

DeVilbiss[®]
4 & 5-Liter Series Oxygen Concentrators

Service

Manual



For Product
Numbers:
515DS
515DZ
515KS
515KZ
515NS
515UK

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



DANGER – NO SMOKING

 **SUNRISE
MEDICAL[®]**

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INTRODUCTION

This service manual was designed to provide Sunrise Medical Respiratory Products Division qualified service technicians and homecare providers with the proper maintenance, service, safety, and repair procedures for the DeVilbiss Oxygen Concentrator.

Read and understand all the information contained in this service manual before attempting to operate or perform any maintenance on the concentrator.

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 room air, separates the nitrogen from the oxygen, and delivers concentrated oxygen to the patient through an oxygen port.

For more in-depth classroom type training, Sunrise Medical holds oxygen concentrator service schools. For service school information, contact the Service Department at **1-800-333-4000 (814-443-4881)**.

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 between the unit in hand and what is described in this manual.

IMPORTANT SAFEGUARDS

Read all instructions before operating the oxygen concentrator. Important information is highlighted by these terms:

⚠ WARNING

WARNING: Safety information for hazards that might cause serious injury or death.

CAUTION: Information for preventing damage to the product.

NOTE: Information to which you should pay special attention.

SAFETY PRECAUTIONS AND GENERAL WARNINGS

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

⚠ WARNING

- B.  **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 (1.6m) 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.

⚠ WARNING

- G. **WARNING:** Electric shock hazard. Do not remove cabinet. The cabinet should only be removed by a qualified Sunrise Medical homecare provider.

⚠ WARNING

- H. **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.

⚠ WARNING

- I. **WARNING:** Do not use oils, greases, or any petroleum-based solvents/cleaners on or near the unit. Use only materials that are compatible with oxygen.

⚠ WARNING

- J. **WARNING:** When replacing the capacitor, do not touch the terminals or allow metal objects to come in contact with the terminals on the capacitor. The capacitor can retain a dangerous charge level for several days after the unit is turned off. The capacitor is located in the base of the unit next to the cooling fan.
- K. Use only Sunrise Medical concentrator replacement parts and accessories.
- L. Do not use regenerated sieve material.

INITIAL INSPECTION

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

1. After removing the DeVilbiss Oxygen Concentrator from the carton, examine it for any external damage. If shipping damage has occurred, contact the Sunrise Medical Customer Service Department at 1-800-333-4000 (814-443-4881) for specific instructions. Save the carton for possible later return; note the position of the unit and placement of the packing material.
2. Open the filter door (Figure 3) and record the number of hours on the hour meter. Check to make sure the air filter is in place.
3. Check to be sure the intake bacteria filter (Figure 4) is 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 to maximum recommended liter flow and let the unit run for at least 20 minutes.
6. Use an oxygen analyzer to check the concentration.

NOTE: If the unit fails to operate properly (oxygen concentration not within specification) or if internal damage is found, contact the Sunrise Medical Customer Service Department at 1-800-333-4000 (814-443-4881).

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. Position the unit at least 6 inches (16 cm) from walls, draperies, or any other objects that might prevent the proper flow of air in and out of the oxygen concentrator.
3. Locate the unit a minimum of 5 feet (1.6 meters) from fireplaces, radiators, heaters, and hot-air registers.

⚠ WARNING

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 5 feet (1.6 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 port.

NOTE: A maximum of 50 feet (15 meters) of tubing plus 7 feet (2.1 meters) of cannula plus a bubble humidifier is allowed between the concentrator and the patient.

Oxygen Tubing Only Connection (Figure 1)

1. Thread the cannula fitting (part #CN100) onto the oxygen outlet port.
2. Attach the 5/32" (4 mm) I.D. oxygen tubing (part #OST07, OST15, OST25, or OST50).

Oxygen Tubing with Humidification Connection

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

1. Fill the humidifier bottle (part #HUM16) with distilled water. Do not overfill. (If using a prefill, go to Step 3.)
2. Thread the wing nut located on the top of the humidifier bottle to the oxygen outlet port so that it is suspended. Make sure it is securely tightened.
3. Attach the 5/32" (4 mm) I.D. oxygen tubing (part # OST07, OST15, OST25, or OST50), not to exceed 50 feet (15 meters), directly to the humidifier bottle outlet fitting.

NOTE: For optimum performance, the DeVilbiss Oxygen Concentrator has a preset nominal output pressure of 8.5 psi (58.6 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:

1. 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.
2. Secure the bottle in the strap.
3. 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.

When ready for operation

1. Attach the nasal cannula (part #CAN00), catheter, or face mask to the oxygen tubing (per the manufacturer's directions).
2. Follow the operating instructions given below.

OPERATING INSTRUCTIONS

1. Remove the power cord completely from the strap. Make sure the power switch is in the "Off" position.
2. 115 Volt Units— Insert the plug into an electrical outlet. The DeVilbiss Oxygen Concentrator uses a two-prong polarized plug and is double-insulated to protect against electric shock. 230 Volt Units— The DeVilbiss Oxygen Concentrator is double-insulated to protect against electric shock. Insert the line cord into the IEC power connector located on the back of the unit. Insert the plug into an electrical outlet.

⚠ WARNING

WARNING: The plug on the DeVilbiss 515DZ and 515DS concentrators 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.

⚠ WARNING

WARNING: 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

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 (1.6m) from hot, sparking, or burning objects or naked flames. Do not use in rooms heated by paraffin or portable gas heaters.

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

Only DeVilbiss Oxygen Concentrators with OSD®

NOTE: There are two 515 OSD concentrator models referred to throughout this Service Manual:

- Early - OSD models
(Concentrator serial number H19999 and lower)
- Later - OSD models
(Concentrator serial number H20000 and higher)

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. If the oxygen purity continues to fall to a low enough level, the yellow "Low Oxygen" light will turn off and the red "Service Required" light will turn on.

NOTE: Refer to "Specifications" for specific 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.

NOTE: After Power On, the OSD conducts a continuous diagnostic evaluation to check for a fault in the piezo electronics. If this condition is detected by the OSD electronics at any time during concentrator operation, the green "Normal Oxygen" OSD light will turn off and the beeping audible and blinking red "Service Required" light alarms activate.

Otherwise 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 purity every second.

- 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 counter-clockwise, the flow increases.

NOTE: Use 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.

- The flow meter has a locking device. If it is necessary to pre-set and lock in the prescribed flow rate, tighten the set 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 set screw.
- The DeVilbiss oxygen concentrator is now ready for use.

PATIENT ALERT SYSTEM

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

The visible alarm located on the front panel (Figure 1) 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.

Non-OSD and early-OSD models:

- Power Failure (Blinking red “Service Required” light and pulsing audible alarm)
- Low Pressure (Continuous red “Service Required” light and audible alarm)
- Below Normal Oxygen - OSD models only (Less than 85%, yellow “Low Oxygen” light. Less than 75%, yellow “Low Oxygen” light and audible alarm)

Later OSD models:

- Power Failure (Blinking red “Service Required” light and pulsing audible alarm)
- Low Flow (Below 0.5 lpm) (Continuous red “Service Required” light and audible alarm)
- Below Normal Oxygen (83.5% to 75%, yellow “Low Oxygen” light. 75% to 60%, yellow “Low Oxygen” light and beeping audible alarm. Less than 60%, red “Service Required” light and beeping audible alarm.)

The visible and audible alarms will activate for approximately 15 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 several minutes before the power fail alarm will activate.

The printed circuit (PC) board (Figure 5) is responsible for controlling the system and alarms.

NOTE: A high pressure condition is indicated by the audible (a “popping” sound) release of pressure from a pressure relief valve located on the compressor head.

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:

- Wash the humidifier bottle in a solution of hot water and dishwashing detergent.
- 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.
- 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 and Oxygen Outlet Connector

The air filter (Figure 3) and oxygen outlet connector should be cleaned at least once a week by the patient. To clean, these steps should be followed:

1. Remove the air filter located in the door on the back of the unit. Remove the oxygen outlet connector (if used) from oxygen outlet port (Figure 1).
2. Wash 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

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.

CAUTION: Operation of the DeVilbiss Oxygen Concentrator in extreme environments or without the air filter will prematurely occlude the intake bacteria 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

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 home-care provider during periodic oxygen patient visits. Failure to properly maintain the unit will void the warranty.

1. Check the oxygen concentration with an oxygen analyzer (part #O2ANA)—every 3 months on non-OSD units or every two years on OSD units.
 - a. 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.

- b. The concentrator must operate for a minimum of 20 minutes before checking the oxygen concentration.
 - c. Connect the analyzer to the unit's oxygen outlet port (Figure 1) and wait until the display stabilizes.
 - d. Record the reading.
2. 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.
3. Change intake filter as follows:
 - a. Extended life intake bacteria filter (part # MC44D-605) - Inspect once a year. Change as necessary, not to exceed 8760 hours.
 - b. Round felt pre-filter (part # 444-503) - change once a month. –OR– Rectangular felt pre-filter (part # MC44D-722) - change every 3 months, AND
 - c. Intake bacteria filter (part # 444-504) - change every six months.
 - d. Open the filter door and replace filters as required.
 4. Change the final bacteria filter (part #PV5LD-651) every two years.
 - a. Unplug the unit, remove the cabinet, and loosen the bib.
 - b. Remove the hose from each end of the filter (Figure 8) and discard the filter.
 - c. Install the new final bacteria filter with the "IN" fitting toward the flow meter.
 - d. Tighten the bib and replace the cabinet.
 5. Check the system performance every two years of operation by measuring the accumulator pressure swing. Use the accumulator pressure test described in the chapter "Component Testing, Repair and Replacement."
 6. Change the compressor HEPA filter—every five years or 25,000 hours of operation (whichever comes first).
 - a. Unplug the unit and remove the rear cabinet.
 - b. Loosen the hose clamp and remove the hose from the outlet fitting end of the HEPA filter (Figure 4).
 - c. Using a wrench, unscrew the HEPA filter from the compressor head outlet fitting.

CAUTION: Use a second wrench to prevent twisting of the brass angle fitting screwed into the outlet port of the compressor.

- d. 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.
- e. Install the new HEPA filter by using a wrench to attach the filter to the compressor head outlet fitting.

CAUTION: Use a second wrench to prevent twisting of the brass angle fitting screwed into the outlet port of the compressor.

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

- f. Attach the hose to the outlet fitting end of the filter and secure with a hose clamp.

7. Leak test the HEPA filter fittings. Apply a 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.

NOTE: This PM Schedule reflects:

- 5000 hour usage equal to one year
- a normal, clean operating environment.

The homecare provider is responsible for:

- determining the condition of the concentrator operating environment.
- determining a preventative maintenance interval frequency (not to exceed the schedule stated above which takes into consideration the specific operating environment).

BETWEEN PATIENT MAINTENANCE

1. Discard oxygen tubing, cannula & humidifier bottle.
2. Discard intake bacteria filter and felt pre-filter (if using these filters instead of the extended life intake bacteria filter).
3. Wash or replace the cabinet air filter.
4. Wash the concentrator cabinet.
5. Check oxygen concentration. If the unit falls within specification, the extended life intake bacteria filter does not need to be replaced between patients.

PREVENTATIVE MAINTENANCE SUMMARY

Patient

- | | |
|--------|--|
| Daily | Clean the humidifier bottle (if used). |
| Weekly | Clean air filter on back of unit.
Clean exterior of cabinet. |
| Other | Clean and replace cannula/mask and tubing as instructed by manufacturer. |

Homecare Provider

- | | |
|----------|--|
| | Change intake filter as necessary following requirements in step 3. |
| 3 months | Check oxygen concentration on non-OSD units. Check the concentrator environment, and set a maintenance interval of less than 3 months if required. |
| 2 years | Check audible alarm and indicator lights. Change final bacteria filter. Check system performance. Check oxygen concentration on OSD units. |
| 5 years | Change compressor HEPA filter (change in 25,000 hours or earlier). |

SYSTEM OPERATION

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

A pneumatic diagram of the system is shown in Figure 15.

The compressed air passes through a four-way valve (Figure 5), which is cycled at a pre-determined rate, 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 exhaust ports located on the four-way valve assembly. The ports are connected to a single piece of black hose running from the valve to the exhaust muffler.

Also during each bed pressurization, a small amount of oxygen flows through an orifice (Figure 9) from the pressurized bed into the depressurizing bed. The orifice is clamped inside a long piece of blue tubing connecting the outlets of the two sieve beds. This helps purge the nitrogen from the depressurizing bed.

The beds will continue to be alternately pressurized and depressurized as the unit operates.

Oxygen leaving the sieve beds is directed through a check valve to the accumulator tank. A pressure regulator (Figure 9) 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 (Figure 8), a check valve, and finally the oxygen outlet port to the patient.

The DeVilbiss Oxygen Concentrator operates on a timed cycle. The cycling is controlled by the PC board. The PC board will send approximately 7.5 VDC (12-15 VDC on non-OSD and early-OSD models) to the four-way valve causing one of the two solenoids to energize.

The PC board also activates the electronic alarm system. A high pressure condition will be indicated with a "popping" type sound produced by release of pressure from a pressure relief valve on the compressor head.

NORMAL OPERATING SEQUENCE

When the concentrator is turned "On," the following normal cycling sequence should be observed by attaching pressure gauges to the sieve bed test points.

1. The four-way valve is quickly cycled back and forth several times to relieve residual bed pressure preventing a static condition in the compressor. This rapid cycling only happens on start-up.

NOTE: The rapid cycling will be heard as several thumping noises at start-up.

2. An approximately 7.5 VDC (12-15 VDC on non-OSD and early-OSD models) signal from the PC board is supplied to the right solenoid for approximately 9-10 seconds. The left sieve bed pressurizes while the right sieve bed is being depressurized to approximately 2 PSI (14 kPa).
3. The signal is then removed from the right solenoid. No voltage is applied to either solenoid for approximately 1 second. Both sieve beds are being equalized in pressure during this phase.
4. An approximately 7.5 VDC (12-15 VDC on non-OSD and early-OSD models) signal from the PC board is applied to the left solenoid for approximately 9-10 seconds. The right sieve bed pressurizes while the left sieve bed is depressurized to approximately 2 PSI (14 kPa).
5. The signal is then removed from the left solenoid. No voltage is applied to either solenoid for approximately 1 second. Both sieve beds are being equalized in pressure during this phase.
6. The cycle then repeats with step 2.

NOTE: High-end sieve bed pressure should not exceed 1/2 PSI (4 kPa) above high-end accumulator pressures. Refer to "Specifications" for normal pressures obtained during the cycle.

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—The unit runs but a low pressure, low output flow or high pressure condition exists.

NOTE: Low pressure and low flow are indicated by both a visible and audible alarm. High pressure is indicated by a “popping” sound caused by the pressure relief valve.

NOTE: Non-OSD and early OSD models were equipped with the low pressure alarm. Later OSD models are equipped with the low flow alarm.

1. Connect test gauges.
2. Refer to the “Normal Operating Sequence” to make sure the unit is cycling properly.
3. If bed pressure is rising slowly, check for occluded filters and severe leaks. If filters are clean and there are no leaks, then the compressor is defective.
4. If the pressure relief valve is releasing pressure, observe whether the unit is cycling or not.
5. If the unit is not cycling, this indicates that the four-way valve is not shifting.
6. If the unit is cycling in conjunction with very high bed pressures, this indicates defective sieve beds.

Type II—The compressor will not start when the unit is turned on.

1. Verify that the cooling fan is running; if it is not, determine where you are losing power.
2. Check for compressor voltage at the compressor connector.
3. If voltage is present, then the capacitor or compressor is defective.
4. If voltage is not present, the wire harness is defective.

⚠ WARNING

WARNING: Mechanical Hazard. Keep fingers, loose clothing, etc. away when working on compressor.

Type III—The concentrator runs and continues to cycle but has low oxygen concentrations.

1. Connect test gauges and check for higher or lower than normal bed pressures.
 - A. High pressures indicate defective sieve beds.
 - B. Low pressures indicate occluded filters, leaks, or defective compressor.
2. Check for oxygen leaks at:

• sieve beds	• flow meter
• accumulator tank	• final bacteria filter
• pressure regulator	• final check valve
• OSD	• outlet port

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.

3. Test accumulator tank pressure. If pressure is lower than normal, then sieve bed check valves are defective.

NOTE: For normal system pressures refer to “Specifications”.

TROUBLESHOOTING

TROUBLESHOOTING CHART A

Visible Alarm OFF	Audible Alarm OFF	Compressor ON	Power Light ON
Other Symptoms	Possible Cause	Possible Remedy	
Pulsating air noise	Intake filter not in place or defective	Check filter and replace if necessary	
	Compressor intake hose disconnected	Reconnect hose	
Excessive noise	Loose or defective motor mounts	Replace motor mounts	
	Defective compressor	Replace compressor	
	Defective cooling fan	Replace cooling fan	
Fluctuating oxygen flow	Occluded humidifier	Clean or replace humidifier	
	Use of improper humidifier	Use only a bubble-type humidifier	
	Occluded filters	Clean or replace filters	
	Occluded or defective cannula and tubing	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.	
	Use of excess oxygen tubing	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.	
	Defective flow meter	Replace flow meter	
	Leak in system	Check for leaks in all hoses and fittings	
	Defective compressor	Replace compressor	
	Defective compressor reed valve	Replace compressor reed valve	
	Defective check valve	Replace check valve	
Pressure regulator not adjusted properly or defective	Adjust or replace pressure regulator		
Little or no oxygen flow	Flow meter not adjusted properly	Adjust flow meter	
	Hose disconnected to flow meter	Reconnect hose	
	Oxygen delivery tubing is kinked or blocked	Straighten tubing or remove obstruction	
	Occluded humidifier	Clean or replace humidifier	
Low oxygen concentration	Leak in system	Check for leaks in all hoses and fittings	
	Defective sieve bed check valve	Replace check valve	
	Defective compressor reed valve	Replace compressor reed valve	
	Defective compressor	Replace compressor	
	Four-way valve not fully shifted	Clean or replace four-way valve	
	Occluded filters	Clean or replace filters	
Audible alarm does not sound during power failure	Unit has not been used for an extended period of time. NOTE: If the concentrator has been unused for an extended period, the unit must run several minutes before the power fail alarm will activate.	Allow unit to run for 20 minutes and retry	
	Defective PC board	Replace PC board	
	Defective power switch	Replace power switch	
	Defective wire harness	Replace wire harness	
Audible alarm does not sound when unit is turned "On"	Defective PC board	Replace PC board	
Pressure relief valve activated - "popping" sound	Defective PC board	Replace PC board	
	Defective valve	Replace valve	
Service Required light does not illuminate when unit is turned "On."	Defective PC board	Replace PC board	
	Defective light	Replace light	
	PC board connectors not properly latched	Be sure tabs are pushed completely into place	

TROUBLESHOOTING

TROUBLESHOOTING CHART B

Visible Alarm	Audible Alarm	Compressor	Power Light
Blinking	Pulsing	OFF	OFF

Other Symptoms	Possible Cause	Possible Remedy
Fan off	Line cord not properly installed or defective	Insert plug in receptacle or replace line cord
	No power at receptacle	Check building circuit breaker or fuse, or have house wiring checked by qualified electrician Circuit may be fully loaded with other appliances and another receptacle may be required
	Oxygen concentrator circuit breaker activated	Press the circuit breaker reset button If unit circuit breaker opens again, check internal wiring
	Line cord quick-connect terminal inside unit is disconnected	Reconnect quick-connect terminal
	Defective power switch	Replace power switch
	Defective circuit breaker	Replace circuit breaker

TROUBLESHOOTING CHART C

Visible Alarm	Audible Alarm	Compressor	Power Light
Blinking	Pulsing	ON	ON/OFF

Other Symptoms	Possible Cause	Possible Remedy
Fan and compressor operating. Pressure relief valve activated – “popping” sound	Blown fuse on PC board	Replace fuse
	Defective PC board	Replace PC board

TROUBLESHOOTING CHART D

Visible Alarm	Audible Alarm	Compressor	Power Light
ON	ON	OFF	ON

Other Symptoms	Possible Cause	Possible Remedy
Fan operating	Wiring harness disconnected/defective	Reconnect/replace wiring harness
	Loose compressor wire	Tighten or attach wire
	Defective capacitor	Replace capacitor
	Defective compressor	Replace compressor
Unit warm to the touch and cannot be restarted for several minutes	Compressor overheated due to: Occluded filters Restricted input or output air passage Low or high line voltage	Clean or replace filters Remove obstruction Check line voltage; use alternate circuit independent of other appliances
	Defective cooling fan	Replace cooling fan
	Defective compressor	Replace compressor

TROUBLESHOOTING CHART E

Visible Alarm	Audible Alarm	Compressor	Power Light
ON	ON	ON	ON

Other Symptoms	Possible Cause	Possible Remedy
Fluctuating or no flow	*System pressure below 9 psi (62.1 kPa) due to: Leak in system Defective compressor	Check for leaks in all hoses and fittings Replace compressor

*Non-OSD and early OSD models only

TROUBLESHOOTING CHART F (OSD UNITS ONLY)

Compressor	Power Light
ON	ON

Other Symptoms	Possible Cause	Possible Remedy
No OSD lights are illuminated.	Defective OSD or malfunctioning concentrator.	Check concentration with an oxygen analyzer. If the concentration is within specification, replace the OSD (early OSD models only). Replace the PC board on later OSD models. If the concentration is low, refer to low oxygen concentration symptom in Troubleshooting Chart A.
No OSD lights are illuminated, but red "Service Required" light is illuminated accompanied by a beeping audible alarm. (later OSD models only)	Oxygen level is low*	Check concentration with an oxygen analyzer. If the concentration is within specification, replace the PC board. If the concentration is low, refer to low oxygen concentration symptom in Troubleshooting Chart A.
Both OSD lights are illuminated. (early OSD models only)	Connector off between OSD and PC board.	Reconnect connector.
	Defective OSD	Replace OSD.
Yellow Low Oxygen light is illuminated.	Oxygen level is low*	Check concentration with an oxygen analyzer. If the concentration is within specification, replace the OSD (early OSD models only). Replace the PC board on later OSD models. If the concentration is low, refer to low oxygen concentration symptom in Troubleshooting Chart A.
Yellow Low Oxygen light is illuminated and an intermittent audible alarm sounds every five seconds.	Oxygen level is low*	Check concentration with an oxygen analyzer. If the concentration is within specification, replace the OSD (early OSD models only). Replace the PC board on later OSD models. If the concentration is low, refer to low oxygen concentration symptom in Troubleshooting Chart A.

*Refer to "Specifications" page for oxygen purity levels.

PROPER REPAIR PROCEDURES

The DeVilbiss 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:

- 1 Slotted bit
- 1 #1 Phillips bit
- 1 #2 Phillips bit
- 1 7/16" Socket 1/4" Drive
- 1 Crescent wrench
- 1 8" Duckbill pliers
- 1 T-10 Bit
- 1 5/32" Allen bit
- 1 5/64" Allen bit
- 1 9/64" Allen bit
- 1 7/64" Allen bit
- 2 0-30 PSI 0-30 in. Hg gauge (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 3mm Hexbit
- 1 T-15 Torx "L" wrench
- 1 10mm 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 voltmeter 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, check the oxygen concentration and test for leaks.

Test for leaks using a certified leak detection solution such as Epi-SEAL® LEAK-SEEK®. 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.

⚠ WARNING

WARNING: When servicing the DeVilbiss 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

WARNING: Electric shock hazard. Do not remove cabinet. The cabinet should only be removed by a qualified Sunrise Medical homecare provider.

⚠ WARNING

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.

CABINET REMOVAL

To remove the front and back cabinets (Figures 2 and 3):

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.

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 4):

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.

To remove the bib completely (Figure 8):

1. Remove the two screws as above.
2. Disconnect the ribbon connector from the PC board.
3. Disconnect the lines from the power switch and circuit breaker. Mark these wires accordingly.
4. Tilt the top of the bib forward to release it from the slot in the body of the concentrator.
5. Remove the hose connected to the bottom of the flow meter.

To reassemble bib:

1. Reconnect the wires and hose.
2. Insert the bib tab into the slot above the four-way valve, and push until it snaps into place.
3. Secure bib with two screws.

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 LOX-8™ is a trademark of Fluoramics, Inc.
 Epi-Seal® Leak-Seek® is a registered trademark of Bonded Products, Inc.

ACCUMULATOR PRESSURE TEST

To check accumulator pressures:

1. Make sure the unit is "Off."
2. Remove front and back cabinets.
3. Use the pressure-vacuum gauge (part #PVO2D-601) and pressure test assembly (part #303DZ-637) included in the Service Kit.
4. On non-OSD and early-OSD models remove the 1/16" (1.6 mm) diameter tubing from the accumulator tank fitting and attach the 1/16" (1.6 mm) diameter tubing on the other end of the pressure test assembly to the accumulator tank fitting just vacated above. This tubing goes from the accumulator to the pressure transducer on the PC board.
On later OSD models remove the 1/16" (1.6 mm) diameter tubing cap (part #370-0035-100) from the accumulator tank fitting and attach the pressure test assembly to the tank fitting just vacated. Use the tubing cap to plug one side of the pressure test assembly.
5. Install the gauge on the pressure test assembly.
6. Turn the unit "On" with the flow rate set to maximum recommended flow.

During each timed cycle, the average pressure in the oxygen accumulator will rise and fall.

NOTE: Normal pressures observed depend on altitude and flow rate. Increases in altitude and flow rate will slightly decrease accumulator pressures. Decreases in the two variables will slightly increase accumulator pressures. Acceptable accumulator pressure swing ranges at various altitudes at the maximum recommended flow are identified in the "Specifications."

NOTE: A defective check valve may cause a rapid drop in accumulator pressure below the minimum value.

NOTE: A defective compressor will be indicated by slowly rising pressure. Pressure may only reach a certain level and then stop.

Low oxygen concentration levels and accumulator pressures higher than normal may indicate defective sieve beds. Severely contaminated beds may also cause the pressure relief valve on the compressor to open.

NOTE: A malfunctioning four-way will also cause high accumulator tank pressure and activation of the pressure relief valve. In this case it should be determined whether the problem is with the sieve beds, four-way, or both.

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.

WARNING

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. The capacitor may hold a charge for several days after the unit is turned off.

If a defective capacitor is suspected, a new one must be installed. The capacitor is strapped into a well molded into the bottom of the unit (Figure 10) next to the cooling fan.

To replace the capacitor:

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets.
3. Remove the 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 new capacitor.
7. Install the new capacitor and secure with a new cable tie.
8. Replace the compressor.
9. Replace the front and back cabinets and secure with the six screws.

COMPRESSOR

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

A compressor that is worn or defective may:

- cause pressure to rise slowly.
- cause excessive noise and/or vibration.
- cause lower oxygen concentrations.

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 #505DZ-643).

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. (Some models have an auxiliary thermostat mounted within the compressor compartment.)

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 the compressor operating voltage (Figure 4):

The compressor requires line voltage 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 voltmeter or test light connected to the brown and blue wires. The voltmeter is the best way to test.
2. If no voltage is detected, disconnect power and check for loose or broken wires between the compressor connector and switch or wire harness.
3. If there is voltage at the compressor connector, then either the capacitor or the compressor itself is defective.

To test the compressor for proper output:

NOTE: If the compressor is not providing a high enough output the patient alert system may be activated.

1. Remove the front and back cabinets.
2. Connect a pressure-vacuum gauge to the accumulator tank test point. See the section Accumulator Pressure Test in the chapter “Component Testing, Repair, and Replacement” for details on attaching the gauge. A defective compressor will be indicated by slowly rising pressure. Pressure may only reach a certain level and then stop.

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 the system—check for air leaks using a leak detection solution.
- The compressor reed valves, Teflon ring, or the compressor itself may be defective. (refer to Figure 12).

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

To remove the compressor:

1. Make sure the unit is unplugged from the wall outlet.
2. Disconnect the compressor wires by disconnecting the white electrical connector (Figure 4).
3. Remove the hose clamp and hose from the outlet fitting on the compressor filter (Figure 4).
4. Remove the two screws from the back of the compressor mounting plate(s) (Figure 4).
5. Remove the two 10 mm hex nuts that secure the mounting plate to the front of the compressor housing (Figure 6). These nuts are located on each side of the four-way valve.
6. Lift compressor and mounting plate up and out of the compressor housing area.
7. Remove the tubing from the compressor intake port fitting.

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

To inspect and/or replace internal components (Figure 14):

1. 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.

2. Check for proper placement of or damage to the gaskets on the bottom of the compressor heads. Replace if damaged.
3. Remove reed valve plates. A reed valve is located on each side of the valve plate.
4. The compressor reed valves should be flush with the valve plate. If the valve is broken or not flush with the valve plate, or foreign matter is detected inside the head, clean or replace the compressor reed valves.

To replace the compressor reed valves (Figure 14):

- a. Remove the screw holding the compressor reed valves in position on the valve plate and discard the used reed valves.
- b. Position the new reed valves so that they are centered and completely cover the holes in the valve plate.
- c. Place the metal retainer on the reed valves 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 14):

- a. Remove screw from top of piston.
- b. Remove the retainer plate.
- c. Discard defective Teflon ring.
- e. Place new Teflon ring into position.
- f. Replace retainer plate.
- g. 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.

To replace the compressor:

NOTE: For mounting plate and motor mount removal, refer to sections below. Also refer to steps used in removing the compressor.

1. Inspect the motor mounts. Replace if damaged. Secure the mounting plate(s) to the bottom of the new compressor using the four compressor mounting hex nuts.
2. Reconnect tubing to the compressor intake fitting.
3. Position compressor on the base of the unit so that the studs on the mounting plates 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 the fitting at compressor filter outlet.
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 hex nuts and mounting plate.

NOTE: If the 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.

To remove motor mounts:

1. Unscrew studded motor mounts from compressor feet by hand.

COOLING FAN

The cooling fan provides a constant air flow to cool the compressor. The cooling fan is located in the bottom of the unit below the compressor (Figure 10).

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. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets.
3. Remove the compressor.
4. Disconnect the cooling fan terminals.
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. Reinstall the compressor.

FINAL CHECK VALVE

This check valve is located between the final bacteria filter and the oxygen outlet fitting. This check valve allows oxygen to flow only 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 8):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and loosen or remove 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.
5. Remove the hose from each end of the final check valve.
6. Attach the hoses to a new check valve. Make sure that the flat side of the check valve is directed toward the oxygen outlet fitting.
7. Replace the outlet fitting assembly and connect the hose to the filter.
8. Replace the bib and front and back cabinets.

FLOW METER

The pressure-compensated flow meter has an accuracy level of $\pm 5\%$ at full scale (exception: $+0\%, -5\%$ at 5 lpm). The flow meter on the DeVilbiss Oxygen Concentrator is designed for use at 8.5 psi (58.6 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 such as Epi-SEAL® LEAK-SEEK®.
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

WARNING: Electric Shock Hazard. Use caution when leak testing near electrical connections.

To replace the flow meter (Figure 8):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets.
3. From behind the bib remove the 2 hoses from the flow meter.
4. While squeezing tabs on flow meter brackets, push the flow meter through the bib.
5. Install new flow meter in bib and reconnect hoses.

FOUR-WAY VALVE

The timed 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 exhausted to a black hose connected to an exhaust muffler.

The dual solenoid four-way valve operates electrically to shift a spool inside the valve. The valve receives approximately 7.5 VDC (12-15 VDC on non-OSD and early-OSD models) from the PC board causing one of these solenoids to activate. When the left solenoid is activated, the right sieve bed will pressurize. After approx. 9-10 seconds the approximately 7.5 VDC (12-15 VDC on non-OSD and early-OSD models) is removed causing the left solenoid to deactivate. No voltage is applied to either solenoid for approximately 1 second. The right solenoid is then activated causing the left bed to pressurize.

If the four-way does not shift, the same bed will continue to pressurize, and the pressure relief valve will relieve the pressure.

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 four-way.

Foreign matter inside valve preventing spool from shifting.

To test the four-way valve (Figure 6):

1. Remove the front cabinet.
2. Connect the pressure-vacuum gauges furnished in the service kit to the test points at the top of the sieve beds in order to observe unit cycling and bed pressures. Refer to the section on "Normal Operating Sequence."
3. If it is determined that the four-way did not shift, continue testing with step 4.
4. Testing for proper four-way voltage is done at the four-way connector on the PC board. Place the test leads of a voltmeter in the two outside pins of the connector to check voltage to one of the solenoids. Place the voltmeter leads on the two inside pins to check voltage to the other solenoid. Approximately 7.5 VDC (12-15 VDC on non-OSD and early-OSD models) should be present for 9-10 seconds alternately on each solenoid (the green 4-way light on the PC board will be illuminated). Energizing the right solenoid will cause the left bed to pressurize, while energizing the left solenoid causes the right bed to pressurize.
5. 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.
6. If approximately 7.5 VDC (12-15 VDC on non-OSD and early-OSD models) is measured at the connecting leads to the valve, then the valve is either defective or foreign matter has gotten inside the valve causing it to malfunction. In either case the four-way valve must be removed to clean or replace it.

To remove the four-way valve: (Figures 6 & 7)

1. Unplug the unit from the wall outlet.
2. Remove the front cabinet and loosen the bib.
3. Disconnect the four-way connector from the PC board.
4. Loosen clamps and remove sieve bed hoses from bottom of four-way.
5. Remove the three screws that secure valve to the front of unit.
6. Loosen clamp and remove the compressor hose and exhaust hose(s) from four-way. Valve may now be cleaned or replaced.

To replace the four-way valve:

1. Reverse the above removal procedure.
2. If the tubing needs to be replaced make sure the new tubing is identical to the old tubing and is exactly the same length in order to ensure proper silencing.

To clean the four-way valve: (Figure 13)

1. Remove the valve as described above.
2. Using a flat screwdriver loosen the two slotted screws on both ends of the four-way. The solenoids may now be separated from the valve body.
3. Remove the spring retainer, spring, and spacer from each end of the valve body. Note the position of these parts.
4. Carefully remove the spool from the valve body.

NOTE: The spool and sleeve are a matched set. Take care not to mix different valve parts.

5. 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.

6. Inspect the o-rings on sleeve. If they are badly worn or defective, they should be replaced using the valve rebuild kit (part# 515DZ-707).
7. The spool and sleeve can be cleaned using a spray-on evaporative electro-contact cleaner; for example, ENVI•RO•TECH™ 1677 or cleaned with a detergent powder; for example, ALCONOX®. If using these cleaners, follow manufacturer's instructions carefully. DO NOT USE ANY TYPE OF CLEANSER THAT IS ABRASIVE OR LEAVES A RESIDUE.
8. Rinse the spool and sleeve thoroughly and dry with a soft, clean, lint-free cloth.
9. Ensure that the air passages (ports) in the valve body are free of any foreign matter. A clean, lint-free cloth or a compressed air hose can be used to clean these.
10. Carefully push sleeve into valve body (turning it slightly) so you do not cut or nick the o-rings. Be sure sleeve is positioned properly in valve body.
11. Reassemble remaining parts of valve in reverse order.
12. Replace valve as described above.

HOUR METER

To replace the hour meter (Figure 9):

1. Make sure 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.

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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.

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

To test the sieve beds:

1. Remove the 1/16" plugged piece of tubing from the top of each sieve bed.
2. Connect the pressure-vacuum gauges to the sieve bed test points (Figure 9) in order to observe unit cycling and bed pressures. Refer to the section on "Normal Operating Sequence."
3. If it is determined that the four-way did not shift, refer to the section on four-way testing. However, if the unit is cycling properly allow unit to run while observing the sieve bed pressures.
4. After 20 minutes of operation, check the oxygen concentration levels. Low oxygen concentration and high pressures indicate contaminated sieve beds.

NOTE: 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 (Figure 7):

1. Make sure any contamination problem has been corrected before replacing.
2. Make sure the unit is unplugged from the wall outlet.
3. Cut the plastic cable ties that secure the sieve beds to the internal structure of the unit.
4. Remove the tubing from the fittings at the top of each sieve bed.
5. Remove the hose clamps and black hose from the bottom of the sieve beds.
6. Install new sieve beds in reverse order using new plastic cable ties. Position the new beds so that the bed serial number label is at the top of the unit.

NOTE: Make sure that the sealing caps remain on the new sieve beds until just prior to connecting hoses and tubing.

7. Leak test all connections with a certified leak detection solution.

OSD® (early OSD models)

The OSD is located beside the PC board.

To replace the OSD:

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 hoses attached to the OSD.
6. Replace the two 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.

NOTE: The OSD on later models is integrated into the printed circuit board. See "Printed Circuit Board" section for removal and replacement.

POWER CORD

To replace the power cord - 115 volt units only (Figure 10):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the back cabinet.
3. Disconnect the power cord connector.

NOTE: Loosening or removing the compressor mounting plate may make it easier to service the power cord.
4. Note wire colors and socket locations before removing wires.
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 the 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.

POWER SWITCH

To replace the power switch (Figure 8):

1. Make sure 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 the 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 the new switch in the correct orientation making sure that it locks into position.
6. Reconnect the wires to the switch terminals.

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 (58.6 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 ± .85 psi (58.6 ± 5.9 kPa) with gauge outlet blocked, adjustment to the pressure regulator may be required. If so, call Sunrise Service Department at **1-800-333-4000 (814-443-4881)**.

NOTE: Make sure no leaks exist before adjusting the 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 or a decrease in oxygen concentration.

To replace the pressure regulator (Figure 9):

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

PRINTED CIRCUIT BOARD

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

On non-OSD and early-OSD models, a pressure transducer on the PC board continuously senses the oxygen pressure in the accumulator tank.

The PC board has preset alarms for low pressure or low output flow and power failure. Should any of the alarm values be exceeded, the patient alert system will activate.

NOTE: Non OSD and early OSD models were equipped with the low pressure alarm. Later OSD models are equipped with the low flow alarm.

NOTE: If the concentrator has been unused for an extended period, the unit must run 20 minutes before the power fail alarm will be enabled.

To remove and replace the PC board (without integral OSD) (Figure 7A):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and the bib.
3. Disconnect all wires, terminals, and connectors.
4. Remove the 1/16" (1.6 mm) tubing 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 wires, terminals, connectors and the tubing to the transducer
8. Replace the bib and front and back cabinets.

To remove and replace the PC board (with integral OSD) (Figure 7B):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and the bib.
3. Disconnect all wires , terminals and connectors.
4. Remove the 1/8" (3.2mm) tubing attached to the sensor.
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 wires, terminals, connectors and the tubing to the sensor.
8. Replace the bib and front and back cabinets.

SIEVE BED CHECK VALVES

A check valve (Figure 9) located between the outlet of each sieve bed and the accumulator tank allows 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.

Run the accumulator pressure test described in the chapter Component Testing, Repair, and Replacement. It covers details of attaching the gauge and a table of acceptable pressure swing ranges at various altitudes.

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

To replace a defective check valve, remove the tubing on either side of it and install a new valve making sure the outlet end is toward the accumulator tank.

Exterior Views

The following figures show the exterior of the DeVilbiss 4 & 5-Liter Series Concentrators.

- Figure 1 Front
- Figure 2 Right side
- Figure 3 Rear

Interior Views

The following figures show the interior of the DeVilbiss 4 & 5-Liter Series Concentrators.

- Figure 4A Rear (early OSD models)
- Figure 4B Rear (later OSD models)
- Figure 5A Front (early OSD models)
- Figure 5B Front (later OSD models)
- Figure 6A Lower front close up (early valve version)
- Figure 6B Lower front close up (later valve version)
- Figure 7A Upper front close up (early OSD models)
- Figure 7B Upper front close up (later OSD models)
- Figure 8 Behind bib
- Figure 9A Top (early OSD models)
- Figure 9B Top (later OSD models)
- Figure 10 Lower rear close up

Other Figures

- Figure 11 Compressor removed from base
- Figure 12 Compressor with head removed
- Figure 13 Four-way valve
- Figure 14 Compressor — exploded diagram
- Figure 15 Pneumatic Diagram
- Figure 16A Wiring Diagram (early OSD models)
- Figure 16B Wiring Diagram (later OSD models)

NOTE: There are two 515 OSD concentrator models referred to throughout this Service Manual:

- Early - OSD models
(Concentrator serial number H19999 and lower)
- Later - OSD models
(Concentrator serial number H20000 and higher)

Figure 1. Exterior Front View

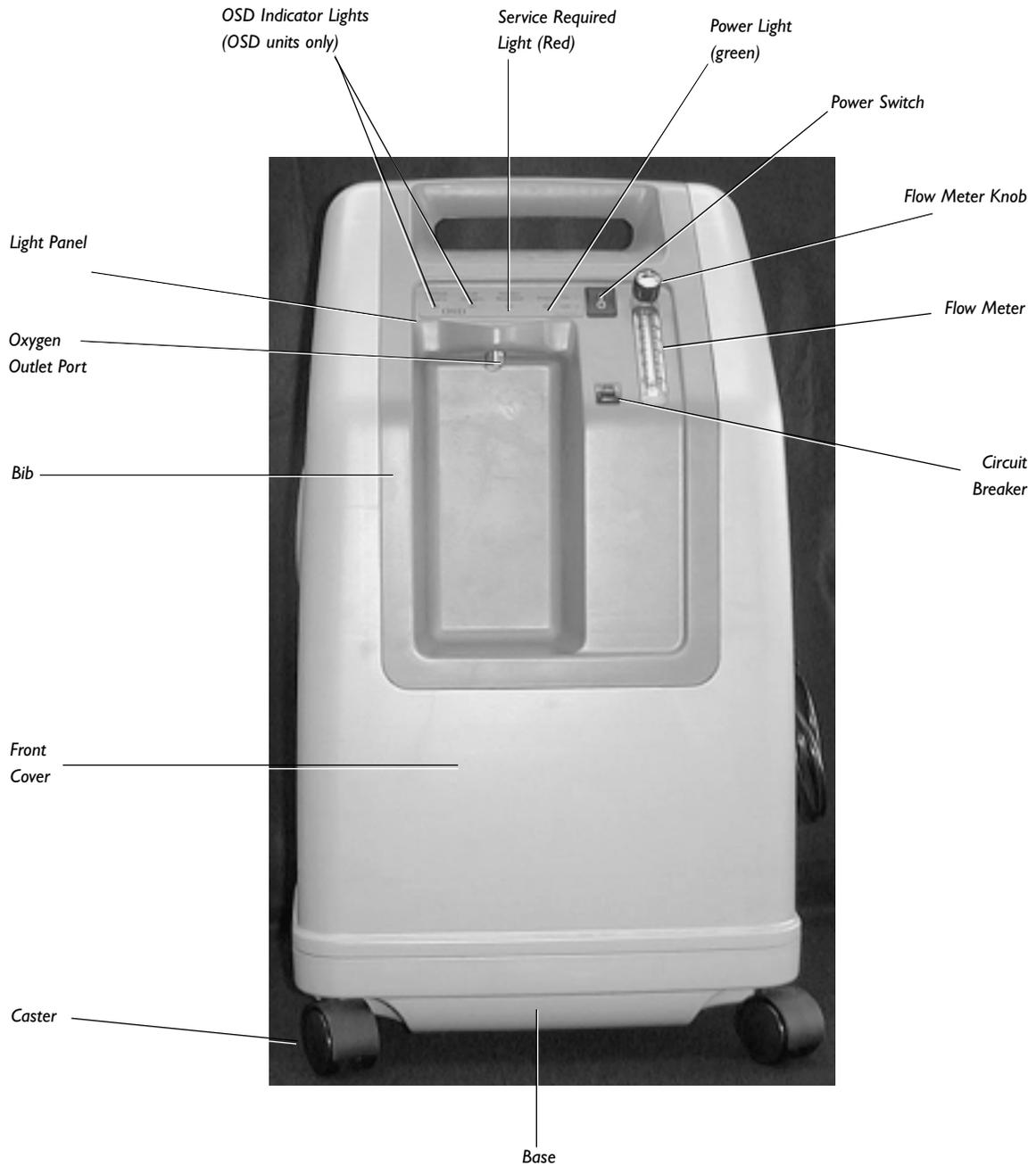


Figure 2. Exterior Side View

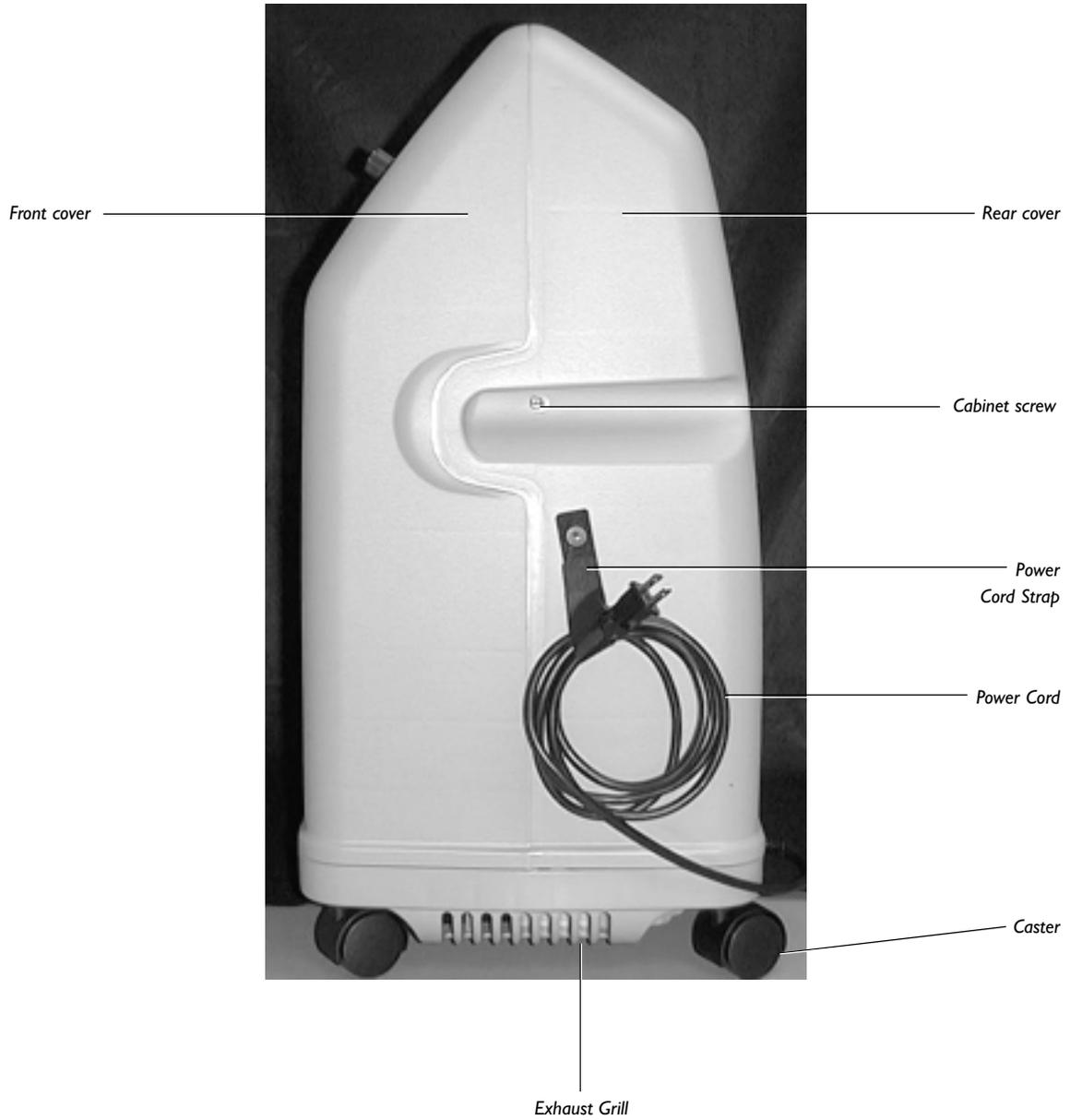


Figure 3. Exterior Rear View

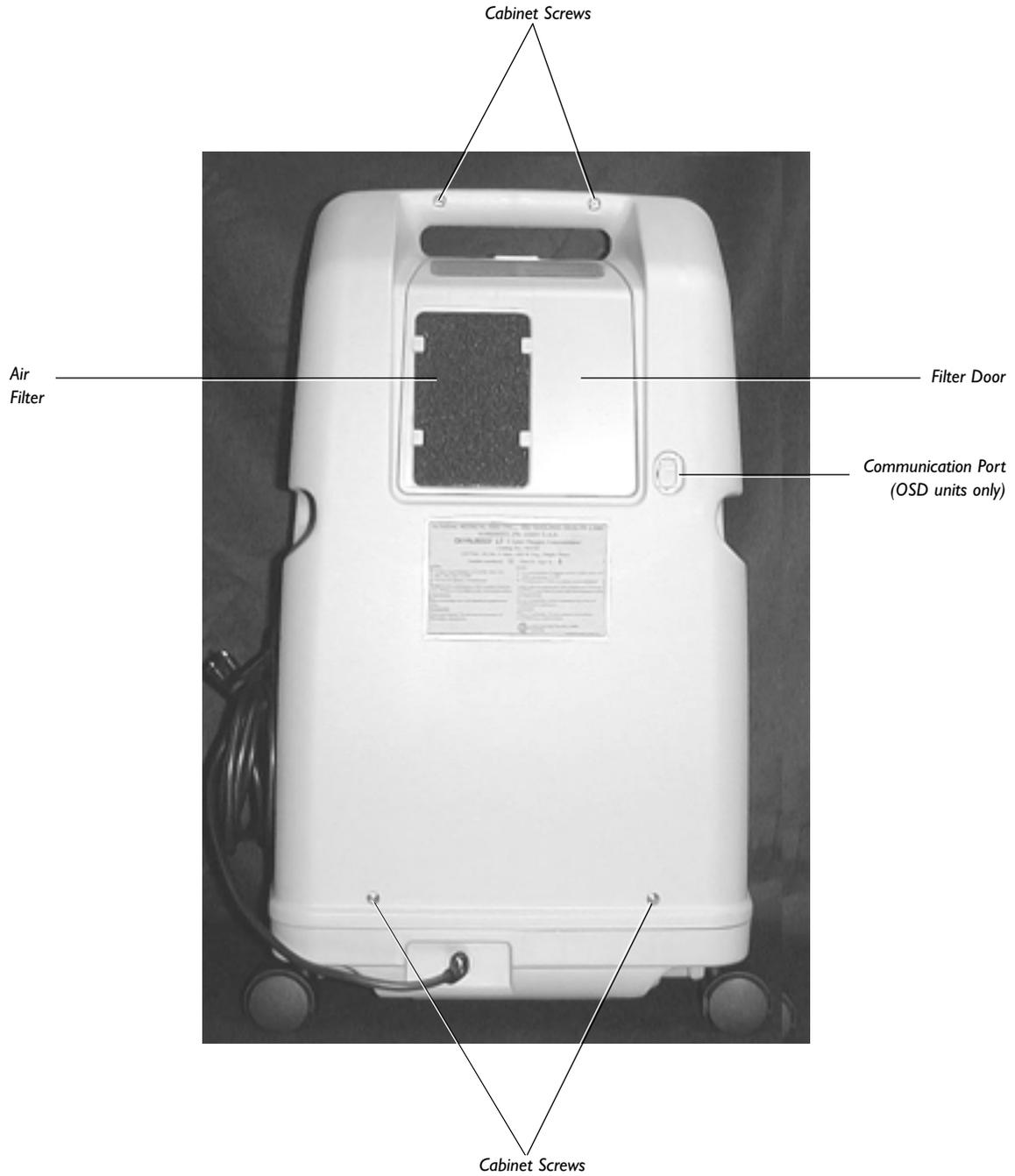


Figure 4A. Interior Rear View (early OSD models)

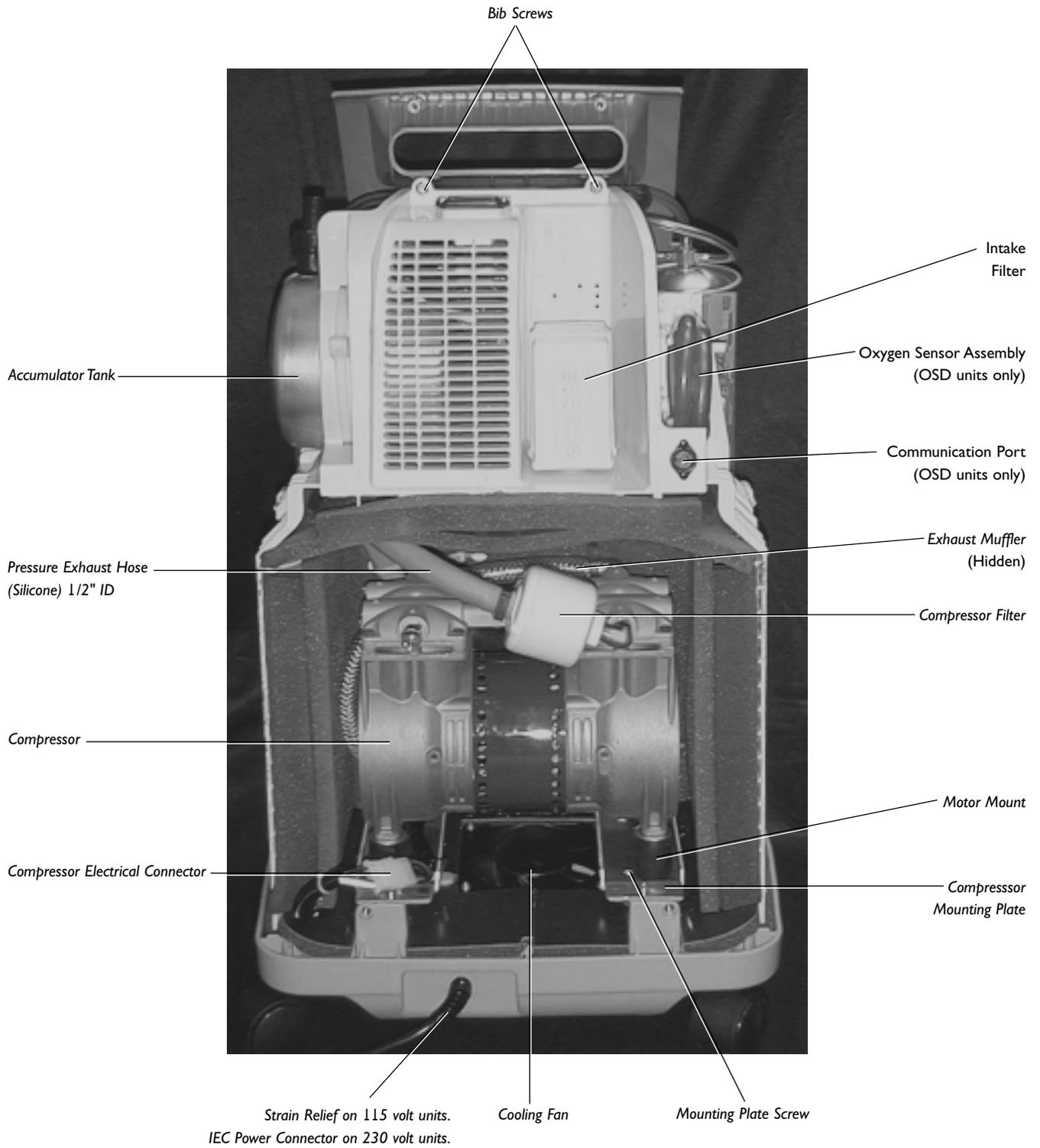


Figure 4B. Interior Rear View (later OSD models)

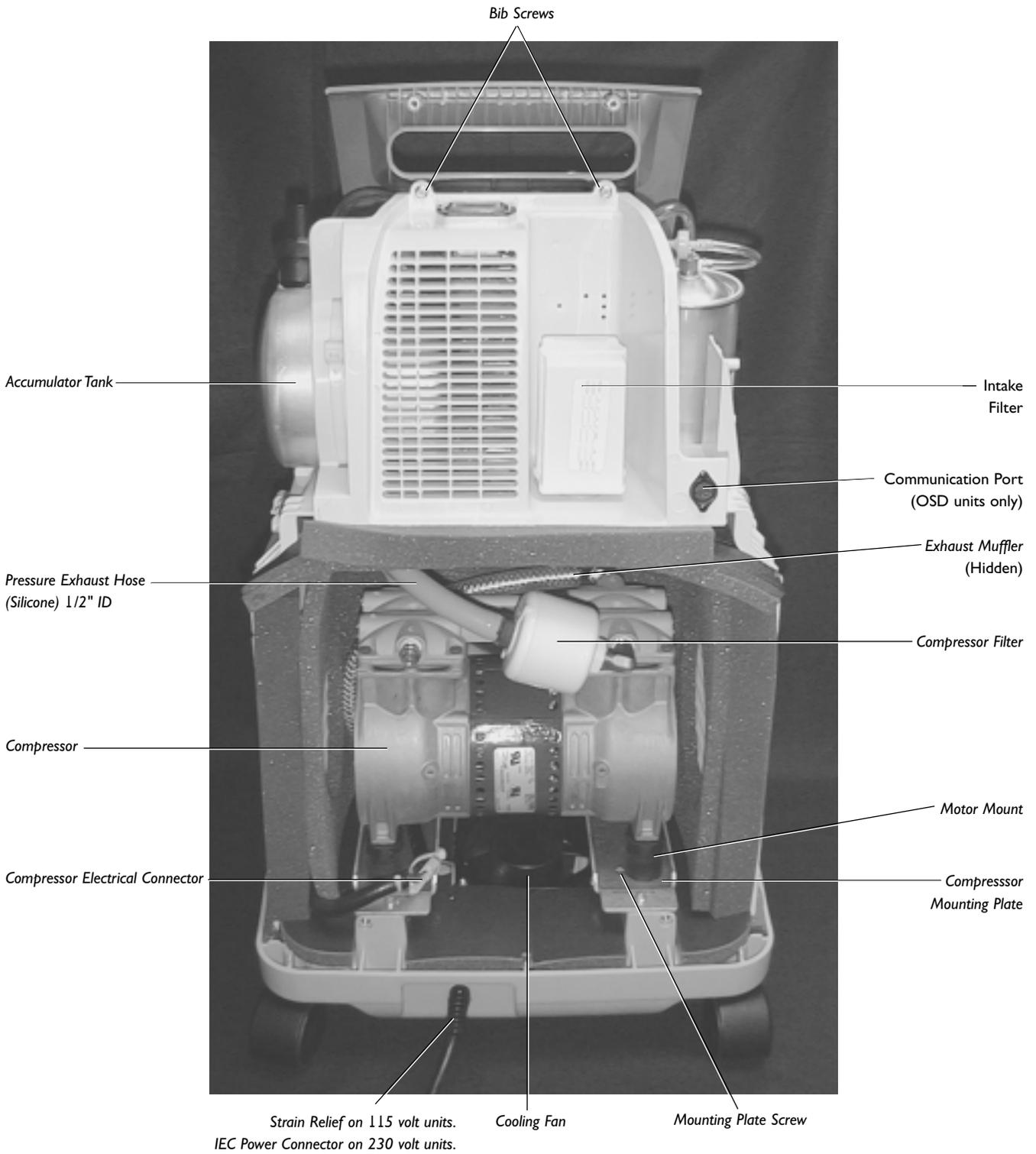


Figure 5A. Interior, Front View (early OSD models)

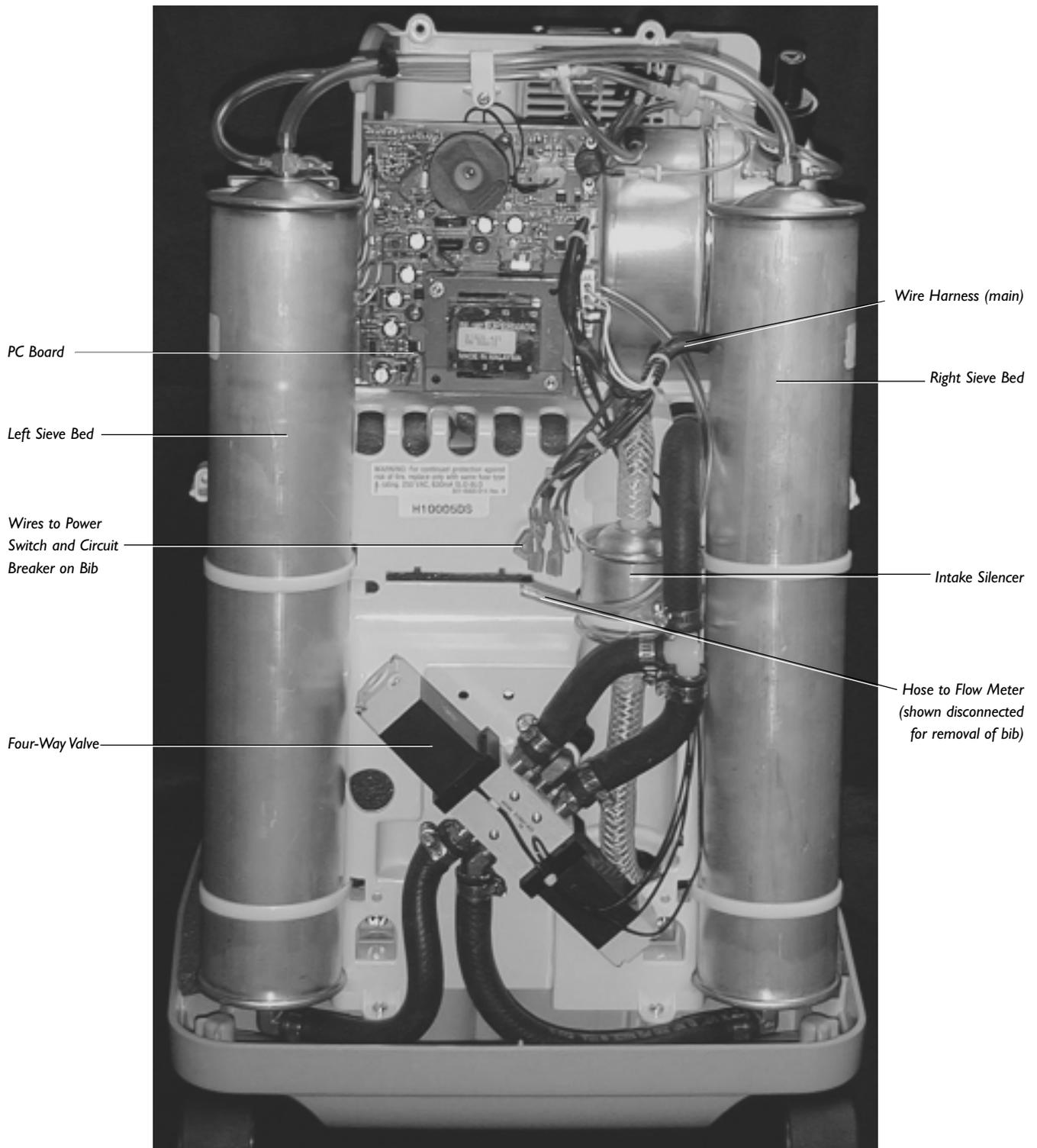


Figure 5B. Interior, Front View (later OSD models)

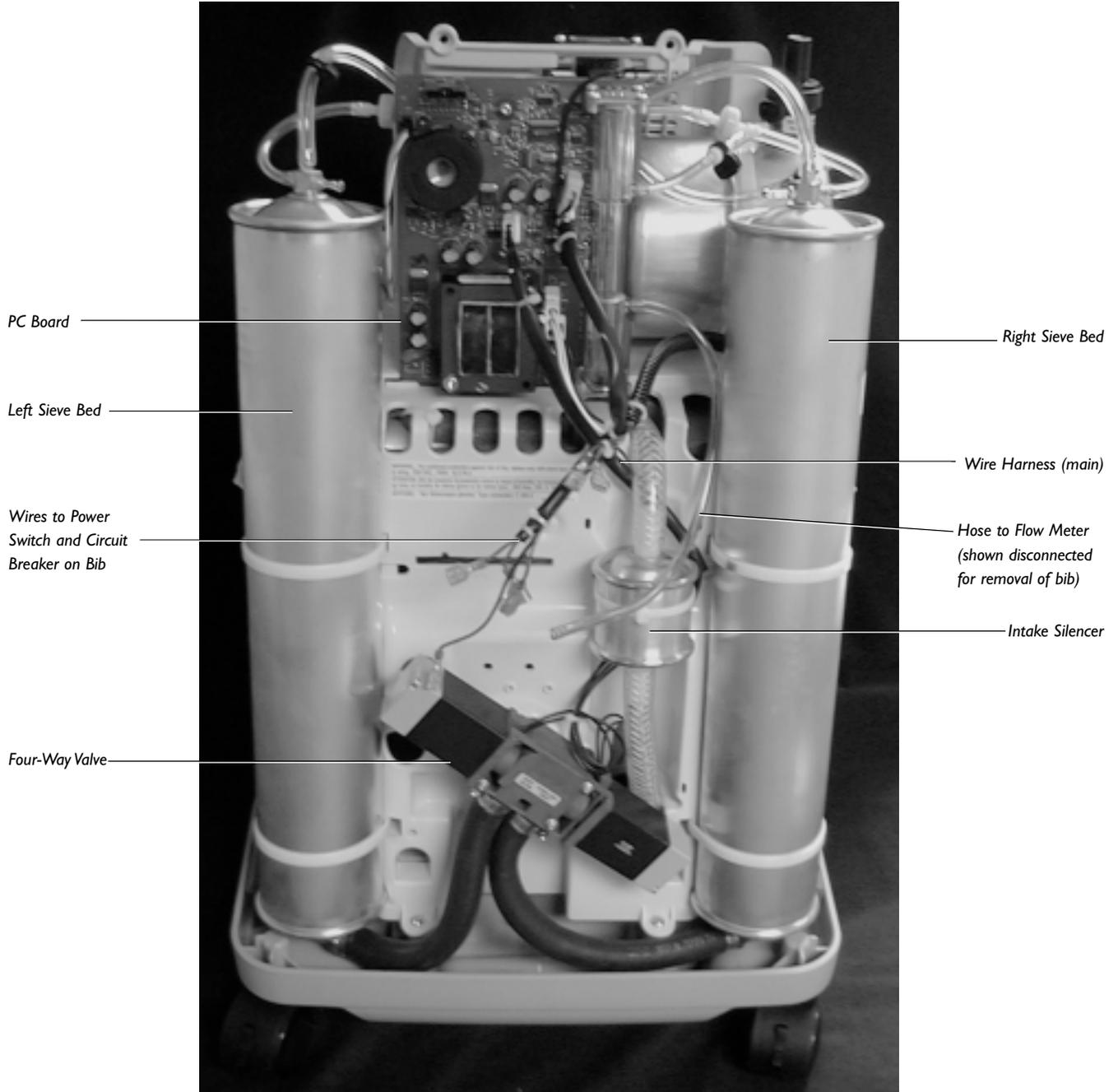


Figure 6A. Interior, Front Lower View (early valve version)

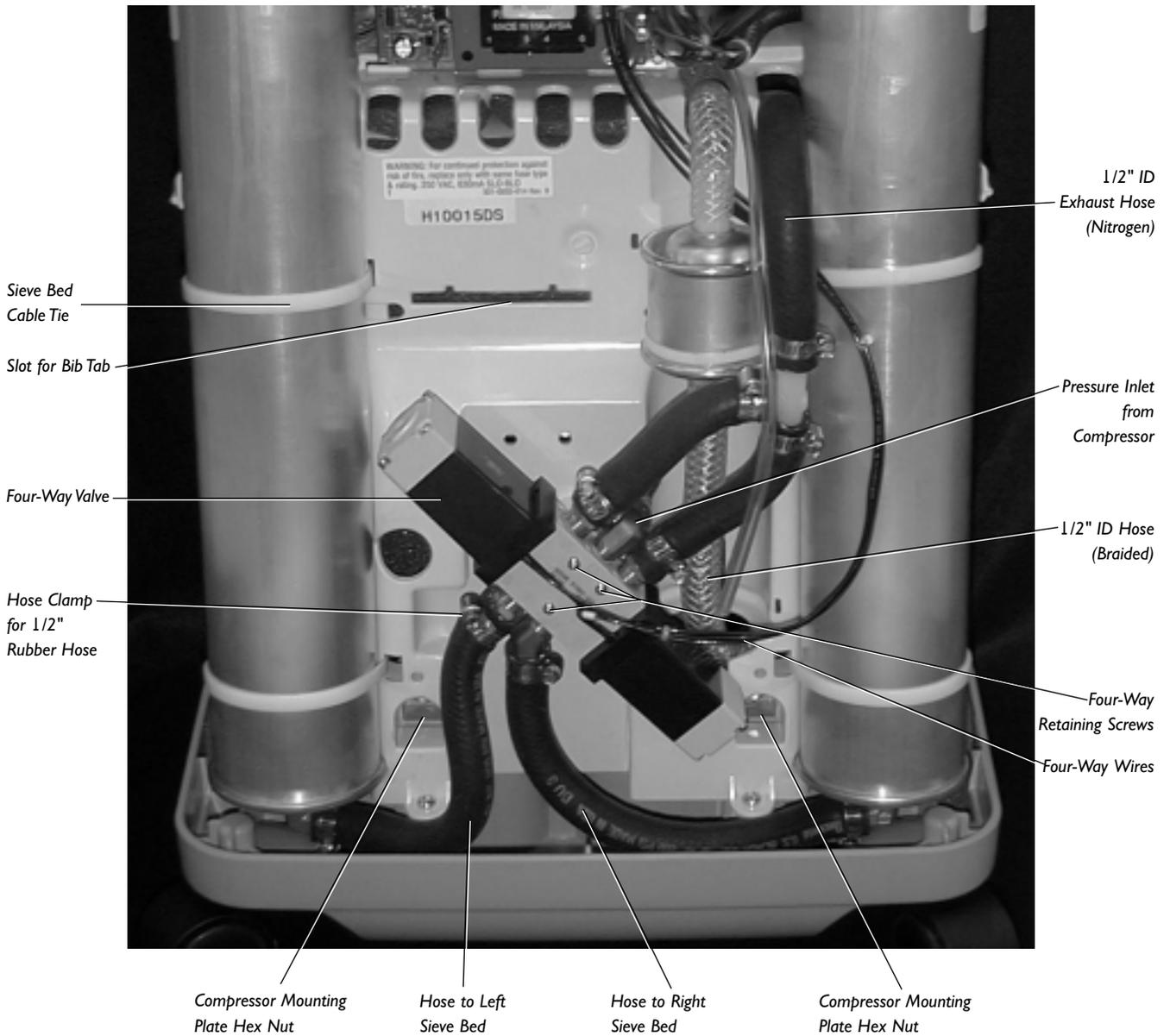


Figure 6B. Interior, Front Lower View (later valve version)

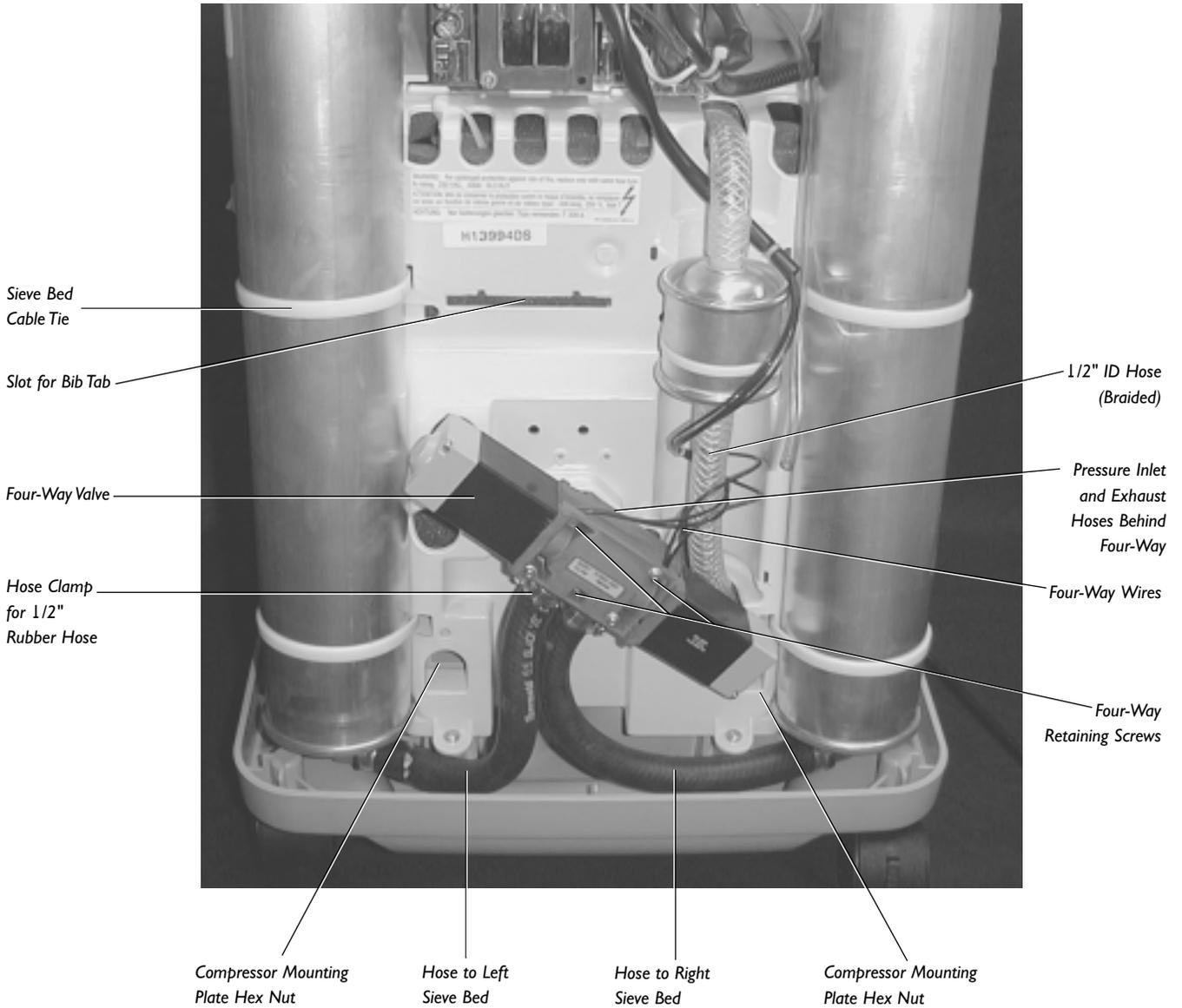


Figure 7A. Interior, Front Upper View (early OSD models)

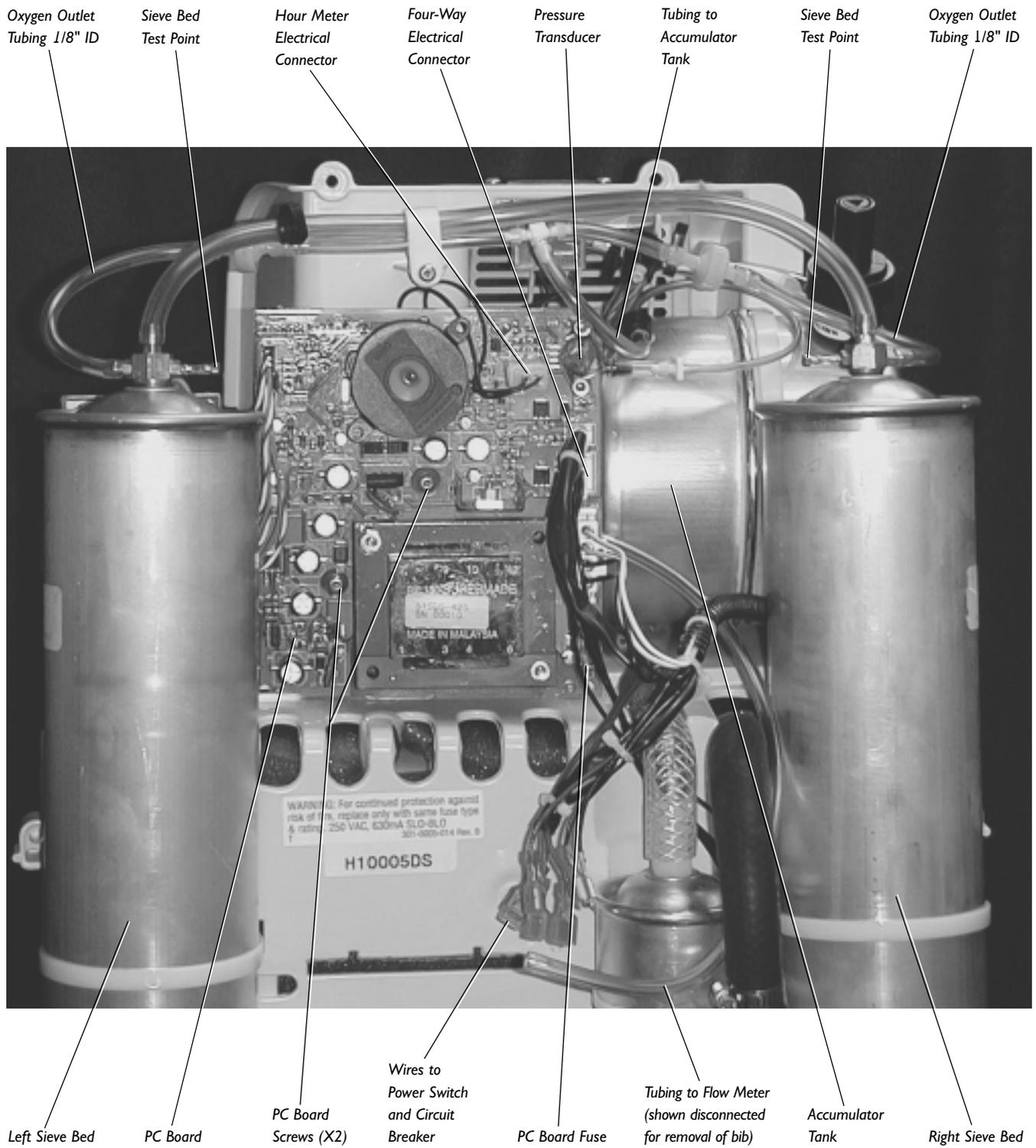


Figure 7B. Interior, Front Upper View (later OSD models)

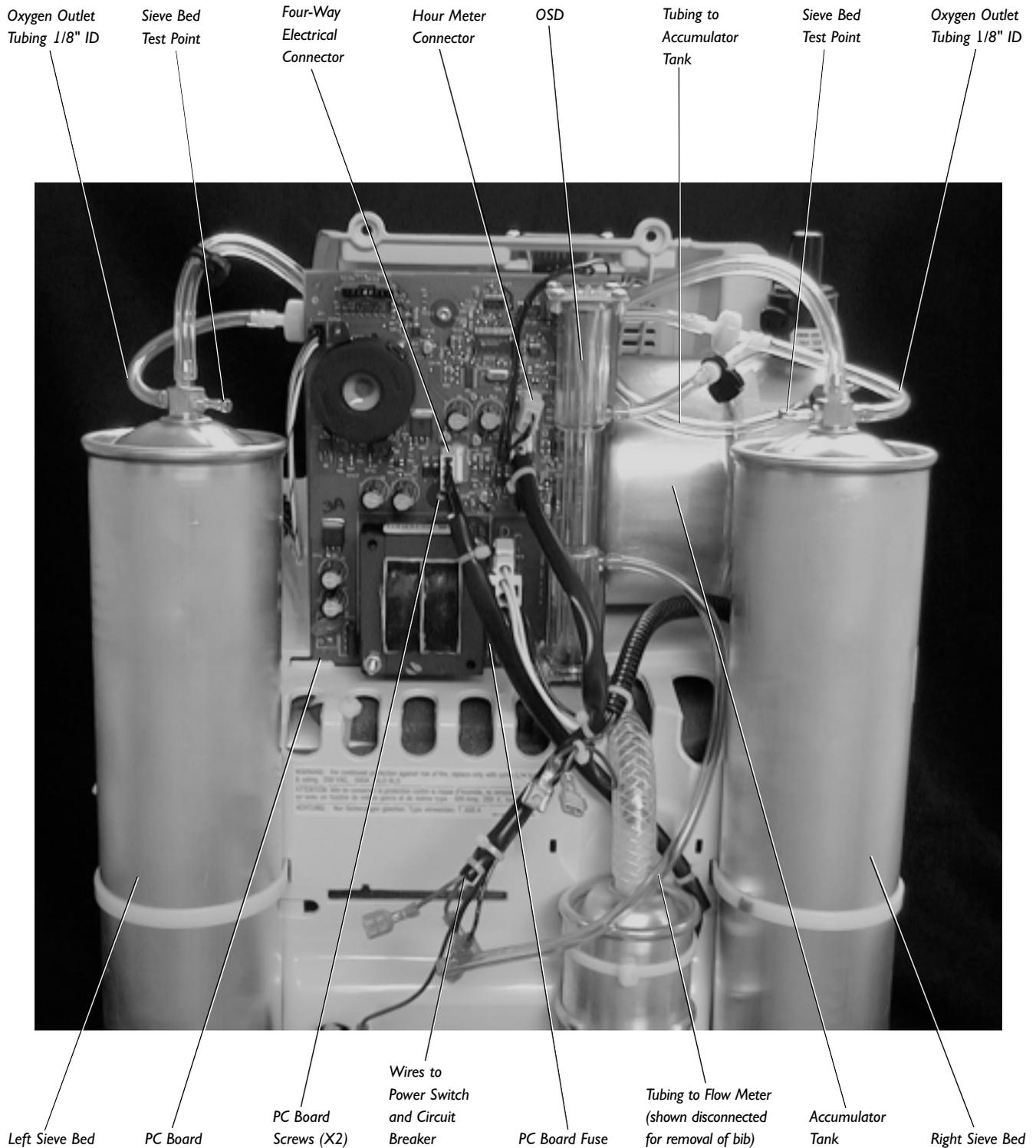
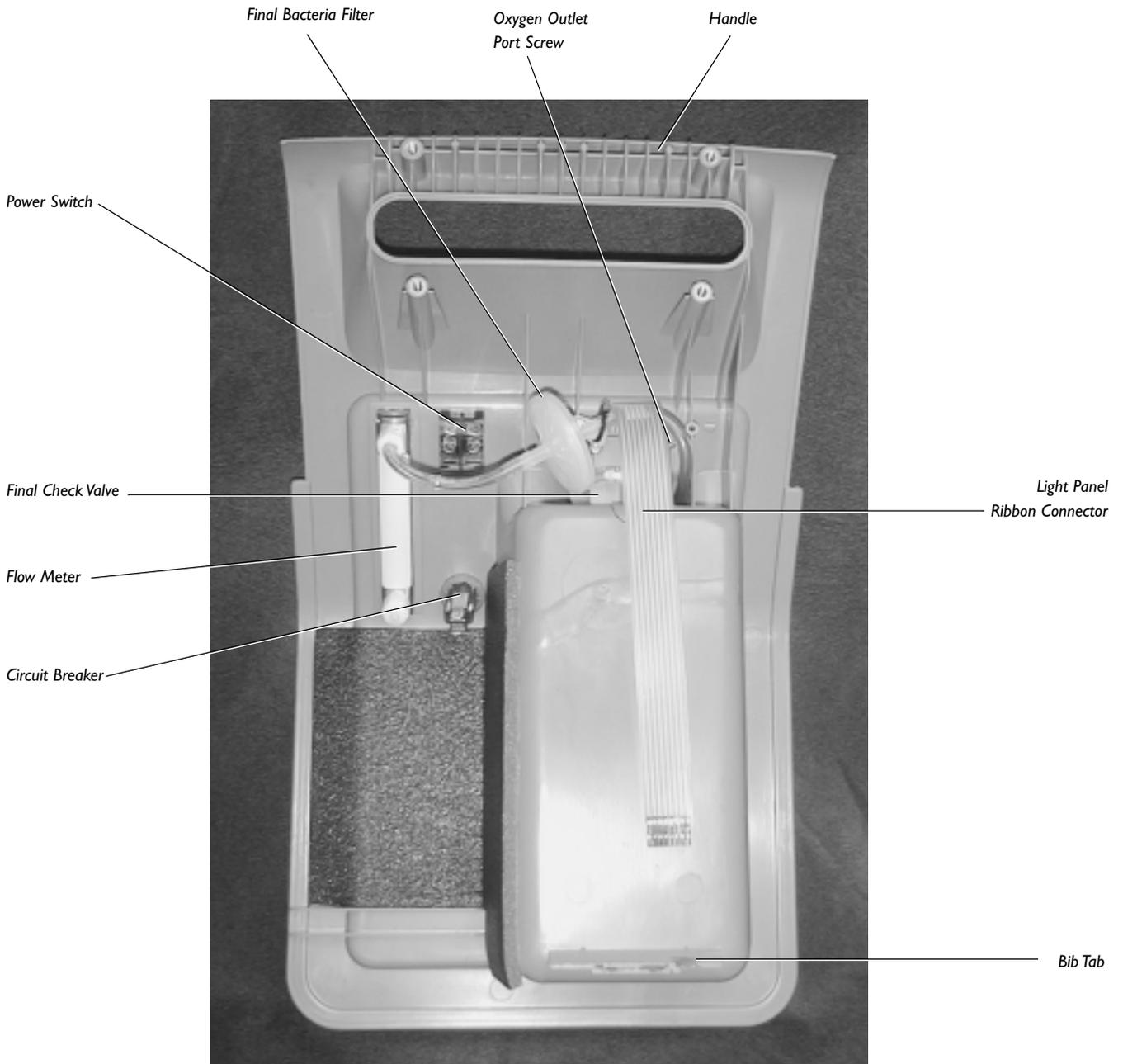
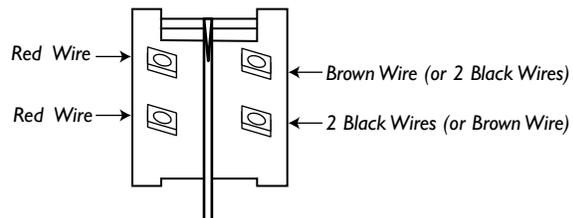


Figure 8. Interior, Behind Bib View



SWITCH DETAIL



EITHER RED WIRE CAN BE CONNECTED TO EITHER LEFT HAND TERMINAL OF SWITCH

Figure 9A. Interior, Top View (early OSD models)

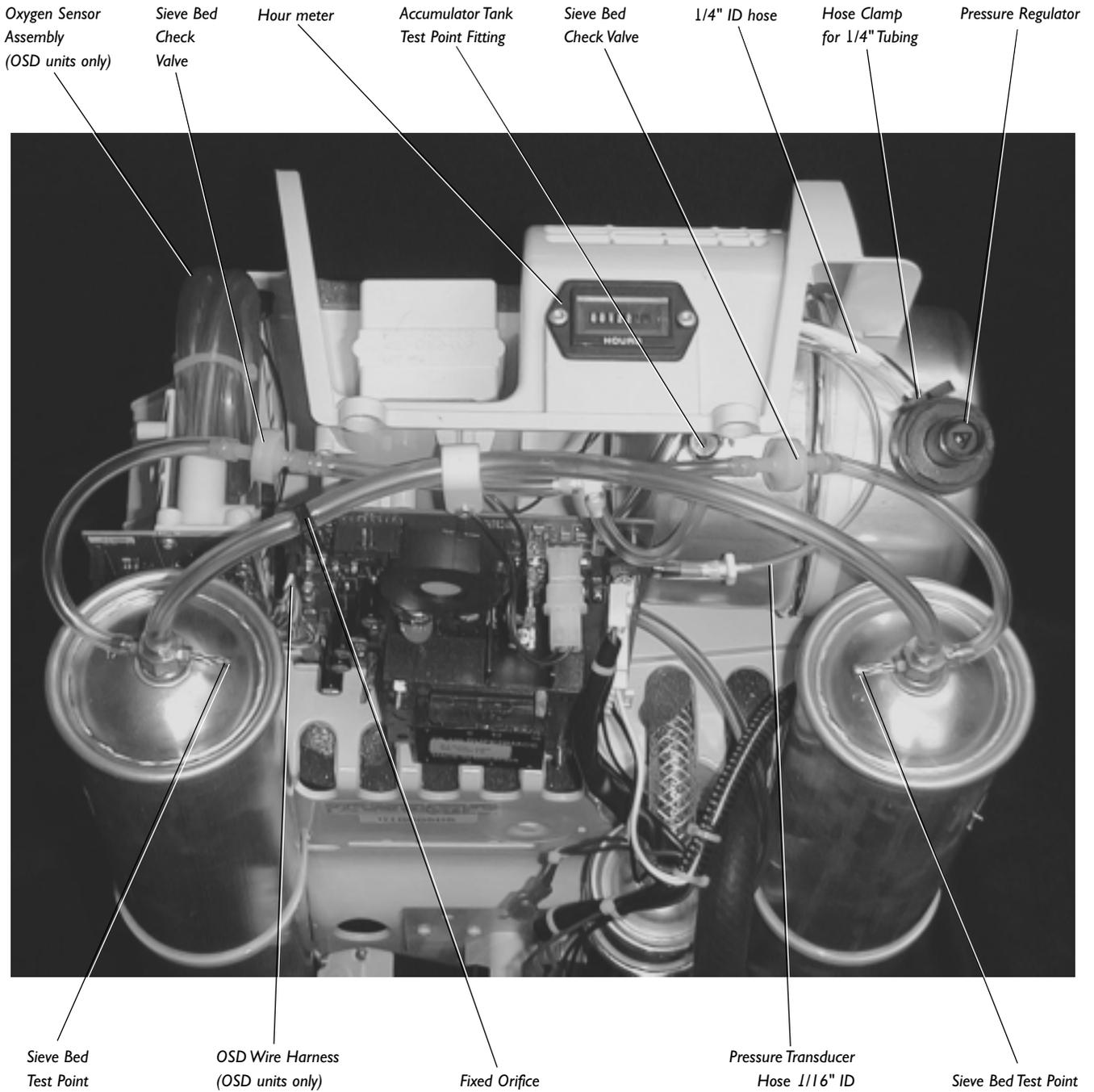


Figure 9B. Interior, Top View (later OSD models)

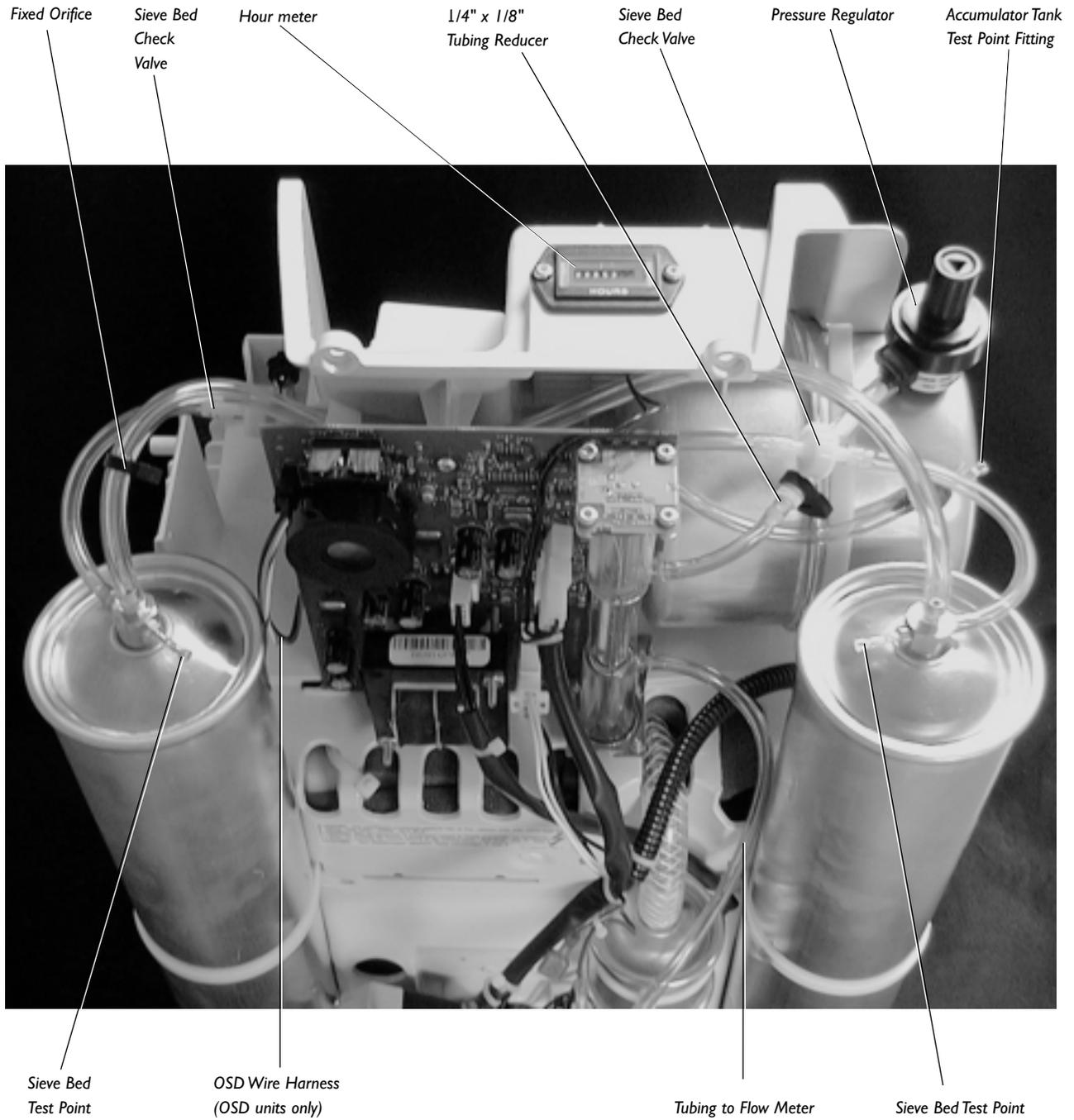
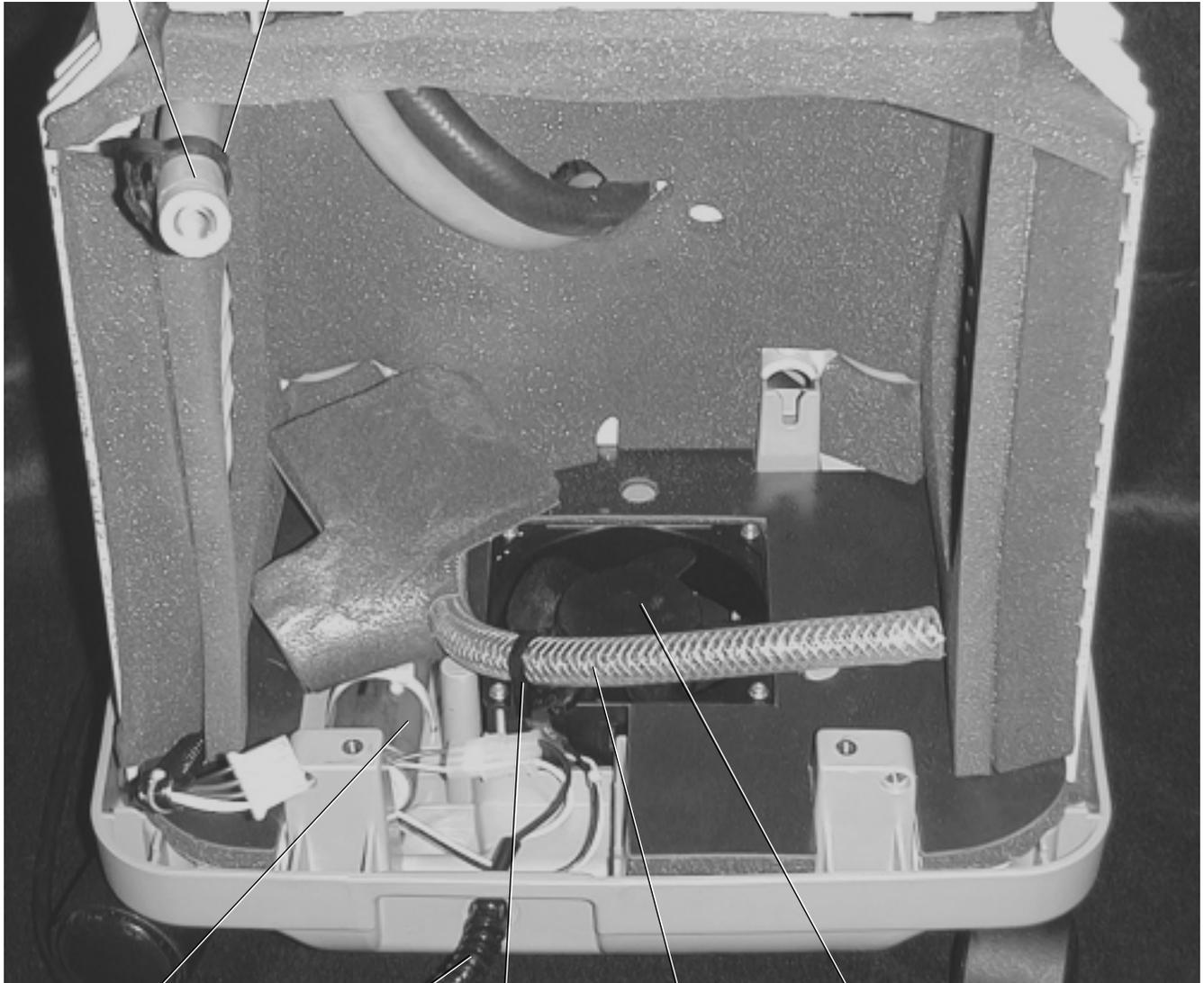


Figure 10. Interior, Rear Lower View

Pressure Exhaust Hose
(Silicone) 1/2" ID

Hose Clamp for
1/2" Rubber Hose



Capacitor

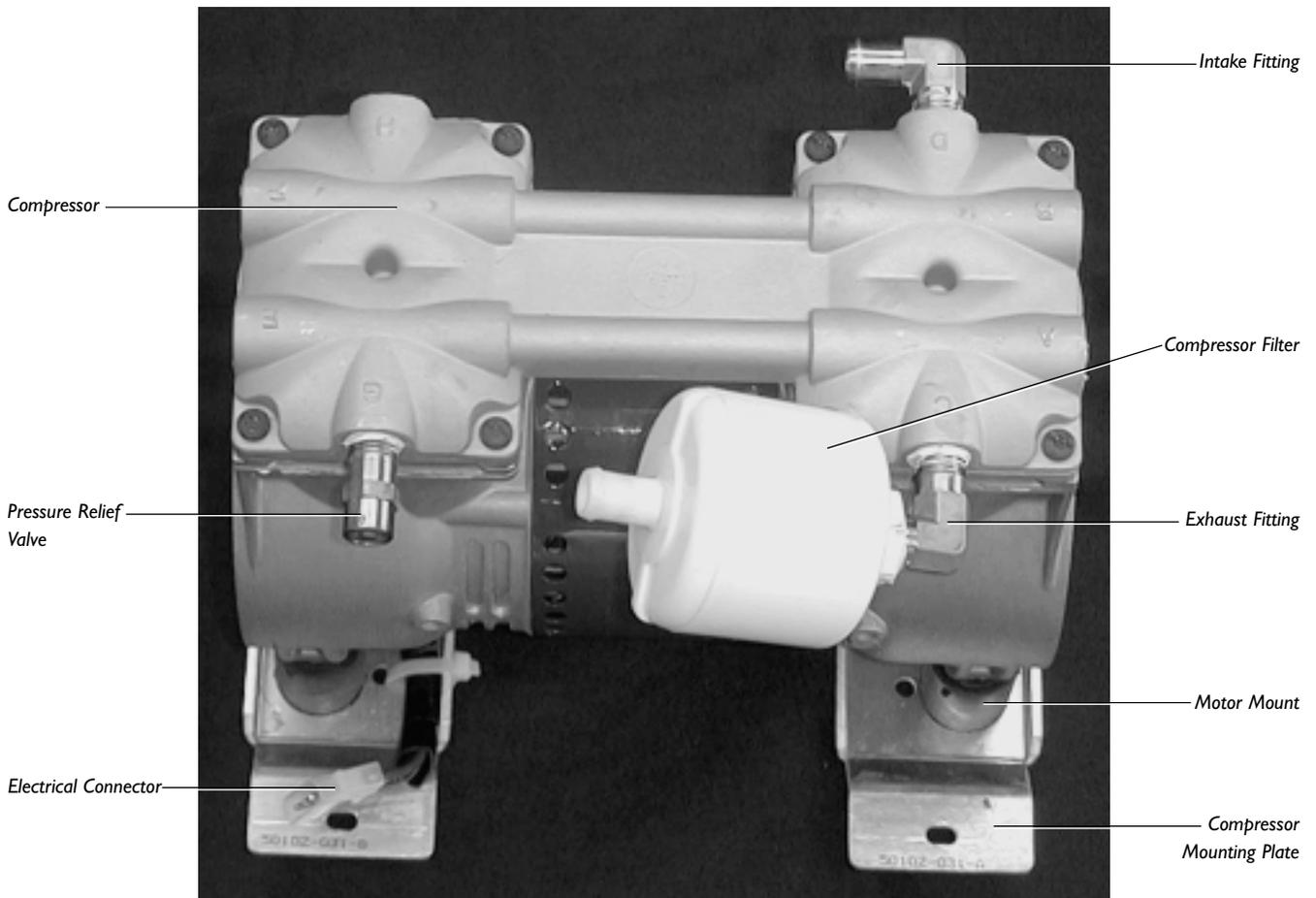
Power Cord Strain Relief
on 115 volt units.
IEC Power Connector on
230 volt units.

Hose Clamp for 1/2"
Braided Tubing

Compressor Intake
Hose 1/2" ID Braided

Cooling Fan

Figure 11. Compressor



*Note— Model 515UK has one large compressor mounting plate.

Figure 12. Compressor With Head Removed

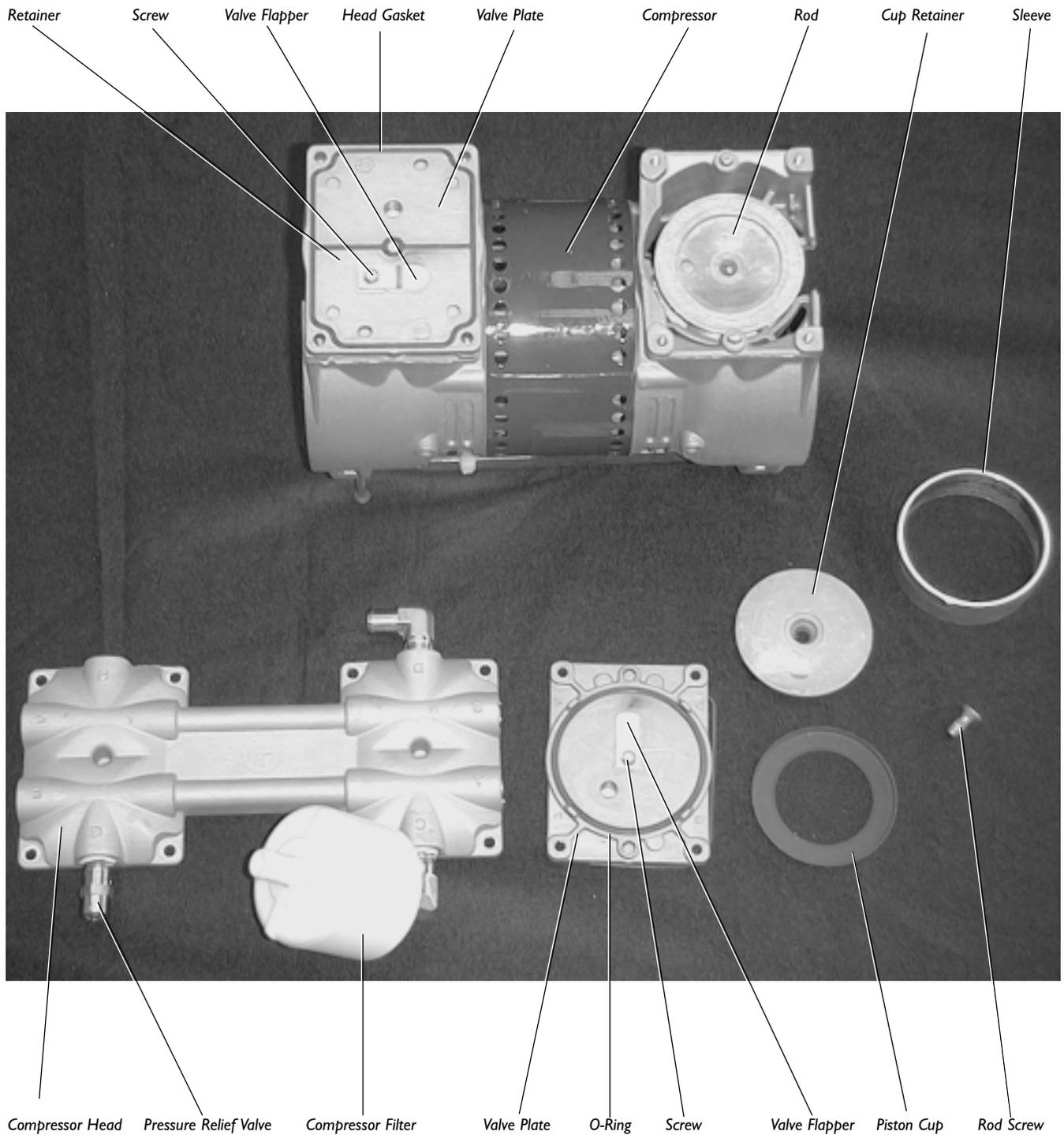


Figure 13. Four-Way Valve

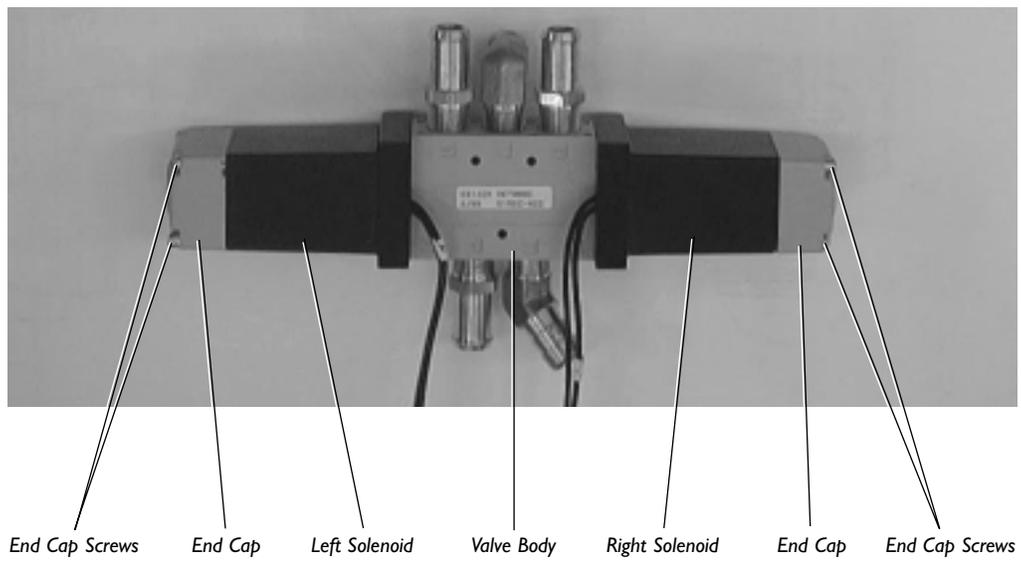
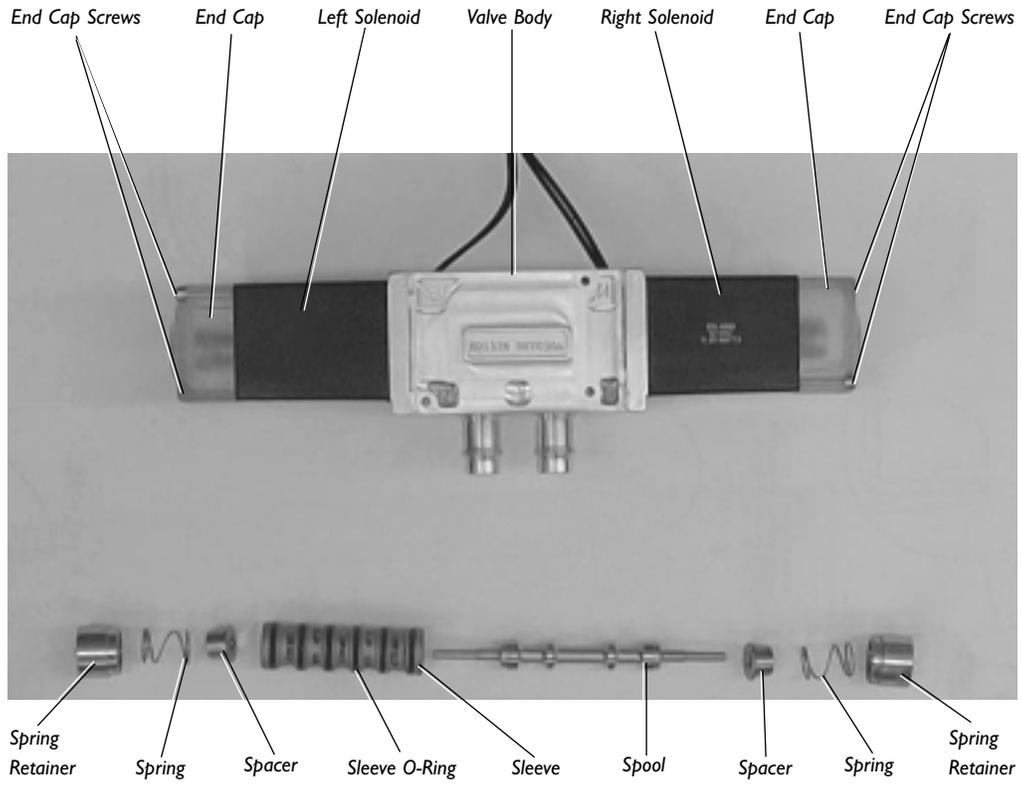


Figure 14 Compressor (exploded view)

- | | | | |
|---|--|----|----------------------------------|
| 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 |

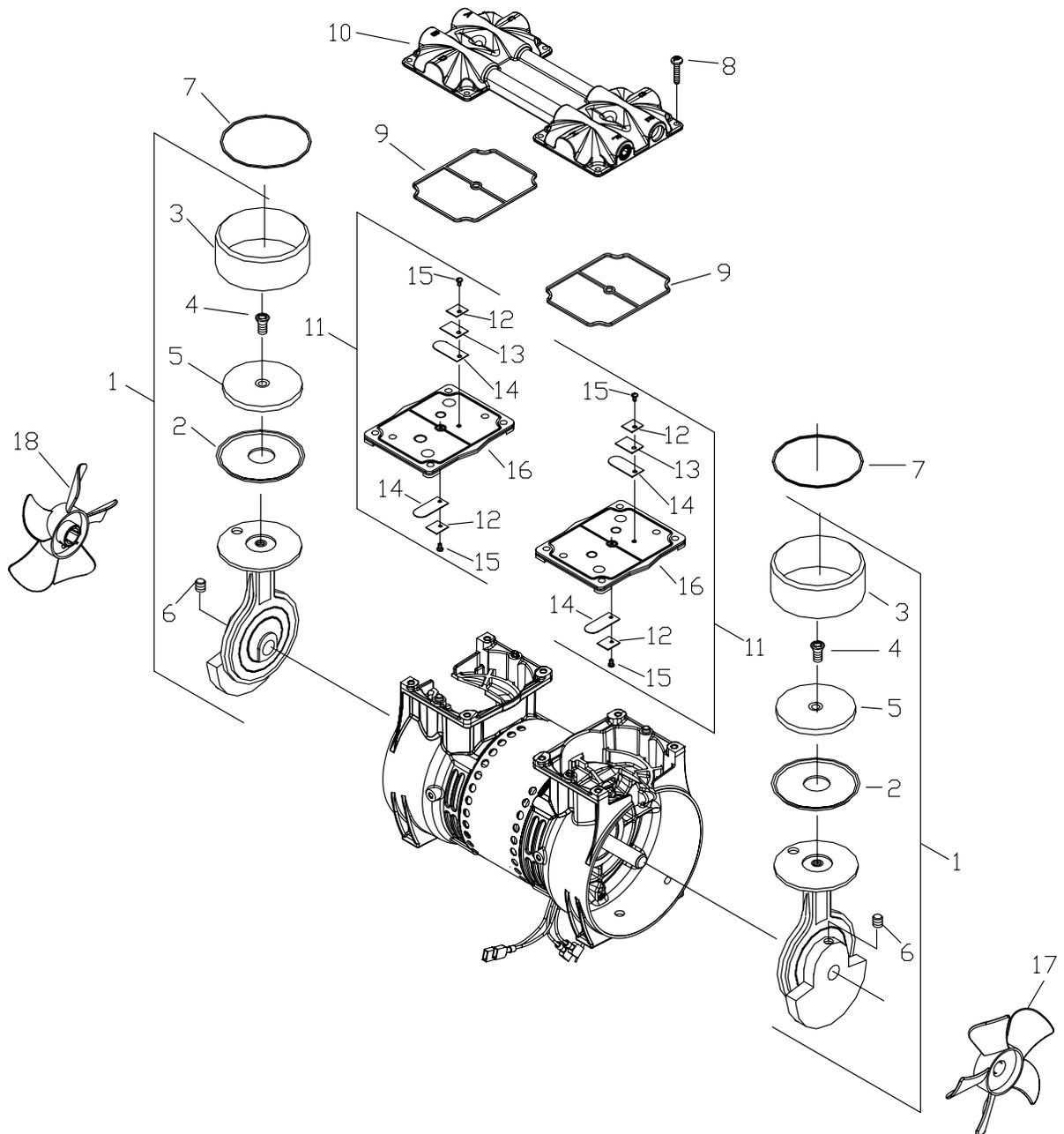
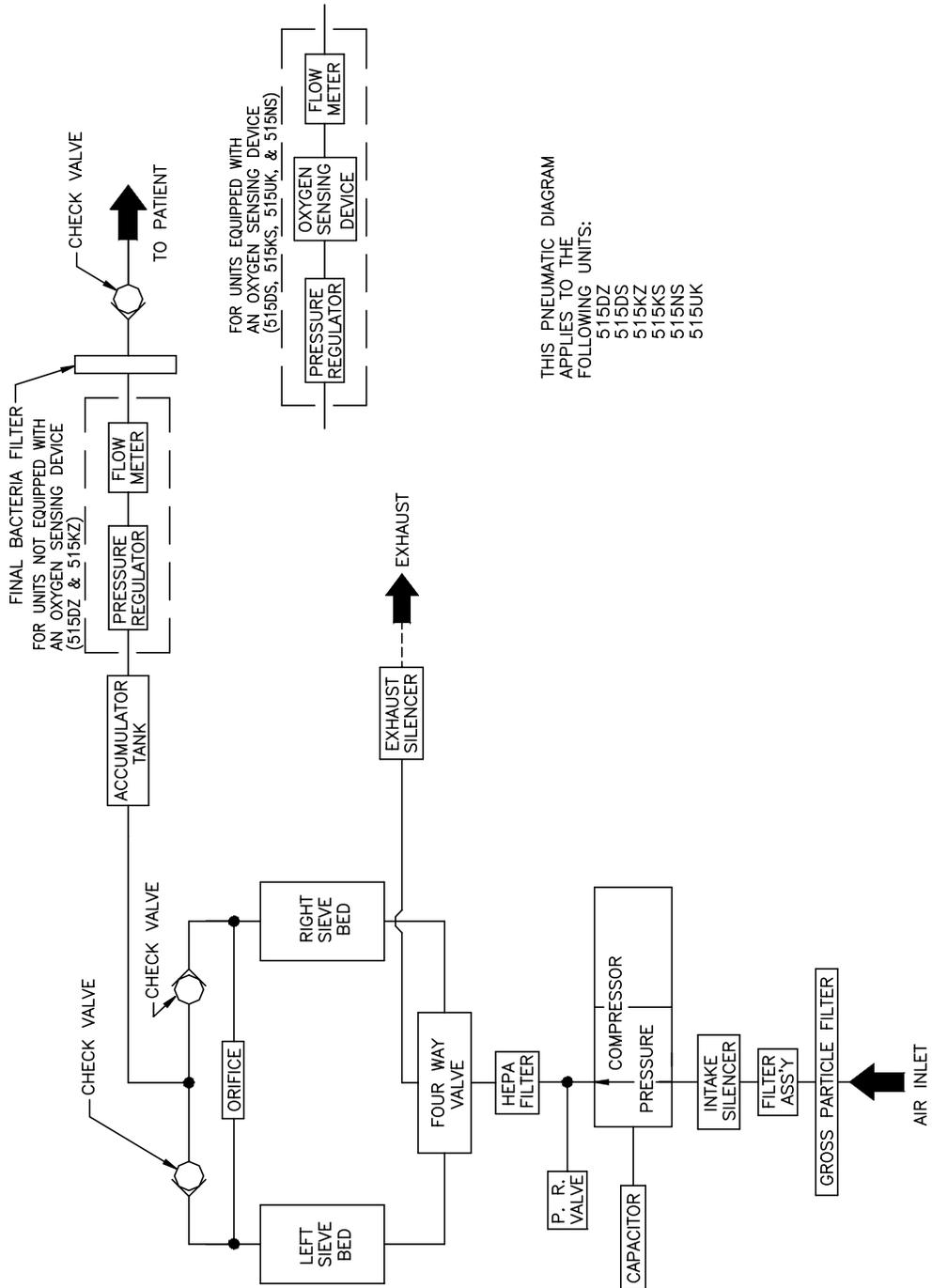


Figure 15 Pneumatic Diagram



THIS PNEUMATIC DIAGRAM APPLIES TO THE FOLLOWING UNITS:
 515DZ
 515DS
 515KZ
 515KS
 515NS
 515UK

Figure 16A Wiring Diagram (early OSD models)

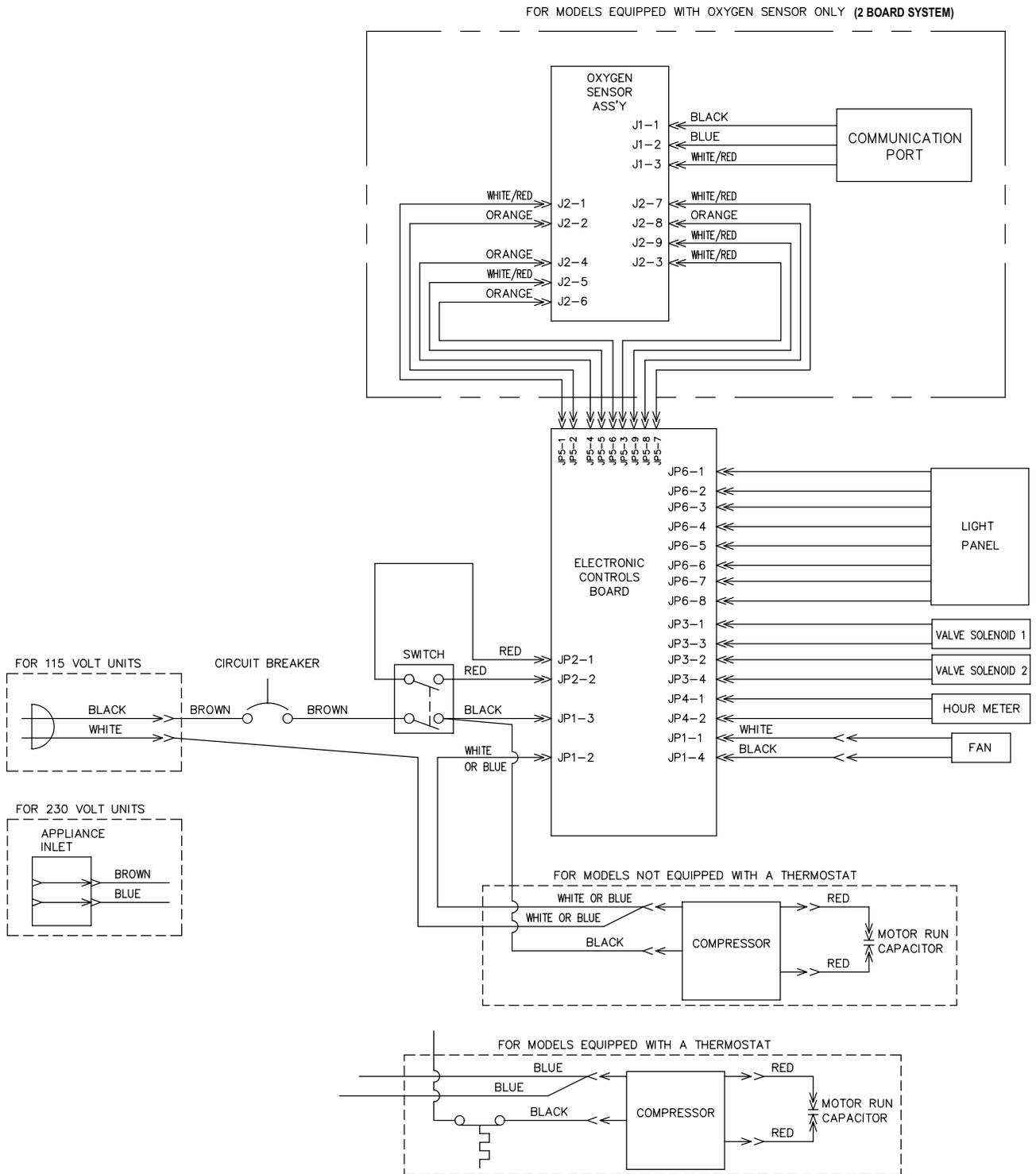
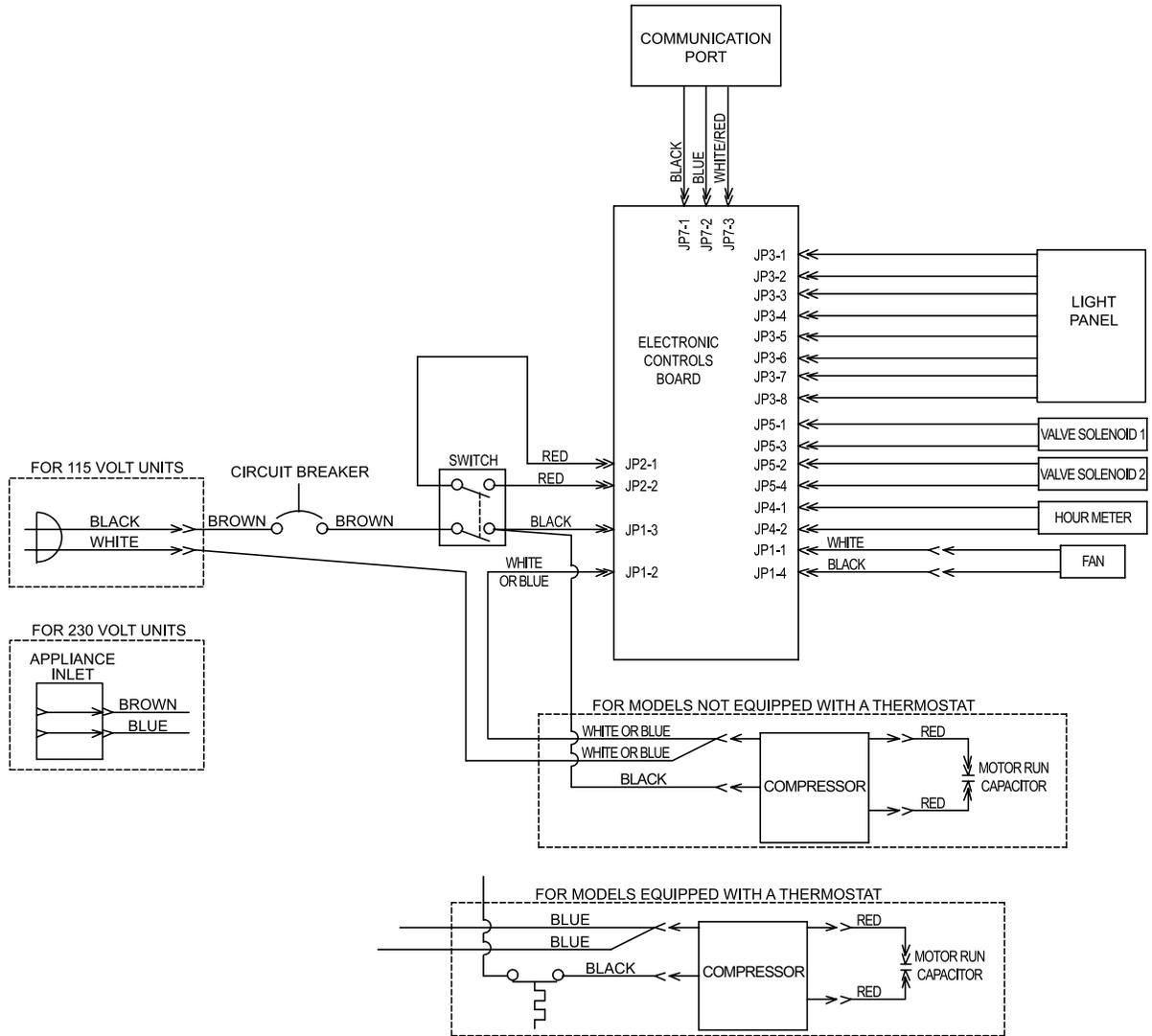


Figure 16B Wiring Diagram (later OSD models)



WARRANTY INFORMATION**DeVilbiss 515DS/515DZ Oxygen Concentrators Limited Warranty**

The DeVilbiss 515DS/515DZ Oxygen Concentrators, manufactured and sold by Sunrise Medical, 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 is warranted for the life of the unit.
- Compressor is warranted for five years.
- All other components are warranted for three years.
- Routine maintenance items, such as filters, are excluded from warranty.

Sunrise Medical'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 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 prepaid. 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 that 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 other 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

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 other 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.

ORDERING INFORMATION

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

- Unit Catalog Number
- Unit Serial Number
- Part Number
- Quantity Required
DeVilbiss Concentrator Instruction Guide—part # SP-515
DeVilbiss 4 & 5 Liter Series Service Manual—part # LT-1823
Orders may be placed by calling:
- Customer Service 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 Customer Service Department (800-333-4000) (814-443-4881) 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:

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

Parts List

Accessories						
Bubble Humidifier	HUM16					
Cannula	CAN00					
Cannula w/2.1m (7 ft) tubing	CAN70					
Fitting, Straight Hum.Adapter	444-506					
Handle	303DZ-647					
Humidifier Stand	MC44DM-509					
Low Output Flow Meter	515LF-607					
Oxygen Analyzer	O2ANA					
Oxygen Outlet Connector Plastic	CN100					
Metal	CN200					
Oxygen Tubing	OST07, OST15, OST25, OST50					
Rear Wheel Conversion Kit	505DZ-636					
Components	515DS	515DZ	515KS	515KZ	515NS	515UK
Accumulator Tank	505DZ-610					
Cable Tie - Sieve Bed	505DZ-617					
Cabinet Parts						
Base	515DZ-603		515KZ-604			
Bib	303DS-603	303DZ-603	303DS-603	303DZ-603	303DS-603	
Filter Door	515DZ-639					
Front Cover	505DZ-601		515KZ-601			
Oxygen Outlet Port	303DZ-606					
Rear Cover	505DZ-602		505ID-602			
Capacitor	515DZ-617		MC64D-617			MC44I-626
Carton with Shipping Inserts	505DZ-606					
Shipping Inserts Only	505DZ-706					
Caster, Non-locking	501DZ-603					
Circuit Breaker	515DZ-615		515KZ-615			
Cooling Fan	515DZ-634		MC29I-634			
Compressor	515DZ-625		515KZ-625			515UK-625
Compressor Service Kit	505DZ-643					
Compressor Mounting Plate	501DZ-631					505DD-631
Exhaust Muffler	515DZ-705		PVO2D-705			
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					
Flow Meter	505DZ-607					
Flow Meter Knob	PVO2D-618					

Parts List

Components (continued)	515DS	515DZ	515KS	515KZ	515NS	515UK
Hose & Tubing						
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 Rubber			444-565			
1/2" ID Silicone			505 DZ-634			
Hose Clamps						
For 1/4" Blue			444-524			
For 1/2" Braided & Silicone			444-538			
For 1/2" Rubber			444-566			
Hour Meter			PV5LD-617			
Light Panel	303DS-615	505DZ-615	303DS-615	505DZ-615		303DS-615
Motor Mounts	MC44D-626		505IZ-609			
Nut, Compressor Mounting	303DZ-630					
PC Board (for non-OSD & early OSD models)						
Main	515DS-622		515KS-622			515UK-622
Fuse for Board	099HI-626		515IZ-610			
Oxygen Sensor Assembly	515DS-621	N/A	515DS-621	N/A	515DS-621	
PC Board (for later OSD models)	515STD-622	N/A	515STK-622	N/A	515STK-622	515STU-622
Pressure Regulator	MC29D-612					
Power Switch	505DZ-508					
Power Cord	PV5LD-618		5610U-627			N/A
Power Cord Strap	MC29D-657					
Power Cord Strain Relief	505DZ-645		N/A			
Screws, Cabinet	303DZ-628					
Sieve Bed	515DZ-619					
Thermostat	N/A					505KZ-624
Valves						
Final & Sieve Bed Check Valve	PVO2D-607					
Four-Way Valve	515DS-702 Starting Serial Numbers listed below – All previous serial numbers use 515DZ-702					
	H13146DS	H12602DZ	H10532KS	H10034KZ	H10001NS	H10642UK
Pressure Relief Valve	515DZ-614					
Valve Rebuild Kit	515DZ-707					
Valve Isolation Mount	515DZ-703					
Wire Harness						
Communication Harness	515DS-608	N/A	515DS-608	N/A	515DS-608	
Main Wire Harness	515DZ-623					515UK-623
OSD Wire Harness	303DS-601	N/A	303DS-601	N/A	303DS-601	
Tools						
AC/DC Test Light	PVO2D-603					
Pressure Test Assembly	303DZ-637					
Pressure Vacuum Gauge	PVO2D-601					
Service Kit	444-501					
Screwdriver with Bits	MC44D-712					
Test Point Plugs	PV5LD-706					

SPECIFICATIONS

	DEVILBISS 4-LITER	DEVILBISS 5-LITER SERIES	
Catalog Number	515UK	515DZ, 515DS	515KZ, 515KS, 515NS
Delivery Rate (Lower delivery rates available for low flow applications)	1 to 4 LPM	1 to 5 LPM	
Maximum Recommended Flow	4 LPM	5 LPM	
Outlet Pressure	8.5 psig (58.6 kPa)		
Electrical Rating	230V, 50 Hz, 1.4 Amp	115V, 60 Hz, 4.2 Amp	220-230V~, 50 Hz, 1.7 Amp 230V~, 60 Hz, 1.9 Amp
Operating Voltage Range	195 - 253V~, 50 Hz	97 - 127V~, 60Hz	187 - 255V~, 50Hz 218 - 253V~, 60 Hz
Oxygen Percentage	1 - 4 LPM=93% ±3%	1 - 5 LPM=93% ±3%	
Operating Altitude (tested at 21 °C only) 0 - 1500 M (0 - 4921 ft) 1500- 3000 M (4921 - 9842 ft) 3000 - 4000 M (9842 - 13,123 ft)	Across the voltage range: No degradation in performance Not recommended / Not tested Not recommended / Not tested	Across the voltage range: No degradation in performance Tested at nominal voltage only: No degradation in performance Not recommended / Not tested	Across the voltage range: No degradation in performance Tested at 230V/50Hz only: ~4% oxygen performance drop at 5 LPM Not recommended / Not tested
Operating Environment Range* 10°C to 35°C, humidity range of 30% to 75%	No degradation in performance across the operating voltage range (tested at sea level)		~4% oxygen performance drop at 5 LPM and 35°C condition. No degradation in performance across the operating voltage range at other liter flows (tested at 670 M).
Power Consumption	295 Watts Average	400 Watts Average	230V/50Hz~365 Watts Average 230V/60Hz~435 Watts Average
Weight	53 lbs. (24.5 Kg)	52 lbs. (23.5 Kg)	53 lbs. (24.5 Kg)
Sound Level (ISO 8359:1996 from front)	50.5 dbA overall average	52.5 dbA overall average**	50.5 dbA (50Hz) overall avg.
Dimensions	27.75"H x 16"W x 14"D (70.5 x 40.6 x 35.6 cm)		
Pressure Relief Valve	44 psig ±3 psig (303 kPa ±21 kPa)		
Operating System	Time Cycle / Pressure Swing		
For units equipped with an OSD, the visible "low oxygen" indicator will activate at the following levels	Units with serial numbers less than H20000: 85% ±2% (The audible alarm will alert at approximately 75%). Units with serial numbers of 20000 and greater: 83.5% ± 1.5% (The audible alarm will alert at approximately 75%). Less than 60%, the red "Service Required" light will activate)		
Storage and Transport Conditions	-40°C to 70°C, humidity range of 10% to 100%, including condensation (tested at ~933 hPa)		
Equipment Class and Type	<input type="checkbox"/> Class II Equipment Double Insulated ⚡ Type B applied Part		
Approval Body and Safety Standard	TUV IEC 601-1 +A1 + A2 EN 60601 + A1 + A2 ISO 8359: 1996	CSA CAN/CSA-C22.2 No. 601.1-M90	TUV IEC 601-1 +A1 + A2 EN 60601 + A1 + A2 ISO 8359: 1996 (515KZ excluded)
EMC Compliance To:	IEC 601-1-2		
Typical Accumulator Pressure at Maximum Recommended Flow @ Sea Level @ 750 M (2460 Ft) @ 1500 M (4921 Ft)	18 - 23 psig (125 - 160 kPa) 16 - 21 psig (110 - 145 kPa) 14 - 19 psig (95 - 130 kPa)	22 - 28 psig (150 - 200 kPa) 20 - 26 psig (140 - 180 kPa) 17 - 23 psig (120 - 160 kPa)	50Hz 21-27 psig (145-190 kPa) 20-26 psig (140-180 kPa) 18-24 psig (125-165 kPa) 60 Hz 27-33 psig (190-230 kPa) 24-30 psig (165-210 kPa) 21-27 psig (110-190 kPa)

Note: Specifications subject to change without notice.

*Note: The OSD performance at 10°C to 35°C, 95% R.H. through the voltage range has been verified on a 515DS at 670m.

**Note: This corresponds with a sound level of 50 dbA overall average as measured according to the guidelines of the now defunct ANSI Z79.13-1981 standard.



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