, Isoflurane	527-2211
Filler, Key, Isoflurane	527-3211
Filler, Anti-spill, Sevoflurane	527-2231
Filler, Key, Sevoflurane	527-3231
Heat/Moisture Exchangers – Small	564-0500
Heat/Moisture Exchangers – Medium	564-1000
Heat/Moisture Exchangers – Large	564-1500
Landmark Second Vaporizer Side Mount Kit	910-600A
Litholyme™ CO ₂ Absorbent – 2.6 lb. (1.18 kg) Bag	561-1310
Litholyme™ CO ₂ Absorbent – 5 gal. Pail	561-1410
Mask, Canine Small	560-3001
Mask, Canine Large	560-3002
Mask, Canine X-Large	560-3003
Mask, Cat Small	560-4001
Mask, Cat Medium	560-4002
Mask, Cat Large	560-4003
Mask Diaphragm, Small	560-3004
Mask Diaphragm, Large	560-3005
Mayo Tray, Side	910-7796A
Modified Jackson Rees Non-Rebreathing Circuit	567-3375
Manifold, E-Tank	580-1270
Pressure Test Kit	910-500A
Rubber Goods Kit, Landmark/Ex3000	510-700A
Tee, Oxygen Dual Inlet	910-125
Tee, Vent, Oxygen Drive	560-0745

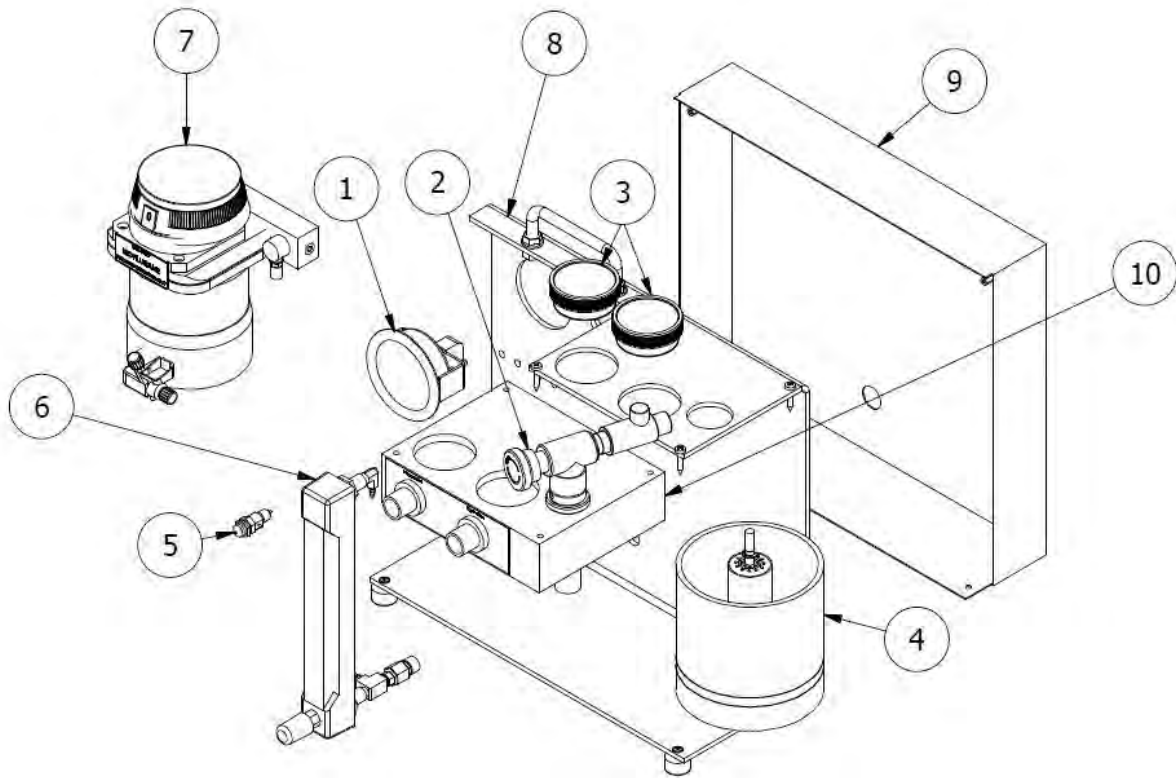
Exploded View Drawings

The following Landmark Anesthesia System exploded view drawings are provided as an easy reference to identify parts and assemblies for use in maintenance, servicing, and ordering of parts.



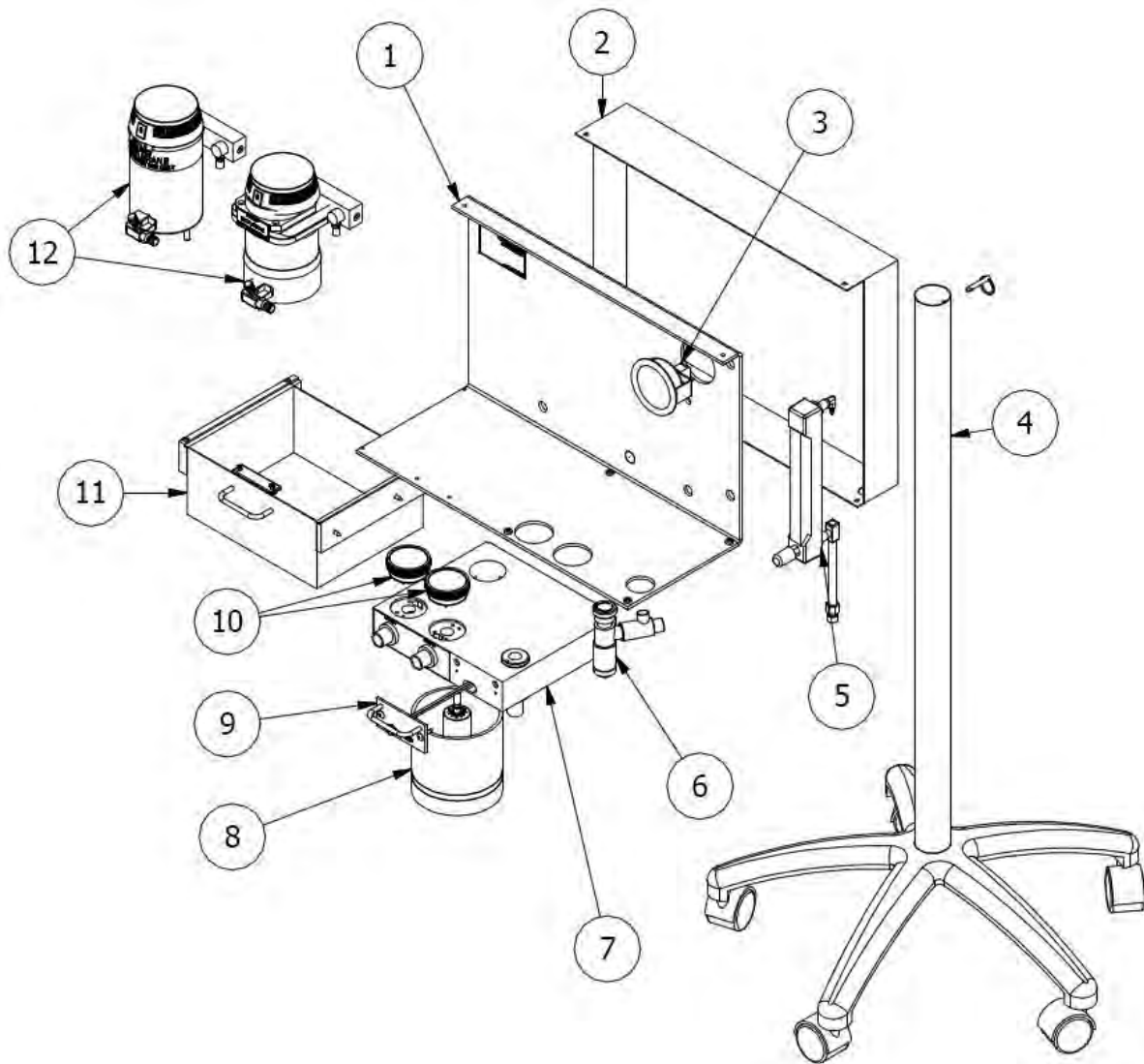
No.	Qty.	Parts List	Page 10-
1	1	510-180A Frame Assembly	5
2	1	510-200A Gauge Assembly	6
3	1	510-625 Mayo Tray	2
4	1	510-170A Back Panel Assembly	7
5	1	510-100A Pole Assembly	8
6	1	510-175A Oxygen Flowmeter Assembly	9
7	1	510-570A APL / Pop-Off Valve Assembly	10
8	1	510-103A Manifold Block Assembly	11
9	1	510-101A Absorber Canister Assembly	12
10	1	510-129A Flush Valve Assembly	13
11	2	510-104A Inspiratory – Expiratory Valve Assembly	14
12	1	Optional Vaporizer Assembly	24 to 31

Figure 10-1 VSA-2100 Floor Model



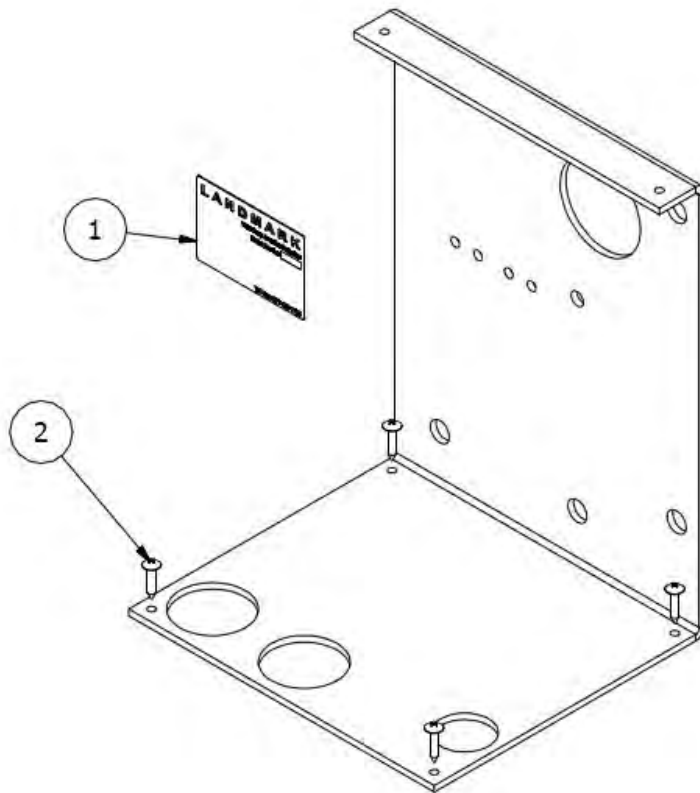
No.	Qty.	Parts List	Page 10-
1	1	510-200A Gauge Assembly	6
2	1	510-571A Right Angle APL / Pop-Off Valve Assembly	15
3	2	510-104A Inspiratory – Expiratory Valve Assembly	14
4	1	510-101A Absorber Canister Assembly	12
5	1	510-133A Flush Valve Assembly	16
6	1	510-176A Oxygen Flowmeter Assembly	17
7	1	Optional Vaporizer Assembly	24 to 31
8	1	710-102A Tabletop Frame Assembly	18
9	1	710-103A Tabletop Back Cover Assembly	19
10	1	710-100A Tabletop Manifold Block Assembly	20

Figure 10-2 VTA-1100 Table Top Machine



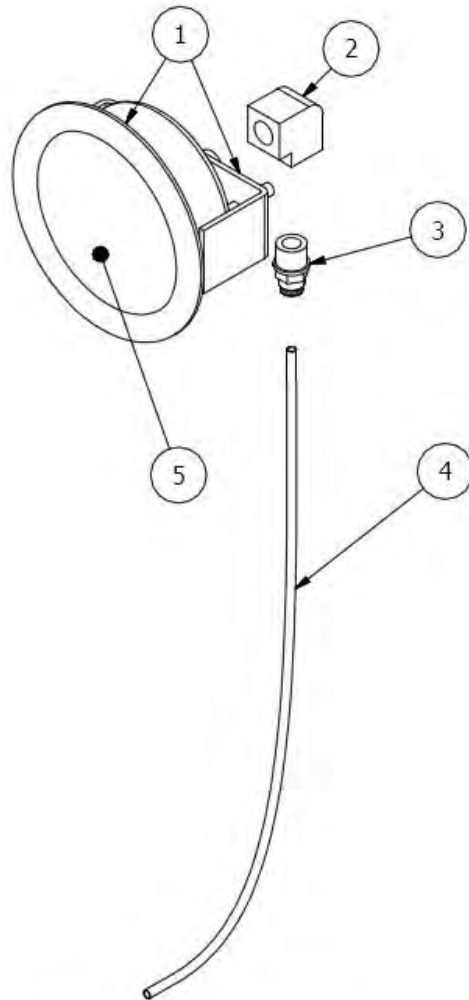
No.	Qty.	Parts List	Page 10-
1	1	610-101A VDA-4100 Frame Assembly	21
2	1	610-100A VDA-4100 Back Panel Assembly	22
3	1	510-200A Gauge Assembly	6
4	1	510-100A Pole Assembly	8
5	1	510-175A Oxygen Flowmeter Assembly	9
6	1	510-570A APL / Pop-Off Valve Assembly	10
7	1	510-103A Manifold Block Assembly	11
8	1	510-101A Absorber Canister Assembly	12
9	1	510-129A Flush Valve Assembly	13
10	2	510-104A Inspiratory – Expiratory Valve Assembly	14
11	1	510-606A Drawer Assembly	23
12	2	Optional Vaporizer Assembly	24 to 31

Figure 10-3 VDA-4100 Doublewide Machine



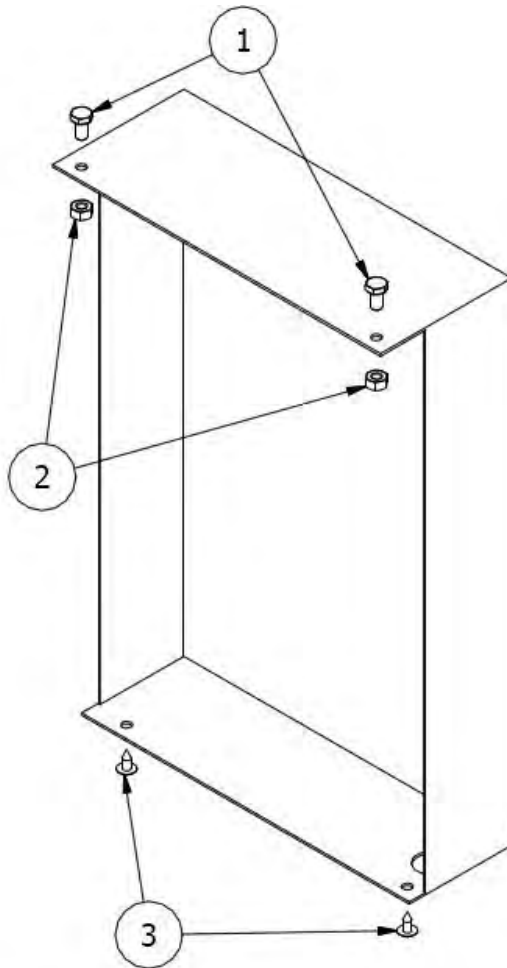
PARTS LIST		
ITEM	QTY	PART NUMBER
		510-180A Frame Assembly - Complete
1	1	510-175 Serial Number Plate
2	4	510-180 #10 Self-tapping Stainless Screw

Figure 10-4 510-180A Frame Assembly



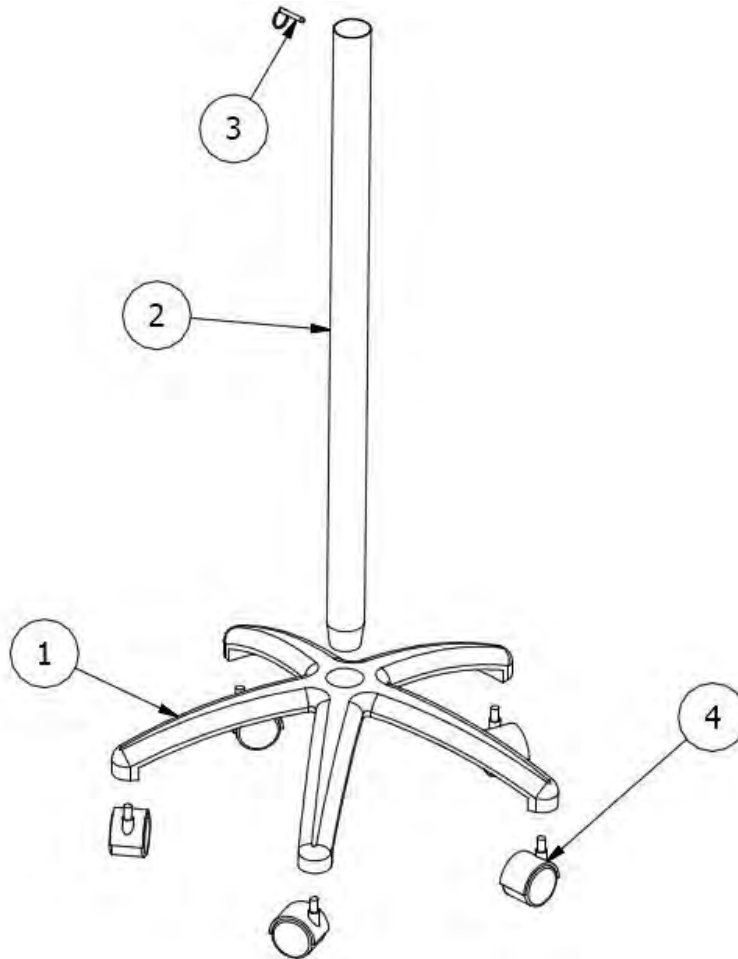
PARTS LIST		
ITEM	QTY	PART NUMBER
		510-200A Gauge Assembly - Complete
1	1	510-505 Gauge
2	1	510-355 1/8 FNPT elbow
3	1	510-126 QC 1/8 NPTM 1/8 Connector
4	1	510-311 1/8 Tubing
5	1	510-145 Gauge cover only

Figure 10-5 510-200A Gauge Assembly



PARTS LIST		
ITEM	QTY	PART NUMBER
		510-170A Back Panel Assembly - Complete
1	2	510-615 #10-32 X 1/2 SS Screw
2	2	510-620 #10-32 Hex Kep SS Nut
3	2	510-610 #10 X 1/2 Self-tapping SS Screw

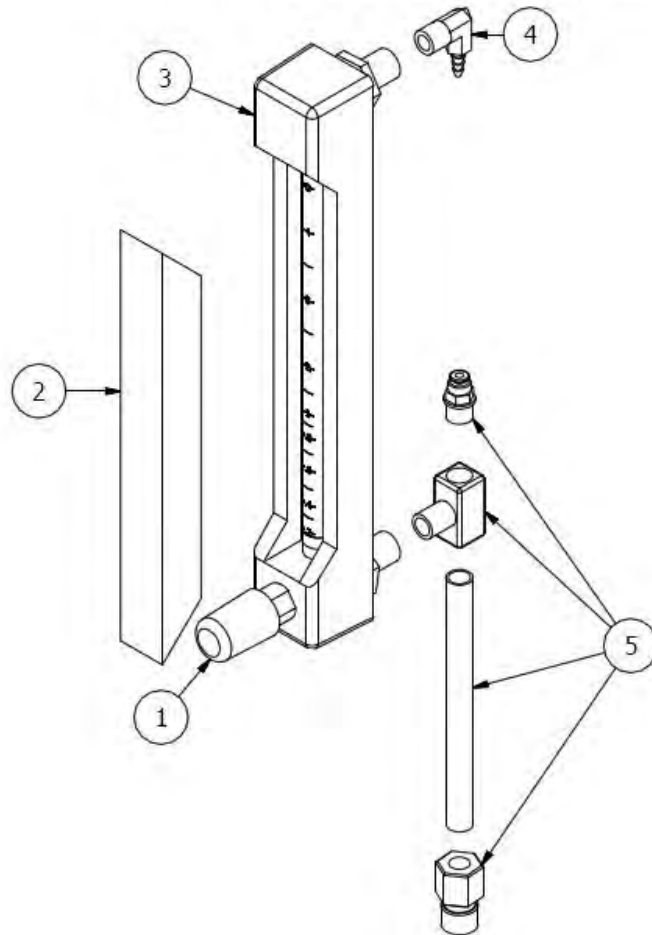
Figure 10-6 510-170A Back Panel Assembly



PARTS LIST		
ITEM	QTY	PART NUMBER
		510-100A Pole Assembly - Complete
1	1	510-705 Pole base
2	1	510-710 Pole
3	1	510-711 Pull Pin
4	5	510-715 Caster

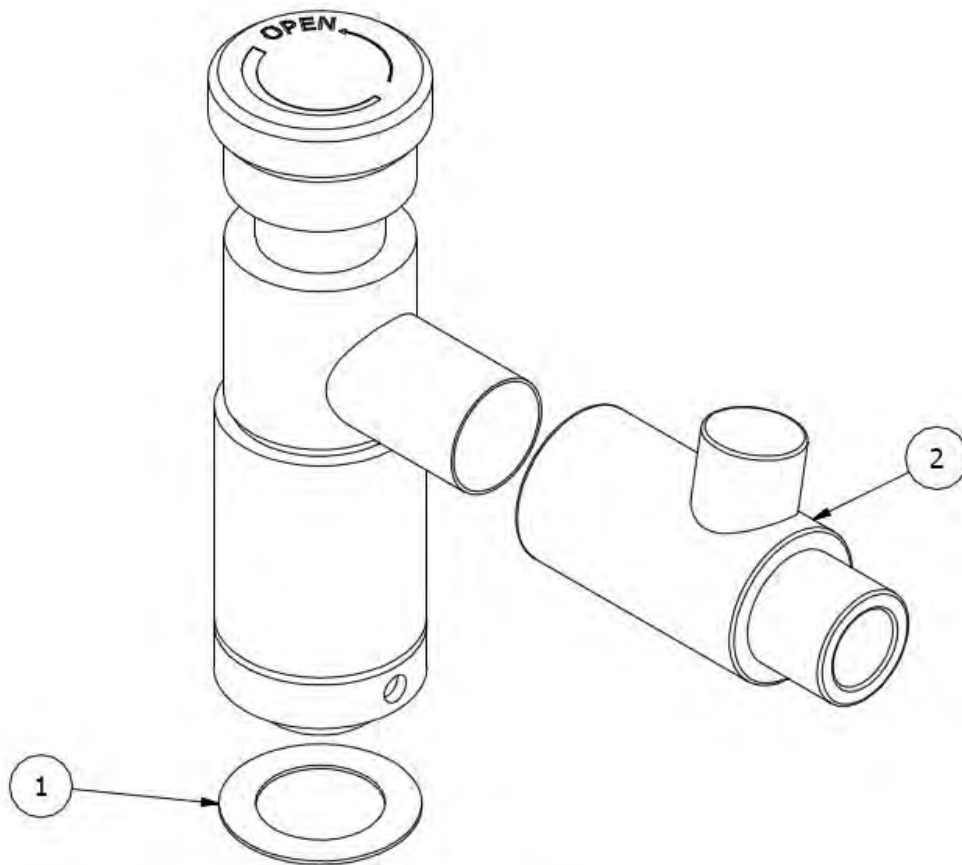
Figure 10-7 510-100A Pole Assembly

*(VSA, VDA, VWA Systems)



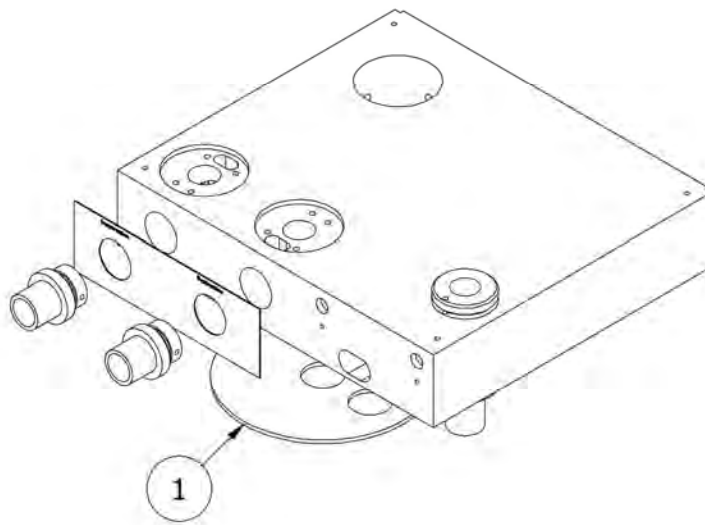
PARTS LIST		
ITEM	QTY	PART NUMBER
		510-175A Oxygen Flowmeter - Complete
1	1	510-520 Flow Control Valve
2	1	510-521 Flowmeter tube cover
3	1	510-510 Oxygen Flowmeter
4	1	510-131 7/16" hose to 1/8" male elbow
5	1	510-130A DISS Inlet Assembly

Figure 10-8 510-175A Oxygen Flowmeter Assembly



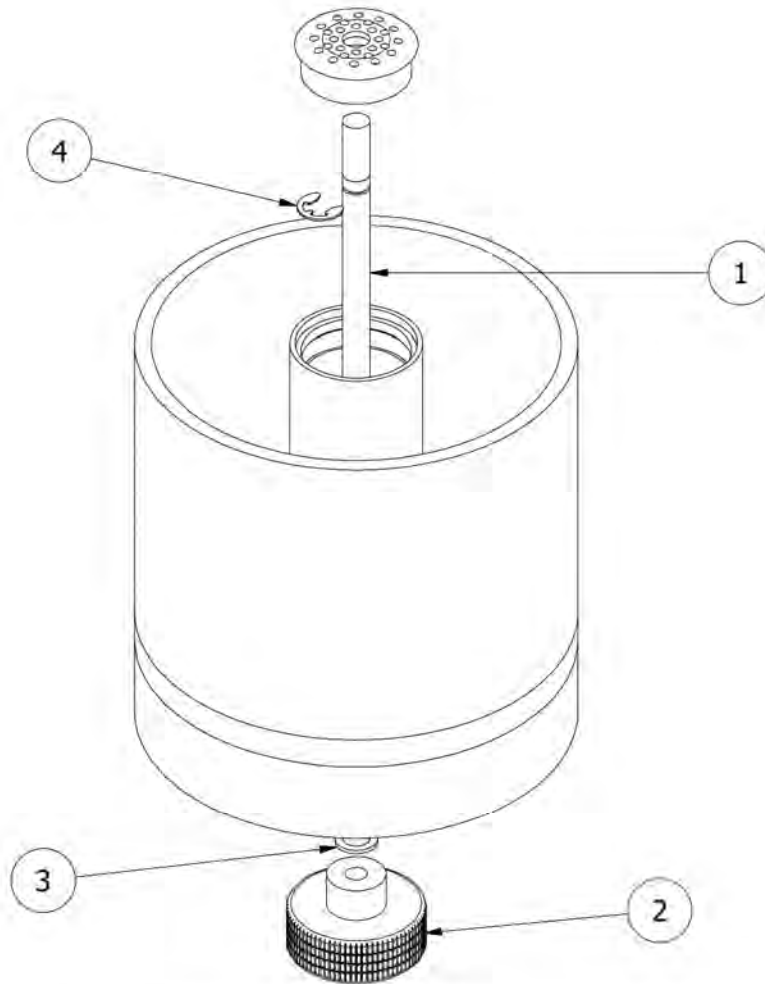
PARTS LIST		
ITEM	QTY	PART NUMBER
		510-570A APL Valve Assembly - Complete
1	1	510-569 APL Valve Gasket
2	1	510-572A Thumb Occlusion valve

Figure 10-9 510-570A APL / Pop-off Valve Assembly



PARTS LIST		
ITEM	QTY	PART NUMBER
		510-103A Manifold Block Assembly - Complete
1	1	510-245 Canister Gasket

Figure 10-10 510-103A Manifold Block Assembly



PARTS LIST		
ITEM	QTY	PART NUMBER
		510-101A Absorber Canister Assembly - Complete
1	1	510-920 Canister Rod
2	1	510-930 Canister Rod Knob
3	1	510-935 Canister Rod washer
4	1	510-940 E-clip

Figure 10-11 510-101A Absorber Canister Assembly

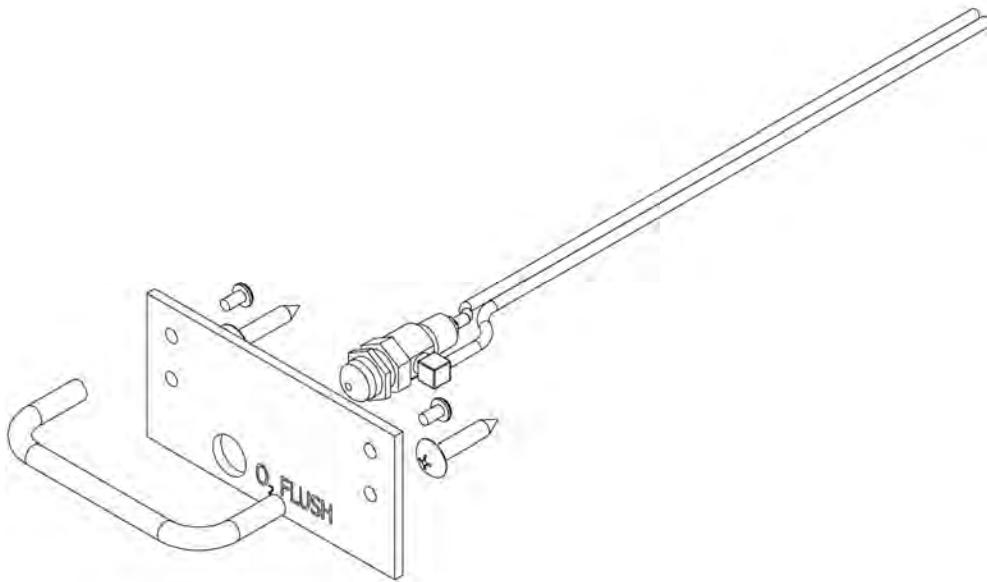
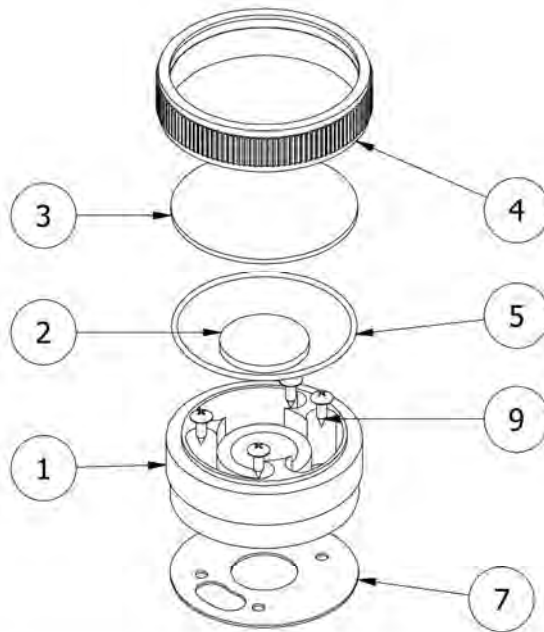
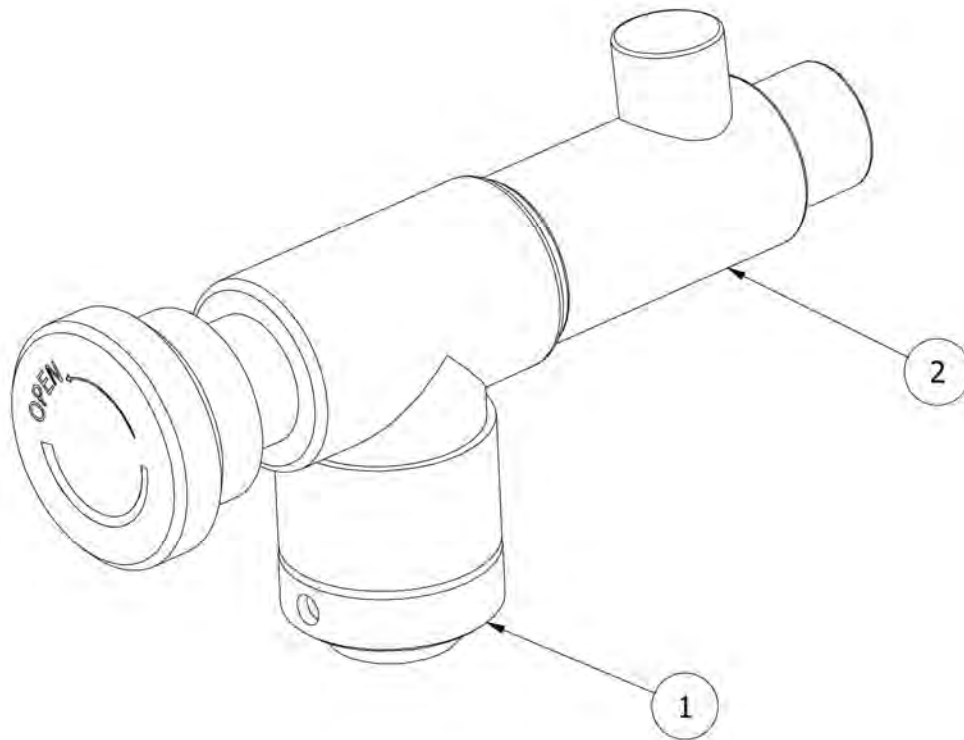


Figure 10-12 510-129A Flush Valve Assembly



PARTS LIST		
ITEM	QTY	PART NUMBER
		510-104A Inspiratory/Expiratory Valve Assembly - Complete
1	1	510-408 Valve Body
2	1	510-403 Valve Disc
3	1	510-750 Valve Cover
4	1	510-407 Valve Ring
5	1	510-405 Valve O-ring
7	1	510-401 Valve Bottom Gasket
9	4	ANSI B18.6.4 - No. 4 - 24 - 3/8

Figure 10-13 510-104A Inspiratory – Expiratory Valve Assembly



PARTS LIST		
ITEM	QTY	PART NUMBER
		510-571A Right Angle APL / Pop-off Valve Assembly
1	1	510-569 APL valve gasket
2	1	510-572A Thumb Occlusion valve

Figure 10-14 510-571A Right Angle APL / Pop-off Valve Assembly

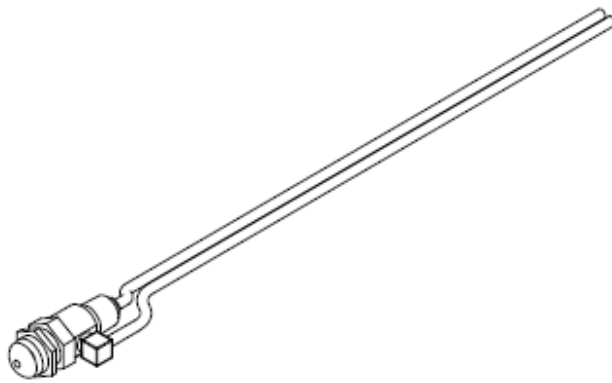
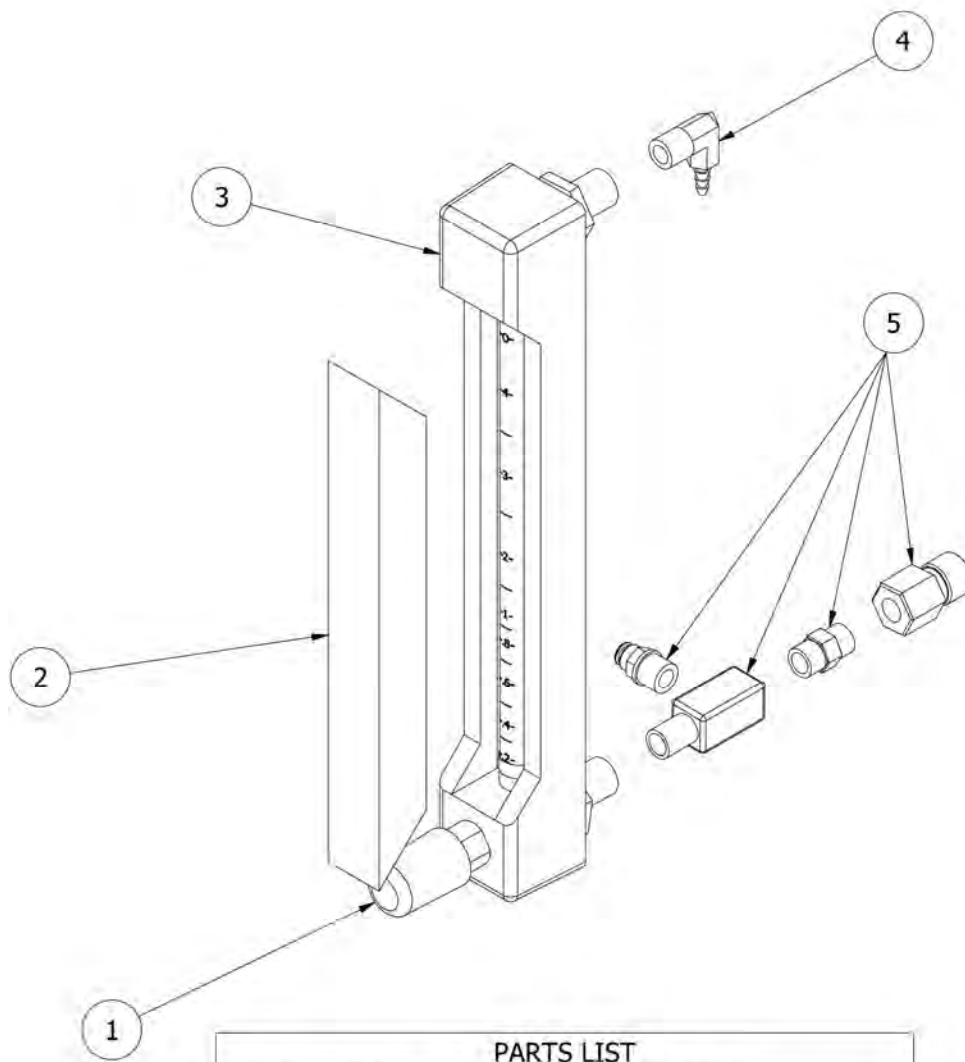
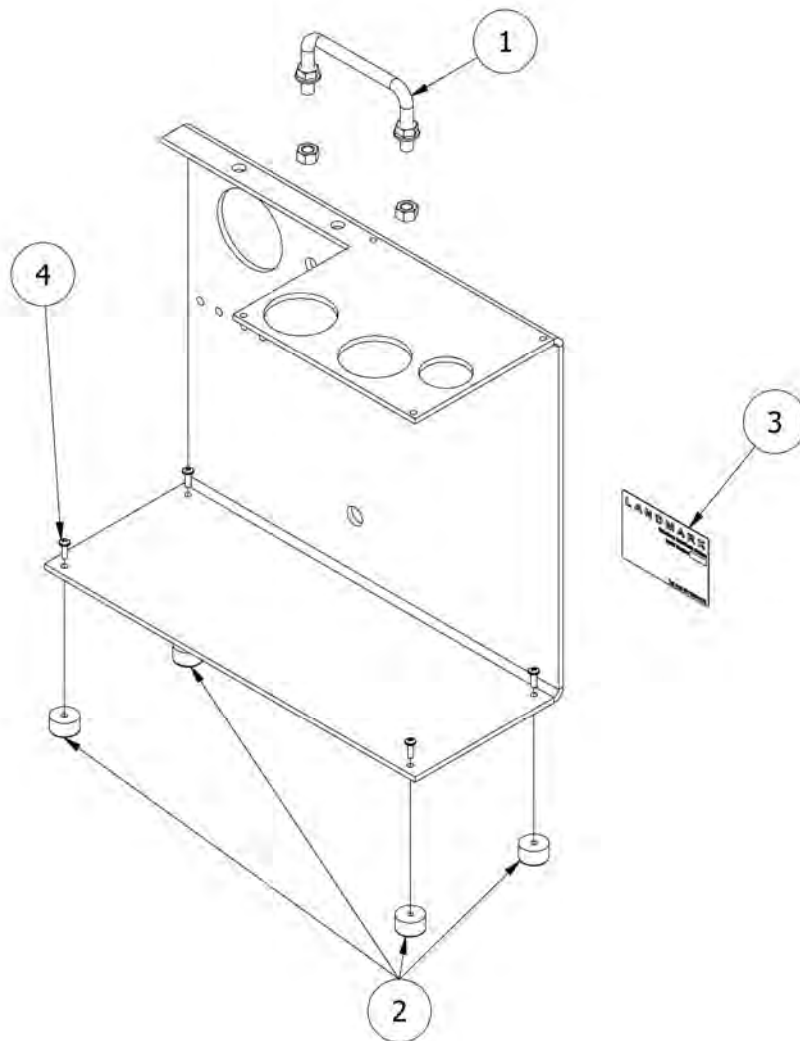


Figure 10-15 510-133A Tabletop Flush Valve Assembly



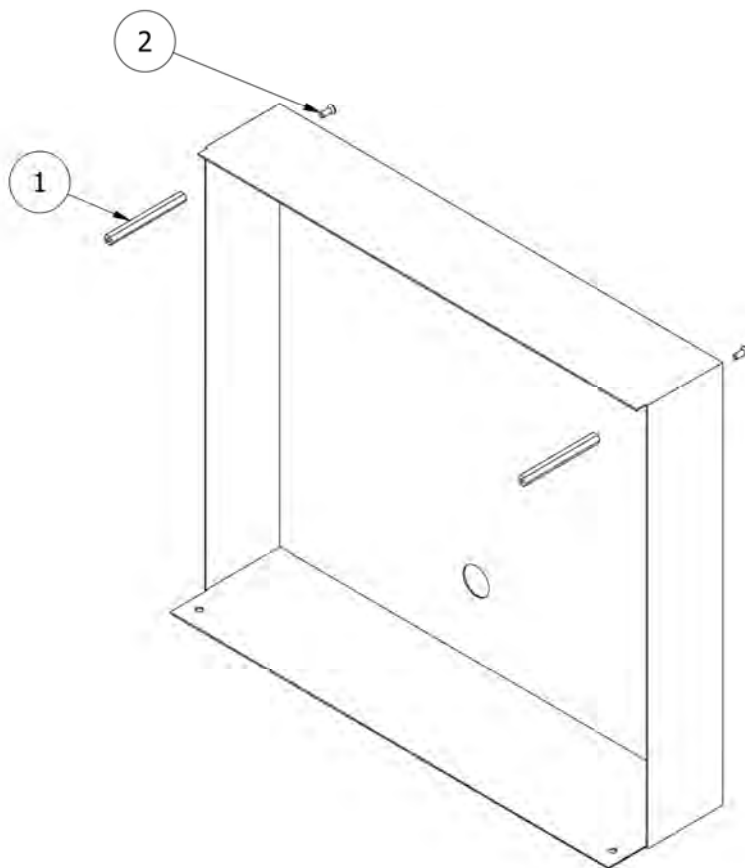
PARTS LIST		
ITEM	QTY	PART NUMBER
		510-176A Oxygen Flowmeter - Complete
1	1	510-520 Flow Control Valve
2	1	510-521 Flowmeter tube cover
3	1	510-510 Oxygen Flowmeter
4	1	510-131 7/16" hose to 1/8" male elbow
5	1	510-175A DISS Inlet Assembly

Figure 10-16 510-176A Oxygen Flowmeter Assembly – Table Top Only



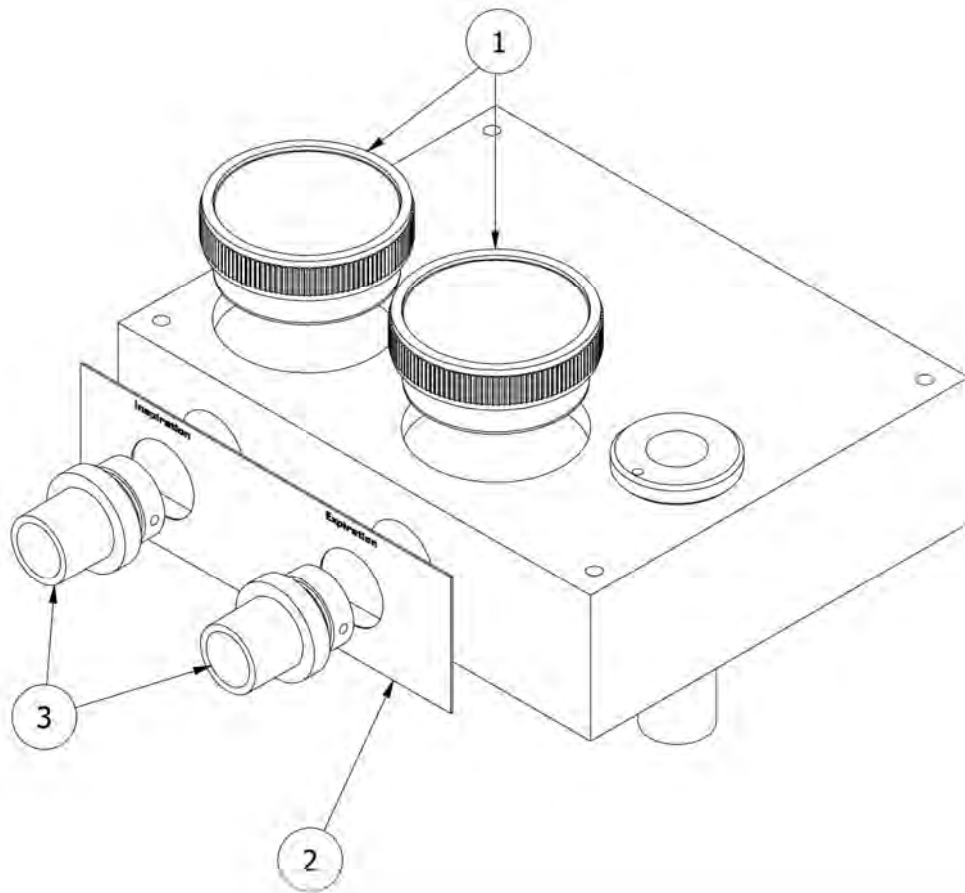
PARTS LIST		
ITEM	QTY	PART NUMBER
		710-102A Tabletop Frame Assembly
1	1	710-640 Handle Assembly
2	4	510-650 Rubber Feet
3	1	510-175 Serial Plate
4	4	510-180 #8 X 1/2" SS Screw

Figure 10-17 710-102A Tabletop Frame Assembly



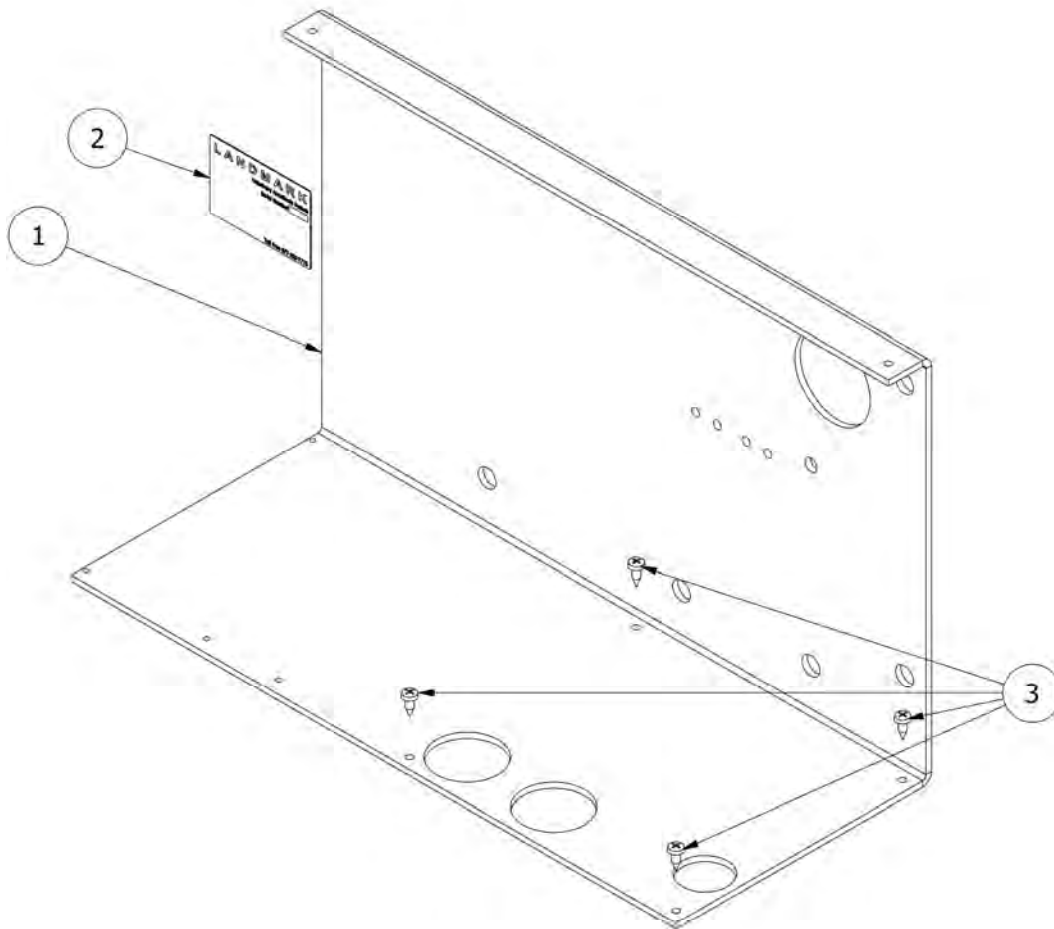
PARTS LIST		
ITEM	QTY	PART NUMBER
		710-103A Back cover
1	2	Stand offs
2	2	Screws

Figure 10-18 710-103A Table Top Back Cover Assembly



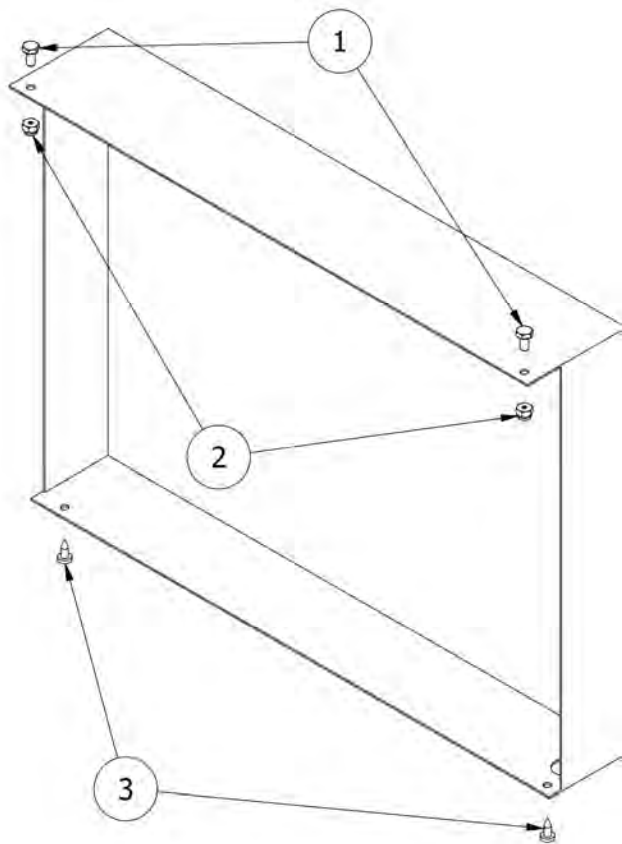
PARTS LIST		
ITEM	QTY	PART NUMBER
		710-100A Tabletop Manifold Block Assembly
1	2	510-104A Insp-Exp Valve Assembly
2	1	510-185 INSP EXP Port Label
3	2	510-216 INSP EXP Port

Figure 10-19 710-100A Tabletop Manifold Block Assembly



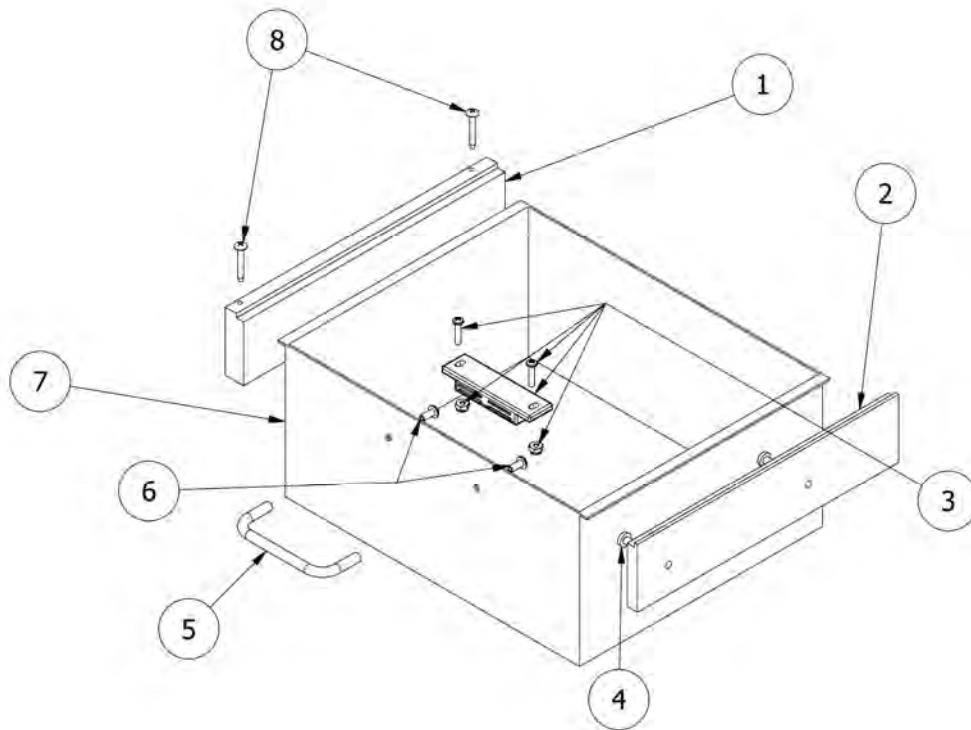
PARTS LIST		
ITEM	QTY	PART NUMBER
		610-101A VDA-4100 frame assembly
1	1	VDA-4100 frame
2	1	510-185 Serial Number Plate
3	4	510-180 Screw #10 X 1" SS Self tap

Figure 10-20 610-101A VDA-4100 Frame Assembly



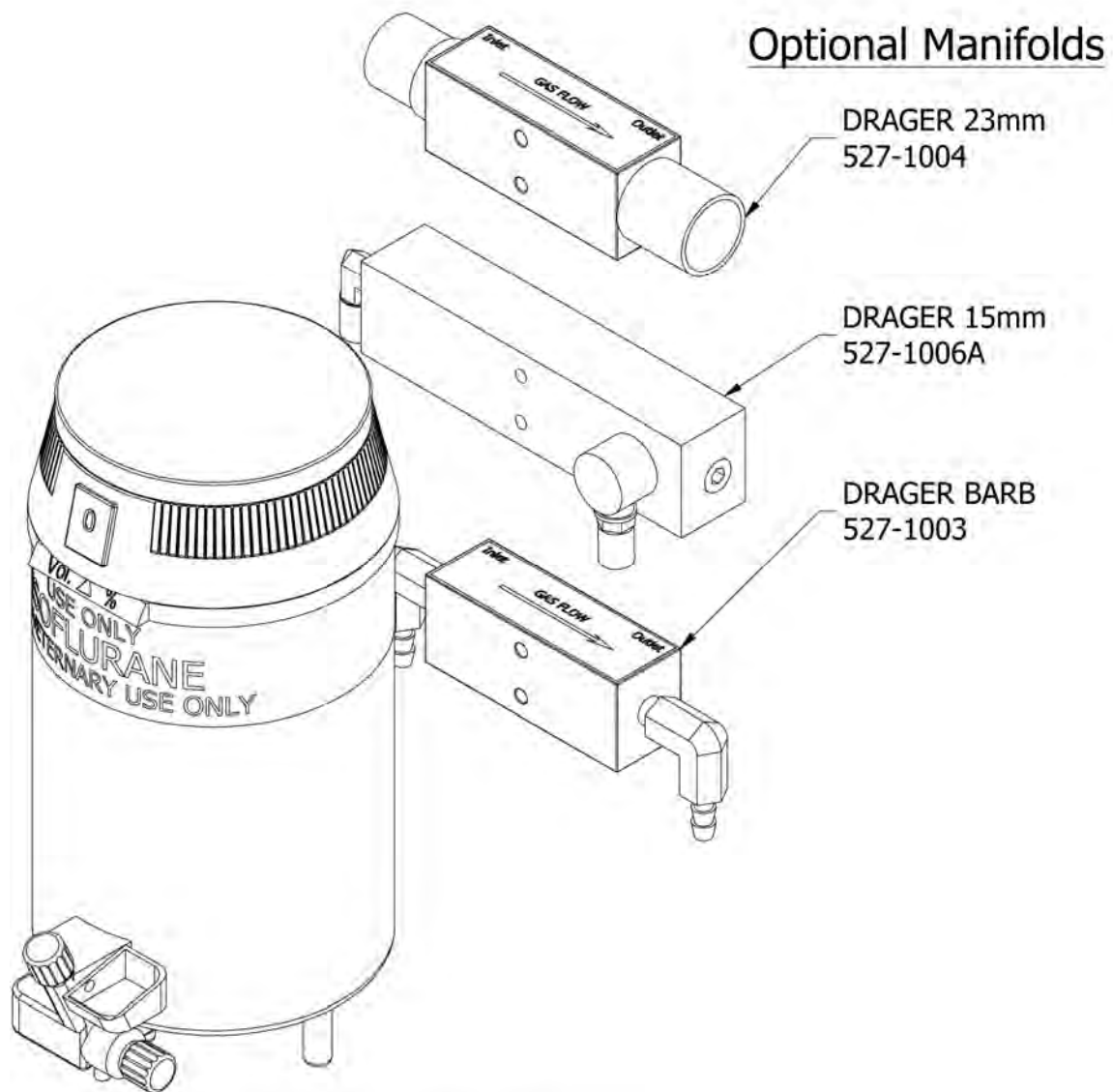
PARTS LIST		
ITEM	QTY	PART NUMBER
		610-100A Back Panel Assembly
1	2	510-615 #10-32 X 1/2" SS screw
2	2	510-620 #10-32 Hex Kep SS nut
3	2	510-610 #10 X 1/2" Self tap SS screw

Figure 10-21 610-100A VDA-4100 Back Panel Assembly



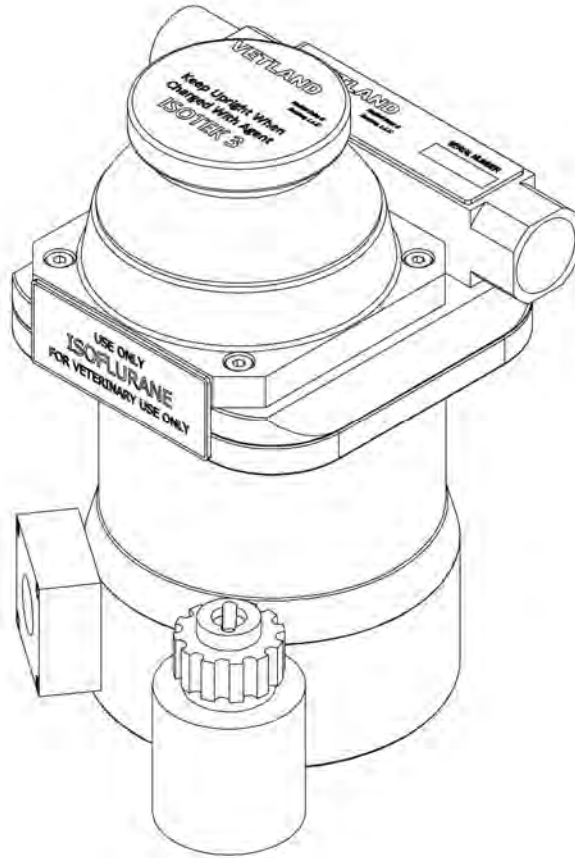
PARTS LIST		
ITEM	QTY	PART NUMBER
		510-606A Drawer Assembly - Complete
1	1	610-608 Drawer Slide Outer
2	1	610-609 Drawer Slide Inner
3	2	610-611 Magnet Assembly
4	2	510-610 Drawer Slide - Inner Screw #10 SS Self Tap
5	1	510-315 Handle
6	2	410-062 Handle Screws
7	1	610-606 Drawer, Finished
8	2	610-610 Slide - Outer Screw #6 X 1" SS Self Tap

Figure 10-22 510-606A Drawer Assembly



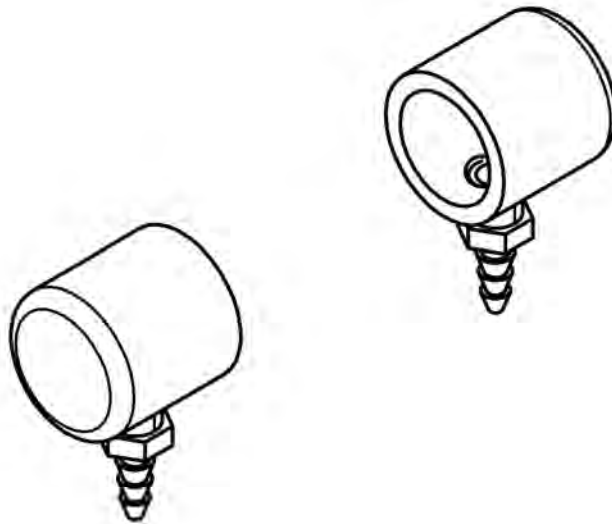
PARTS LIST	
PART #	DESCRIPTION
	Drager Vaporizer
521-11-22	Isoflurane - Funnel fill
521-11-32	Isoflurane - Key fill
521-31-22	Sevoflurane - Funnel fill
521-31-32	Sevoflurane - Key fill

Figure 10-23 Drager Vaporizer



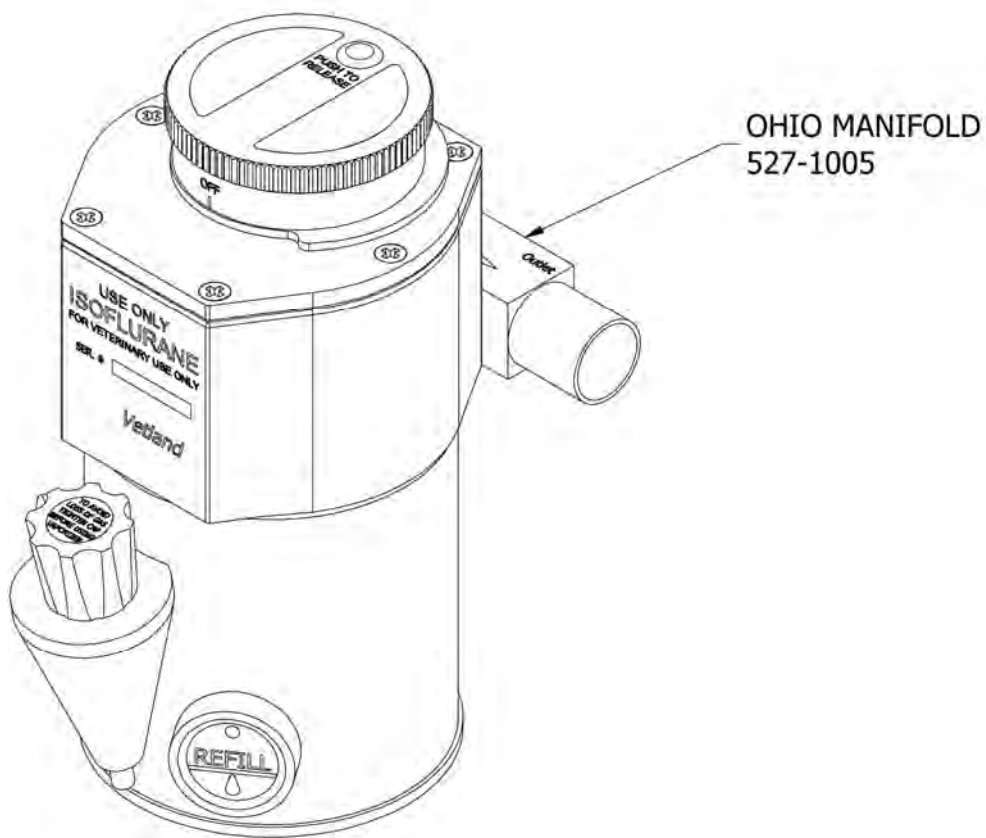
PARTS LIST	
PART #	DESCRIPTION
	Tec 3 Vaporizer
523-11-22	Isoflurane - Funnel fill
523-11-32	Isoflurane - Key fill
523-31-22	Sevoflurane - Funnel fill
523-31-32	Sevoflurane - Key fill

Figure 10-24 Tec3 Vaporizer



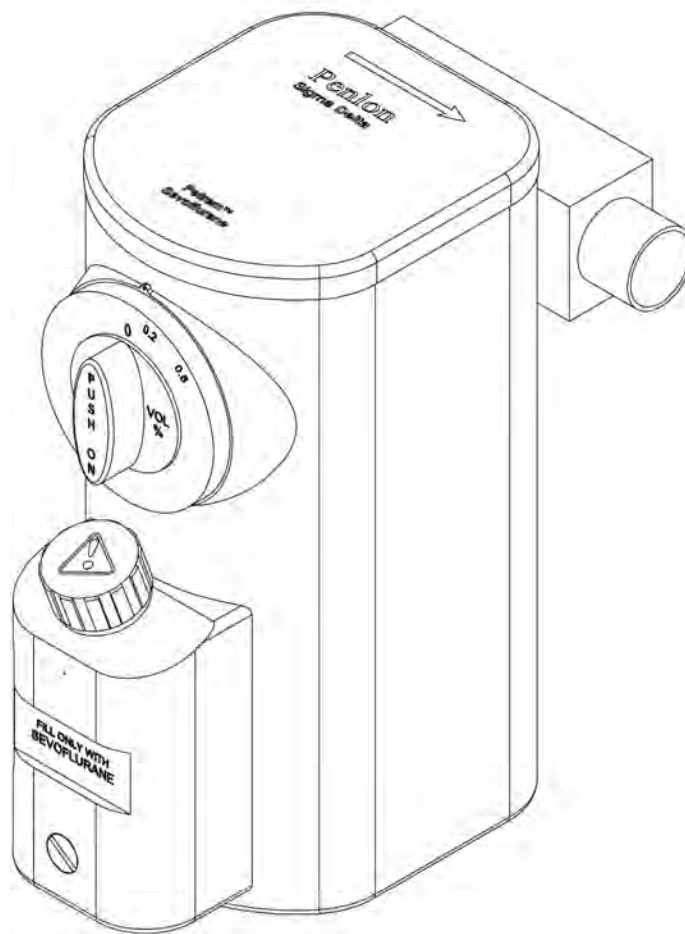
OPTIONS	
PART NUMBER	DESCRIPTION
527-1001P	Plastic 23mm Inlet Cap
527-1002P	Plastic 23mm Outlet Cap
527-1001M	Metal 23mm Inlet Cap
527-1002M	Metal 23mm Outlet Cap

Figure 10-25 23 Millimeter Outlet Caps



PARTS LIST	
PART #	DESCRIPTION
	Ohio Vaporizer
522-11-22	Isoflurane - Funnel fill
522-11-32	Isoflurane - Key fill
522-31-22	Sevoflurane - Funnel fill
522-31-32	Sevoflurane - Key fill

Figure 10-26 Ohio Vaporizer



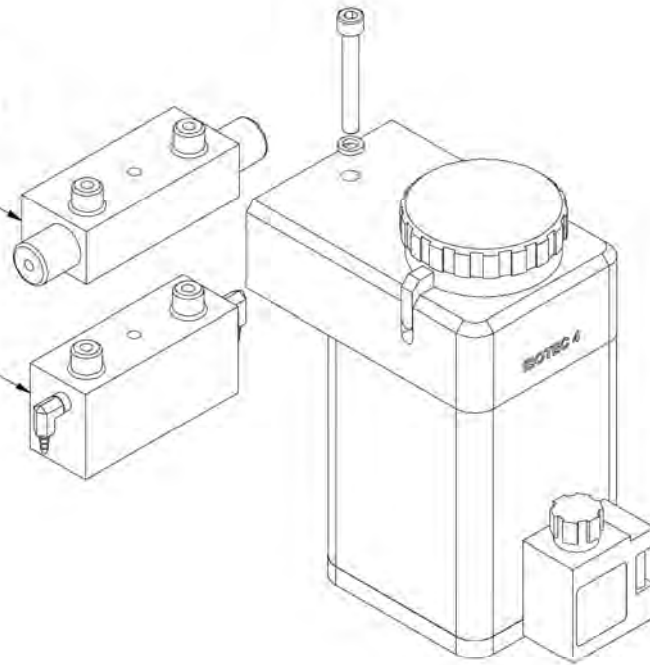
PARTS LIST	
PART #	DESCRIPTION
	Penlon Vaporizer
525-11-22	Isoflurane - Funnel fill
525-11-32	Isoflurane - Key fill
525-31-22	Sevoflurane - Funnel fill
525-31-32	Sevoflurane - Key fill

Figure 10-27 Penlon Vaporizer

Optional Mainfolds

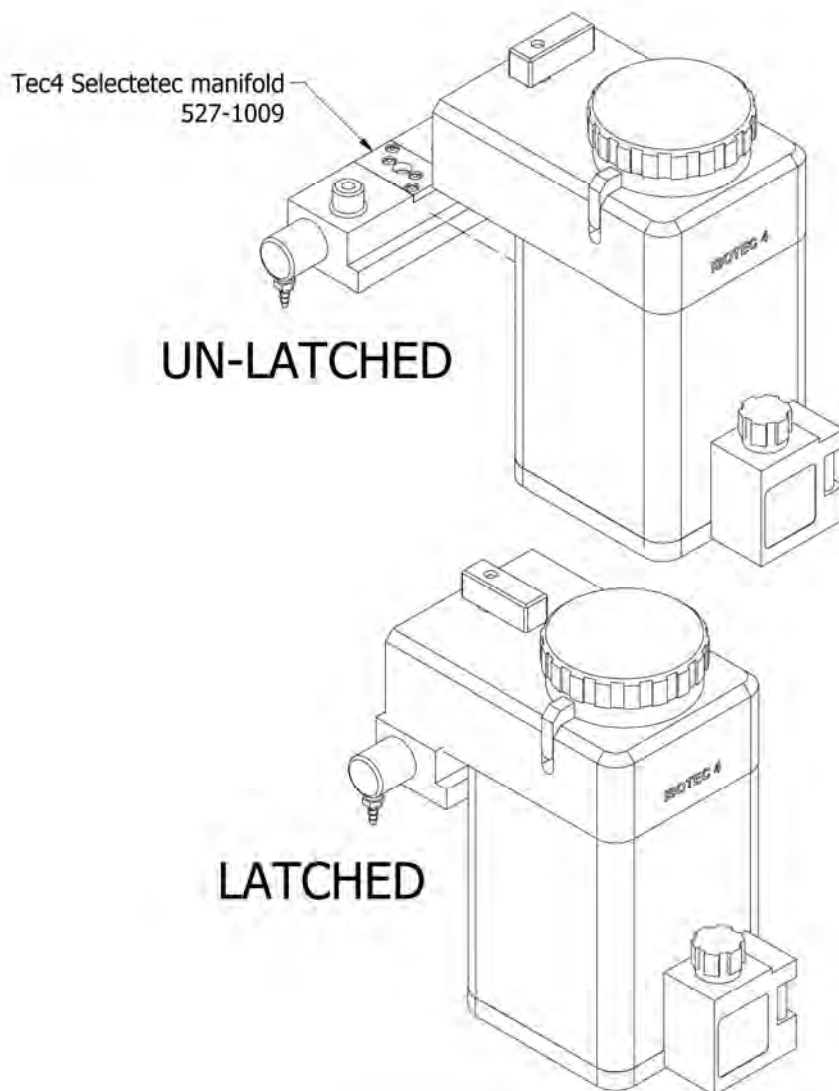
Tec4 23mm
527-1008

Tec4 - Barb
527-1007



PARTS LIST	
PART #	DESCRIPTION
	Tec4 Vaporizer
524-11-22	Isoflurane - Funnel fill
524-11-32	Isoflurane - Key fill
524-31-22	Sevoflurane - Funnel fill
524-31-32	Sevoflurane - Key fill

Figure 10-28 Tec4 Vaporizer – Bolt-on Type



PARTS LIST	
PART #	DESCRIPTION
	Tec4 Latch on Vaporizer
526-11-22	Isoflurane - Funnel fill
526-11-32	Isoflurane - Key fill
526-31-22	Sevoflurane - Funnel fill
526-31-32	Sevoflurane - Key fill

Figure 10-29 Tec 4 Vaporizer – Latching Type (1 of 2)

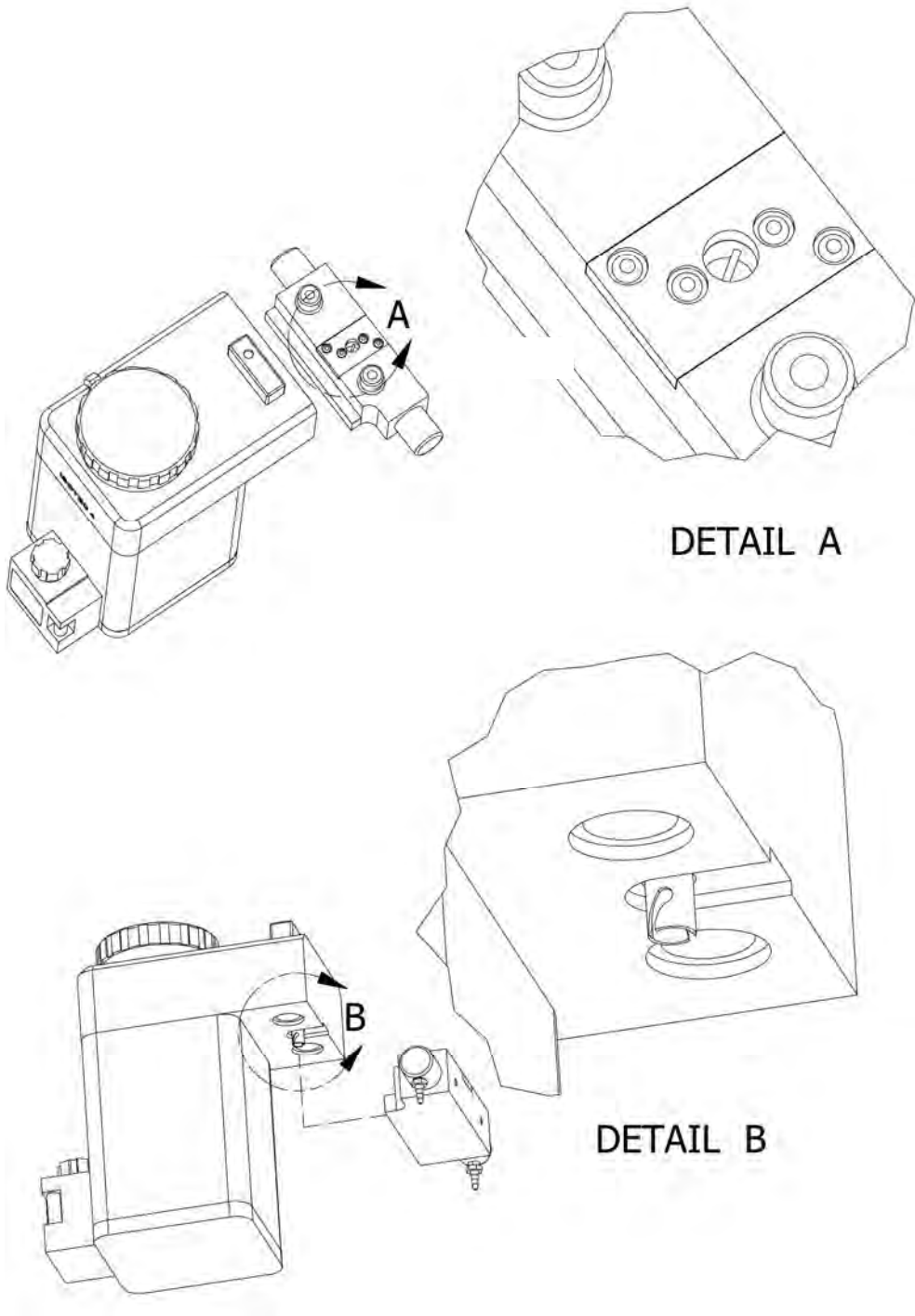


Figure 10-30 Tec 4 Vaporizer – Latching Type (2 of 2)



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