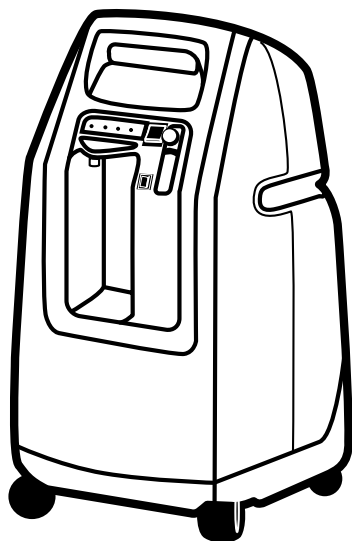


*DeVilbiss*<sup>®</sup> 5 Liter Oxygen Concentrator  
Models 505DZ, 505DS, 505CZ, & 505CS

*Service*

*Manual*



CAUTION-Federal (U.S.A.) law  
restricts this device to sale by or  
on the order of a physician.

 **SUNRISE  
MEDICAL**<sup>®</sup>

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## Introduction

This service manual was created for Sunrise Medical qualified service technicians to define the proper maintenance, service, and repair procedures on the DeVilbiss 5 Liter Oxygen Concentrator. For more in-depth classroom-type training, Sunrise Medical holds oxygen concentrator service schools. For service school information, contact the Service Department at 1-800-338-1988.

## IMPORTANT SAFEGUARDS

When using electrical products, especially when children are present, basic safety precautions should always be followed. Read all instructions before using. Important information is highlighted by these terms:

**DANGER** - urgent safety information for hazards that will cause serious injury or death.

**WARNING** - important safety information for hazards that might cause serious injury.

**CAUTION** - information for preventing damage to the product.

**NOTE** - information to which you should pay special attention.

## READ ALL INSTRUCTIONS BEFORE USING.

## Safety Precautions and General Warnings

- A. Federal (U.S.A.) law restricts this device to sale by or on the order of a physician.
- B. Oxygen promotes rapid burning. Do not smoke when using this unit or when near a person receiving oxygen therapy. Do not operate the oxygen concentrator within a minimum of five feet (1.5 meters) from hot, sparking, or burning objects or naked flames. Do not use in rooms heated by paraffin or portable gas heaters.
- C. Do not place a humidifier with an oxygen patient unless prescribed by a physician and then only a bubble-type humidifier should be used.
- D. Do not connect the oxygen concentrator to an electrical outlet controlled by a wall switch; the outlet should be independent of other appliances.
- E. Do not use an electrical adapter or extension cord with the oxygen concentrator.
- F. Only operate the oxygen concentrator with all filters in place; do not operate if the air filter is wet.
- G. Electric shock hazard. Do not remove cabinet. The cabinet may only be removed by a qualified Sunrise Medical homecare provider.
- H. Disconnect the power cord from the wall outlet before attempting repairs on the unit. Extra care should be taken if it is necessary to operate the unit with the cabinet removed.
- I. Do not use oils, greases, or any petroleum-based solvents/cleaners on or near the unit. Use only materials that are compatible with oxygen.
- J. When replacing the capacitor, do not touch the terminals or allow metal objects to come in contact with the terminals on the capacitor.
- K. Use only DeVilbiss concentrator replacement parts and accessories.
- L. Do not use regenerated sieve material.

## Theory of Operation

An oxygen concentrator is a device that delivers highly concentrated oxygen for therapeutic applications.

Room air is a mixture of 78% nitrogen, 21% oxygen, 1% argon and other gases. The concentrator draws in the air, separates the nitrogen from the oxygen, and allows delivery of the concentrated oxygen to the patient through the oxygen port.

# Operation/Installation

## DeVilbiss 5 Liter Oxygen Concentrator Operation

The DeVilbiss 5 Liter Oxygen Concentrator uses a pressure swing adsorption system. The air is drawn into the unit through the air filter and into a double-head compressor.

The compressed air passes through a four-way valve and is directed into one of two sieve beds. The sieve beds contain molecular sieve material which is a synthetically produced inorganic silicate. It is very porous and has the unique ability to selectively adsorb nitrogen from the air as it passes through the sieve bed.

As one bed is being pressurized, the other bed is quickly depressurized. This allows the nitrogen that was adsorbed during its pressurization cycle to be exhausted from the sieve material.

The nitrogen is released through an exhaust muffler located on the back of the manifold assembly. Also during each bed pressurization, a small amount of oxygen flows through an orifice located in the manifold into the depressurizing bed. This helps purge the nitrogen from the bed.

A purge valve will also open momentarily during each cycle change to allow high purity oxygen to flow into the bed that is just beginning its pressurization cycle. This helps to maintain the proper concentration levels, especially at high-flow rates. Once the purge valve closes, the nitrogen is exhausted from the sieve beds.

The beds will continue to be alternately pressurized and depressurized as the unit operates. This cycling process will vary in length depending on altitude and oxygen output flow rate. Refer to specifications.

Oxygen leaving the sieve beds is directed through a check valve to the accumulator tank. A pressure regulator on the tank controls the oxygen pressure as it leaves the accumulator and enters the flow meter. The flow meter allows the oxygen flow to be controlled and adjusted to the level prescribed by the patient's physician. From the flow meter, the oxygen passes through the final bacteria filter, check valve, and outlet port to the patient.

## Microprocessor-Controlled Pressure-Sensing System

The DeVilbiss 5 Liter Oxygen Concentrator operates on a microprocessor-controlled pressure-sensing system to cycle the unit. The cycling is controlled and monitored by the PC board. This is accomplished by use of a pressure transducer mounted on the PC board. The transducer is connected to the accumulator tank by 1/16" diameter tubing and allows the PC board to sense the oxygen pressure and cycle time at this point.

A cycle change takes place when the pressure in the accumulator tank reaches 25.5 PSI (175 kPa). The PC board will send 12-15 VDC to the four-way valve causing the valve to activate. At the same time, the green "4-way" indicator light on the PC board will illuminate.

With the four-way in the activated position, compressed air is directed to the left sieve bed. When the PC board senses 25.5 PSI (175 kPa) in the oxygen accumulator tank, the PC board removes the 12-15 VDC from the four-way. This causes the four-way to deactivate or go to the "rest" position and compressed air is then directed to the right sieve bed. The green "4-way" indicator light on the PC board is not illuminated when the voltage is removed from the valve.

This cycling process is repeated every time the PC board senses 25.5 PSI (175 kPa) in the oxygen accumulator tank.

The PC board also activates the alarm system whenever it senses a low or high pressure condition or when the cycle time has exceeded its preset minimum or maximum limits. The alarm system will also activate in the case of a power failure and electrical or pneumatic component failure.

## OSD Option

The DeVilbiss 5 Liter Oxygen Concentrator with the optional OSD (oxygen sensing device) monitors the concentration of oxygen leaving the accumulator tank. There are two additional indicator lights on the front panel.

- Normal Oxygen (green light) - oxygen purity normal
- Low Oxygen (yellow light) - oxygen purity low - requires servicing

**NOTE** – If the oxygen purity continues to fall, an intermittent audible signal will also sound.

**NOTE** – Refer to specifications for specific alarm settings.

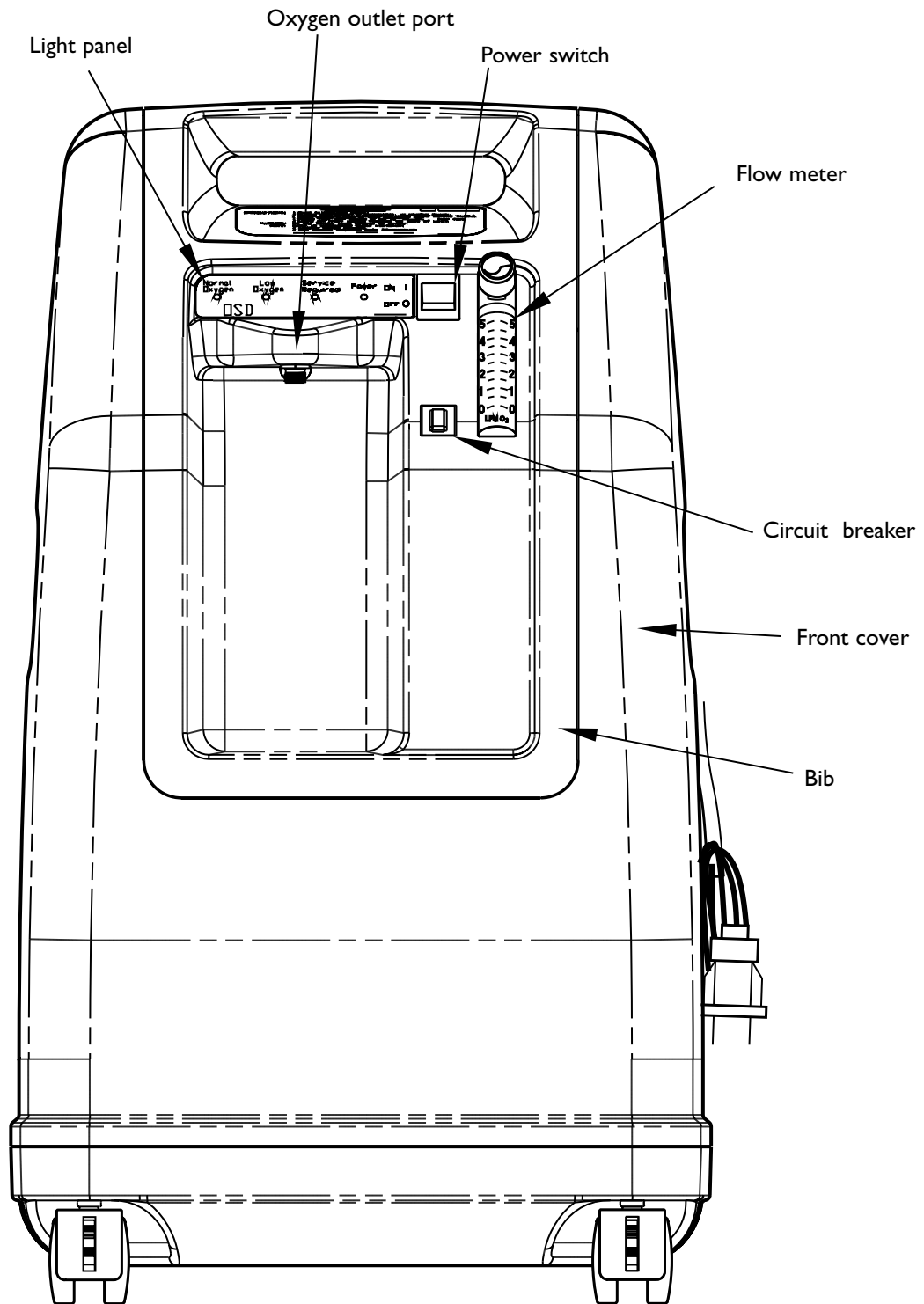
### DeVilbiss 5 Liter Overview

This service manual was designed to supply homecare providers with the proper maintenance, service, and safety procedures for the DeVilbiss 5 Liter Oxygen Concentrator. Read and understand all the information contained in this service manual before attempting to operate or perform any maintenance on the concentrator.

**NOTE** – Sunrise Medical reserves the right to alter or change the design of the DeVilbiss Oxygen Concentrator series. Hence, slight differences in construction or components may exist than what is described herein.

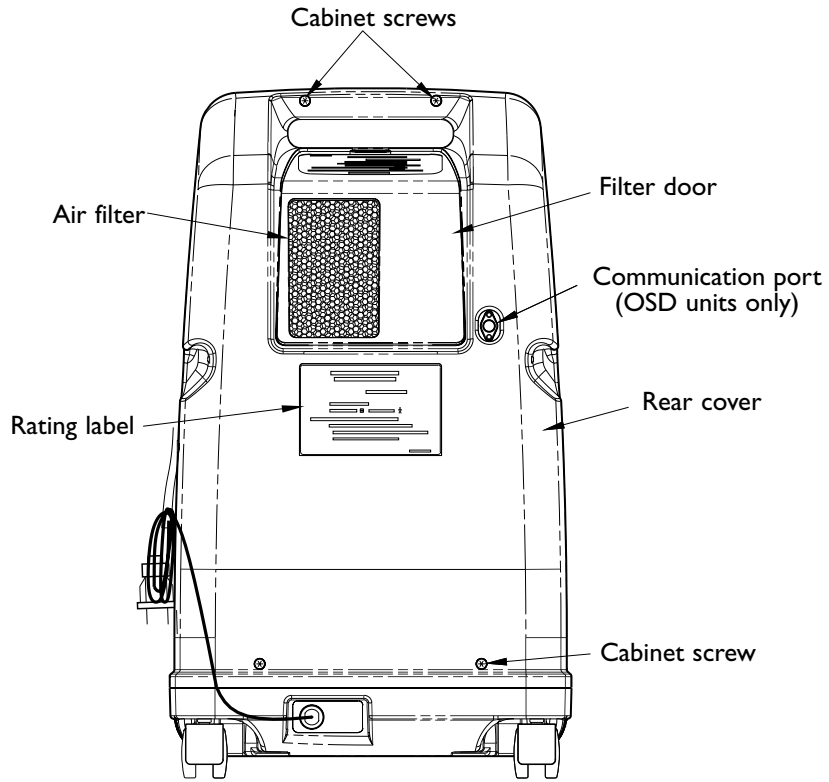
# OPERATION/INSTALLATION

The following figures will help familiarize you with the exterior of the DeVilbiss 5 Liter Oxygen Concentrator.



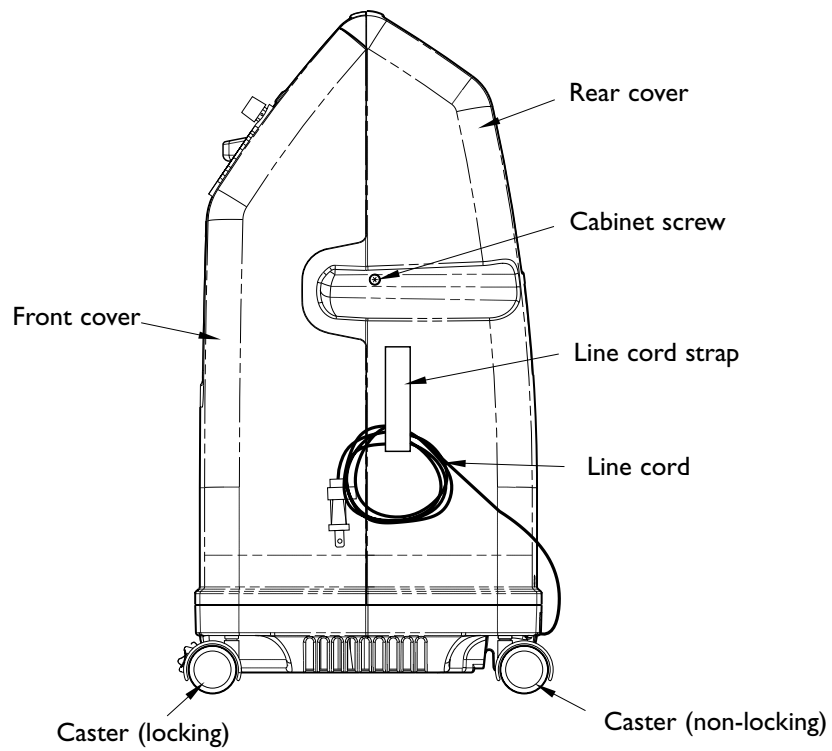
**Exterior Front View**

**Figure 1**



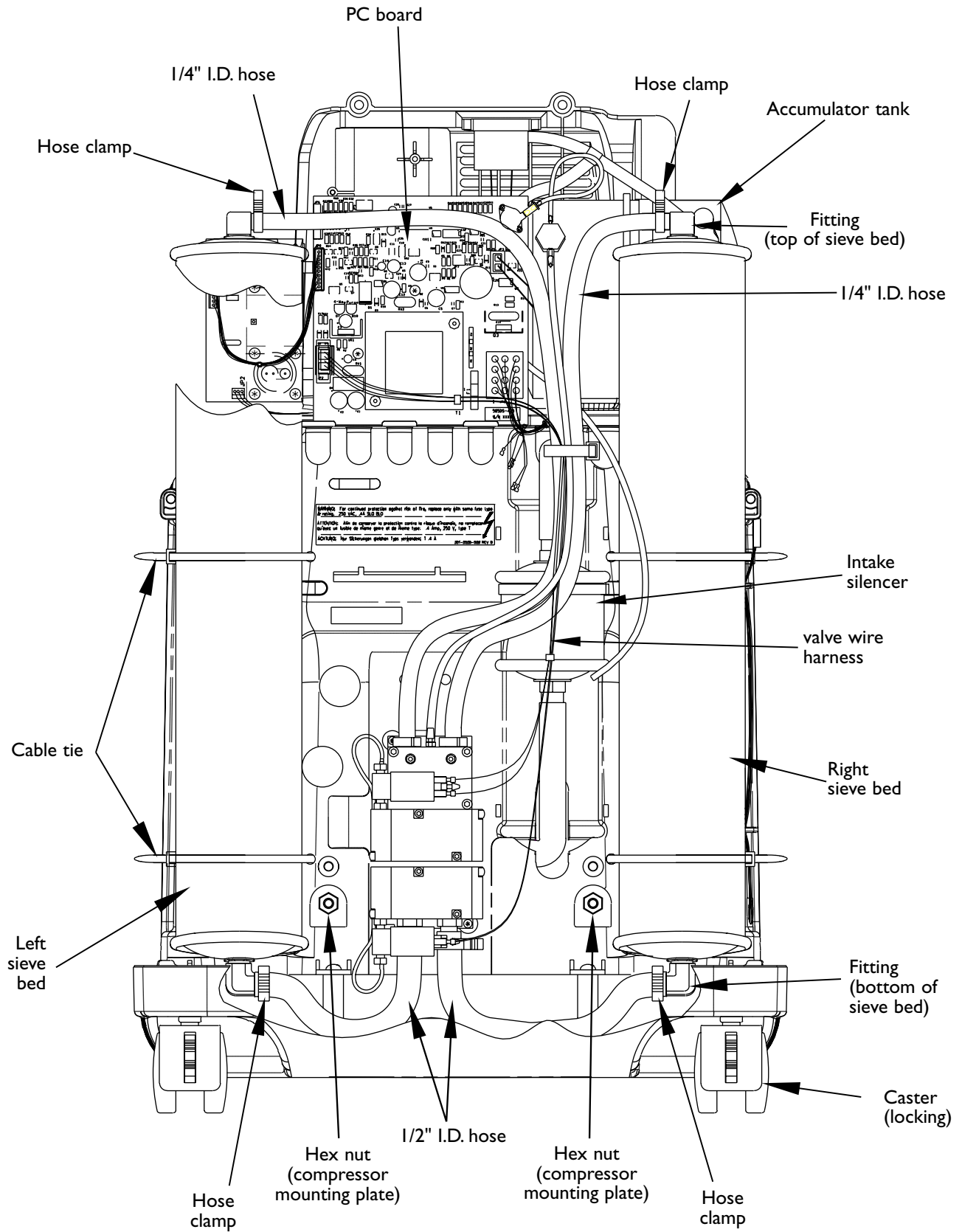
Exterior Back View

Figure 2



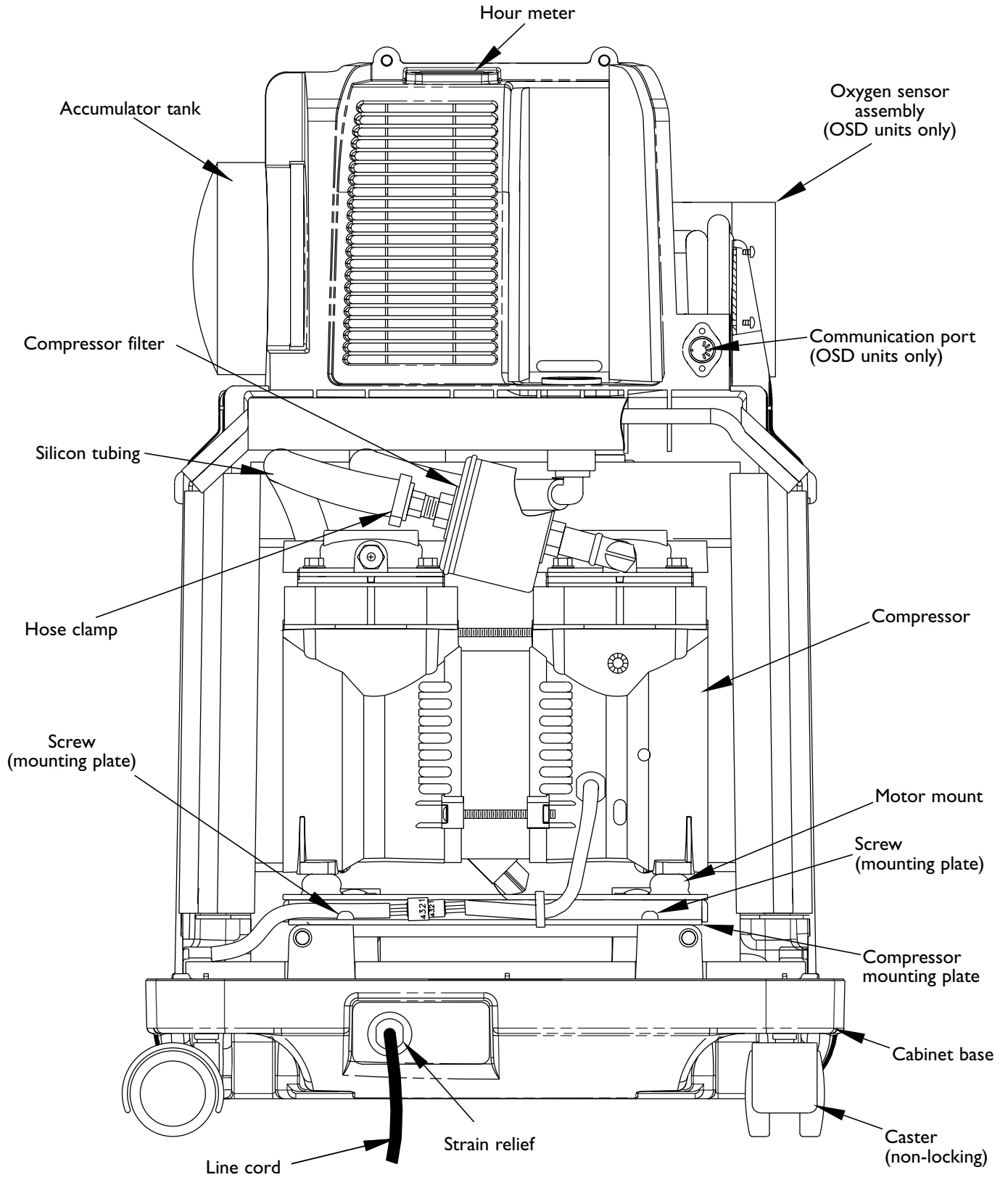
Exterior Side View

Figure 3



Interior Front View

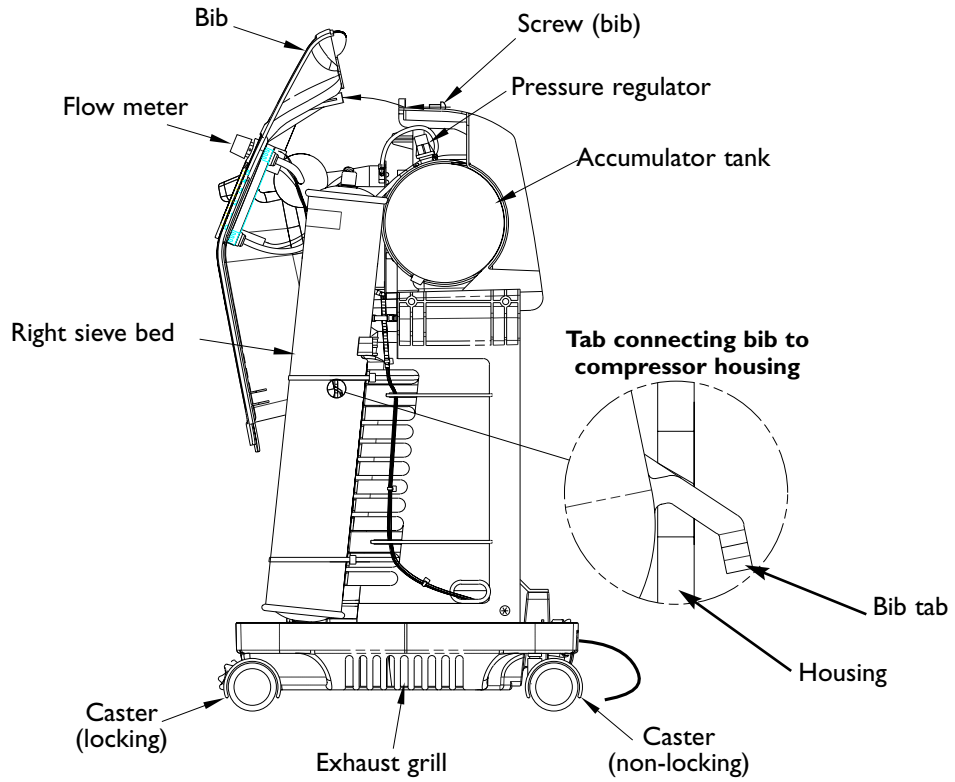
Figure 4



Interior Back View

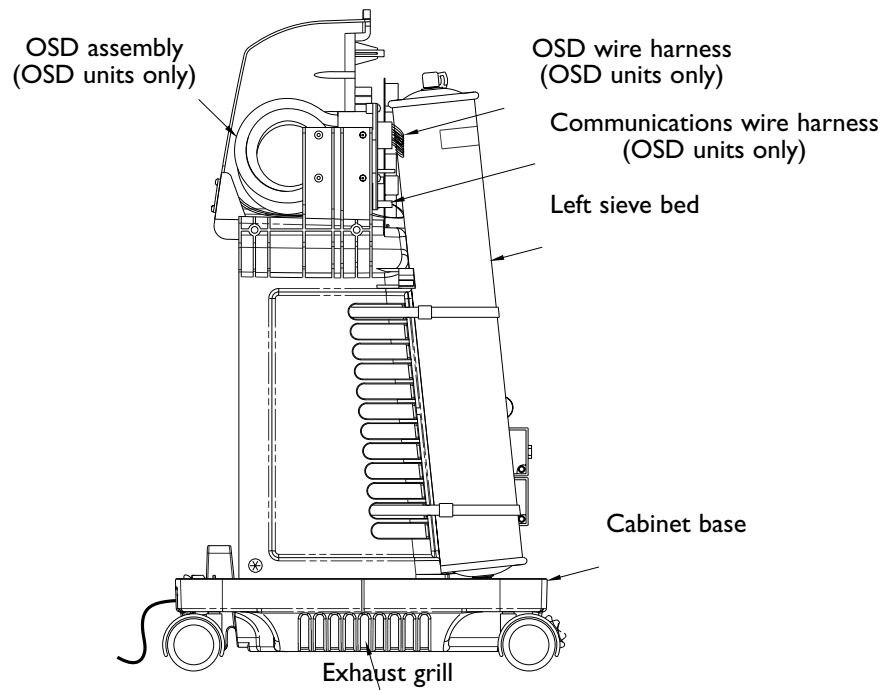
Figure 5





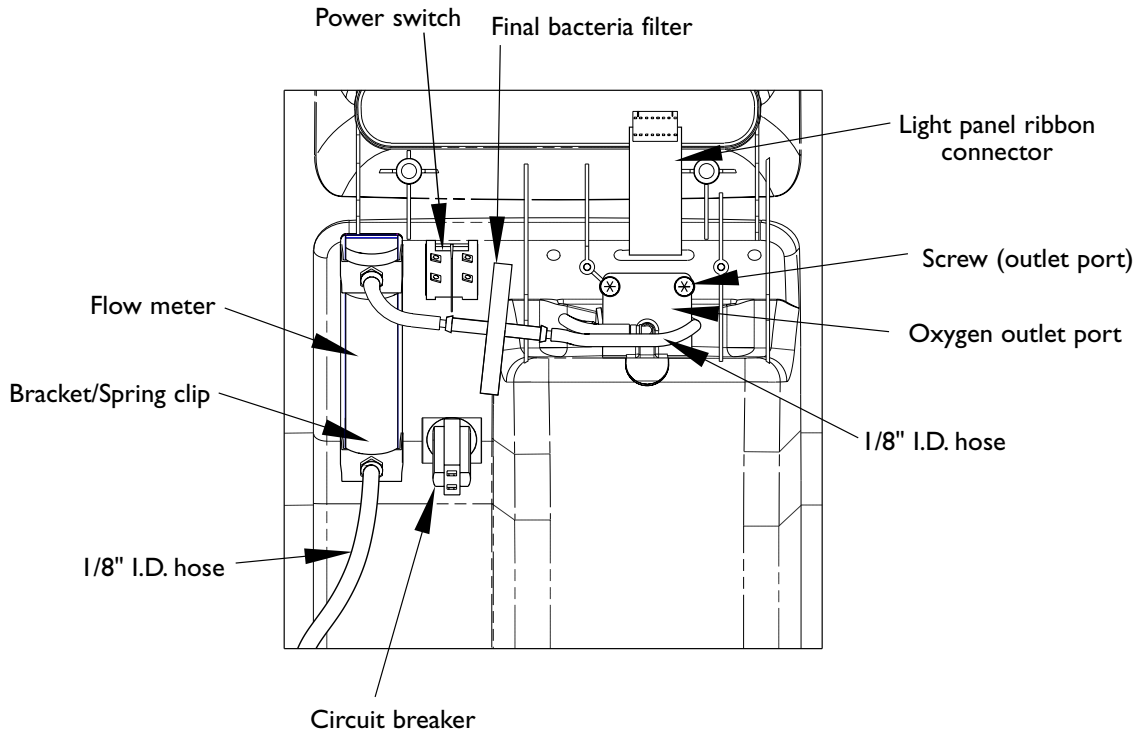
Interior Right Side View

Figure 6



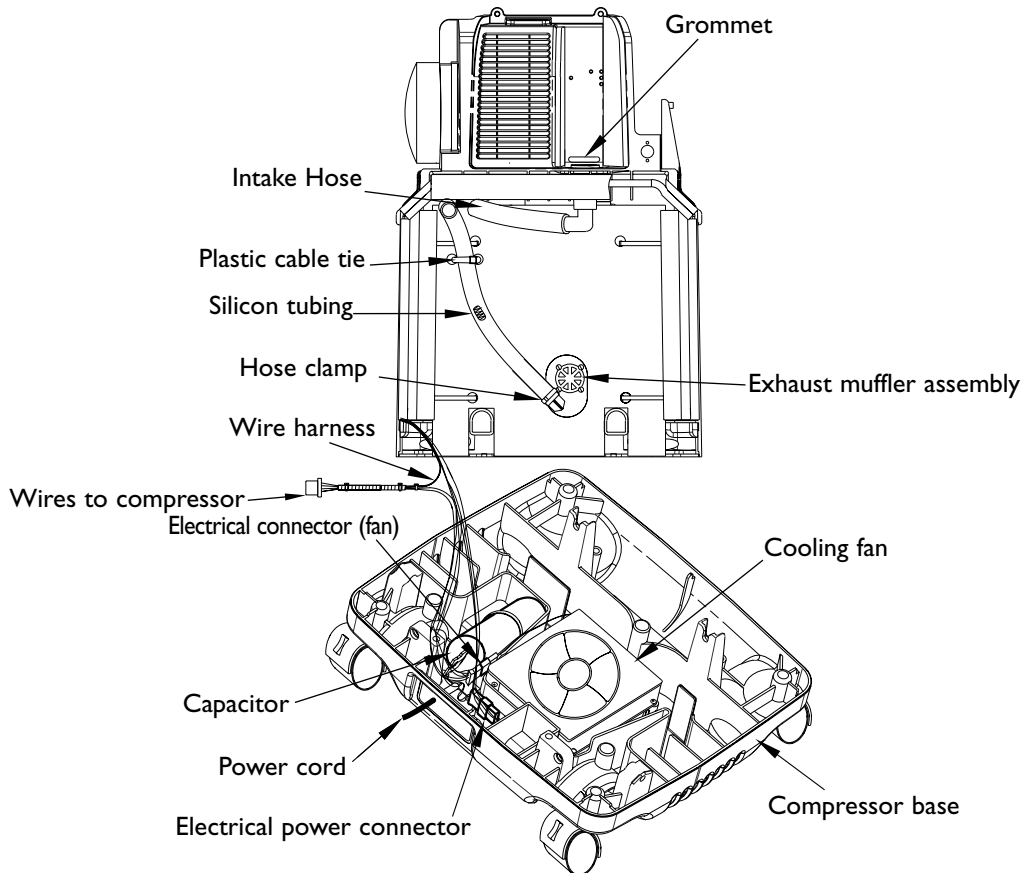
Interior Left Side View

Figure 7



**Behind Bib**

**Figure 8**



**Compressor Housing Area & Bib**

**Figure 9**

## Operating the DeVilbiss 5 Liter Oxygen Concentrator

1. Remove the power cord completely from the strap. Make sure the power switch is in the "Off" position.
2. Insert the plug into an electrical outlet. The DeVilbiss 5 Liter Oxygen Concentrator has a two-prong polarized plug and is double-insulated to protect against electric shock.

**NOTE** – The plug on the DeVilbiss 5 Liter Oxygen Concentrator has one blade wider than the other. To reduce the risk of electric shock, this plug is intended to fit in a wall outlet only one way. Do not attempt to defeat this safety feature.

**CAUTION** – Improper use of the power cord and plugs can cause a burn, fire, or other electric shock hazards. Do not use the unit if the power cord is damaged.

**⚠ WARNING** – Oxygen promotes rapid burning. Do not smoke when using this unit or when near a person receiving oxygen therapy. Do not operate the oxygen concentrator within a minimum of five feet (1.5 meters) from hot, sparking, or burning objects or naked flames. Do not use in rooms heated by paraffin or portable gas heaters.

3. Press the power switch to the "On" position. When the unit is turned on, the "Service Required" light will illuminate and audible signal will sound (the patient alert system) momentarily. The "Power" light also illuminates.

### Only DeVilbiss Concentrators with OSD

The OSD is an optional device within DeVilbiss concentrators that monitors the oxygen produced by the unit. The OSD operates as follows:

- Normal Oxygen (green light) - oxygen purity normal
- Low Oxygen (yellow light) - oxygen purity low (requires servicing).

**NOTE** – If the oxygen purity continues to fall, an audible signal will sound intermittently. Refer to specifications for alarm settings.

When the unit with the OSD is turned "On," all four indicator lights (Power, Service Required, Low Oxygen, and Normal Oxygen) on the front panel will briefly illuminate. After a few seconds, only the "Power" and "Normal Oxygen" lights will remain on.

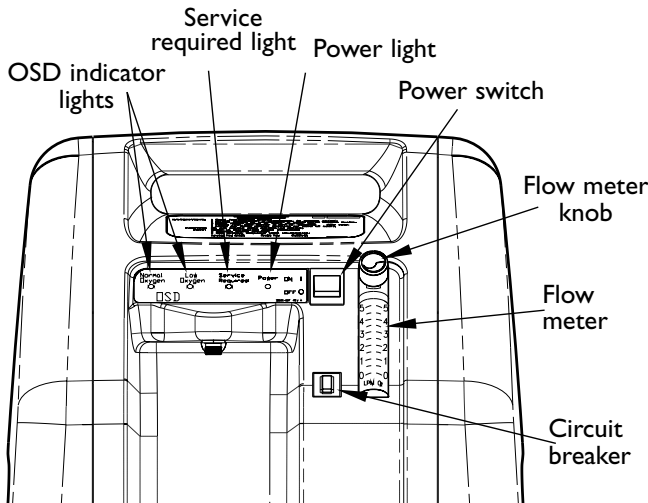


Figure 10

For the first fifteen minutes of operation, the green "Normal Oxygen" light will remain illuminated during the oxygen stabilization process. After that time, the OSD will begin monitoring the oxygen twice every second.

**NOTE** – If the "Service Required" light illuminates and the audible signal alarms during operation, the unit will automatically shut off. Turn the power switch "Off." Then turn the unit "On" again. If the "Service Required" light remains on, refer to the Troubleshooting Chart.

4. Slowly turn the flow meter knob until the flow meter ball is centered on the line next to the appropriate flow rate.

**NOTE** – When the flow meter knob is turned clockwise, the flow decreases (and eventually will shut off the oxygen flow). When the knob is turned counterclockwise, the flow increases.

**NOTE** – If the flow meter is turned to approximately 0 LPM, it may activate the Restricted Flow Alarm. The unit will continue to run, however an intermittent audible and visible alarm may be activated.

**NOTE** – Use a low output flow meter (part #515LF-607) for flow rates under 1 LPM.

**NOTE** – The unit may require up to 20 minutes for the oxygen concentration and flow rate to stabilize. The flow rate should be monitored and readjusted if necessary.

5. The flow meter has a locking device. If it is necessary to preset and lock in the prescribed flow rate, tighten the hex screw located on the hex nut just below the control knob using a 1/16" Allen bit. No adjustment can be made without loosening the hex screw.
6. The DeVilbiss 5 Liter Oxygen Concentrator is now ready for use.

## Performing Initial Inspection

It is suggested that an initial inspection be performed upon receiving the oxygen concentrator.

1. After removing the oxygen concentrator from the carton, examine it for any external damage. If shipping damage has occurred, contact the Sunrise Medical Shipping/Traffic Department at 1-800-338-1988 for specific instructions.
2. Record the number of hours on the hour meter.
3. Check to be sure the extended life filter and the air filter are in place.
4. Plug the unit into an electrical outlet, turn the unit "On," and check the audible and visible alarms.
5. Set the flow meter at 5 LPM and let the unit run for at least 20 minutes.
6. Using SMART Track or an oxygen analyzer, check the concentration at 5 LPM.
7. Using SMART Track or a stop watch, check the cycle time for bed 1 and bed 2 at 5 LPM.

**NOTE**—If the unit fails to operate properly (i.e., oxygen concentration or cycle times are not within specification) or if internal damage is found, contact the Sunrise Medical Service Department at 1-800-338-1988.

### Suggested Patient Setup

1. Position the unit near an electrical outlet in the room where the patient spends most of his or her time.

**NOTE** – Do not connect to an electrical outlet controlled by a wall switch. The outlet should be independent of other appliances.

2. Locate the unit a minimum of five feet (1.5 meters) from fireplaces, radiators, heaters, and hot-air registers.
3. Position the unit at least 6 inches (15 centimeters) from walls, draperies, or any other objects that might prevent the proper flow of air in and out of the oxygen concentrator.

**⚠ WARNING—Oxygen promotes rapid burning. Do not smoke when using this unit or when near a person receiving oxygen therapy. Do not operate the oxygen concentrator within a minimum of five feet (1.5 meters) from hot, sparking, or burning objects or naked flames. Do not use in rooms heated by paraffin or portable gas heaters.**

**⚠ WARNING—Electric Shock Hazard. Only qualified Sunrise Medical homecare providers may remove the cabinet.**

4. Attach the appropriate oxygen accessories (oxygen tubing or humidifier) to the oxygen outlet.

**NOTE** – A maximum of 50 feet (15 meters) of tubing (plus 3 feet (1 meter) cannula) is allowed between the concentrator and the patient.

#### Oxygen Tubing Only Connection (Figure 11):

- a) Thread the cannula fitting (part #CN100 or CN200) onto the oxygen outlet port.
- b) Attach the cannula oxygen tubing (part #OST07, OST15, OST25, or OST50).

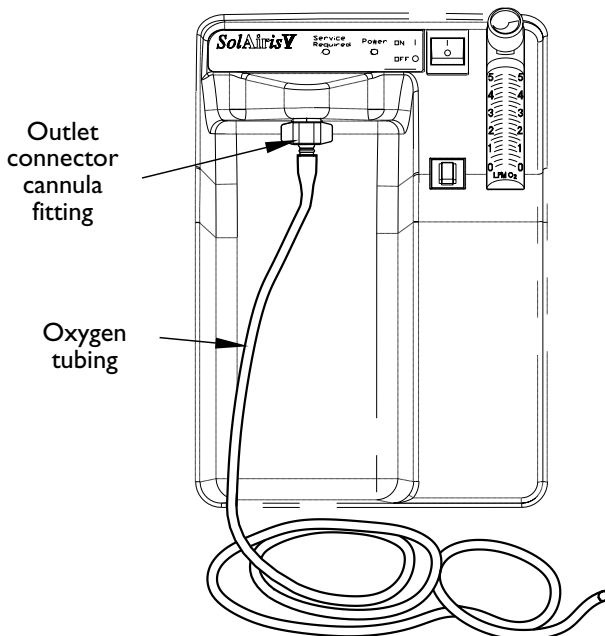


Figure 11

#### Oxygen Tubing With Humidification Connection (Figure 12):

If the physician has prescribed an oxygen humidifier as part of the patient's therapy, follow these steps:

- a) Fill the humidifier bottle (part #HUM16) with distilled water. Do not overfill. (If using a prefill, go to letter c.)
- b) Thread the wing nut located on the top of the humidifier bottle to the oxygen outlet so that it is suspended. Make sure it is securely tightened.
- c) Attach the oxygen tubing (part #OST07, OST15, OST25, or OST50), not to exceed 50 feet (15 meters), directly to the humidifier bottle outlet fitting.

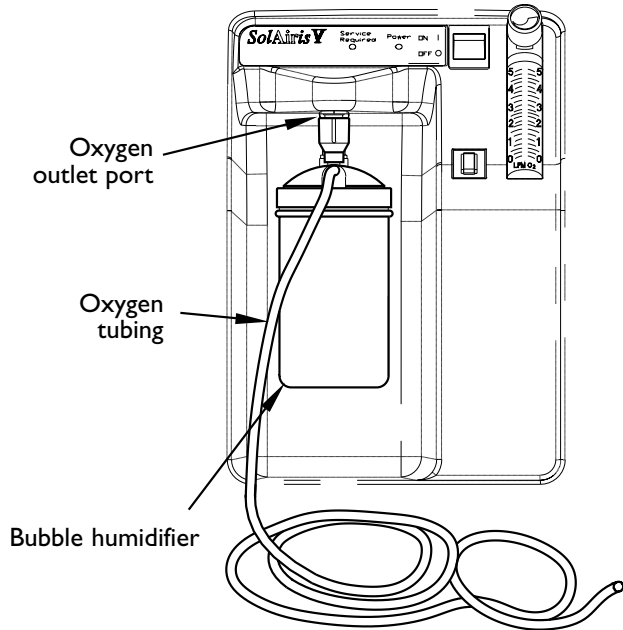


Figure 12

**NOTE**—For optimum performance, the DeVilbiss 5 Liter Oxygen Concentrator has a preset nominal output pressure of 8.5 PSI (60 kPa). Use only “bubble-type” humidifiers. Do not use “jet-type” humidifiers.

**NOTE**—Condensation from the humidifier may occur in longer lengths of tubing or if the tubing is laying on a cold floor. This can be reduced by using a removable humidifier stand (part #MC44DM-509).

#### To use the stand:

- Attach a straight humidifier adapter fitting (part #444-506) to the bottle by turning the wing nut on the humidifier until it is tight on the fitting.
  - Secure the bottle in the strap.
  - Attach one end of the oxygen tubing to the oxygen outlet on the unit and the other end to the plastic adapter fitting on the humidifier. Locate the humidifier near the patient.
5. Attach the nasal cannula (part #CAN00), catheter, or face mask to the oxygen tubing (per the manufacturer's directions).
  6. Follow the Operating Instructions.

## Routine Patient Maintenance

The oxygen patient should perform the following maintenance:

### Oxygen Humidifier (reusable bottles only)

The patient should clean the humidifier bottle daily. The patient should follow the instructions supplied by the manufacturer. If no cleaning instructions were supplied, these steps should be followed:

1. Wash the humidifier bottle in a solution of hot water and dishwashing detergent.
2. Soak the humidifier in a solution of one part white vinegar to three parts hot water for 30-45 minutes. This solution acts as a germicidal agent.
3. Rinse thoroughly with hot tap water and refill with distilled water for use. Do not overfill.

### Cannula/Mask and Tubing

The patient should clean and replace the cannula or mask and tubing as instructed by the manufacturer.

### Air Filter

The air filter should be cleaned at least once a week by the patient. To clean the air filter, these steps should be followed:

1. Remove the air filter, located on the back of the unit.
2. Wash the air filter in a solution of warm water and dishwashing detergent.
3. Rinse thoroughly with warm tap water and towel dry. The filter should be completely dry before reinstalling.

**⚠ WARNING – Do not attempt to operate the unit without the air filter or while the filter is still damp.**

**NOTE** – The air filter should be monitored more closely in environments with abnormal amounts of dust and lint.

**NOTE** – Operation of the DeVilbiss 5 Liter Oxygen Concentrator in extreme environments or without the air filter will prematurely occlude the intake filter and cause a decrease in the unit performance.

### Exterior Cabinet

The patient should clean the concentrator exterior cabinet by using a damp cloth or sponge with a mild household cleaner and wiping it dry.

**⚠ WARNING – Do not apply liquids directly to the cabinet or utilize any petroleum-based solvents or cleaning agents.**

## Periodic Homecare Provider Preventative Maintenance

Every DeVilbiss oxygen concentrator is tested at the factory. To assure continued trouble-free performance, the following preventative maintenance should be performed by the homecare provider during periodic oxygen patient visits. Failure to properly maintain the unit will void the warranty.

### DeVilbiss 5 Liter Recommended Preventative Maintenance (PM)

- A. Check oxygen concentration\* with an oxygen analyzer (part #O2ANA) - every 3 months for non-OSD models and once every two years for OSD models.

To verify the oxygen concentration:

1. Calibrate the oxygen analyzer prior to checking the oxygen concentration. The analyzer should be properly calibrated using the manufacturer's recommended procedure.

**NOTE** – Changes in temperature, altitude, or humidity may affect the analyzer's oxygen concentration reading. The analyzer should be calibrated in similar conditions to the location of the concentrator.

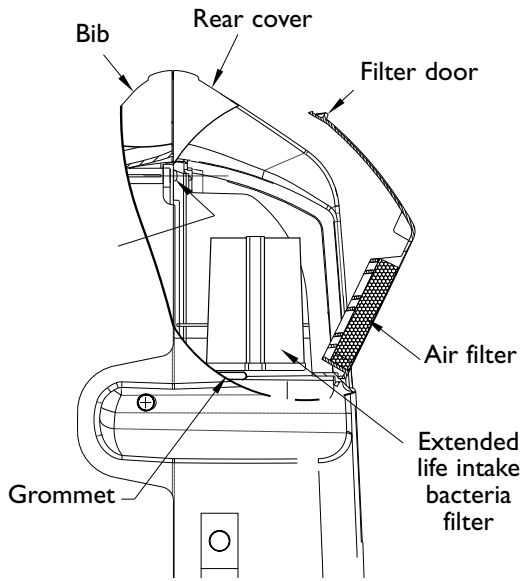
2. The concentrator must operate for a minimum of 20 minutes before checking the oxygen concentration.
  3. Connect the analyzer to the unit's oxygen outlet port and wait until the display stabilizes.
  4. Record the reading.
- B. Check the audible alarm and indicator lights - every two years. When the power switch is turned "On," listen for the audible alarm and check to see if the front panel indicator lights are operating.
- C. Inspect extended life intake bacteria filter if used (part #MC44D-605) - once a year (under normal operating conditions). Replace as required - not to exceed 8760 hours.

### To change the filter (Figure 13):

1. Open the filter door.
2. Pull the extended life filter out from the rubber grommet and discard.
3. Place the current date and hours of operation on the label of a new extended life filter.
4. Insert the new extended life filter securely into the grommet and close the filter door.

**NOTE** – If the DeVilbiss extended life intake bacteria filter is not used, the following filters may be substituted. Note the different PM schedules.

- Round Felt Pre-Filter (part #444-503) - change once a month OR Rectangular Felt Pre-Filter (part #MC44D-722) - change every three months
- AND
- Intake Bacteria Filter (part #444-504) - change every six months
- D. Change final bacteria filter (part #PV5LD-651) - every two years.



**Figure 13**

**To change the final bacteria filter (Figure 14):**

1. Unplug the unit and remove the cabinet.
  2. Remove the hose from each end of the filter.
  3. Discard the filter.
  4. Install the new final bacteria filter with "IN" fitting toward flow meter.
- E. Recommended cycle time check - every two years or 10,000 hours of operation (whichever comes first). Monitor the unit cycle times (using SMART Track or a stop watch) and if longer than normal cycle times exist with no leaks, inspect and change internal components as needed. Refer to specifications for normal cycle times.
- F. Change compressor HEPA filter - every five years or 25,000 hours of operation (whichever comes first).

**To replace the compressor HEPA filter:**

1. Unplug the unit and remove only the rear cabinet.
2. Loosen hose clamp and remove the hose from the outlet fitting end of the HEPA filter.
3. Using a wrench, unscrew the HEPA filter from the compressor head.
4. Discard the HEPA filter.

**NOTE** – Teflon® tape or LOX-8™ paste should be applied to the compressor fitting omitting the first thread, prior to installation of the HEPA filter.

5. Install the new HEPA filter by using a wrench to attach the filter to the compressor head until tight.

Teflon® is a registered trademark of DuPont.

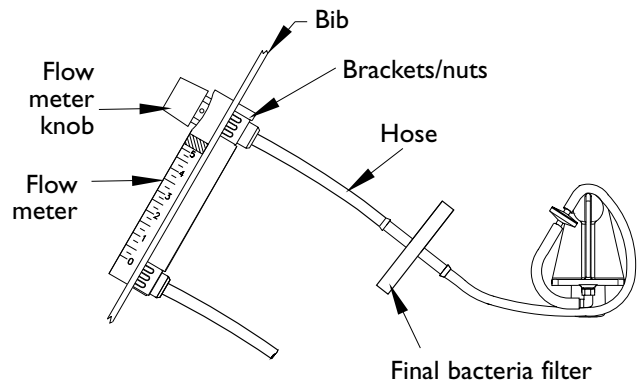
LOX-8™ is a trademark of Fluoramics, Inc.

Epi-Seal® Leak-Seek® is a registered trademark of Bonded Products, Inc.

**NOTE** – Make sure the filter end marked "IN" is toward compressor.

6. Attach the hose to the outlet fitting end of the filter and secure with hose clamp.
7. Leak test the HEPA filter fittings. Apply the leak test solution (such as Epi-Seal® LEAK-SEEK®) to fittings and connections with the unit running. If an air leak is present, the solution will bubble.

\* The Preventative Maintenance Schedule stated above reflects a normal, clean operating environment. The homecare provider is responsible for determining the condition of the concentrator operating environment and determining a preventative maintenance interval frequency (not to exceed three months on non-OSD models or two years on OSD models) which takes into consideration the specific operating environment.



**Figure 14**

**Between Patient Maintenance**

- A. Discard oxygen tubing, cannula, humidifier bottle, intake bacteria filter and felt pre-filter (if using these filters instead of the extended life intake bacteria filter).
- B. Wash or replace the air filter.
- C. Check oxygen concentration. If the unit falls within oxygen specification, the extended life intake bacteria filter does not need to be replaced between patients (but must be changed annually).

## Patient Alert System

The DeVilbiss Concentrator patient alert system will detect unit component failure as well as restricted flow situations. This system is comprised of both visible and audible alarms which signal the patient if a malfunction should occur.

The diagnostic lights on the PC board will help service personnel diagnose the cause of the malfunction.

The visible alarm located on the front panel reads "Service Required." The audible alarm system is internally powered; no batteries are required. When the indicator lights illuminate or the audible alarm sounds, other than during unit start-up, a problem has occurred such as:

- low/high pressure
- minimum/maximum cycle
- valve failure
- bed failure
- compressor failure
- restricted flow (blinking visible alarm and pulsing audible alarm)
- power fail (blinking visible alarm and pulsing audible alarm)

The visible and audible alarms will activate for approximately 20 minutes in a no power situation. If the unit is turned "On" and later the power is removed, no alarm will sound for the first 10 seconds. After that time, the alarm will produce an audible pulse every few seconds while the visible alarm blinks.

**NOTE** – If the concentrator has been unused for an extended period, the unit must run 20 minutes before the power fail alarm will become operational.

The printed circuit (PC) board is responsible for monitoring and controlling the entire system as well as the alarms by using a pressure transducer. When the pressure sensed by the pressure transducer indicates a malfunction, the patient alert system will activate regardless if it is a pressure or component failure. Alarms will also be activated if the system fails to operate within the preset minimum and maximum cycle times. The alarm system cannot be overridden. Most major malfunctions will shut the unit off automatically, preventing any further damage to the unit.

## Diagnostic System

The PC board has three red diagnostic lights, labeled D17, D16, and D18. Should a unit malfunction occur, the unit will shut off, and these lights will illuminate in a particular sequence. The diagnostic lights should be used as a troubleshooting aid, in conjunction with the pressure-vacuum gauges, because there may be more than one reason for a malfunction.

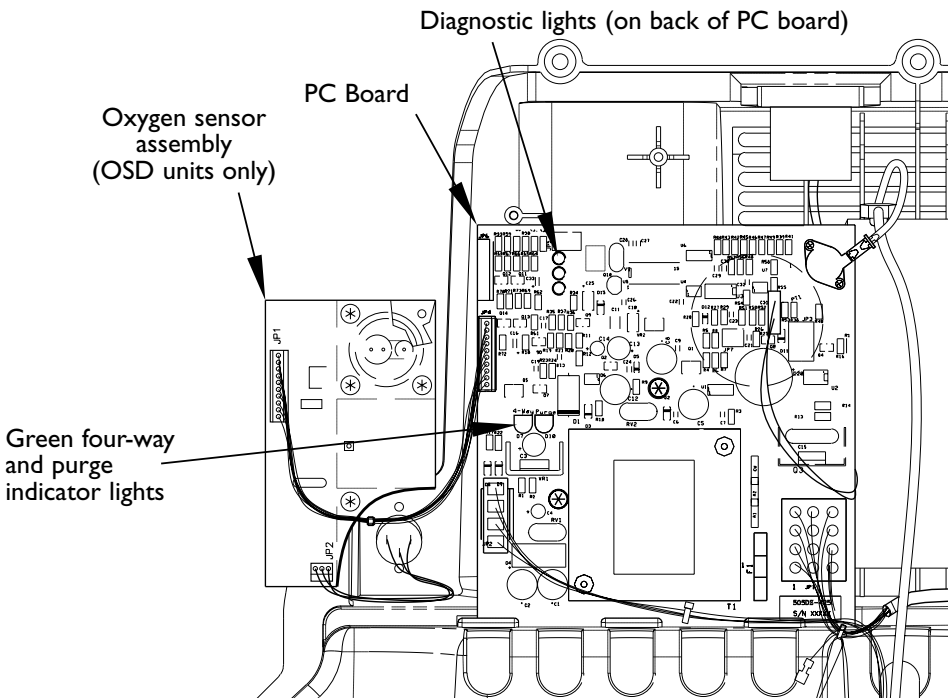
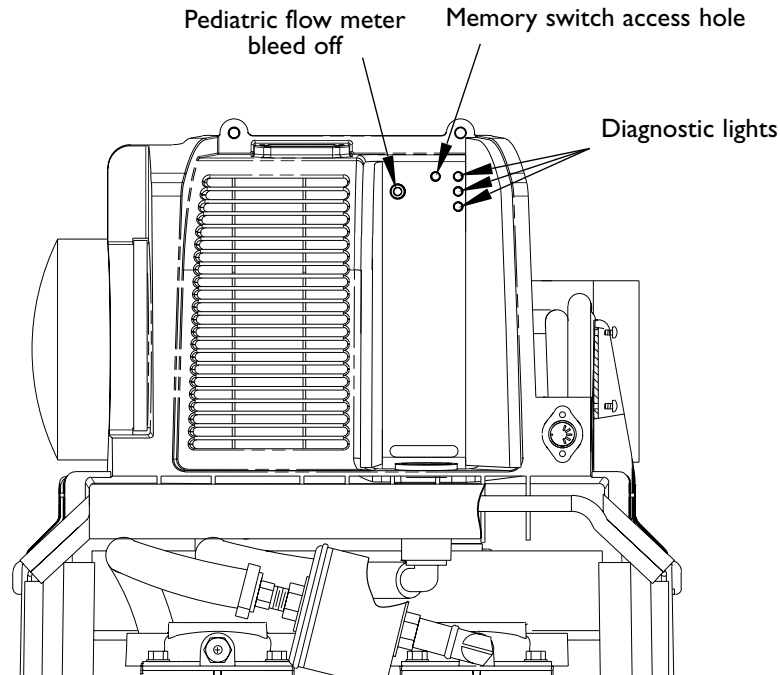


Figure 15

The diagnostic system will also keep the last diagnostic light failure sequence in memory. This gives the service technician the ability to view the cause of a unit shutdown after the unit has been turned off.

To view the light sequence corresponding to the unit malfunction without opening the unit:

1. Turn the unit "On."
2. Open the air filter door.
3. Use the plastic error indicator tool (part #303DZ-635) or other non-metallic tool to press and release memory switch "S" through the single access hole located to the left of the three vertical diagnostic light access holes. The PC board will display the light sequence for the last failure mode (unless the memory has been cleared).



**Figure 16**

**⚠ WARNING—Electric Shock Hazard. Do not use metal or other conductive tools when pressing the memory switch; doing so may cause personal injury and product damage.**

After viewing the light sequence, the memory may be cleared for future assistance.

To clear the diagnostic light memory:

1. Unplug unit while still running. Do not turn the unit "Off." Do not plug the unit back into the wall outlet until the first alarm sounds (approximately 10 seconds).
2. Plug unit back into the wall outlet. This process will reset diagnostic light memory.



### IMPORTANT

Shown below are the failure combinations for the diagnostic service lights D17, D16, and D18 top to bottom and their respective meanings. **NOTE** – These lights will illuminate when the unit shuts off and can be observed when unit is turned off and on again by depressing and releasing switch “S” while unit is running. It is extremely beneficial to attach pressure-gauges to the sieve bed test points and verify the following:

	<p><b>HIGH PRESSURE A</b> POSSIBLE CAUSE: PURGE VALVE, PC BOARD (VOLTAGE TO 4-WAY)</p>		<p><b>HIGH PRESSURE</b> POSSIBLE CAUSE: SAME AS “A” (NO 4-WAY VOLTAGE )</p>
	<p><b>LONG CYCLE A</b> POSSIBLE CAUSE: LEAK, WORN COMPRESSOR (VOLTAGE TO 4-WAY)</p>		<p><b>LONG CYCLE</b> POSSIBLE CAUSE: SAME AS “A” (NO 4-WAY VOLTAGE )</p>
	<p><b>SHORT CYCLE A</b> POSSIBLE CAUSE: SEIVE BEDS, 4-WAY (VOLTAGE TO 4-WAY)</p>		<p><b>SHORT CYCLE</b> POSSIBLE CAUSE: SAME AS “A” (NO 4-WAY VOLTAGE )</p>
	<p><b>PC BOARD FAILURE</b> POSSIBLE CAUSE: WIRE HARNESS, DEFECTIVE ELECTRONIC COMPONENT (VOLTAGE TO 4-WAY)</p>		<p>AN UNEVEN CYCLE TIME <b>DURING OPERATION</b> POSSIBLE CAUSE: LEAK, CROSS PORT VALVE LEAKAGE</p>
<p><b>NOTE</b> – These alarms will illuminate when unit shuts off and can be observed when unit it turned off and on again by depressing and releasing switch “S” while unit is running.</p>			

When a system error is sensed, the compressor will automatically shut off, but the cooling fan will continue to run. The audible alarm will also sound and the "Service Required" light on the control panel will illuminate.

**NOTE**—The green “4-way” indicator light on the PC board will illuminate only when the four-way valve is activated. At the same time the left sieve bed should be pressurizing. When it is off, the right bed should be pressurizing. This light is not considered an alarm indicator.

## Normal Operating Sequence

When pressure test gauges are attached to the test points on the manifold, the following cycling sequence should be observed. Most types of unit malfunctions will cause a deviation in this sequence and possibly a unit shutdown or a change in cycle times.

When the concentrator is turned "On," this normal cycling sequence should be observed by attaching the pressure/vacuum gauges to the sieve bed test points located at the top of the beds:

- A. Left sieve bed is pressurized (approximately 26 PSI or 180 kPa) and right sieve bed is depressurized to approximately 2 PSI or 15 kPa.
  - I. Four-way valve is shifted.
    - a. Pilot pressure is entering four-way (approximately 22-28 PSI or 150-200 kPa).
    - b. 12-15 VDC signal from PC board is present at terminals on pilot valve and the green four-way indicator light is illuminated.
- B. Purging action is present (1.2 seconds) and bed pressures equalize at approximately 12-15 PSI or 80-100 kPa.
  - I. Purge valve is shifted.
    - a. Pilot pressure is entering purge (approximately 22-28 PSI or 150-200 kPa).
    - b. 12-15 VDC signal from PC board is present at terminals on pilot valve for only 1.2 seconds and the green purge indicator light is illuminated.
- C. Right sieve bed is pressurized (approximately 26 PSI or 180 kPa) and left sieve bed depressurizes to approximately 2 PSI or 15 kPa.
  - I. Four-way valve is in rest position.
    - a. The pilot valve shuts off pilot pressure to four-way.
    - b. No voltage is present as described in step B.
- D. Purging action is present (1.2 seconds) and bed pressures equalize at approximately 12-15 PSI or 80-100 kPa.
  - I. Purge valve is shifted.
    - a. Pilot pressure is entering purge (approximately 22-28 PSI or 150-200 kPa).
    - b. 12-15 VDC signal from PC board is present at terminals on pilot valve for only 1.2 seconds and the green purge indicator light is illuminated.
- E. Step A is repeated.

**NOTE** – Refer to specifications for typical cycle times at 5 LPM.

## Simplified Troubleshooting

The key to simple troubleshooting is to recognize which type of problem exists and select the most effective approach to solving the problem. The different types of problems and the approaches for solutions are as follows:

Type I-Unit runs for a while and shuts off.

Approach-Connect the pressure-vacuum gauges to the sieve bed test points and look for the proper cycling sequence. If something in the sequence is incorrect, troubleshoot the appropriate components (i.e. if the right bed pressurizes first, troubleshoot the four-way valve).

Type II-Power switch is in the “On” position and “Power” indicator light is illuminated, cooling fan runs, but compressor will not start.

Approach-Check the compressor voltage (115 VAC).

- If voltage is present, then a defective capacitor or compressor exists.

**⚠ WARNING—Mechanical Hazard. Keep fingers, loose clothing, etc. away when working on compressor.**

- If voltage is not present, then a defective wire harness or PC board exists.

Type III- The unit is operating and continues to cycle, but has low oxygen concentration.

Approach-Check cycle times.

- If cycle times are shorter than normal, check for:
  - ✓ defective sieve beds
- If cycle times are longer than normal, check for:
  - ✓ occluded filters
  - ✓ system leaks
  - ✓ defective compressor
  - ✓ malfunctioning sieve bed check valves

**NOTE** – Check for leaks using a certified leak detection solution. Apply leak test solution to all fittings and hose connections with unit running. If an air leak is present, the solution will bubble. All leaks should be repaired before putting the unit back in service.

- If cycle times are normal, check for an oxygen leak:
  - ✓ top of the sieve beds
  - ✓ accumulator tank
  - ✓ pressure regulator
  - ✓ flow meter
  - ✓ final bacteria filter
  - ✓ outlet port
- If cycle times are normal and no oxygen leaks exist, then connect the pressure-vacuum gauges and look for proper purging action. If no purge action, troubleshoot purge valve.
  - ✓ Check pilot pressure; if pressure falls below 19 PSI or 130 kPa, check for pilot pressure leaks. If there are no leaks, replace manifold.

## TROUBLESHOOTING

A.	Symptom			
	Visible Alarm	Audible Alarm	Compressor	Power Light
	OFF	OFF	ON	ON
	Other Symptoms	Possible Cause	Possible Remedy	
1.	Pulsating air noise.	<ol style="list-style-type: none"> <li>1. Intake filter not in place or defective.</li> <li>2. Compressor intake hose disconnected.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check filter and replace if necessary.</li> <li>2. Reconnect hose.</li> </ol>	
2.	Excessive noise.	<ol style="list-style-type: none"> <li>1. Loose or defective motor mounts.</li> <li>2. Defective compressor.</li> <li>3. Defective cooling fan.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten or replace motor mounts.</li> <li>2. Replace compressor.</li> <li>3. Replace cooling fan.</li> </ol>	
3.	Fluctuating oxygen flow.	<ol style="list-style-type: none"> <li>1. Occluded humidifier.</li> <li>2. Use of improper humidifier.</li> <li>3. Occluded filters.</li> <li>4. Occluded or defective cannula and tubing.</li>   <li>5. Use of excessive tubing.</li>   <li>6. Defective flow meter.</li> <li>7. Leak in system.</li> <li>8. Defective compressor.</li> <li>9. Defective compressor reed valve.</li> <li>10. Defective check valve.</li> <li>11. Pressure regulator not adjusted properly or defective.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean or replace humidifier.</li> <li>2. Use only a bubble-type humidifier.</li> <li>3. Clean or replace filters.</li> <li>4. Detach cannula from oxygen delivery tubing. If proper flow is not attained, check tubing for kinks or other obstructions. Clean or straighten as required or replace tubing if necessary.</li> <li>5. The unit is designed to deliver 5 LPM with a cannula on 50 feet (15 meters) of approximately 5/32" (4 mm) inside diameter tubing. Smaller diameter tubing or the addition of any other flow restriction may prevent obtaining the desired flow rate.</li> <li>6. Replace flow meter.</li> <li>7. Check for leaks in all hoses and fittings.</li> <li>8. Replace compressor.</li> <li>9. Replace compressor reed valve.</li> <li>10. Replace manifold base.</li> <li>11. Adjust or replace pressure regulator.</li> </ol>	
4.	Little or no oxygen flow.	<ol style="list-style-type: none"> <li>1. Flow meter not adjusted properly</li> <li>2. Hose disconnected to flow meter.</li> <li>3. Oxygen delivery tubing is kinked or blocked.</li> <li>4. Occluded humidifier.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust flow meter.</li> <li>2. Reconnect hose.</li> <li>3. Straighten tubing or remove obstruction.</li> <li>4. Clean or replace humidifier.</li> </ol>	
5.	Low oxygen concentration and possible increase in cycle time.	<ol style="list-style-type: none"> <li>1. Leak in system.</li> <li>2. Defective sieve bed check valve.</li> <li>3. Defective compressor reed valve.</li> <li>4. Defective compressor.</li> <li>5. Four-way valve not fully shifted.</li> <li>6. Occluded filters.</li> <li>7. Purge valve stuck in the deactivated position.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for leaks in all hoses and fittings.</li> <li>2. Replace manifold base.</li> <li>3. Replace compressor reed valve.</li> <li>4. Replace compressor.</li> <li>5. Clean or replace four-way valve.</li> <li>6. Clean or replace filters.</li> <li>7. Refer to "How to Troubleshoot Purge Valve."</li> </ol>	
6.	Low oxygen concentration and decrease in cycle time.	<ol style="list-style-type: none"> <li>1. Contaminated sieve beds.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace sieve beds.</li> </ol>	
7.	Audible alarm does not sound when unit is turned "On" or during power failure.	<ol style="list-style-type: none"> <li>1. Unit has not been used for an extended period of time.</li> <li>2. Defective PC board.</li> <li>3. Defective power switch.</li> <li>4. Defective wire harness.</li> </ol>	<ol style="list-style-type: none"> <li>1. Allow unit to run for 20 minutes and retry.</li> <li>2. Replace PC board.</li> <li>3. Replace power switch.</li> <li>4. Replace wire harness.</li> </ol>	
8.	Service Required light does not illuminate when unit is turned "On."	<ol style="list-style-type: none"> <li>1. Defective PC board.</li> <li>2. Defective light panel.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace PC board.</li> <li>2. Replace light panel.</li> </ol>	
9.	Low pilot pressure and possibly low oxygen concentration.	<ol style="list-style-type: none"> <li>1. Leak in pilot pressure system.</li> <li>2. Defective check valve in pilot accumulator cavity of manifold.</li> <li>3. Defective compressor reed valve.</li> <li>4. Defective compressor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check for leaks in all pilot pressure hoses and fittings.</li> <li>2. Replace manifold base.</li> <li>3. Replace compressor reed valve.</li> <li>4. Replace compressor.</li> </ol>	

## TROUBLESHOOTING

Symptom			
Visible Alarm	Audible Alarm	Compressor	Power Light
<b>Blinking</b>	<b>Pulsing</b>	<b>OFF</b>	<b>OFF</b>

Other Symptoms	Possible Cause	Possible Remedy
1. Fan off.	<ol style="list-style-type: none"> <li>1. Line cord not properly installed or defective.</li> <li>2. No power at receptacle.</li> <li>3. Oxygen concentrator circuit breaker activated.</li> <li>4. Line cord quick-connect terminal inside unit is disconnected.</li> <li>5. Defective power switch.</li> <li>6. Defective circuit breaker.</li> </ol>	<ol style="list-style-type: none"> <li>1a. Insert plug in receptacle.</li> <li>1b. Replace line cord.</li> <li>2a. Check building circuit breaker or fuse, or have house wiring checked by qualified electrician.</li> <li>2b. Circuit may be fully loaded with other appliances and another receptacle may be required.</li> <li>3. Press the unit circuit breaker reset button. If unit circuit breaker opens again, check internal wiring.</li> <li>4. Reconnect quick-connect terminal.</li> <li>5. Replace power switch.</li> <li>6. Replace unit circuit breaker.</li> </ol>
2. Fan operating	<ol style="list-style-type: none"> <li>1. Blown fuse on PC board.</li> <li>2. Defective PC board.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace fuse.</li> <li>2. Replace PC board.</li> </ol>

Symptom			
Visible Alarm	Audible Alarm	Compressor	Power Light
<b>Blinking</b>	<b>Pulsing</b>	<b>ON</b>	<b>ON</b>

Other Symptoms	Possible Cause	Possible Remedy
1. No oxygen flow.	<ol style="list-style-type: none"> <li>1. Severe restriction of flow due to:               <ol style="list-style-type: none"> <li>a. Crimped tubing.</li> <li>b. Occluded humidifier.</li> <li>c. Flow meter turned off or set too low.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>a. Straighten tubing.</li> <li>b. Clean or replace humidifier.</li> <li>c. Adjust flow meter.</li> </ol>

Symptom			
Visible Alarm	Audible Alarm	Compressor	Power Light
<b>ON</b>	<b>ON</b>	<b>OFF</b>	<b>ON or OFF</b>

Other Symptoms	Possible Cause	Possible Remedy
1. Fan operating, no indicator lights illuminated on PC board.	<ol style="list-style-type: none"> <li>1. Defective PC board.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace PC Board</li> </ol>

## TROUBLESHOOTING

E.	Symptom			
	Visible Alarm	Audible Alarm	Compressor	Power Light
	ON	ON	OFF	ON
	Other Symptoms	Possible Cause	Possible Remedy	
1.	Fan operating.	<ol style="list-style-type: none"> <li>1. Wiring harness disconnected/defective.</li> <li>2. Loose compressor wire.</li> <li>3. Defective capacitor.</li> <li>4. Defective PC board.</li> <li>5. Defective compressor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reconnect/replace wiring harness.</li> <li>2. Tighten or attach wire.</li> <li>3. Replace capacitor.</li> <li>4. Replace PC board.</li> <li>5. Replace compressor.</li> </ol>	
2.	Unit warm to the touch and cannot be restarted for several minutes.	<ol style="list-style-type: none"> <li>1. Compressor overheated due to:                             <ol style="list-style-type: none"> <li>a. Occluded filters.</li> <li>b. Restricted input or output air passage.</li> <li>c. Low or high line voltage.</li> </ol> </li> <li>2. Defective cooling fan.</li> <li>3. Defective compressor.</li> </ol>	<ol style="list-style-type: none"> <li>1.                             <ol style="list-style-type: none"> <li>a. Clean or replace filters.</li> <li>b. Remove obstruction.</li> <li>c. Check line voltage, use alternate circuit independent of other appliances.</li> </ol> </li> <li>2. Replace cooling fan.</li> <li>3. Replace compressor.</li> </ol>	
3.	Fan operating, D16 or D16 & D18 illuminated on PC board.	<ol style="list-style-type: none"> <li>1. Four-way valve failed to shift properly.</li> <li>2. Contaminated sieve beds.</li> </ol>	<ol style="list-style-type: none"> <li>1. Refer to How to Troubleshoot Four-Way Valve.</li> <li>2. Refer to How to Troubleshoot Sieve Beds.</li> </ol>	
4.	Compressor ran then shut off, fan operating, D17 or D17 & D18 illuminated on PC board.	<ol style="list-style-type: none"> <li>1. Maximum cycle time was exceeded due to                             <ol style="list-style-type: none"> <li>a. Leak in system.</li> <li>b. Defective compressor reed valve.</li> <li>c. Defective compressor.</li> <li>d. Four-way valve not fully shifted.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>a. Check for leaks in all hoses and fittings.</li> <li>b. Replace compressor reed valve.</li> <li>c. Replace compressor.</li> <li>d. Clean or replace four-way valve.</li> </ol>	
5.	Fan operating, D17 & D16 or all three indicator lights illuminated on PC board.	<ol style="list-style-type: none"> <li>1. Purge valve stuck in activated position.</li> <li>2. Defective PC board.</li> </ol>	<ol style="list-style-type: none"> <li>1. Refer to How to Troubleshoot Purge Valve.</li> <li>2. Replace PC board.</li> </ol>	

F.	Symptom			
	Visible Alarm	Audible Alarm	Compressor	Power Light
	ON	ON	OFF	ON
	Other Symptoms	Possible Cause	Possible Remedy	
1.	Fluctuating or no flow.	<ol style="list-style-type: none"> <li>1. System pressure below 9 PSI or 62 kPa due to:                             <ol style="list-style-type: none"> <li>a. Leak in system.</li> <li>b. Defective compressor.</li> <li>c. Four-way valve not fully shifted.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>a. Check for leaks in all hoses and fittings.</li> <li>b. Replace compressor.</li> <li>c. Clean or replace four-way valve.</li> </ol>	

**NOTE** – When unit runs for a short time and stops and any of the red diagnostic lights illuminate, connect gauges and look for proper operating sequence.

**NOTE** – Refer to Diagnostic System for explanations of the various diagnostic lights and alarms.

## OSD troubleshooting

A.	Symptom			
	Visible Alarm	Audible Alarm	Compressor	Power Light
	ON	ON	ON	ON
	Other Symptoms	Possible Cause	Possible Remedy	
1.	No OSD lights are illuminated.	1. Connector off between OSD and PC board. 2. Defective OSD.	1. Reconnect connector. 2. Replace OSD.	
2.	Both OSD lights are illuminated.	1. Defective OSD.	1. Replace OSD.	
3.	Yellow Low Oxygen light is illuminated.	1. Oxygen level is low*.	1. Check concentration with an oxygen analyzer. If the concentration is within specification, replace the OSD. If the concentration is low, refer to Numbers A5 and A6 in the Unit Troubleshooting Chart.	
4.	Yellow Low Oxygen light is illuminated and an intermittent audible alarm sounds every five seconds.	1. Oxygen level is low*.	1. Check concentration with an oxygen analyzer. If the concentration is within specification, replace the OSD. If the concentration is low, refer to Numbers A5 and A6 in the Unit Troubleshooting Chart.	

\*Refer to specifications for oxygen purity levels.

# Component Testing, Repair & Replacement

## Proper Repair Procedures

The DeVilbiss 5 Liter Oxygen Concentrator is designed for ease of service. To aid service personnel, a Service Kit (part #444-501) is available which contains the necessary gauges, tools, and testing instruments to properly service the oxygen concentrator. On parts that are sold separately, the part number is indicated in parenthesis.

The following parts are included in the Service Kit.

### Service Kit

- (1) 6-8" Slotted bit
- (1) #1 Phillips bit
- (1) #2 Phillips bit
- (1) 7/16" Socket 1/4" Drive
- (1) Crescent wrench
- (1) Channel lock pliers
- (1) 8" Duckbill pliers
- (1) 5/32" Allen bit
- (1) 9/64" Allen bit
- (1) 7/64" Allen bit
- (1) T10 bit
- (2) 0-30 PSI 0-30 in. Hg gauge and hose (part #PVO2D-601)
- (1) Tool box
- (2) Test fittings (part #303DZ-637)
- (1) Torx screwdriver w/bits (part #MC44D-712)
- (1) AC/DC test light (part #PVO2D-603)
- (1) 1/4" Ratchet wrench
- (1) 3 mm Hexbit
- (1) T-15 Torx "L" wrench
- (1) 10 mm Socket 1/4" Drive
- (1) 1/4" Drive extension
- (1) Plastic storage case
- (1) Plastic error indicator tool (part #303DZ-635)

In addition to the Service Kit, an oxygen analyzer (part #O2ANA) is needed to periodically check oxygen concentration levels. A volt meter will be needed for more accurate voltage testing.

**NOTE** – Be sure to read all of the steps involved before beginning any of the procedures in this manual.

**NOTE** – After repairing or replacing a component, run the unit for 20 minutes and check the oxygen concentration.

**CAUTION** – When servicing the DeVilbiss 5 Liter Oxygen Concentrator, be absolutely certain that the correct tools are used and that the parts are free of oil and grease or any material not compatible with oxygen. Teflon® tape is recommended and must be applied to the male threads omitting the first thread to eliminate the possibility of tape particles entering the oxygen system. LOX-8™ sealant may be used in place of Teflon tape.



**⚠ WARNING – Electric shock hazard. Do not remove cabinet. The cabinet may only be removed by a qualified Sunrise Medical homecare provider.**

**⚠ WARNING – Disconnect the power cord from the wall outlet before attempting repairs on the unit. Extra care should be taken if it is necessary to operate the unit with the cabinet removed.**

### Leak Testing

Check for leaks using a certified leak detection solution. Apply leak test solution to all fittings and hose connections with the unit running. If an air leak is present, the solution will bubble. All leaks should be repaired before putting the concentrator back in service.

### Cabinet Removal

To remove the front and back cabinets (Figures 17 & 18):

1. Ensure the unit is unplugged from the wall outlet.
2. Using a screwdriver, remove the six screws that hold the back cabinet to the internal structure and the bib.

**NOTE** – All six screws are the same size.

3. Remove the back cabinet by sliding it toward the rear until clear.
4. Remove the front cabinet by pushing the top shoulders toward the back of the unit, then outward away from behind the bib. Tilt the top of the front cabinet forward until it can be pulled out of the base of the unit.

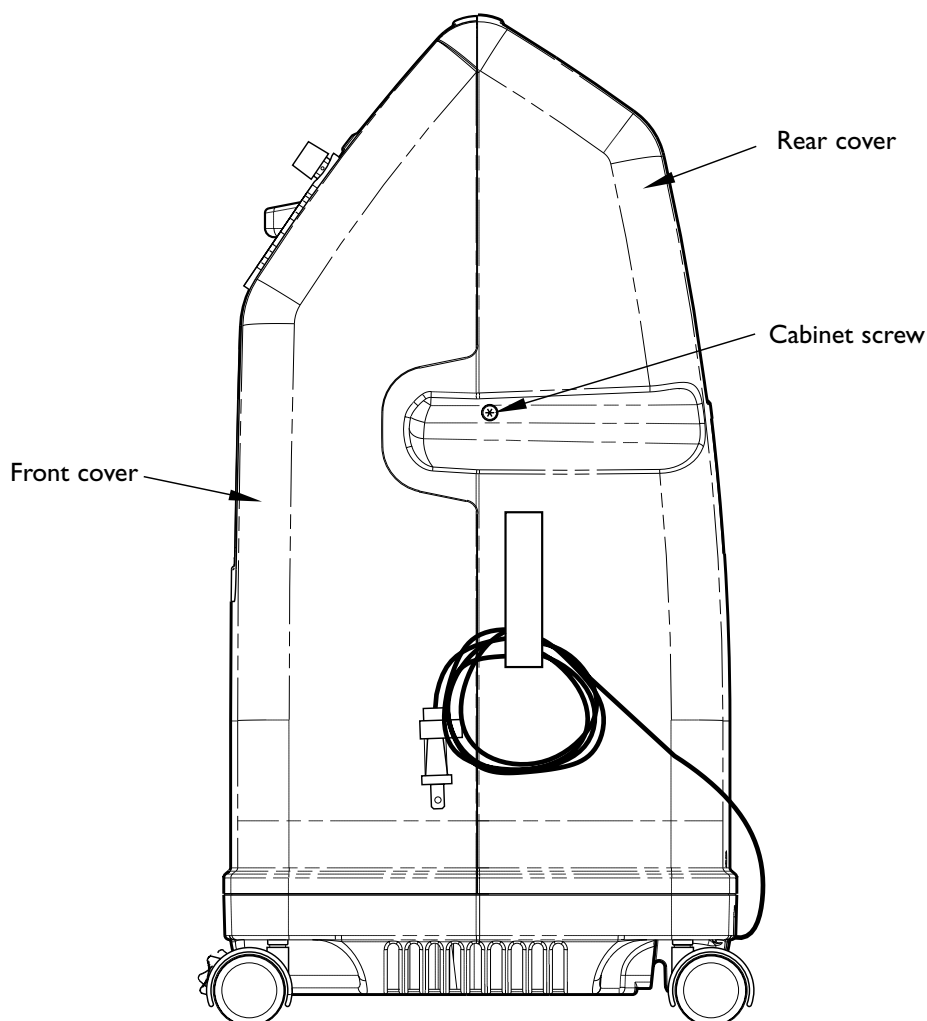
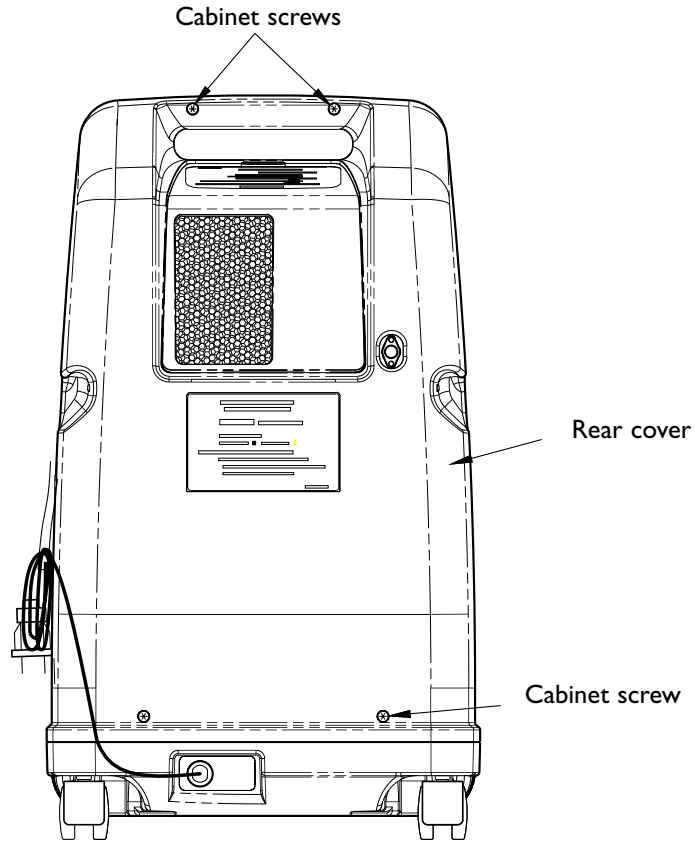


Figure 17

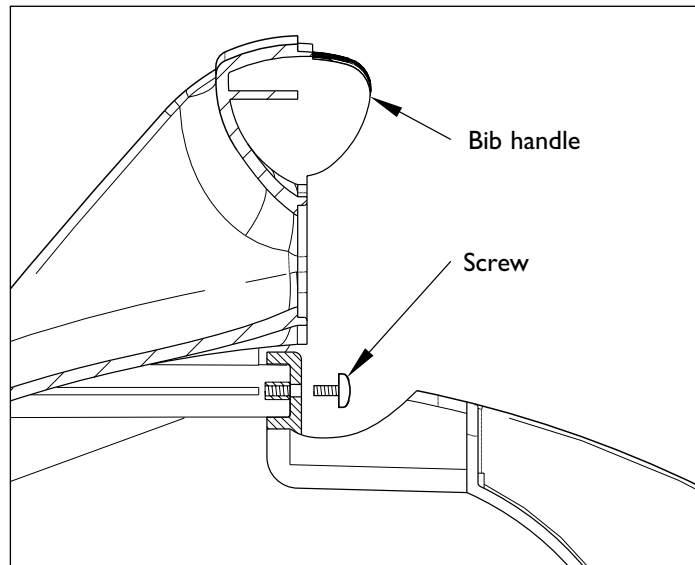


**Figure 18**

The majority of all the servicing and repairs can be done without removing the front bib. However, to gain access to the components behind the bib, it may be loosened or removed.

**To loosen the bib (Figure 19):**

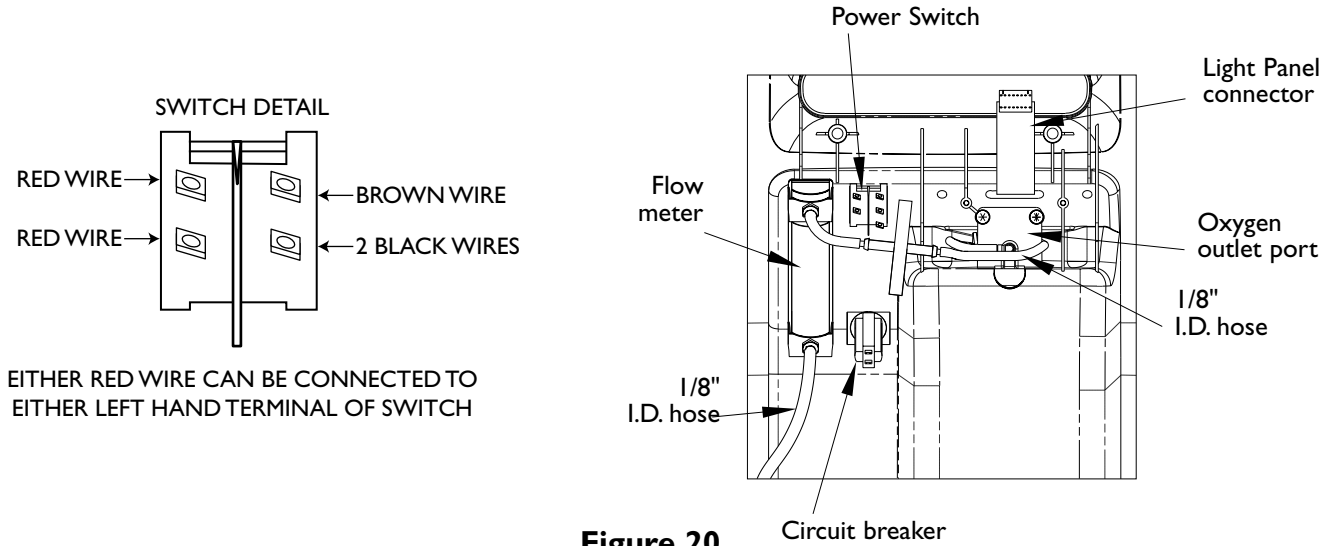
1. Remove the two screws (located directly above the hour meter) that hold the bib to the unit's internal structure. This will allow access to the components behind the bib.



**Figure 19**

**To remove the bib completely (Figure 20):**

1. Disconnect the ribbon connector from the PC board.
2. Disconnect the wires from the power switch and circuit breaker. Mark these wires accordingly.
3. Unsnap bib from housing.
4. Remove the hose connected to the bottom of the flow meter.



**Figure 20**

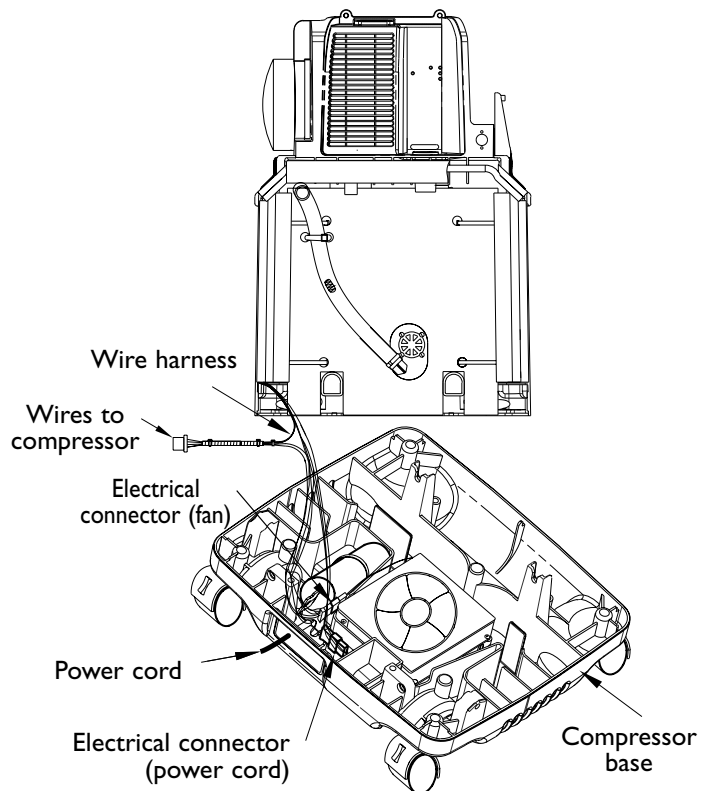
**To reassemble bib:**

1. Reconnect the wires and hose.
2. Insert the bib tab into the compressor housing slot above the four-way valve.
3. Push until the bib snaps into place.
4. Secure bib with the two screws.

**Power Cord**

**To replace the power cord (Figure 21):**

1. Ensure the unit is unplugged from the wall outlet.
  2. Remove the back cabinet.
  3. Disconnect the power cord connector.
- NOTE** – Loosening or removing compressor mounting plate may make it easier to service power cord.
4. Note wire colors and socket locations before removing sockets from the connector housing.
  5. Using a pair of duckbill pliers, squeeze the power cord strain relief and pull it out of the base of the unit.
  6. Insert a new power cord through hole in the base of the unit and secure with strain relief.
  7. Insert sockets into connector housing and then reconnect the power cord connector.
  8. Replace back cabinet and secure with the six screws.



**Figure 21**

## Flow Meter

The DeVilbiss 5 Liter Oxygen Concentrator pressure-compensated flow meter has an accuracy level of  $\pm 5\%$  of full scale (exception:  $+0\%/-5\%$  at 5 LPM). The flow meter on the DeVilbiss 5 Liter Oxygen Concentrator is designed for use at 8.5 PSI or 60 kPa at flow rates up to 5 LPM.

### To check for leaks in the flow meter tubing:

1. Check for leaks using a certified leak detection solution.
2. Apply leak test solution to all fittings and hose connections with the unit running.
3. If an air leak is present, the solution will bubble. All leaks should be repaired before putting the concentrator back in service.

**⚠ WARNING—Electric Shock Hazard. Use caution when leak testing near electrical connections.**

### To replace flow meter (Figure 22):

1. Ensure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and loosen the bib.
3. Remove hose from each end of flow meter.
4. Remove the flow meter from the bib.
5. Install the new flow meter in reverse order.

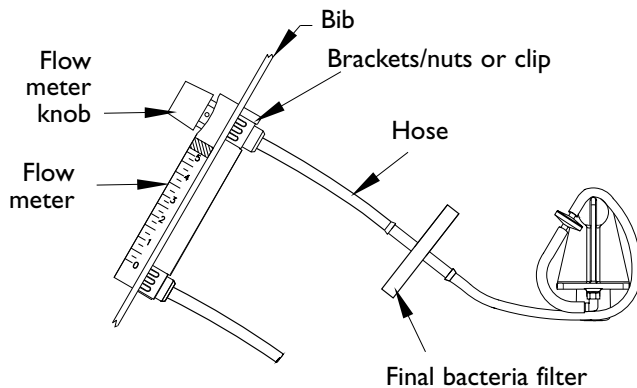


Figure 22

## Power Switch

### To replace the power switch (Figure 20):

1. Ensure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and loosen the bib.
3. Note the position of the wires and switch before removing the wires from switch terminals.
4. While squeezing the locking tabs on the sides of the switch, push the switch out of the front of the bib.
5. Install new switch in correct orientation making sure that it locks into position.
6. Reconnect wires on the switch terminals.

## Hour Meter

### To replace the hour meter:

1. Ensure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and loosen the bib.
3. Disconnect the hour meter connector from the PC board.
4. Remove the two screws securing the hour meter and remove the meter.
5. Install a new hour meter and secure with the two screws.
6. Connect the hour meter to the PC board.

## Pressure Regulator

The pressure regulator stabilizes the flow of oxygen to the patient and establishes back pressure on the system. It is pre-set at 8.5 PSI or 60 kPa and should not have to be adjusted in the field.

### To test the pressure regulator:

1. Turn the unit "On."
2. Set the flow meter at 2 LPM.
3. Use a pressure-vacuum gauge (part #PVO2D-601) and a fitting suitable to fit on the oxygen outlet or on a short piece of tubing connected to the outlet.
4. If the pressure-vacuum gauge reads anything other than 8.5 PSI  $\pm$  .5 PSI (60 kPa  $\pm$  3.5 kPa) with gauge outlet blocked, adjustment to the pressure regulator may be required. If so, call Sunrise Medical Technical Service at 1-800-333-4000.

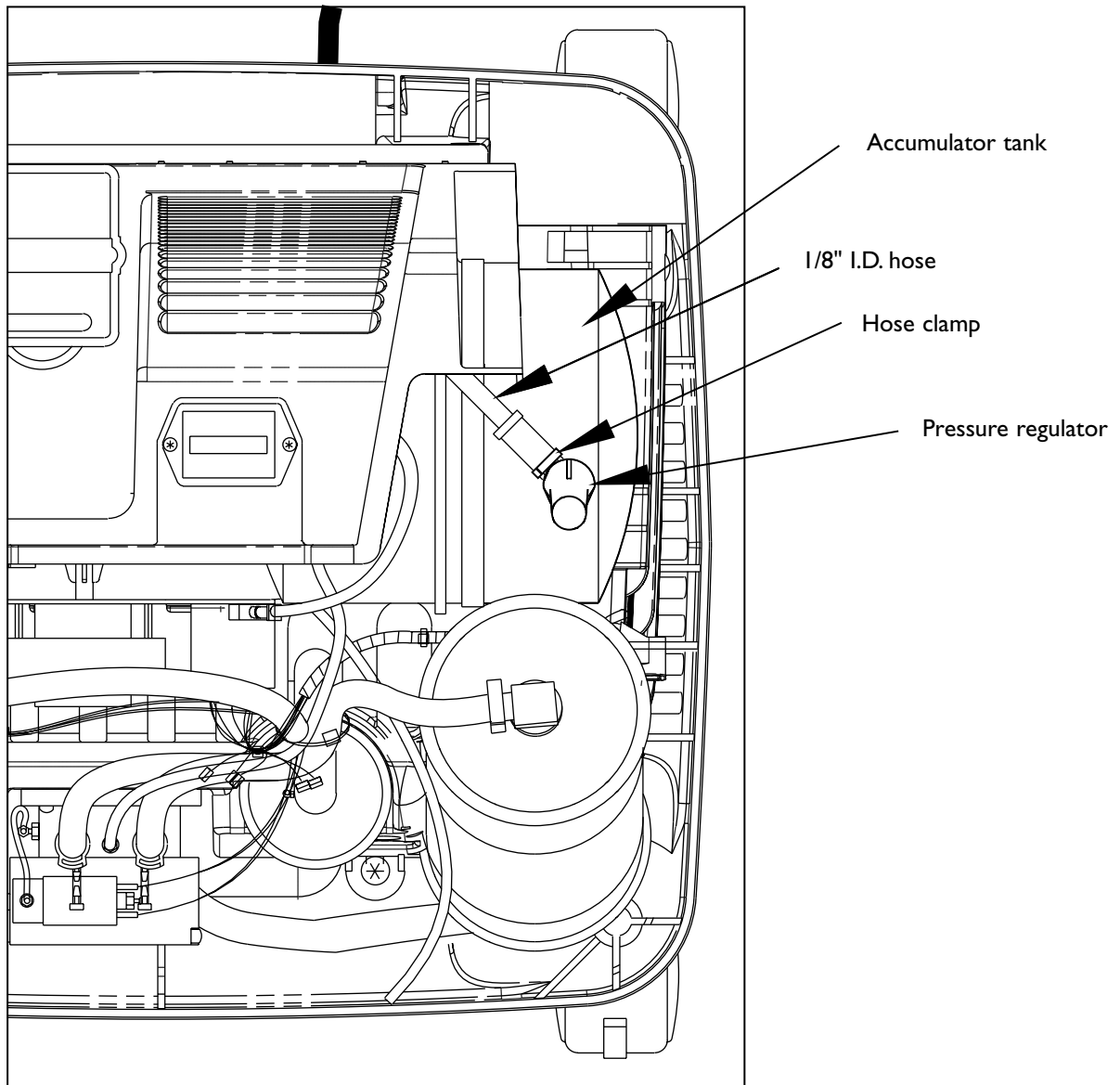
**NOTE** – Ensure no leaks exist before adjusting pressure regulator.

A malfunction in the pressure regulator will cause either:

- a loss or fluctuation in the oxygen flow which will be seen on the flow meter.
- a decrease in oxygen concentration.

**To replace pressure regulator (Figure 23):**

1. Ensure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets.
3. Remove hose clamp and hose from the pressure regulator.
4. Unscrew the regulator from accumulator tank.
5. Install a new regulator on accumulator tank and attach the hose and clamp.



**Figure 23**

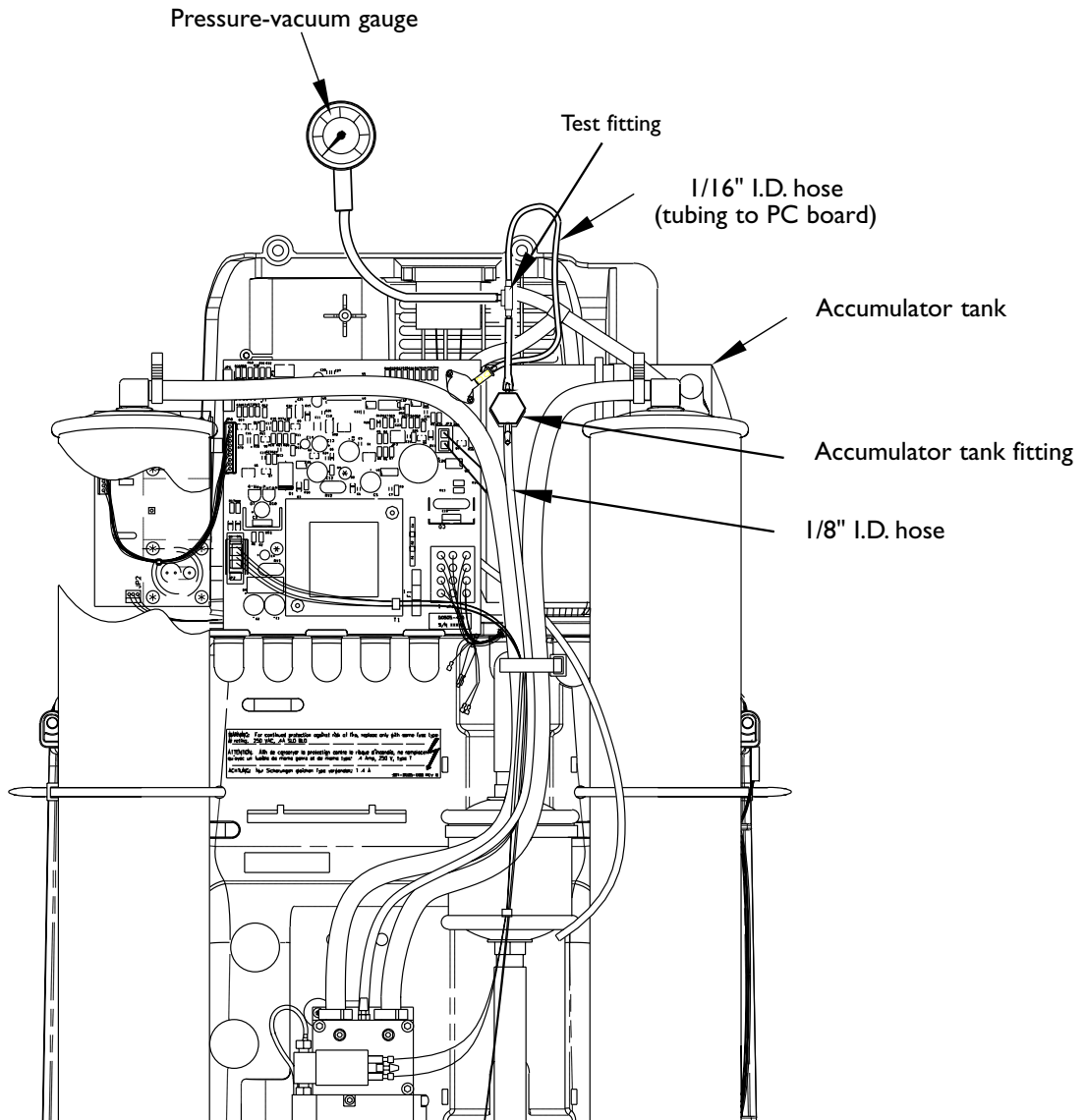
**Sieve Bed Check Valves**

Two check valves located in the manifold assembly allow oxygen to pass through the sieve beds to the accumulator tank when the bed pressure is greater than the accumulator tank pressure. These valves also prevent reverse flow of oxygen from the accumulator to the sieve beds.

A defective check valve will result in a decrease in oxygen concentration and lower accumulator pressures.

**To check accumulator pressures (Figure 24):**

1. Ensure the unit is "Off."
2. Remove front and back cabinets.
3. Use the pressure-vacuum gauge (part #PV02D-601) and test fitting (part #303DZ-632) included in the Service Kit.
4. Remove the 1/16" diameter hose from the accumulator tank and attach it to the barbed fitting on the test fitting.
5. Attach the 1/16" diameter hose on the other end of the test fitting to the accumulator tank fitting.
6. Install the gauge on the test fitting.
7. Turn the unit "On" with the flow rate set to 5 LPM.



**Figure 24**

During each cycle, the pressure in the oxygen accumulator will rise to approximately 25.5 PSI (175 kPa) and the four-way valve will shift to start a new 1/2 cycle. The pressure will then decrease to approximately 19 PSI (130 kPa) at 5 LPM. This minimum pressure will vary according to flow rate. The higher the flow rate, the lower the pressure will drop in the accumulator tank. When the check valve opens allowing oxygen to flow into the accumulator, pressure will start to increase until maximum pressure is reached (25.5 PSI or 175 kPa) again starting another new 1/2 cycle.

**NOTE**—A defective check valve may cause a rapid drop in accumulator pressure, pressures below approximately 19 PSI (or 130 kPa) at 5 LPM, or a longer than normal cycle time. If a defective check valve exists, the manifold must be replaced; refer to the section on servicing the manifold assembly.

## Final Check Valve

Another check valve is located between the final bacteria filter and the oxygen outlet fitting. This check valve allows only oxygen to flow out of the unit. When the unit is turned off and oxygen flow stops, the check valve closes to prevent water from being drawn into the unit.

A defective final check valve may allow water to be drawn in from the humidifier bottle when the unit is turned off. This may occlude the final bacteria filter and/or the flow meter causing a restriction of flow and making it difficult to adjust the flow rate.

### To replace the final check valve (Figure 25, 26, & 27):

1. Ensure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and loosen the bib.
3. Remove the hose from the outlet side of the final bacteria filter.
4. Remove the two screws from the back of the oxygen outlet fitting assembly and remove the assembly.

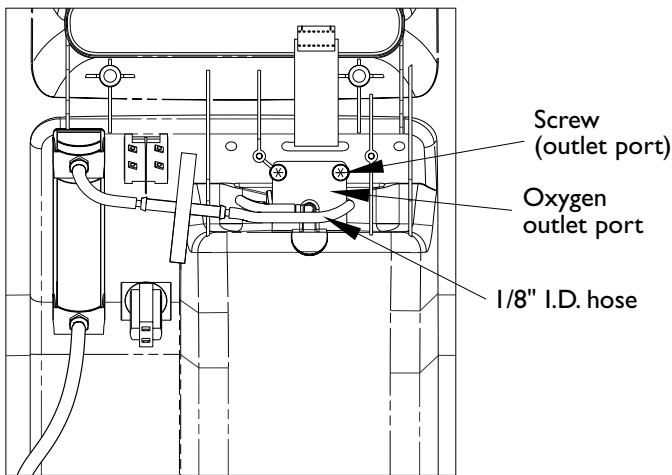


Figure 25

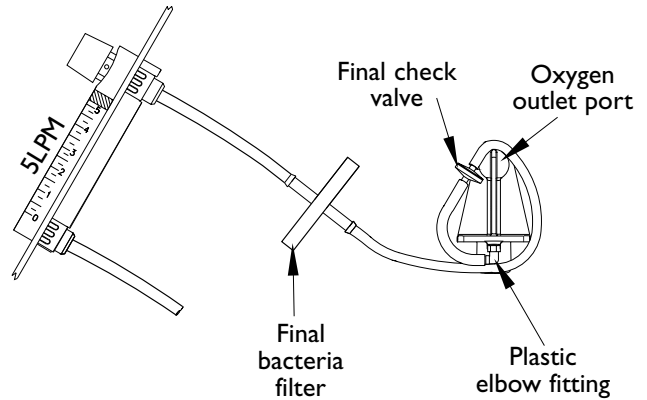


Figure 26

5. Remove the hose from each end of final check valve.
6. Attach the hoses to a new check valve. Ensure that the flat side of the check valve is directed away from the oxygen outlet port.
7. Replace the outlet fitting assembly and connect the hose to the filter.

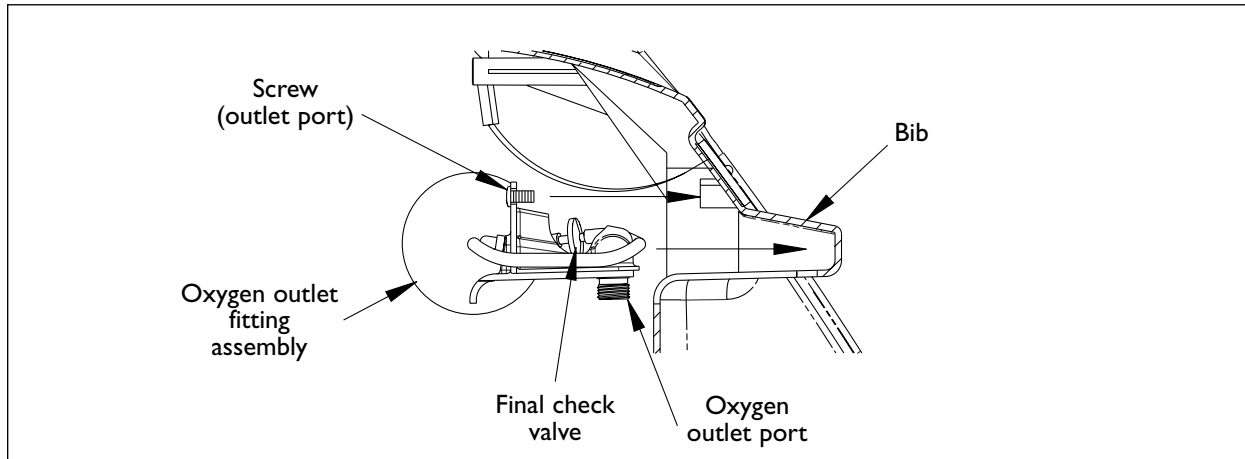


Figure 27

## Molecular Sieve Beds

The two molecular sieve beds alternately remove the nitrogen from the air passing through them and provide the patient with a constant supply of oxygen.

Sieve bed pressures can be read by attaching pressure-vacuum gauges to the test points located at the top of the manifold assembly. Normal pressure observed will be approximately 26 PSI (180 kPa). While one bed is pressurized, the other will depressurize to approximately 2 PSI (15 kPa).

The efficiency of the molecular sieve material will be impaired if it becomes contaminated by moisture. Contamination causes the molecular sieve material to lose its nitrogen adsorbing properties resulting in a decrease in oxygen concentration. Also, the pressure within the sieve bed will increase faster due to contamination which results in a shorter cycle time. Once the cycle time reaches the minimum preset cycle time, the patient alert system will sound due to a short cycle.

**NOTE**—The unit should run for a minimum of 20 minutes before turning “Off” to prevent problems associated with moisture contamination in the system.

The following tools are needed to test sieve beds:

- (2) Pressure-vacuum gauges (part #PVO2D-601)
- (2) Pressure test fittings (part #303DZ-632)

To test the sieve beds (Figure 28):

1. Remove the front and back cabinets.
2. Remove the two 1/16" plugged pieces of tubing on the top corners of the manifold.
3. Attach the 1/16" I.D. hose from the test fitting to one of the access fittings on the manifold. Attach one of the plugged pieces of tubing to the 1/16" barbed fitting on the test fitting. Attach the second pressure test fitting to the other access fitting. Connect the pressure-vacuum gauges to the test assemblies. Turn the unit on and observe the cycling.
4. Take cycle times. Refer to specifications for typical cycle times at 5 LPM.
5. After 20 minutes of operation, check the oxygen concentration levels. A combination of short cycle times and low oxygen concentration indicates contaminated sieve beds.

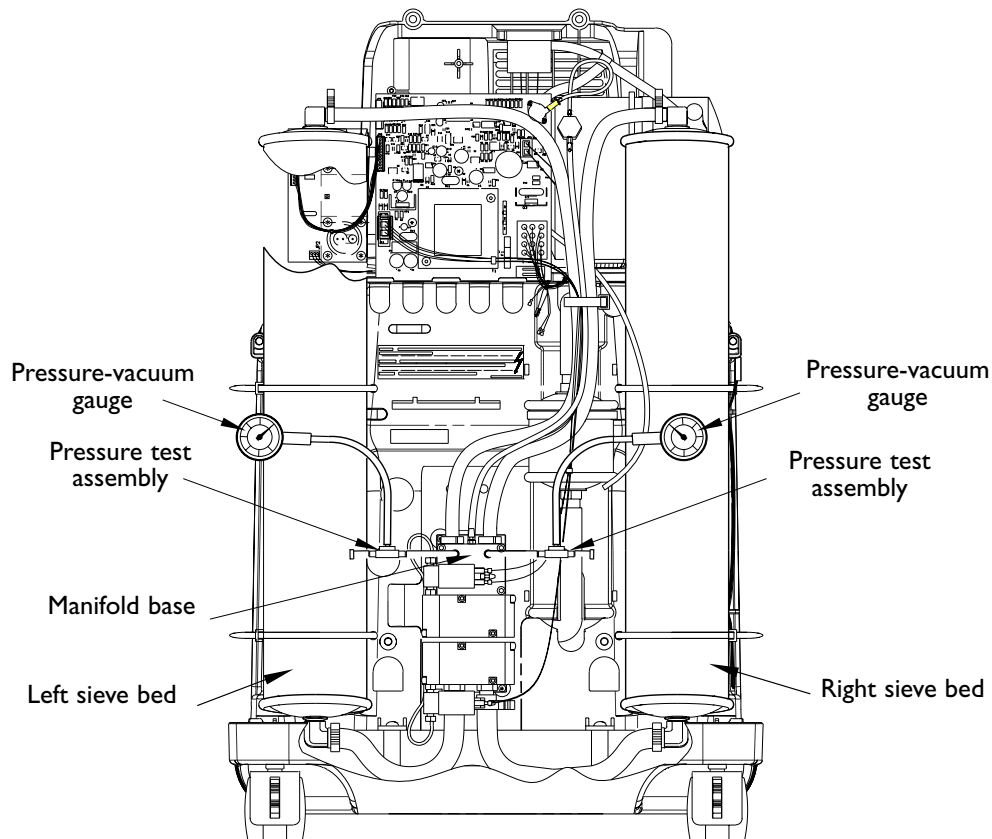


Figure 28



**NOTE**—If the short cycle (DI6 or DI6 and DI8) alarm has been activated, it must be determined whether the problem is with the sieve beds, a failure of the four-way to shift, or a restriction of flow. A flow meter turned off or crimped tubing may cause such a restriction. Short cycling would indicate bed failure and non-cycling would indicate a four-way valve malfunction.

If the molecular sieve material is found to be no longer effective, first locate the source of the malfunction or cause (such as leaks) for contamination and take corrective action.

**To replace the molecular sieve beds (after the problem has been corrected) (Figure 29):**

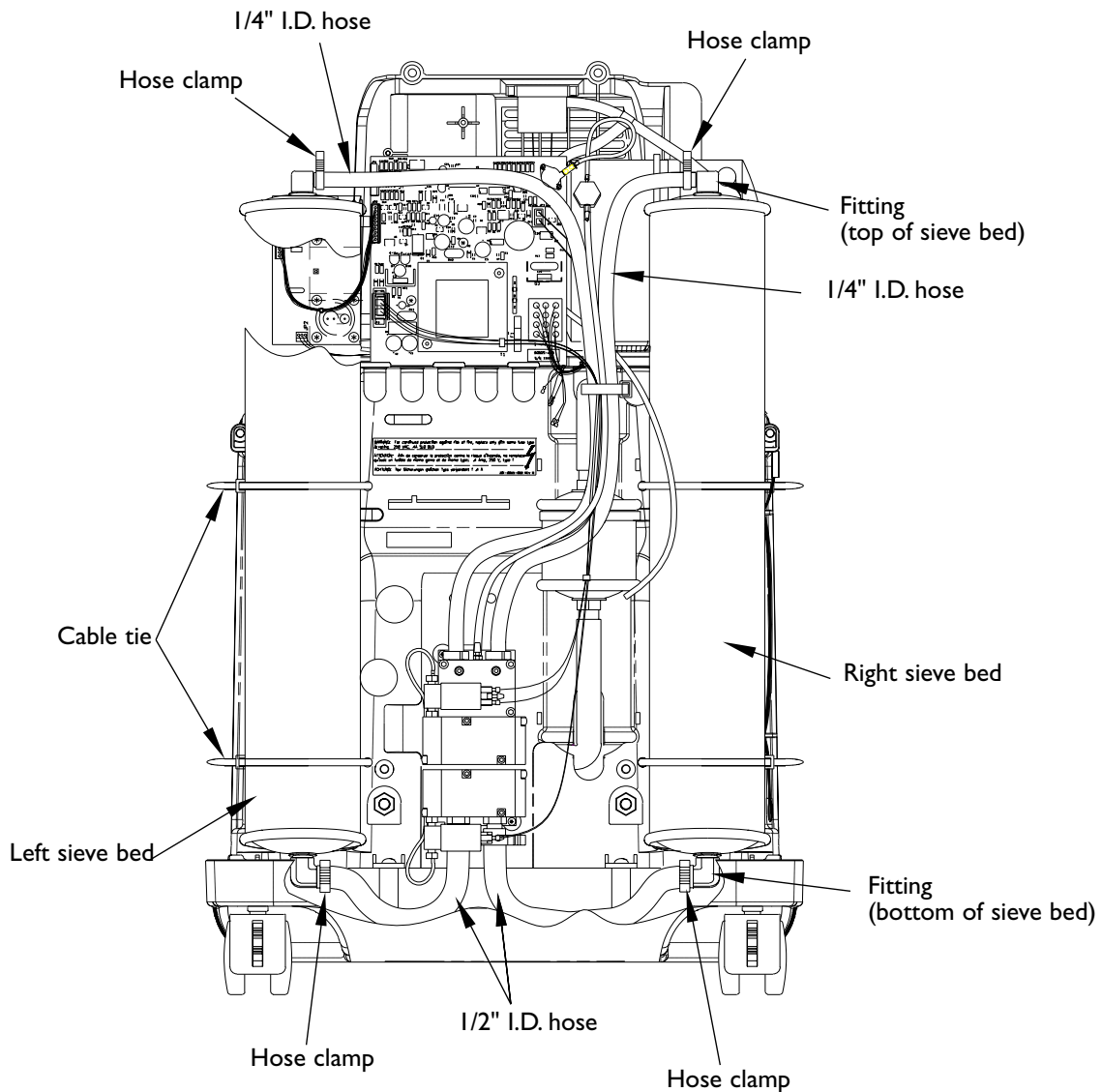
1. Ensure the unit is unplugged from the wall outlet.
2. Remove the plastic cable ties that secure sieve beds to internal structure of the unit.

**NOTE**—Cable ties are reusable, do not cut; press release tab to loosen cable tie.

3. Remove the 1/4" I.D. tubing from the top of each sieve bed.
4. Remove the hose clamps and reinforced tubing from the bottom of the sieve beds.
5. Install new sieve beds in reverse order. The bed serial number label should be at the top of the unit.

**NOTE**—Ensure that the sealing caps are removed from the new sieve beds just prior to connecting hoses.

6. Leak test all hose connections with a certified leak detection compound.



**Figure 29**

## Compressor

The DeVilbiss 5 Liter Oxygen Concentrator uses a double-head, oil-free compressor. The compressor is secured to a metal plate with four rubber motor mounts.

A compressor that is worn or defective may:

- cause excessive noise and/or vibration.
- result in a long cycle on each sieve bed.
- cause lower oxygen concentrations.

Long cycle times will activate the alarm system when the unit exceeds the maximum preset cycle time and the red (long cycle) diagnostic light on the PC board will illuminate.

A worn or defective compressor can be caused by a defective internal component such as:

- reed valve
- o-ring
- gasket
- Teflon® ring

These components are included in the Compressor Service Kit (part #MC44D-643, DAP compressor). (505DZ-643, Thomas Q2 compressor)

**NOTE**—A built-in thermal cutoff switch will shut the compressor off if it becomes overheated. This protects the compressor from damage caused by heat build-up.

**NOTE**—A pressure relief (PR) valve is located on the pressure head to prevent high pressure build up in the system should a component malfunction occur.

### To test compressor operating voltage:

The compressor requires 115VAC to operate. If the compressor does not start when the unit is turned on, the voltage input must be tested:

1. This voltage can be checked at the compressor connector using a volt meter or test light connected to the black and white wires. The volt meter is the best way to test. (Refer to test position, Figure 30.)
2. If no voltage is detected, disconnect power and check for loose or broken wires between the compressor connector and PC board.
3. If the wiring is good, replace the PC board.
4. If there is voltage at the compressor connector, then either the capacitor or the compressor itself is defective. (Refer to Simplified Troubleshooting).

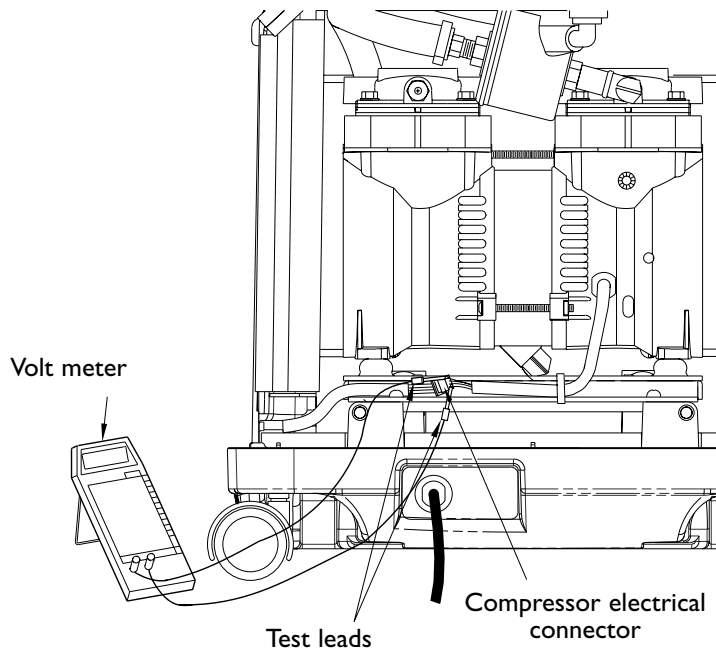


Figure 30

**To test the compressor for proper output:**

**NOTE**—If the compressor is not providing a high enough output, the cycle time will be long and the patient alert system might be activated.

1. Remove the front and back cabinets.
2. Connect a set of pressure-vacuum gauges to the test points on the top of the manifold assembly. A defective compressor will be indicated by slowly rising pressure. Pressure may only reach a certain level and then stop and eventually activate the long cycle alarm.

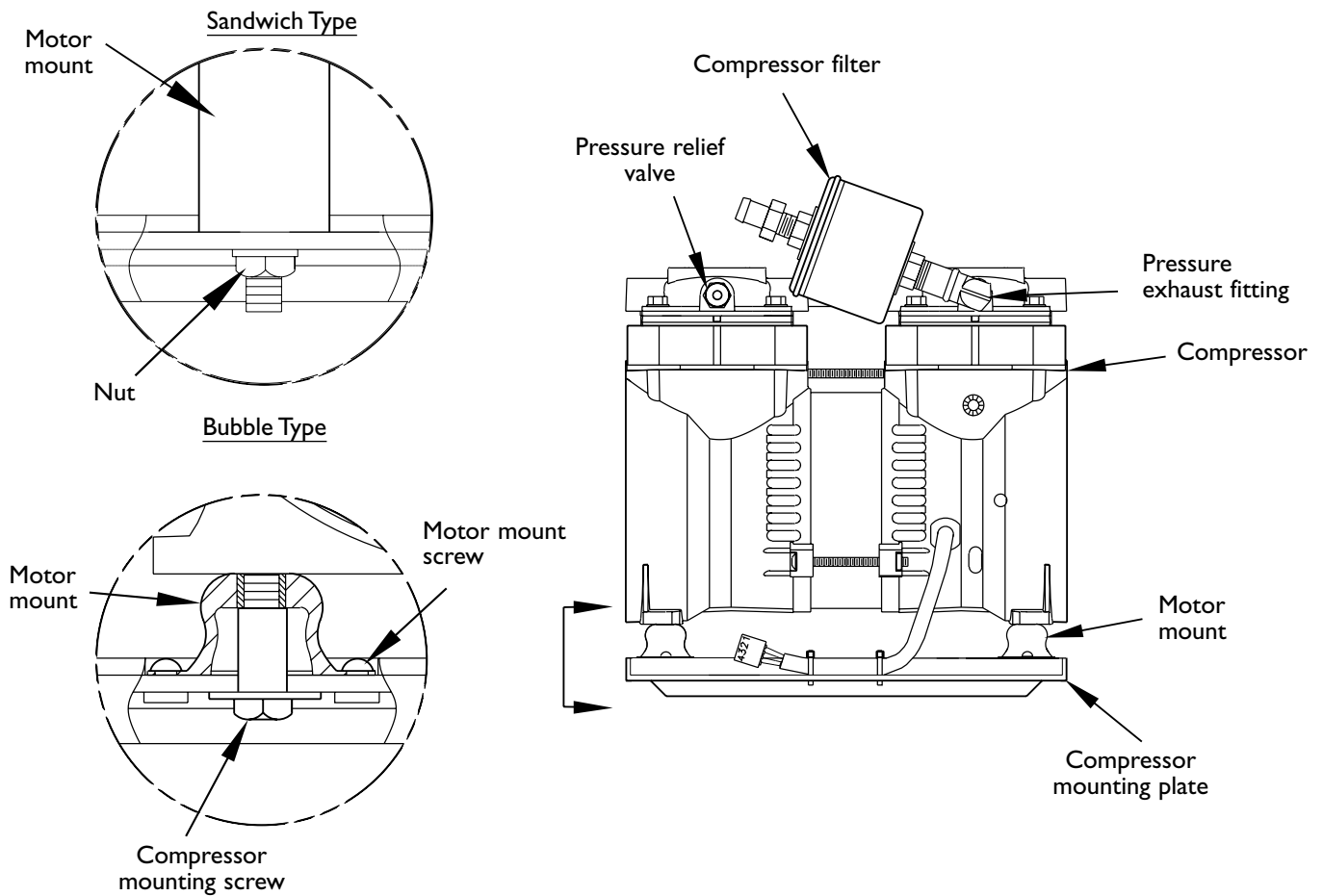
**If these conditions are observed then:**

- The unit filter(s) may be occluded - check the air filter, intake filter, and the compressor filter for occlusions.
- There may be a severe leak in system - check for air leaks using a leak detection solution.
- Compressor reed valves, Teflon ring, or the compressor itself may be defective (refer to Figure 35).

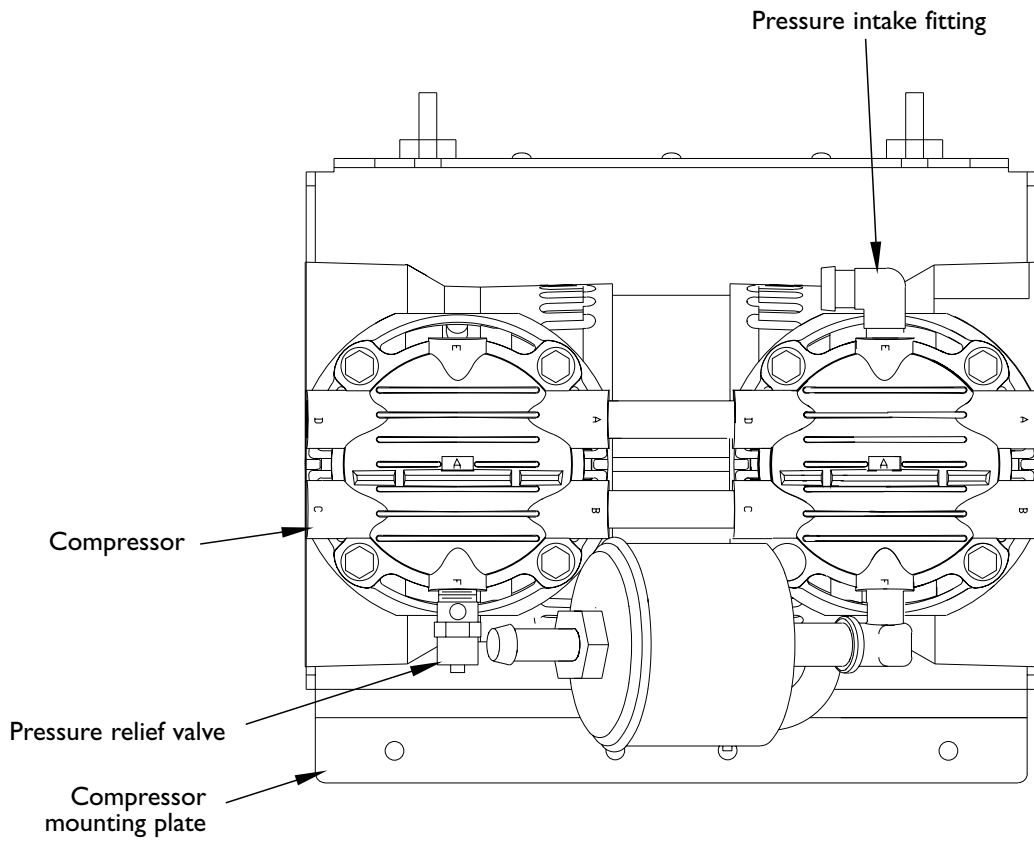
If the filters are not occluded and no leaks are found, the compressor must then be removed and repaired or replaced.

**To remove compressor:**

1. Ensure the unit is unplugged from the wall outlet.
2. Disconnect the compressor wires by disconnecting the white electrical connector (Figure 30).
3. Remove hose clamp and tubing from the outlet fitting on the compressor filter (Figure 33).

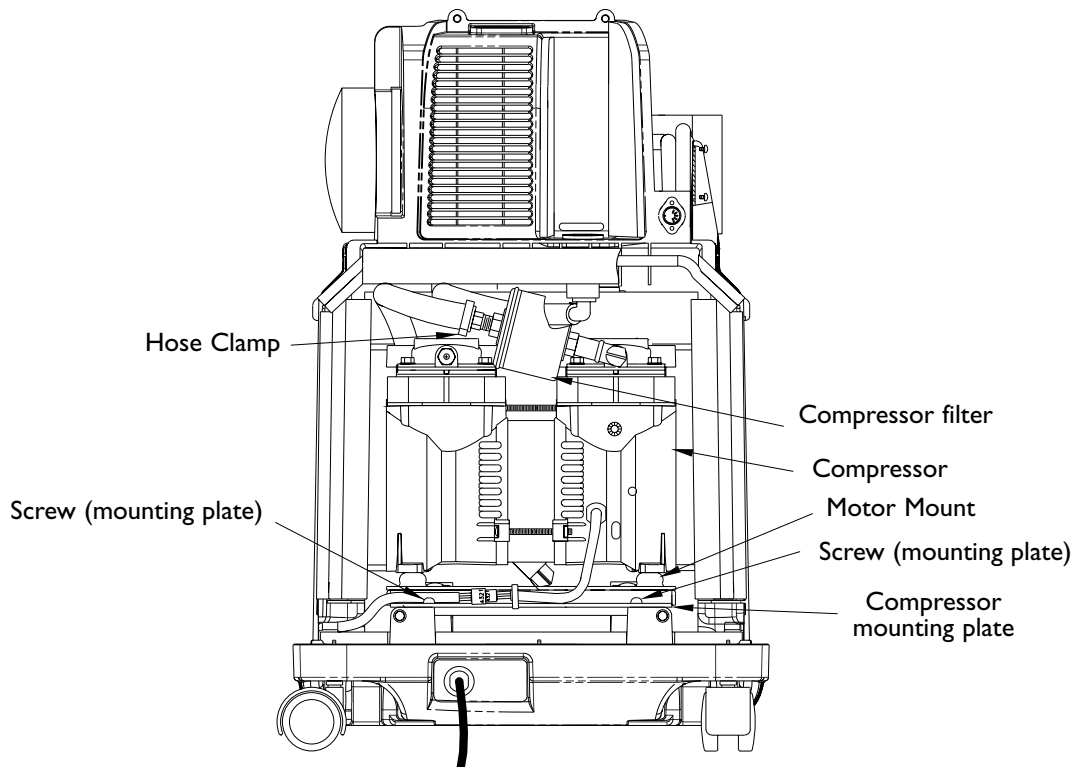


**Figure 31**



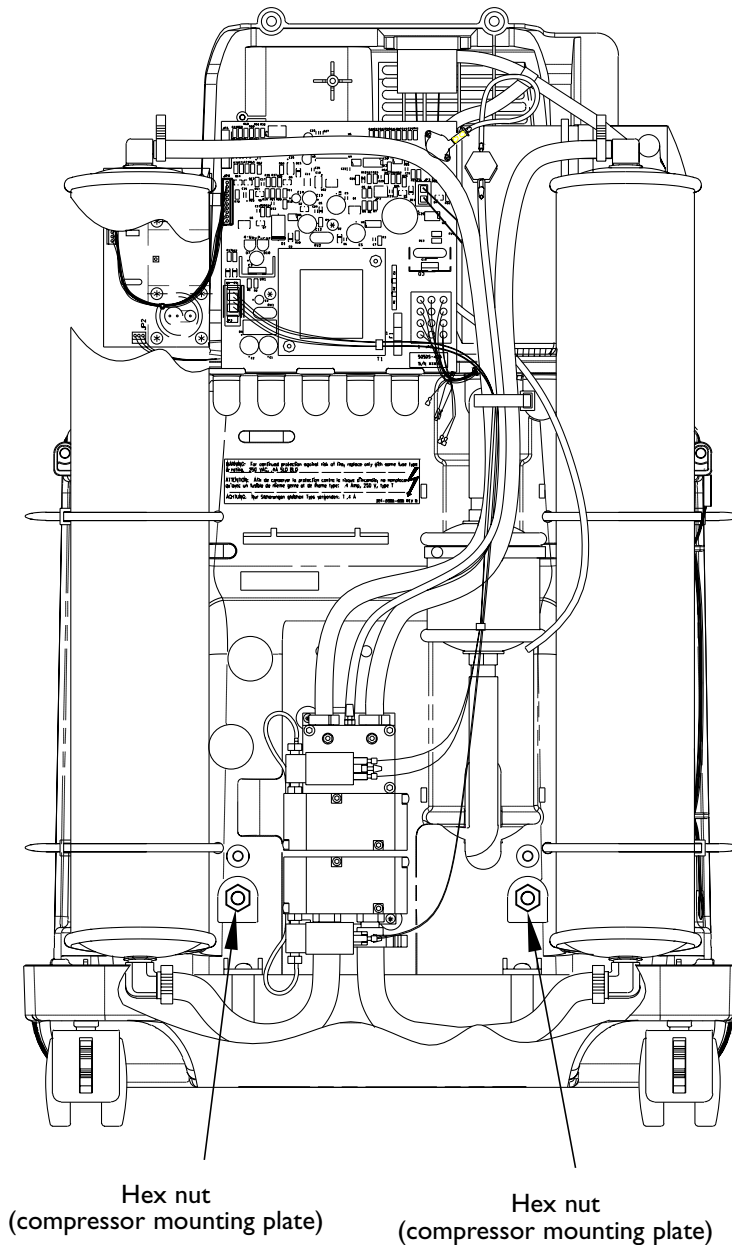
**Figure 32**

4. Remove the two screws from the back of the compressor mounting plate (Figure 33).



**Figure 33**

- Remove the two hex nuts that secure the mounting plate to the front of the compressor housing (Figure 34). These nuts are located on each side of the four-way valve.



**Figure 34**

- Lift compressor and mounting plate up and out of the compressor housing area.

**CAUTION**—If the unit has been running recently, the compressor may be hot.

**To inspect and/or replace internal components (Figure 35):**

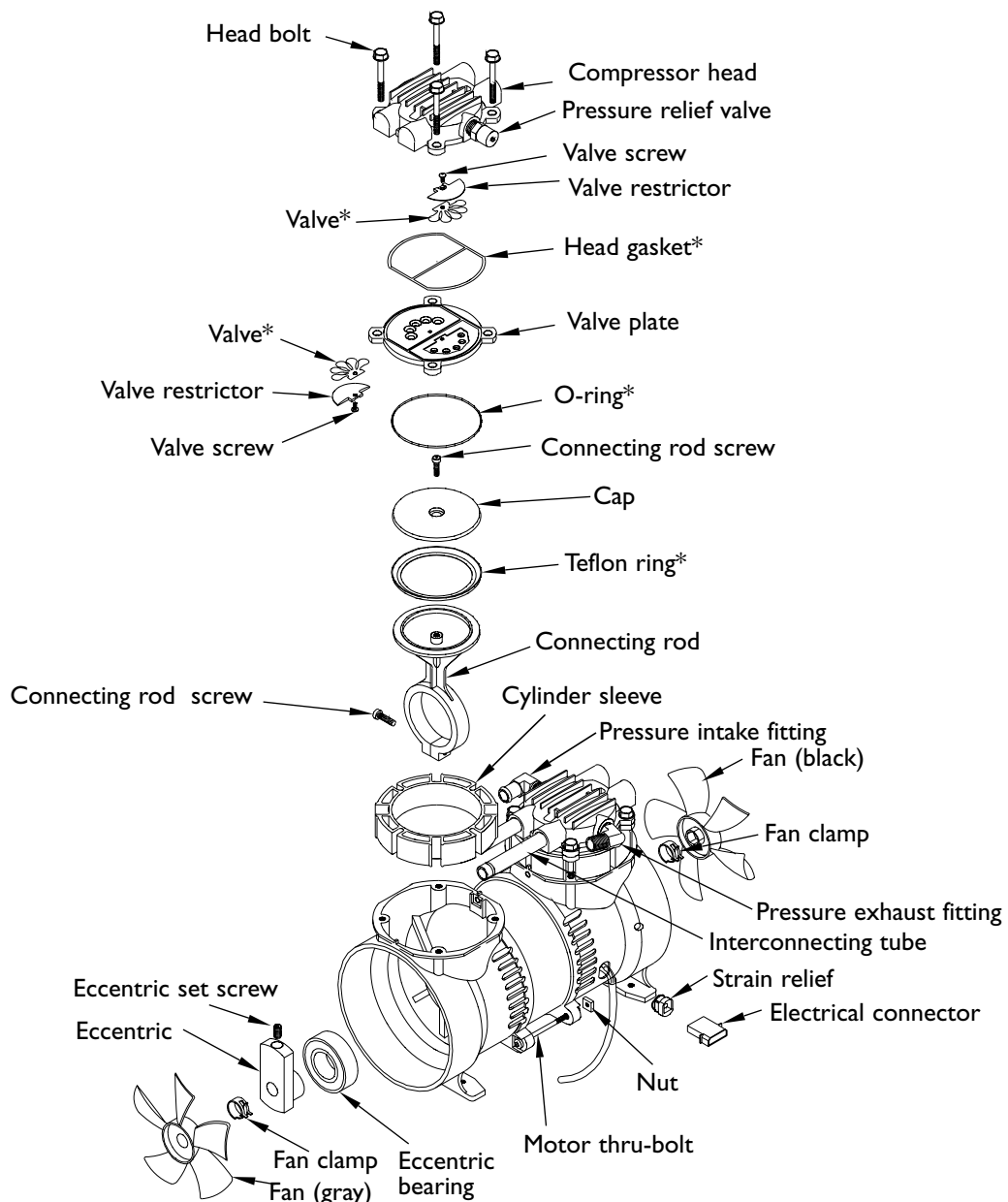
- Remove the eight screws that hold the compressor heads in place. When removing the heads, be sure to keep each head and its components with the correct compressor side.
- Check for proper placement of or damage to the gaskets on the bottom of the compressor heads. Replace if damaged.
- Remove reed valve plates. A reed valve is located on each side of the valve plate.
- The compressor reed valves should be flush with the valve plate. If the valve is broken, not flush with valve plate, or foreign matter is detected inside the head, clean or replace the compressor reed valve.

**To replace the compressor reed valve (Figure 35):**

- a) Remove screw holding compressor reed valve in position on valve plate and discard reed valve.
  - b) Position the new reed valve so that it is centered and completely covers the holes in the valve plate.
  - c) Place the metal retainer on the reed valve and secure with the reed valve screw.
5. Check for proper placement of or damage to the rubber o-ring on the bottom of the valve plate. Replace if damaged.
  6. Remove piston sleeves by pulling upward and inspect Teflon ring on pistons. Replace if badly worn or damaged.

**To replace Teflon ring (Figure 35):**

- a) Remove screws from top of piston.
  - b) Remove the retainer plate.
  - c) Discard defective Teflon ring.
  - d) Place new Teflon ring into position.
  - e) Replace retainer plate.
  - f) Secure with screws.
7. Reposition sleeve on piston.
  8. Place valve plates on the compressor so that heads of reed valve screws are aligned with the indentation in top of pistons.
  9. Install the compressor heads so that the holes in the heads are aligned with the holes in the compressor housing.
  10. Secure compressor heads with the screws.

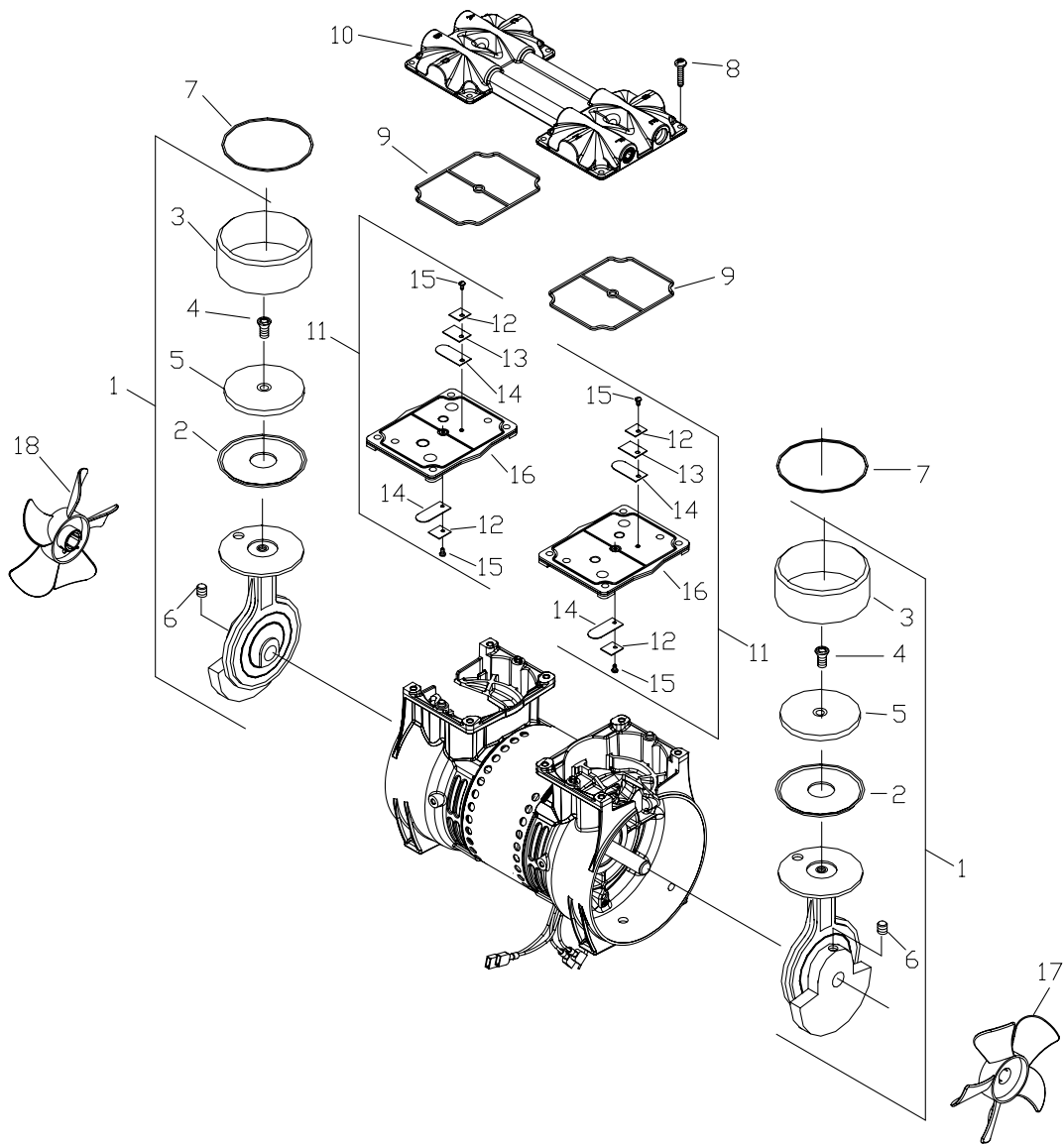


\*Included in the compressor service kit (part# MC44D-643)

**Figure 35A**

Thomas Q2 Compressor (exploded view)

- |   |  |    |                                   |
|---|--|----|-----------------------------------|
| 1 | Connecting rod, eccentric and bearing assembly | 10 | Head                              |
| 2 | Piston cup*                                    | 11 | Valve plate assembly              |
| 3 | Cylinder sleeve                                | 12 | Valve keeper strip                |
| 4 | Screw - piston cup retainer                    | 13 | Valve restraint                   |
| 5 | Piston cup retainer                            | 14 | Valve flapper - intake & exhaust* |
| 6 | Set screw - eccentric                          | 15 | Screw - valve flapper             |
| 7 | O-ring - sleeve*                               | 16 | Valve plate                       |
| 8 | Screw - head                                   | 17 | Fan - white                       |
| 9 | O-ring*  | 18 | Fan - black                       |



\*Included in the compressor service kit (part#505DZ-643)

Figure 35B

**To replace compressor (Figure 36):**

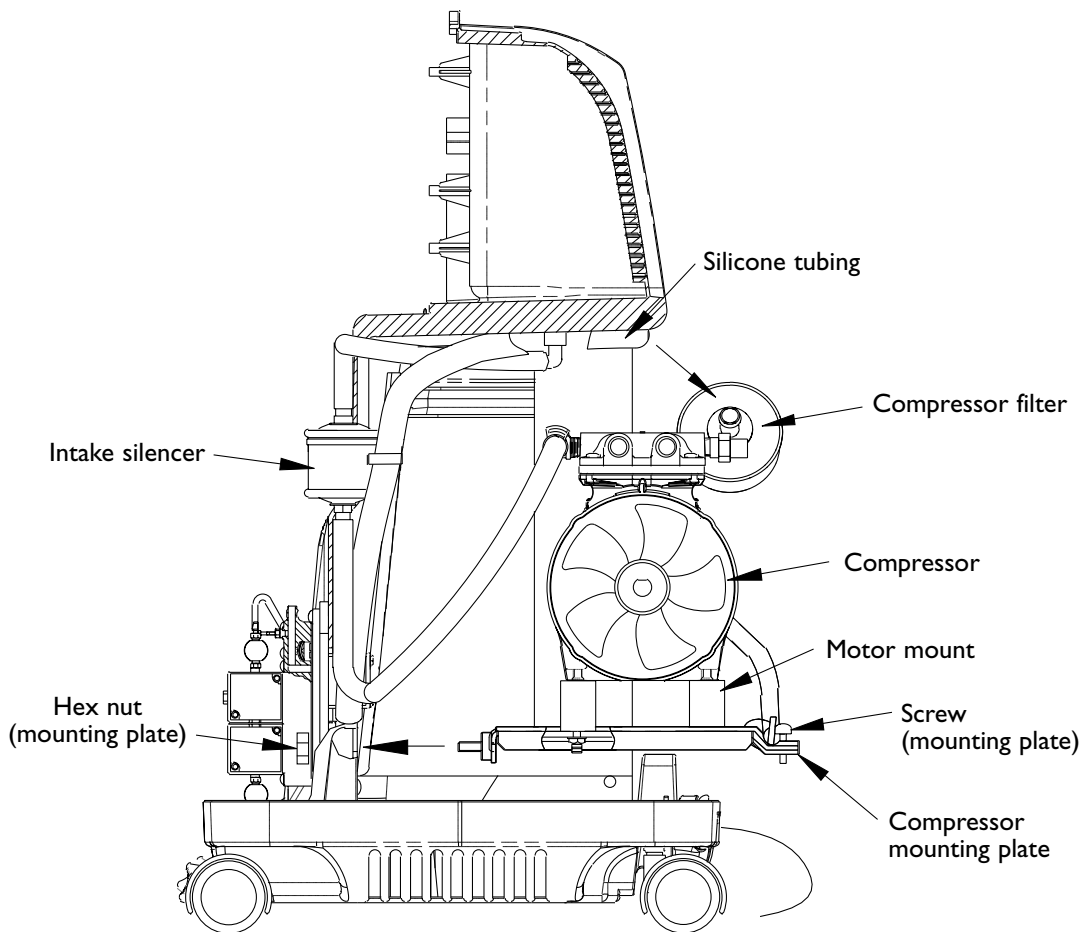
**NOTE**—For mounting plate and motor mount removal, refer to sections below.

1. Inspect motor mounts. Replace if damaged. Install motor mounts on compressor mounting plate. Secure the plate to the bottom of the new compressor using the appropriate hardware.
2. Reconnect braided tubing to the pressure intake fitting.
3. Position compressor on the base of the unit so that the studs on the mounting plate are aligned with notches on the front of the unit base.
4. Secure mounting plate with two screws on the back and install nuts on the front side of the plate.
5. Reconnect hose to compressor filter.
6. Reconnect the compressor electrical connector.

**To remove compressor from the mounting plate:**

1. Turn compressor upside down so that it is resting on the heads.
2. Remove the four compressor mounting hardware and mounting plate.

**NOTE**—If compressor must be replaced, the compressor filter must be removed from the defective compressor. Depending on the hours of operation, a new compressor filter should be installed on the compressor if it is replaced or rebuilt.



**Figure 36**



## Cooling Fan

The cooling fan provides a constant air flow to cool the compressor.

A defective cooling fan may cause the compressor's internal thermo-protective device to activate and shut the compressor off. Should this condition occur, the compressor will require several minutes for the thermo-protective device to reset.

**If the cooling fan is defective, it must be replaced:**

1. Ensure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets.
3. Remove the compressor.
4. Disconnect the cooling fan quick-connect terminal.
5. Note the position of the fan before removing the four retaining screws that secure the fan to the base of the unit.
6. Remove the defective fan and secure the replacement fan in position with the four retaining screws.

**NOTE**—When installing the fan, be sure the air flow directional arrow on the side of the fan is directed away from the compressor.

7. Reconnect the electrical connector.
8. Replace the compressor.

## Four-Way Valve

The pneumatically operated four-way valve alternately distributes pressure supplied by the compressor to the two molecular sieve beds. While one bed is being pressurized the other bed is being exhausted through the four-way valve. Exhaust gases passing through the four-way are directed to the purge valve so they can be released from the unit.

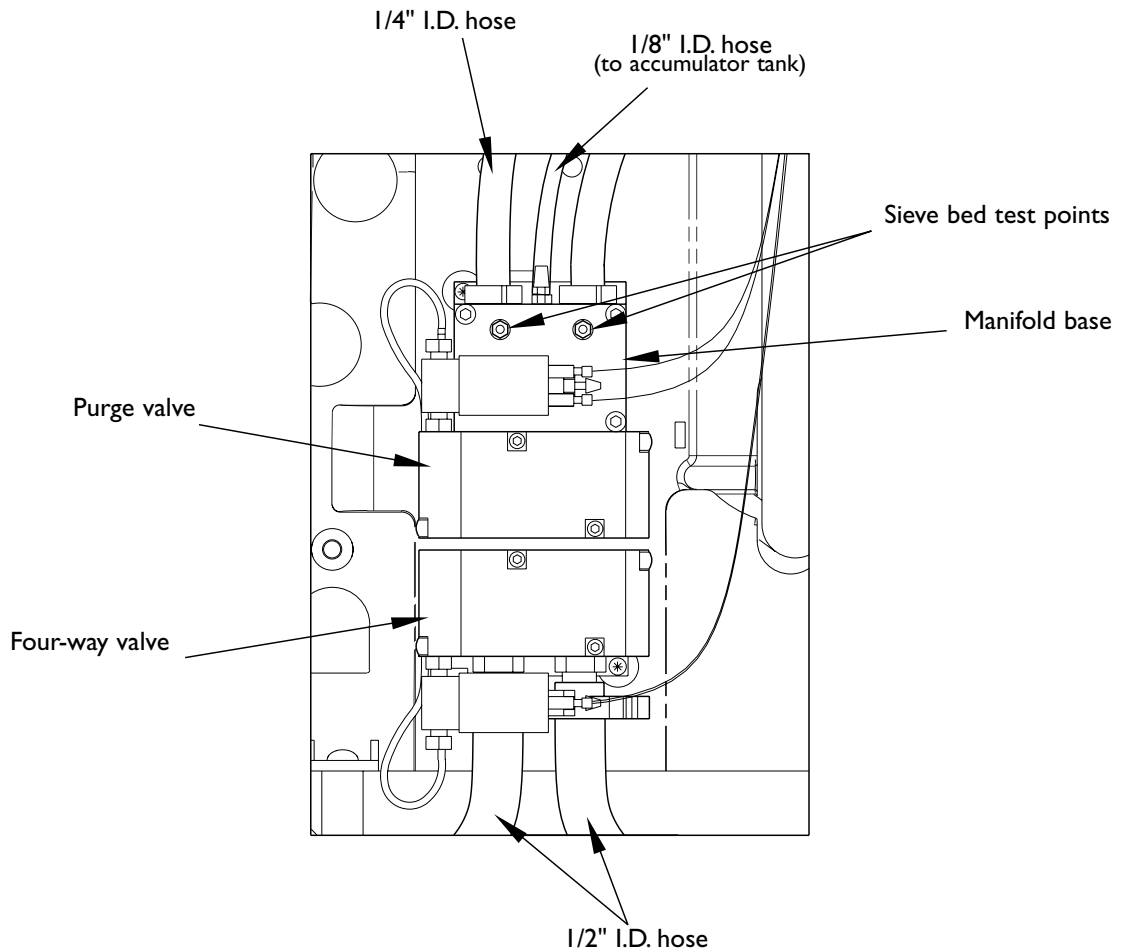


Figure 37

The four-way valve, while operating pneumatically, uses an external pilot valve that allows pressure to shift the spool inside the four-way. This pilot valve receives a signal (12-15 VDC) from the PC board causing it to open and allowing pilot pressure to activate the four-way. When the four-way is activated, the left sieve bed will pressurize. Once the bed fills the oxygen accumulator tank, the cycle is changed by removing the signal to the pilot valve. This will cause the four-way to deactivate and pressurize the right sieve bed.

**NOTE**—The four-way valve will not shift until the oxygen accumulator tank is filled. This will take approximately 10 seconds depending on altitude and liter flow.

If the four-way does not shift, the alarm system may be activated and the short cycle light on the PC board will illuminate. Refer to Alarm System. If the alarm system is not activated, short cycle times and low oxygen concentration will result because the same bed will continue to pressurize.

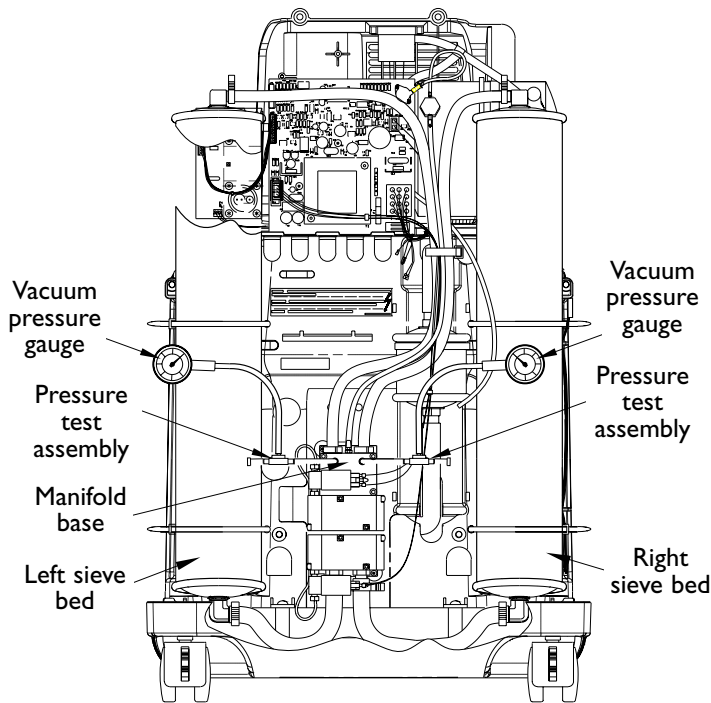
There are several reasons for the four-way to malfunction. The cause of failure must be determined before corrective action can be taken.

**Some reasons for four-way failure are:**

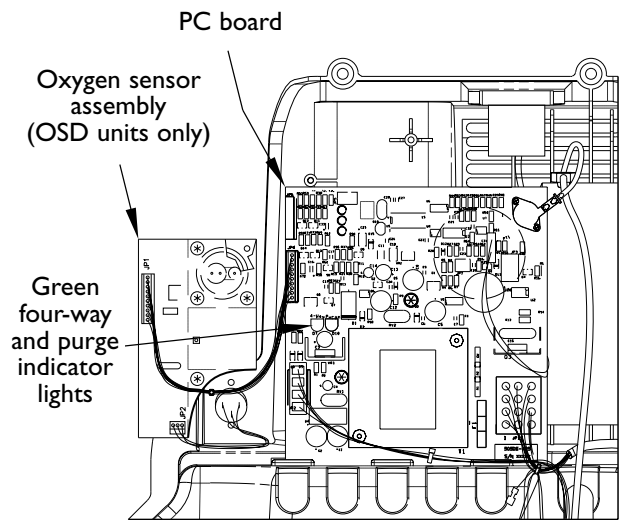
- Continuous or no voltage to pilot valve on four-way.
- Little or no pilot pressure.
- Foreign matter inside valve preventing spool from shifting.
- O-rings on sleeve may be worn preventing the valve from shifting properly.

**To test four-way valve:**

1. Remove the front cabinet.
2. Connect pressure gauges furnished in the service kit to the test points located on the manifold assembly.
3. Turn unit on and observe the green indicator light labeled “4-way” on the PC board. When this light is illuminated the four-way should be activated and the left sieve bed should be pressurizing. If the right bed pressurizes instead, this indicates that the four-way did not properly shift.



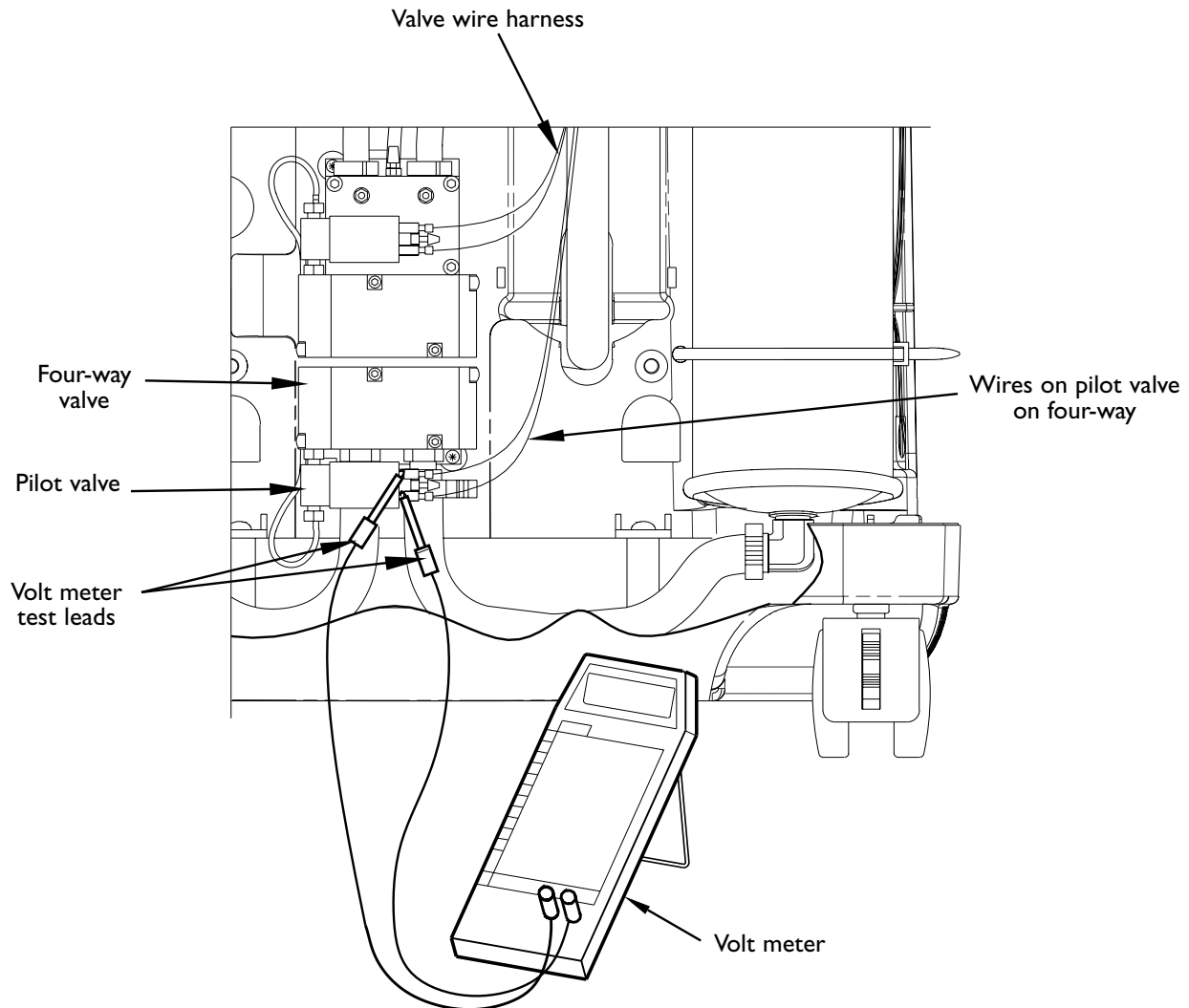
**Figure 38**



**Figure 39**

If the left bed does pressurize first, observe whether pressure is shifted to the right bed once the shift point pressure is reached or if the left bed proceeds to pressurize again. In either case, if either bed continues to pressurize without shifting, further testing is needed. Refer to the Normal Operating Sequence.

4. Place the test leads of a volt meter across the terminals of the pilot valve. Approximately 12-15 VDC should be measured while the green "4-way" indicator light is illuminated (voltage will be supplied for approximately 9-10 seconds or until the oxygen accumulator tank is filled). If this reading is not obtained, check for loose or broken wires from the four-way valve to the PC board. If no loose or broken wires are found, replace the PC board.
5. Test for pilot pressure. Refer to Pilot Pressure System.
6. If 12-15 VDC is measured at connecting leads to four-way and pilot pressure is normal, then four-way valve is either defective or foreign matter has gotten inside valve causing it to malfunction. In either case the four-way valve must be removed to clean or replace it.

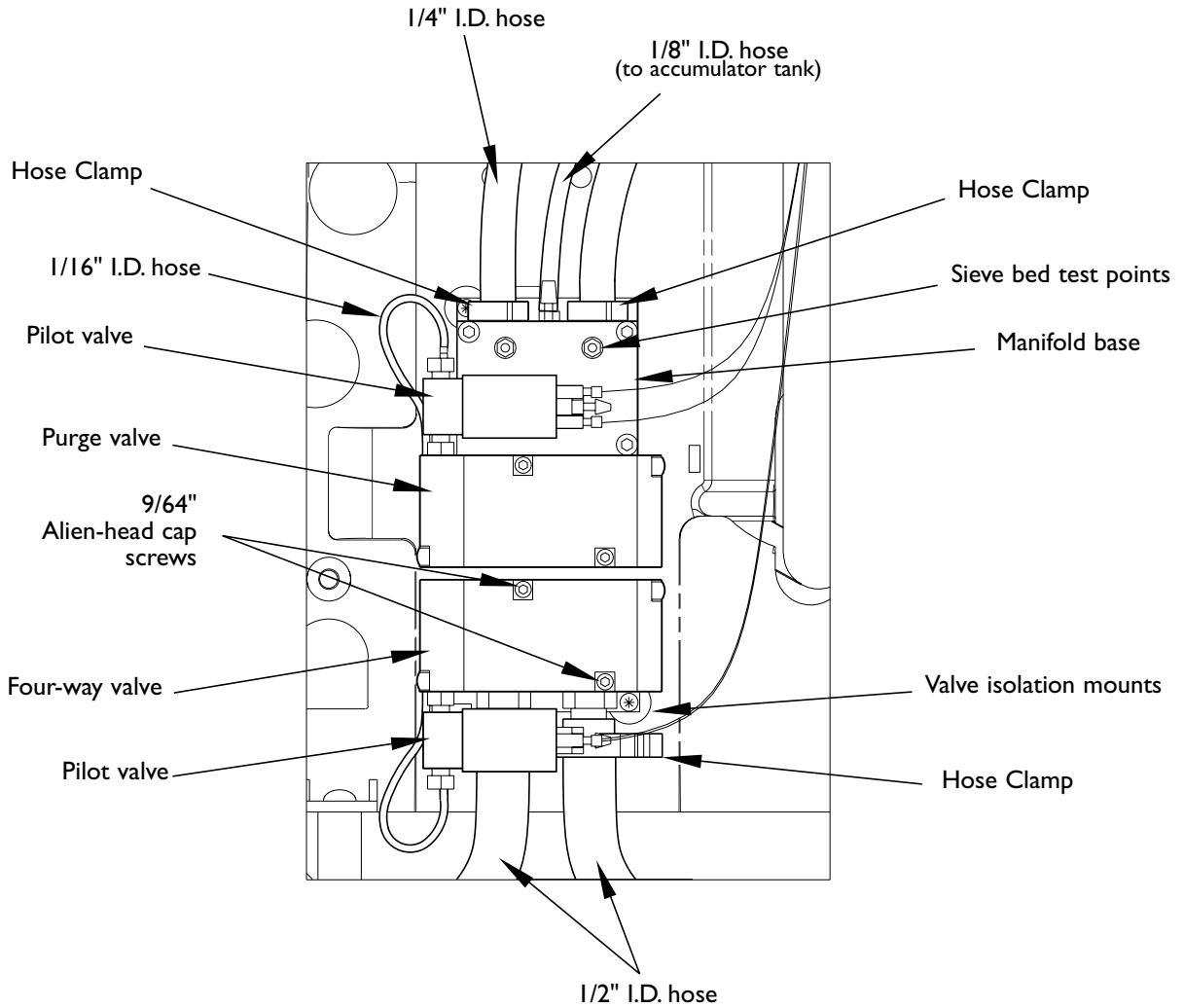


**Figure 40**

**To remove four-way valve (Figure 41):**

1. Unplug the unit from the wall outlet.
2. Remove the front cabinet.
3. Disconnect the two wires from terminals on pilot valve.
4. Remove the pilot pressure tubing from pilot valve.
5. Remove the two allen-head cap removal screws from top of four-way using an allen wrench. The top of valve body and gasket can now be removed.

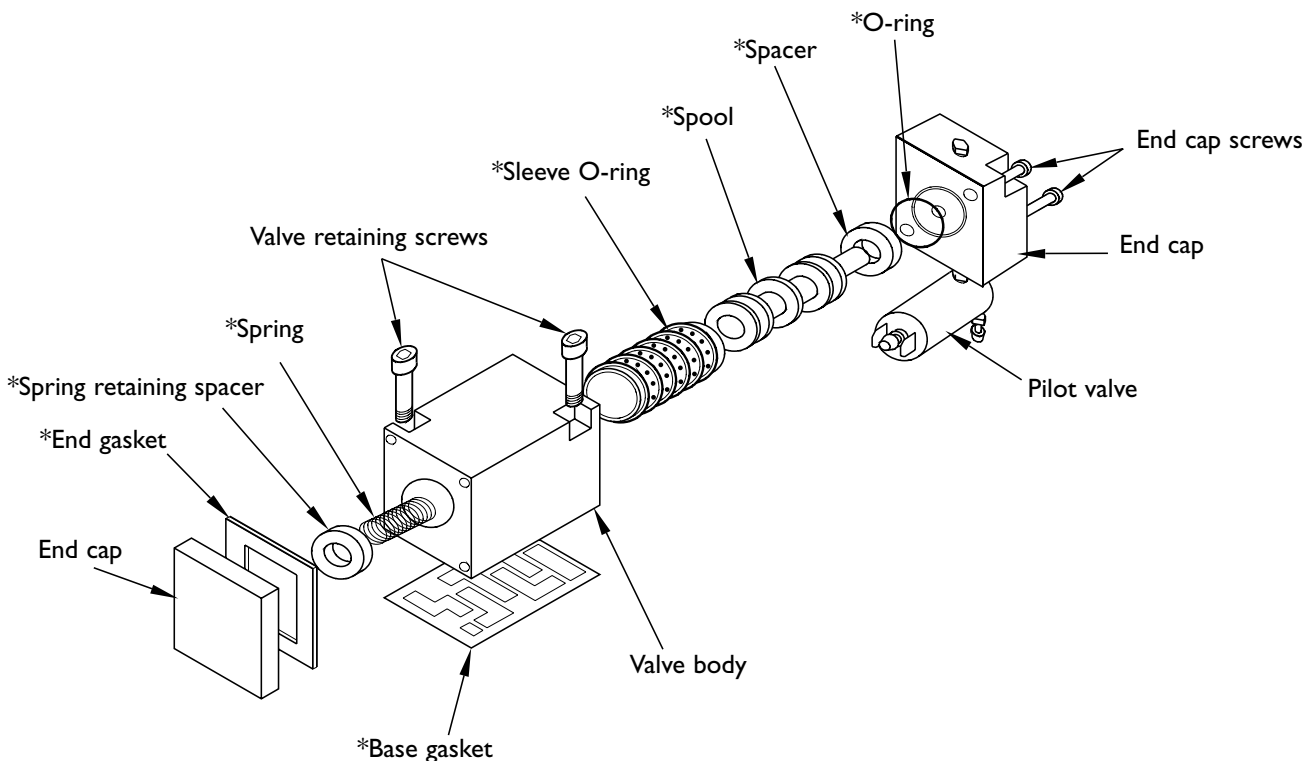
**NOTE**—Do not remove manifold. The manifold will remain on the unit whether you are cleaning or replacing the valve.



**Figure 41**

**To clean the four-way valve (Figure 42):**

1. Remove the two allen head valve retaining screws from the top of the four-way valve. The top of the valve body can now be removed along with the pilot valve. The valve manifold will remain on the unit. A rubber gasket located between the valve body and manifold should also be removed.
2. Remove the end cap screws from both ends of the valve so that the end plates, plastic spacers, and spring can be removed. Note the position of these parts.
3. Carefully remove spool from valve body. (**NOTE**—Spool and sleeve are a matched set. Care should be taken not to mix different valve parts.)
4. Using a non-metallic rod or dowel with a diameter no greater than the sleeve, slowly push the sleeve out either end of the valve body. (**NOTE**—Pushing too fast will cause o-rings to roll and jam.) Inspect the o-rings on sleeve. If they are badly worn or defective, they should be replaced using the Valve Rebuild Kit (part #MC441-707).
5. The spool and sleeve can be cleaned using a spray-on evaporative electro-contact cleaner; e.g. ENVI•RO•TECH™ 1677, or cleaned with a detergent powder; e.g. ALCONOX®. If using these cleaners, follow manufacturer's instructions carefully. **DO NOT USE ANY TYPE OF CLEANSER THAT IS ABRASIVE OR LEAVES A RESIDUE.**
6. Rinse the spool and sleeve thoroughly and dry with a soft, clean, lint-free cloth.
7. Ensure that the air passages (ports) in both the valve body and manifold are free of any foreign matter. A clean, lint-free cloth or a compressed air hose can be used to clean these.
8. Carefully push sleeve into valve body (turning it slightly) so you do not cut or nick the o-rings. To ensure proper placement of sleeve, use the spring retaining spacer and push the sleeve and spacer in until the spacer is flush with the end cap mounting surface.
9. Reassemble remaining parts of valve in reverse order.



**\*Included in the four-way valve rebuild kit (part# MC441-707)**

**Figure 42**

**To replace four-way valve:**

1. Align valve body and gasket on manifold. Ensure that gasket is aligned properly. Secure with two allen head screws.
2. Attach pilot pressure tubing to pilot valve.
3. Reconnect the two wires on terminals of pilot valve.
4. Replace cabinet and secure with fasteners.

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ENVI•RO•TECH™ 1677 is a trademark of Tech Spray, Inc.

## Purge Valve

Like the four-way, the pneumatically operated purge valve uses an external pilot valve. This pilot valve will receive a signal (approximately 12-15 VDC) from the PC board at the beginning of each cycle (except the first) causing the purge to be activated for approximately 1.2 seconds. While the purge is activated, oxygen is transferred from the pressurized bed to the depressurized bed and the exhaust port is closed. When the purge is deactivated, the exhaust port opens allowing nitrogen to be exhausted. It is released through an exhaust muffler located on the back of the manifold assembly.

The opening and closing of the purge valve can be observed by attaching pressure gauges to the test points on the manifold assembly. When the purge is activated, there will be a sudden increase in pressure in one bed and a sudden decrease in the other as the cycle changes. When the purge is deactivated, the pressures in the sieve beds will continue to increase and decrease respectively. You will hear the oxygen being transferred when the purge is activated and the exhaust will also be heard when the valve is deactivated.

A purge valve stuck in the activated position will cause both sieve beds to pressurize simultaneously and activate the alarm system. The appropriate red indicator lights will be illuminated.

If the purge valve remains in a deactivated position, the alarm system will not be activated but the following symptoms may be noticed:

- No sudden increase and decrease of sieve bed pressures when cycle changes. They will go up and down gradually.
- Only the exhaust can be heard when unit cycles.
- Possible drop in oxygen concentrations, especially at the higher liter flows.

There are several reasons for the purge valve to malfunction. The cause of failure must be determined before the proper corrective action can be taken. Some reasons for purge failure are:

- Continuous or no voltage to pilot valve on purge.
- Little or no pilot pressure.
- Foreign matter inside valve preventing spool from shifting.
- Defective or damaged purge.
- O-rings on sleeve may be worn preventing the valve from shifting properly.

### To test purge valve:

1. Remove the front cabinet.
2. Connect pressure gauges furnished in the service kit to the test points located on the manifold assembly.
3. Turn unit on and observe the green indicator light labeled purge on the PC board. When this light is illuminated (approximately 1.2 seconds), the purge should be activated and there should be a sudden increase and decrease of pressure in the respective sieve beds. The absence of this purging action indicates that the purge was not properly activated. Refer to the Normal Operating Sequence.

4. Place the test leads of a volt meter across the terminals located on the pilot valve. Approximately 12-15 VDC should be measured while the green purge indicator light is illuminated (voltage will be supplied for approximately 1.2 seconds). If this reading is not obtained, check for loose or broken wires from the purge valve to the PC board. If no loose or broken wires are found, replace the PC board.
5. Test the pilot pressure. Refer to Pilot Pressure System.
6. If 12-15 VDC is measured at connecting leads to purge and pilot pressure is normal, then the purge valve is either defective or foreign matter has gotten inside valve causing it to malfunction. In either case, the purge valve must be removed to clean or replace it.

### To remove purge valve (Figure 41):

1. Unplug the unit from the wall outlet.
2. Remove the front cabinet.
3. Disconnect the two wires from terminals on pilot valve.
4. Remove the pilot pressure hose from pilot valve.
5. Remove the two allen-head cap screws from the top of purge using an allen wrench. The top of valve body and gasket can now be removed.

**NOTE**—Do not remove manifold. The manifold will remain on the unit whether you are cleaning or replacing the valve.

### To clean purge valve:

1. Remove the two allen-head screws from the top of the purge valve. The top of the valve or valve body can now be removed along with the pilot valve. The valve manifold will remain on the unit. A rubber gasket located between valve body and manifold should also be removed.
2. Remove the screws from the ends of the valve so that the end plates, plastic spacers, and spring can be removed. Note the position of these parts.
3. Carefully remove spool from valve body. **NOTE**—Spool and sleeve are a matched set. Care should be taken not to mix different valve parts.
4. Using a non-metallic rod or dowel with a diameter no greater than the sleeve, slowly push the sleeve out either end of the valve body. (**NOTE**—Pushing too fast will cause o-rings to roll and jam.) Inspect the o-rings on sleeve. If they are badly worn or defective, they should be replaced using the Valve Rebuild Kit (part #MC441-707).
5. The spool and sleeve can be cleaned using a spray-on evaporative electro-contact cleaner; e.g. ENVI•RO•TECH™ I677, or cleaned with a detergent powder; e.g. ALCONOX®. If using these cleaners, follow manufacturer's instructions carefully. **DO NOT USE ANY TYPE OF CLEANER THAT IS ABRASIVE OR LEAVES A RESIDUE.**
6. Rinse the spool and sleeve thoroughly and dry with a soft, clean, lint-free cloth.
7. Ensure that the air passages (ports) in both the valve body and manifold are free of any foreign matter. A clean, lint-free cloth or a compressed air hose can be used to clean these.

8. Carefully push sleeve into valve body (turning it slightly) so you do not cut or nick the o-rings. To ensure proper placement of sleeve, use the spring retaining spacer and push the sleeve and spacer in until the spacer is flush with the end cap mounting surface.
9. Reassemble remaining parts of valve in reverse order.

**To replace purge valve:**

1. Align valve body and gasket on manifold. Ensure that gasket is aligned properly. Secure with two allen head screws.
2. Attach pilot pressure tubing to purge.
3. Reconnect the two wires on terminals of pilot valve.

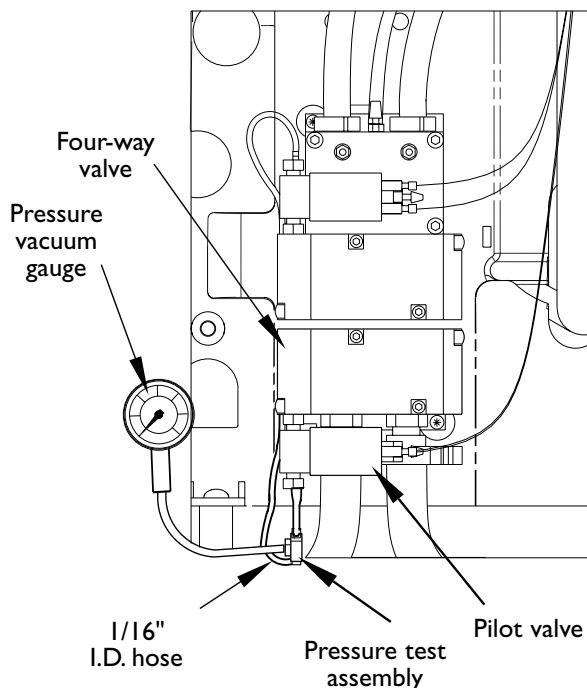
**Pilot Pressure System**

The compressed air in the pilot pressure system is used to activate the four-way and purge valves. This compressed air (approximately 22-28 PSI or 125-200 kPa) is stored in the pilot accumulator cavity within the manifold. An internal check valve on the inlet side allows compressed air to enter and prevents it from escaping. The outlet end of the cavity is connected to the pilot valves on the purge and four-way by an externally mounted "T" fitting and 1/16" tubing.

A defective check valve in the pilot accumulator or leak in the pilot pressure tubing would result in lower pilot pressure. This, in turn, could cause a malfunction of the four-way and/or purge valve or low oxygen concentration.

**To test pilot pressure:**

1. Remove the front cabinet.
2. Remove the pilot pressure hose from the pilot valve on the four-way or purge.
3. Attach the pilot pressure hose to the barbed fitting on one end of the pressure test assembly that is included in the service kit.
4. Attach the 1/16" hose on the other end of the test assembly to the fitting on the pilot valve.
5. Install a pressure gauge on the test assembly.
6. With the unit operating, pilot pressure readings should be alternating from 22-28 PSI (125-200 kPa). This pressure range may vary slightly from one unit to another. This is essentially the same pressure as that being exhausted by the compressor. Therefore, it can also be used to help determine if the compressor is working properly.
7. If pilot pressure is low, check sieve bed pressure.
8. If sieve bed pressures are normal, check for leaks in the pilot pressure system. If no leaks are found, then the check valve in the pilot accumulator may be leaking internally and the manifold base must be replaced (see Figure 44).
9. If sieve bed pressures are low or rising slowly, then:
  - a. One or more of unit filters may be occluded.
  - b. There is a severe leak in system.
  - c. Compressor reed valves, Teflon ring, or the compressor itself may be defective.



**Figure 43**

## Manifold Assembly

The manifold assembly is located on the front of the unit below the bib and has two externally mounted valves, the four-way and purge. These valves can be removed separately for cleaning or replacement when necessary. The base of the manifold assembly does not have to be removed in this case.

The manifold base contains internal check valve, an orifice, and a pilot accumulator cavity with check valve. If troubleshooting procedures reveal that a unit malfunction is the result of a failure of one of these check valves or any other internal manifold problem, then the entire manifold base must be replaced. Do not take the base of the manifold apart nor attempt to change any internal components.

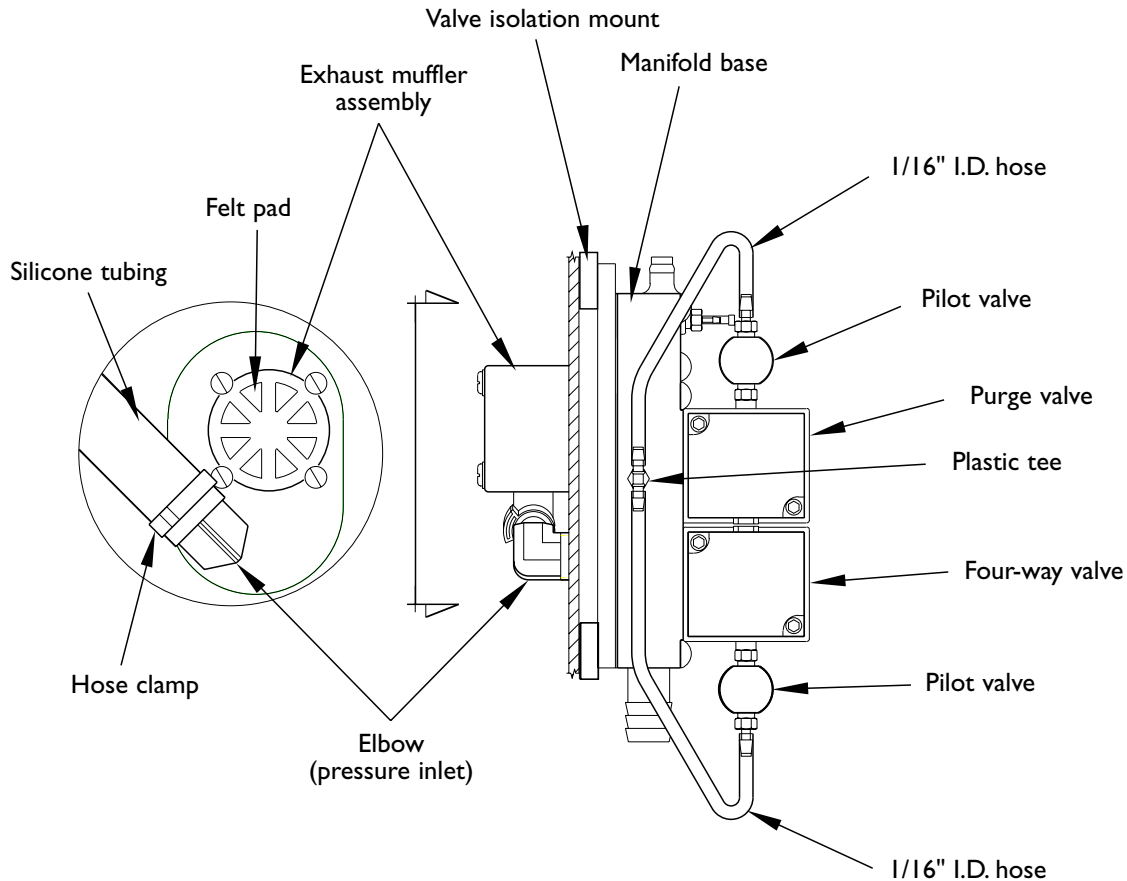


Figure 44

### To remove manifold:

**NOTE**—Removal of the manifold will be easier if you remove the compressor first.

1. Unplug the unit from the wall outlet.
2. Remove the front and rear cabinets.
3. Remove the center oxygen outlet tubing from the top of the manifold assembly.
4. Loosen hose clamps and remove the left and right sieve bed oxygen supply hoses from the top of the manifold.
5. Loosen hose clamps and remove the left and right sieve bed hoses from the bottom of the manifold.
6. Disconnect the wires from the terminals on the four-way and purge pilot valves.
7. Remove the two mounting screws located at the upper left and lower right corners of the manifold.
8. Carefully pull the manifold assembly away from the unit a short distance to gain access to the pressure inlet fitting on the back of the manifold.
9. Loosen hose clamp and remove the compressor exhaust hose from pressure inlet fitting and remove manifold assembly.

**NOTE**—If a replacement manifold is not to be installed immediately, then the sieve bed hoses should be sealed to prevent bed contamination.



**To replace manifold:**

1. Remove the four-way and purge valves from the defective manifold and install them on the new manifold base.
  2. Remove any protective covers from hose fittings on replacement manifold.
- NOTE**—Care should be taken to avoid damaging the fittings.
3. Attach the compressor exhaust hose to the inlet fitting on the back of the manifold and secure with hose clamp.
  4. Position the manifold assembly on the unit and secure with the two screws in the upper left and lower right corners.
  5. Install first the right and then the left sieve bed hoses on the fittings at the bottom of the manifold unit and secure with hose clamps.
  6. Install the smaller (1/8" I.D.) oxygen tubing on the center

fitting at the top of the manifold.

7. Install the right sieve bed oxygen supply hose to the top right manifold fitting, and the left sieve bed oxygen supply hose to the top left manifold fitting. Secure with hose clamps.

**NOTE**—Ensure that the right sieve bed hose is connected to the right manifold fitting and the left sieve bed hose to the left manifold fitting.

8. Connect the electrical wire pairs to the four-way and purge pilot valves.

**NOTE**—The yellow-brown wire pair connects to the purge pilot valve (upper valve) and the purple-brown wire pair connects to the four-way pilot valve (lower valve).

9. Close cabinet and secure with fasteners.

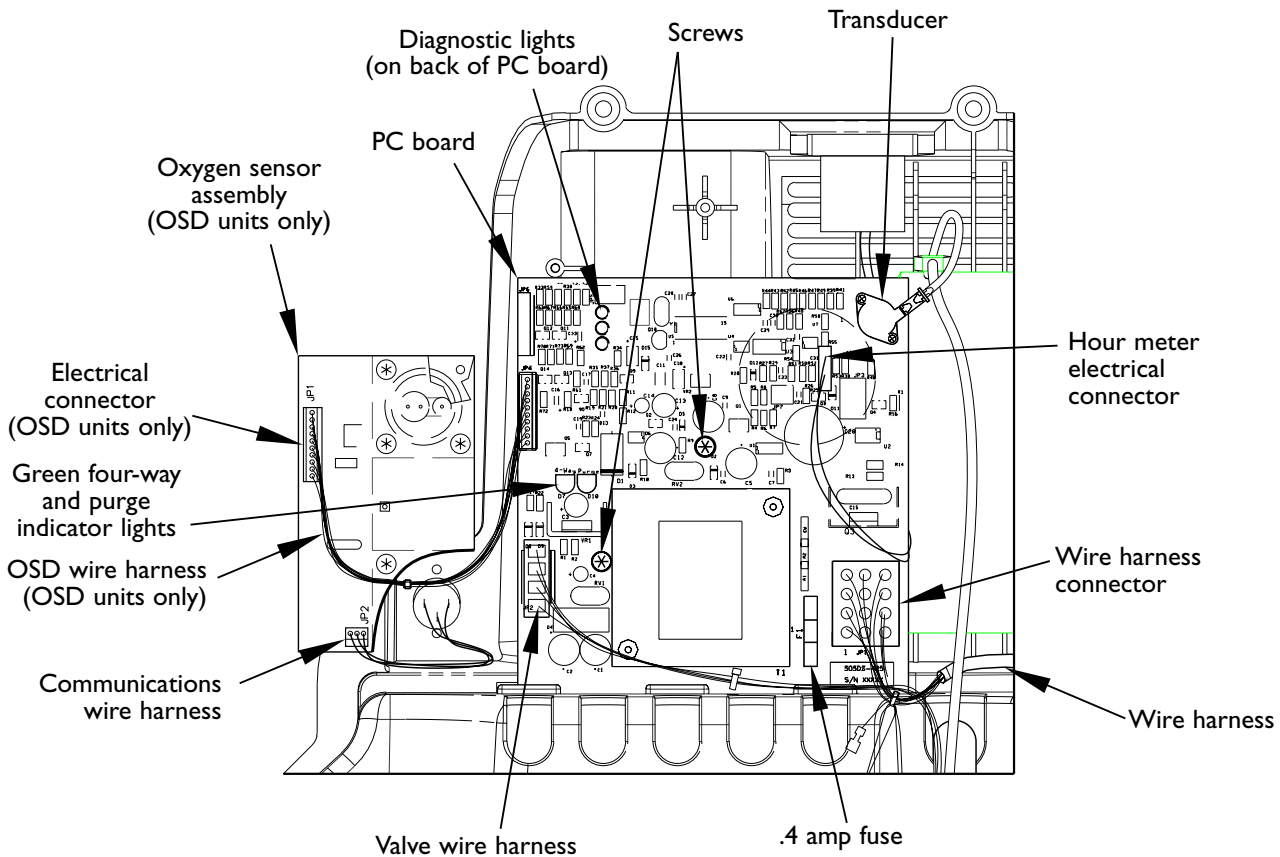
**Printed Circuit Board**

The printed circuit (PC) board is responsible for monitoring and controlling the DeVilbiss 5 Liter Oxygen Concentrator.

A pressure transducer on the PC board continuously senses the oxygen pressure in the accumulator tank. Once the pressure in the accumulator tank reaches approximately 25.5 PSI (175 kPa), the PC board sends a signal to the four-way valve and the spool moves inside the valve. Upon sensing 25.5 PSI (175 kPa) again, it removes the signal and the valve moves to its rest position.

The PC board has preset alarms for minimum and maximum cycle times, low and high pressure points, and a power fail alarm. Should any of the alarm values be exceeded, the patient alert system will activate.

**NOTE**—If the concentrator has been unused for an extended period, the unit must run 20 minutes before the power fail alarm will become operational. The alarm system incorporates a retry feature which virtually eliminates nuisance service calls.



**Figure 45**

**To remove and replace the PC board (Figure 45):**

1. Ensure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and loosen the bib.
3. Disconnect the electrical connectors of the wire harnesses from the PC board by depressing the latches and pulling them straight out.
4. Remove the 1/16" hose attached to the transducer.
5. Remove the two screws that secure the board to the unit and remove the PC board.
6. Install the new PC board and secure it using the two screws.
7. Reconnect all electrical connectors and the transducer hose.

**⚠ WARNING**—Electric Shock Hazard: When replacing the capacitor, do not touch the terminals or allow metal objects to come in contact with the terminals on the capacitor. Ensure the concentrator is unplugged from the wall outlet.

If a defective capacitor is suspected, a new one must be installed.

**To replace the capacitor:**

1. Ensure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets.
3. Remove compressor.
4. Disconnect the two wires from the terminals on the capacitor.
5. Cut the nylon cable tie holding the capacitor in place and remove the capacitor.
6. Reconnect the wires to the capacitor terminals.
7. Install the new capacitor and secure with a cable tie.
8. Replace compressor.
9. Replace cabinet and secure with the six screws.

**Capacitor**

The capacitor enables the compressor to start and run by supplying voltage to the windings of the compressor motor. A defective capacitor will result in the compressor running slower or not starting.

**OSD**

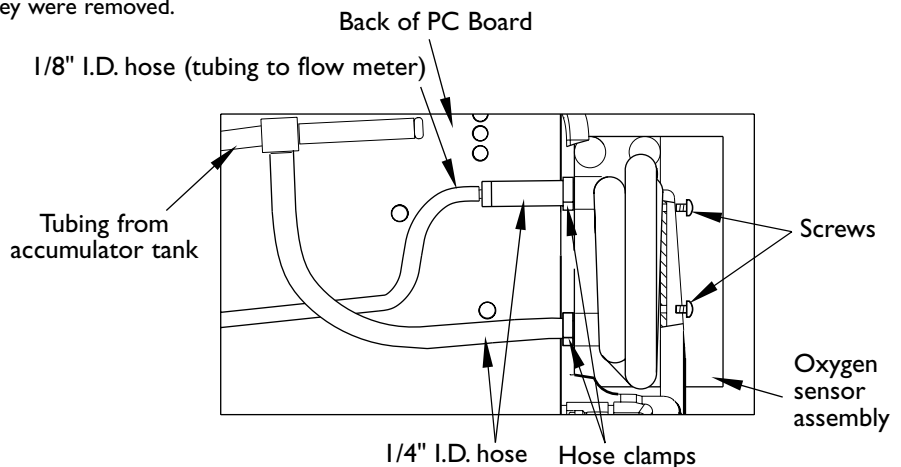
The OSD is located beside the PC board.

**To replace the OSD (Figure 46):**

1. Ensure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and loosen the bib.
3. Disconnect the two terminal connectors for the OSD at the end of the wire harness by depressing the latches and pulling them straight out.

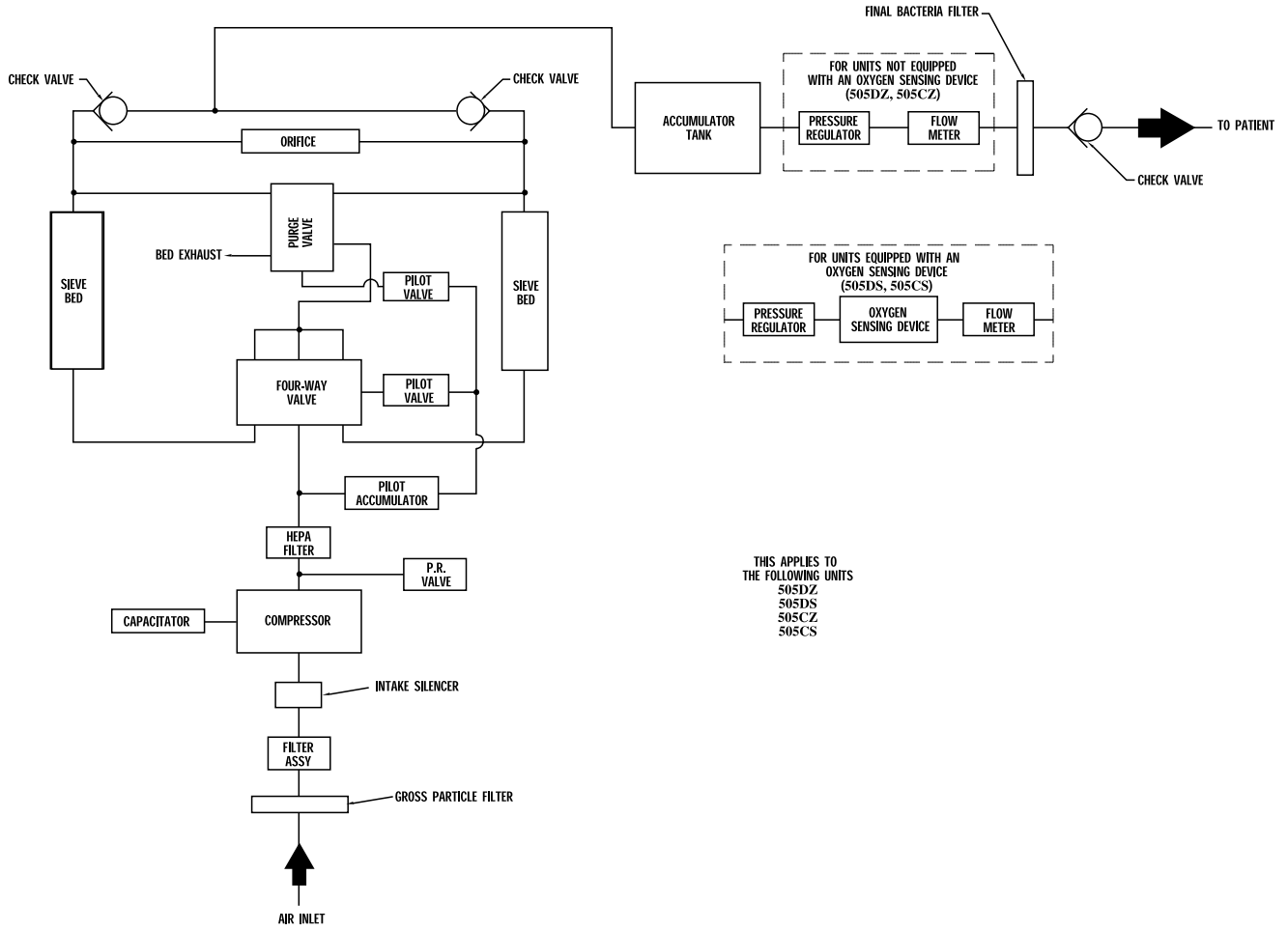
**NOTE**—To facilitate easier access to the OSD tubing, remove the 2 screws that hold the main PC board in place.

4. Remove the two screws from the bracket located on the side facing the inner structure.
5. Remove the two hose clamps and two 1/4" hoses attached to the OSD.
6. Replace the two 1/4" hoses and tighten the hose clamps to the new OSD.
7. Mount the OSD to the bracket using the two screws.
8. Reconnect the two terminal connectors.
9. Reinstall main PC board screws if they were removed.



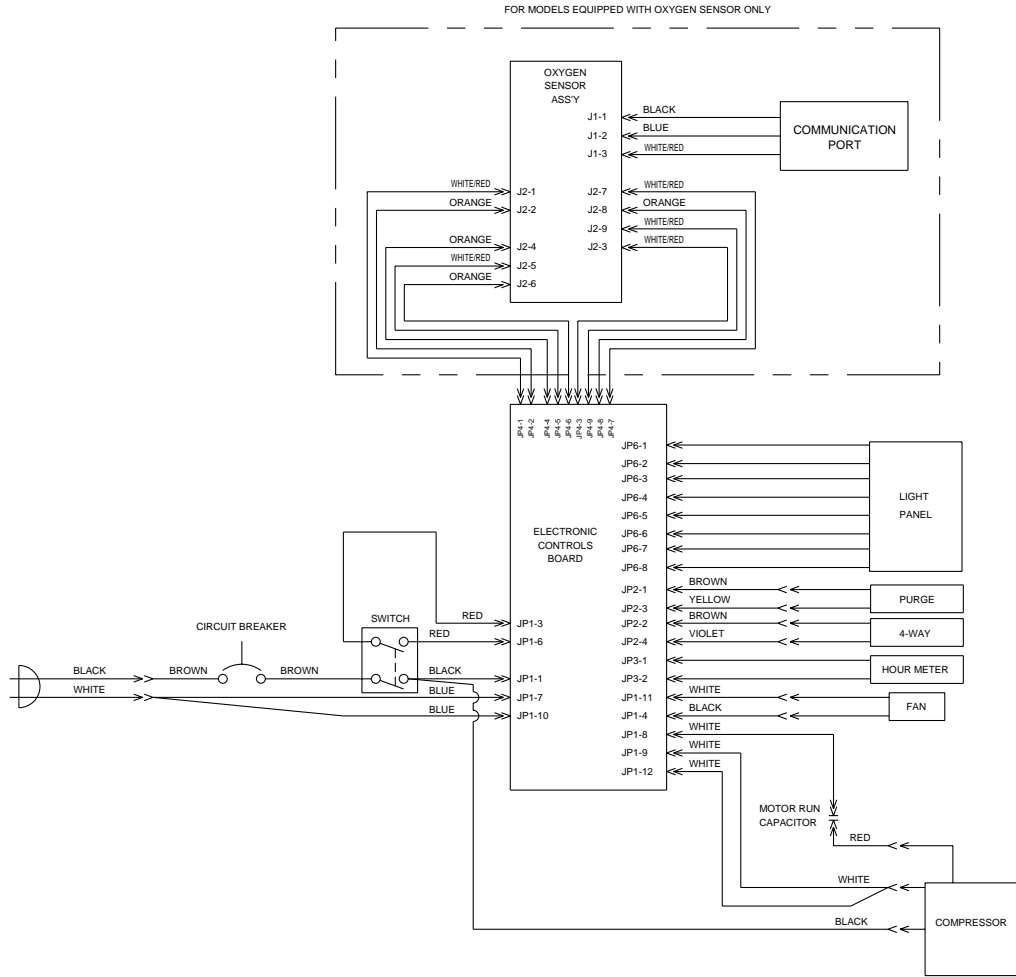
**Figure 46**

# PNEUMATIC DIAGRAM



THIS APPLIES TO  
THE FOLLOWING UNITS  
505DZ  
505DS  
505CZ  
505CS

# WIRING DIAGRAM



## SPECIFICATIONS

### Specifications

Model:.....	505CZ (#D1000ICZ and above) 505DZ (#D1000IDZ and above) 505CS (#D1000ICS and above) 505DS (#D1000IDS and above)
Delivery Rate.....	1/2 to 5 LPM
Oxygen Specification <sup>1</sup> .....	1 LPM = 94% ± 3% 2 - 4 LPM = 95% ± 3% 5 LPM = 93% ± 3%
Maximum Recommended Flow.....	5 LPM
Sound Levels.....	49 dBA average
Outlet Pressure.....	8.5 PSIG (60 kPa)
Electrical Rating.....	(DAP 115V, 60 Hz, 5 Amp) (Thomas Q2 4.4 Amp #D36532DS and above) (Thomas Q2 4.4 Amp #D3046IDZ and above)
Operating Voltage Range.....	95 - 132V, 60 Hz
Power Consumption.....	400 Watts average
Weight.....	Approximately 51 lbs. (23 kg.)
Dimensions.....	27.75" H x 16" W x 14" D (70.5cm H x 40.5cm W x 35.5cm D)
Pressure Relief Valve.....	35psig ± 3psig (240 kPa ± 21 kPa)
OSD Settings:	
Visible Alarm.....	505CS: 85% ± 2%; 505DS: 85% ± 2%
Audible Alarm.....	505CS: 82% ± 2%; 505DS: 75% ± 2%
Typical Cycle Times vs. Altitude at 5 LPM <sup>2</sup>	
0 ft (0 m).....	10 seconds
2500 ft (750 m).....	12 seconds
5000 ft (1500 m).....	17 seconds



Class II Equipment, Double Insulated



Type B Applied Part

**NOTE** – Specifications subject to change without notice.

<sup>1</sup>Between sea level and 5000 ft (1500m) at 70°F (21°C) ambient across the operating voltage range. From 5000 ft (1500m) to 13100 ft (4000m) the end user should check with their Sunrise Medical provider for suitability.

<sup>2</sup>Differences in altitude, flow rate, and operational voltages will alter these cycle times. Use these cycle times as guidelines only.

## **Ordering Information**

When ordering components, instruction guides, or service manuals the following must be provided:

- Unit Product Number
- Unit Serial Number
- Part Number
- Quantity Required

DeVilbiss Oxygen Concentrator Instruction Guide - part #SP-505

DeVilbiss 5 Liter Oxygen Concentrator Service Manual - part #LT-1692

DeVilbiss 3 Liter Oxygen Concentrator Service Manual - part #LT-1691

Orders may be placed by calling:

- Customer Service/Order Entry 800-333-4000
- Warranty parts: U.S.A. 800-333-4000
- Canada 905-660-2459
- International Department 814-443-4881

## **PARTS RETURN AND ORDERING POLICY**

ALL DEFECTIVE COMPONENTS THAT ARE STILL UNDER WARRANTY MUST BE RETURNED TO THE FACTORY IN SOMERSET, PA WITHIN 30 DAYS AFTER SHIPMENT OF THE NEW COMPONENTS. IF THE COMPONENTS ARE NOT RECEIVED WITHIN THIS PERIOD, AN INVOICE WILL BE ISSUED TO YOUR ACCOUNT.

REBUILT EXCHANGE PARTS PRICING IS AVAILABLE ONLY WITH THE RETURN OF DEFECTIVE PARTS WITHIN 30 DAYS. COMPONENTS WILL THEN BE BILLED AT THE REBUILT COST; THERE WILL BE A CHARGE FOR SHIPPING. IF THE DEFECTIVE COMPONENT IS NOT RECEIVED WITHIN 30 DAYS, THEN A NEW COMPONENT INVOICE WILL BE ISSUED TO YOUR ACCOUNT. COMPONENTS THAT ARE OUT OF WARRANTY AND NOT ON A REBUILT/EXCHANGE PROGRAM DO NOT HAVE TO BE RETURNED TO THE FACTORY.

Before returning parts or units to the factory, call the Sunrise Medical Returns (1-800-333-4000) to obtain a return authorization number. Include in the package a note indicating the return authorization number along with your company name, address, phone number, and account number. The return authorization number should also be written on the outside of the package.

To expedite your order for warranty or non-warranty parts the following information should be given to the representative:

- Product number
- Serial number
- Hour meter reading for each concentrator
- Account number
- Company name and address

**PARTS LIST**

Description	Part Number
<b>Accessories</b>	
Bubble Humidifier .....	HUM16
Cannula (disposable: 50/case.....)	CAN00
Cannula w/7 ft (2.1m)	
Oxygen Tubing (disposable): 50/case .....	CAN70
Handle .....	303DZ-647
Humidifier Stand.....	MC44DM-509
Oxygen Analyzer .....	O2ANA
Oxygen Outlet Connector:	
Plastic.....	CN100
Metal.....	CN200
Oxygen Tubing.....	OST07, OST15, OST25, OST50
Low Output Flow Meter .....	303PZ-619
Rear Wheel Conversion Kit .....	505DZ-636
<b>Components</b>	
Accumulator Tank.....	505DZ-610
Cable Tie-Sieve Bed .....	505DZ-617
Cabinet Parts:	
Base .....	505DZ-603
Bib: For 505CZ and 505DZ.....	505DZ-621
For 505CS and 505 DS.....	303DS-603
Filter Door .....	505DZ-639
Front Cover .....	505DZ-601
Oxygen Outlet Port.....	303DZ-606
Rear Cover.....	505DZ-602
Capacitor .....	MC64D-617
Carton with Shipping inserts.....	505DZ-606
Shipping inserts only .....	505DZ-706
Caster - Locking .....	PV5LD-604
Non-Locking.....	PV5LD-603
Circuit Breaker.....	MC64D-615
Cooling fan.....	303DZ-618
Compressor - New Thomas Q2 .....	505DS-625
Rebuilt DAP.....	505DZ-625-RE
Compressor Service Kit -DAP.....	MC44D-643
-Q2.....	505DZ-643
starting s/n D36532DS and D30461DZ and above	
Compressor Mounting Plate:	
Prior to s/n D21496DZ, and D26365DS	
and all 505CZ & 505CS.....	505DZ-631
Starting s/n D21496DZ, and D26364DS.....	505DD-631
Filters:	
Cabinet Air Filter .....	505DZ-604
Compressor Filter .....	303DZ-639
Extended Life Intake filter .....	MC44D-605
Final Bacteria Filter .....	PV5LD-651
Intake Bacteria Filter .....	444-504
Intake Rectangular Felt Filter.....	MC44D-722
Intake Round Felt Filter .....	444-503
Fittings:	
Accumulator Tank.....	444-582
Compressor Exhaust .....	505DZ-648
Plastic for Manifold .....	MC44D-706
Flow Meter.....	505DZ-607
Flow Meter Knob .....	PV02D-618

Description	Part Number
<b>Hose and Tubing</b>	
1/16" ID Blue.....	444-526
1/8" ID Blue.....	444-554
1/4" ID Blue.....	444-525
1/2" ID Braided.....	444-549
1/2" ID Silicon.....	505DZ-634
Hose Clamps - For 1/4" Blue .....	444-524
For 1/2" Braided & Silicon.....	444-538
Hour Meter.....	PV5LD-617
Light Panel - For 505CZ and 505DZ.....	505DZ-615
For 505CS and 505DS .....	303DS-615
<b>Motor Mounts:</b>	
Prior to s/n D21496DZ & D26365DS	
and all 505CZ and 505CS.....	505DZ-609
Starting s/n D21496DZ and D26365DS.....	505DD-609
Nut, Compressor Mounting Plate	
& Motor Mount.....	303DZ-630
PC Board-Main - For units with OSD .....	505DZ-622
For units without an OSD .....	505DS-622
Fuse (.4 Amp) for Board .....	PVO2D-610
Oxygen Sensor Assembly (OSD Units Only) .....	505DS-621
Pressure Regulator .....	MC29D-612
Power Switch.....	505DZ-508
Power cord Strap.....	MC29D-657
Screw - Cabinet.....	303DZ-628
Compressor Shoulder Bolt .....	303DZ-629
For Bubble Style Motor Mounts .....	303DZ-631
Sieve Bed.....	MC64D-619
Strain Relief.....	PV5LD-602
<b>Valves:</b>	
Final Check Valve.....	PVO2D-607
Four Way Valve.....	MC 441-702
Manifold Accessory Kit .....	MC44D-706
Manifold Base.....	505DZ-701
Manifold Exhaust Muffler .....	MC44D-705
Purge Valve .....	MC441-703
Pressure Relief Valve.....	505DZ-614
Valve Rebuild Kit.....	MC441-707
Valve Isolation Mount.....	505DZ-703
<b>Wire Harness:</b>	
Communication Wire Harness	
(OSD units only) .....	505DS-608
Main Wire Harness.....	303DZ-623
OSD Wire Harness (OSD units only) .....	303DS-601
Power Cord.....	PV5LD-618
Valve Wire Harness .....	505DZ-626
<b>Tools</b>	
AC/DC Test Light .....	PVO2D-603
Plastic Error Indicator Tool .....	303DZ-635
Pressure/Vacuum Gauge w/o Hose .....	PVO2D-601
Service Kit.....	444-501
Screwdriver with bits, 6-Lobe.....	MC44D-712
Test Point Plugs .....	PV5LD-716
Test Fittings .....	303DZ-637

## Warranty Information

### Limited Warranty-DeVilbiss 5 Liter

The DeVilbiss 5 Liter Oxygen Concentrators, manufactured and sold by Sunrise Medical HHG, are warranted as stated below. This warranty extends only to the buyer purchasing the equipment directly from Sunrise Medical, or through its providers, distributors, or agents, as new equipment.

This equipment is warranted by Sunrise Medical to be free from defects in workmanship and materials as stated below from date of shipment by Sunrise Medical to the original purchaser:

- Valving warranted for the life of the unit.
- OSD warranted for the life of the unit (OSD models only).
- Compressor warranted for five years.
- All other components warranted for three years.
- Routine maintenance items, such as filters, are excluded from Warranty.

Sunrise Medical HHG's obligation under this warranty is limited to the option of repairing at its plant or an Authorized Service Center or supplying a replacement for component part(s). To make claim under this warranty, the original purchaser must notify Sunrise Medical at its plant in Somerset, PA or an Authorized Service Center. The claim will be evaluated and, if bona fide, further instructions will be issued. For component part(s) return(s), it shall be the responsibility of the provider to remove the defective component part(s), properly package in a Sunrise Medical approved shipping container, properly identify by a Return Authorization Number, and to make shipment pre-paid. This warranty does not cover the cost of labor incurred, either by the homecare provider or Sunrise Medical, in removing or replacing the warranty component part(s). Service under this warranty must be performed by a qualified Sunrise Medical provider and/or an Authorized Sunrise Medical Service Center.

**NOTE** – This warranty does not obligate Sunrise Medical to replace an oxygen concentrator that is being repaired with a loaner unit during the time of repair.

**NOTE** – Replacement components do not carry a new warranty and shall only be warranted for the unexpired portion of the original Limited Warranty.

This warranty shall not apply, and Sunrise Medical shall be relieved of any obligation or liability if:

- This equipment is not operated and maintained in accordance with Sunrise Medical operating and service instructions.
- Routine maintenance, servicing, and repair are not performed by qualified Sunrise Medical service personnel.
- The equipment has been repaired or altered by the use of non-authorized parts or components (i.e., regenerated sieve material).
- The filters that were used on the unit were not authorized Sunrise Medical filters or quality filters approved by Sunrise Medical.

THERE IS NO OTHER EXPRESS WARRANTY. IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE DURATION OF THE EXPRESS LIMITED WARRANTY AND TO THE EXTENT PERMITTED BY LAW ANY AND ALL IMPLIED WARRANTIES ARE EXCLUDED. THIS IS THE EXCLUSIVE REMEDY AND LIABILITY FOR CONSEQUENTIAL AND INCIDENTAL DAMAGES UNDER ANY AND ALL WARRANTIES ARE EXCLUDED TO THE EXTENT EXCLUSION IS PERMITTED BY LAW. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, OR THE LIMITATION OR EXCLUSION OF CONSEQUENTIAL OR INCIDENTAL DAMAGE, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

### Sunrise Medical Labor Warranty

Sunrise Medical backs up its reputation for unexcelled product quality and reliability by extending a free three-year labor warranty when the unit or components under warranty are returned to our Somerset, PA facility or an authorized Sunrise Medical warranty center. Repairs to units returned to our other authorized service centers are not covered by our free labor policy unless otherwise stipulated:

- Labor warranty is effective from date of shipment from Sunrise Medical to original purchaser (provider).
- Routine maintenance items, such as filters, are excluded.

### Optional Extended Warranty (DeVilbiss 5 Liter Extended Warranty - part #505 EXTWAR)

The Optional Extended Warranty must be selected at time of purchase. Under the Optional Extended Warranty, the equipment is warranted by Sunrise Medical to be free from defects in workmanship and materials for a period of five years, except as stated below, from date of shipment by Sunrise Medical to the original purchaser.

- Valving warranted for the life of the unit.
- OSD warranted for the life of the unit (OSD models only).
- Routine maintenance items, such as filters, are excluded from Warranty.

Under the Optional Extended Warranty you will receive a free five-year labor warranty when the unit or components under warranty are returned to our Somerset, PA facility or an authorized Sunrise Medical warranty center. Repairs to units returned to our other authorized service centers are not covered by our free labor policy unless otherwise stipulated.

A \$50 charge for the Optional Extended Warranty will be added to your invoice at billing.

**NOTE** – International model warranties may vary.





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Sunrise Home Healthcare Group

7477 East Dry Creek Parkway

Longmont, Colorado 80503

(800) 333-4000

In Canada (800) 263-3390