



**PowerMax™ Surgical
Suction Producers**
Models: PM-1, PM-3, PM-4

Installation & Operation

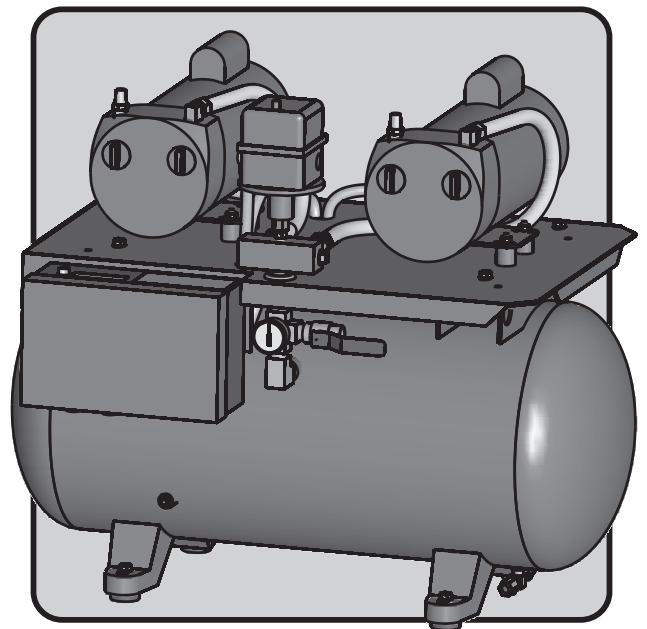


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Safety Warnings and Important Information

WARNING: Always disconnect electrical power to PowerMax before servicing.

WARNING: Pumps are extremely hot during operation. To avoid burning yourself, allow unit to cool before servicing.

WARNING: Pump motors are thermally protected with an automatic reset and may restart without warning.

WARNING: Pump motors are controlled by a vacuum switch and will have line voltage applied to them whenever the tank vacuum level is below the minimum setpoint. The unit may start without warning.

WARNING: Pump exhaust can cause eye or skin damage. Keep air stream away from face and hands. Pumps should exhaust through the supplied filter/muffler or through an exhaust system venting to outside.

IMPORTANT: Installations must be made to all local codes.

CAUTION: Never lubricate PowerMax vacuum pumps. The sealed bearings are permanently lubricated. Service life of the carbon vanes will be reduced by petroleum products.

CAUTION: Do not block the flow of cooling air over the pump in any way.

CAUTION: Exhaust air from this pump can be as hot as 180°F. Do not direct air towards temperature-sensitive materials.

CAUTION: Installation of an exhaust system, venting to outside of the building, is recommended.

CAUTION: To avoid pump overheating and thermal shutdowns, the installation site must be properly ventilated and, if necessary, air conditioned to prevent ambient temperatures from exceeding 104°F/40°C.

CAUTION: Pumps installed outdoors must be protected from rain, snow, direct sunlight and excess dust. Temperature limits and ventilation recommendations must also be followed.

CAUTION: On PM-3 and PM-4 units, keep all service switches in the ON position during normal operation. Service switches should only be turned OFF when maintenance is being performed on PowerMax unit.

SECTION 1.0

ABOUT POWERMAX SURGICAL SUCTION PRODUCERS

The PowerMax is designed to satisfy the high-volume requirements of most surgical procedures. A dry vacuum system, the PowerMax pumping unit is installed in a utility area with hard piping connecting to vacuum outlet stations in the operating rooms.

PowerMax units are available in single, dual and triple pump configurations. Single pump units supply a maximum flow rate of 8 cubic feet per minute (cfm); dual pump units deliver 16 cfm while triple pump units provide 24 cfm.

PowerMax units use rotary vane vacuum pumps that require no lubrication. Air is drawn from the operating rooms through a Matrix Surgical Operating Room Package to an ASME-certified reservoir and then into the pump inlets. Rapidly rotating vanes propel the air to the discharge of the pump, producing vacuum levels in the range of 13 - 20 inches of mercury (in./Hg).

Vacuum level is adjustable to the needs of the practice by adjusting the pump "on-off" points at the vacuum switch. A vacuum gauge provides monitoring of vacuum level.

A low voltage relay is included to allow "on-off" operation of PowerMax from the operating rooms or other locations remote to the pump unit.

PowerMax is readily maintained with almost no regular servicing required. The pumps and motors are permanently lubricated.

The carbon composite vanes of the pumps are replaceable onsite, ensuring years of delivery of the specified vacuum level. Each pump has an inlet and exhaust filter that are replaced periodically to prevent dirt, foreign matter or moisture from degrading performance.

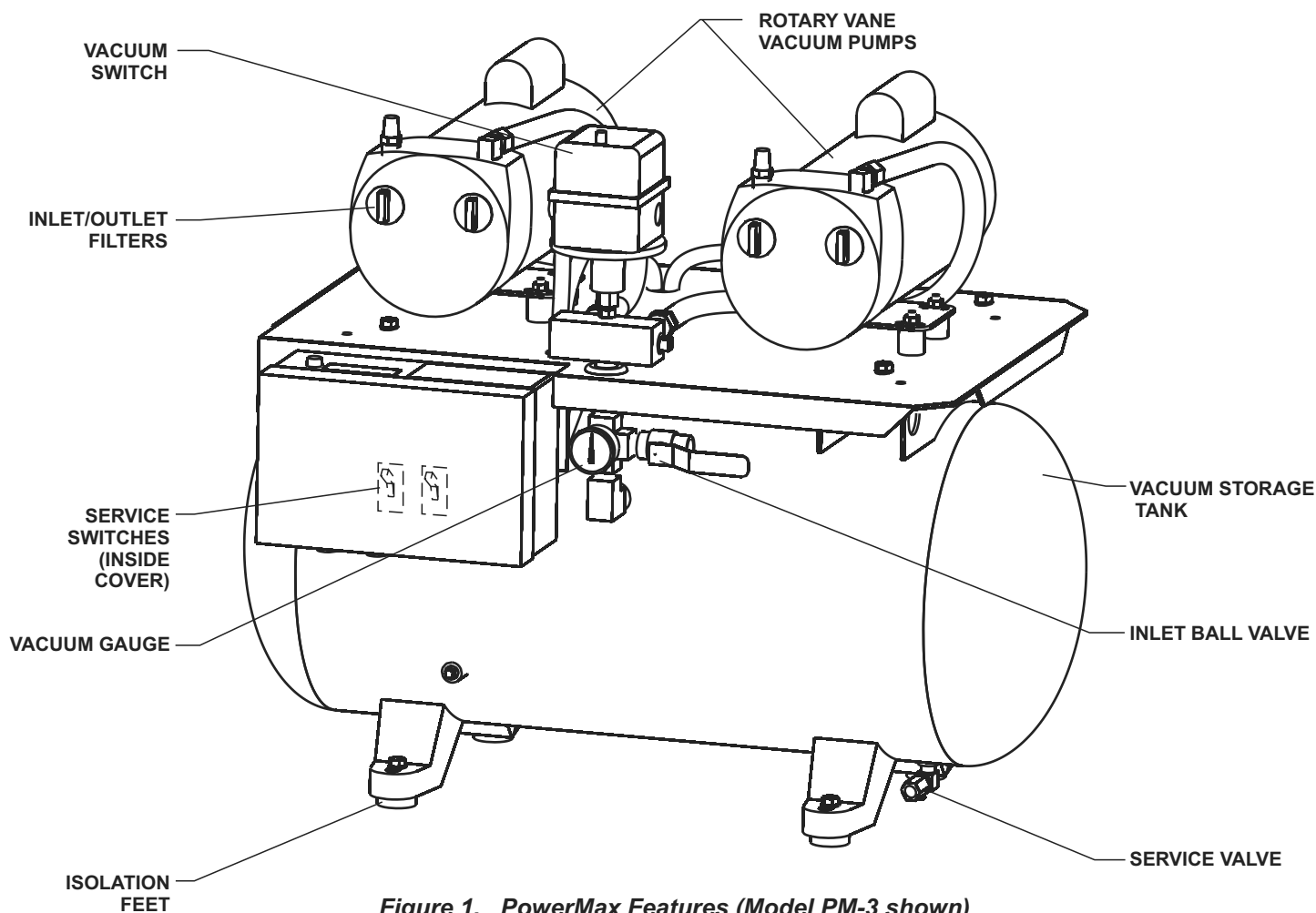


Figure 1. PowerMax Features (Model PM-3 shown)

ABOUT POWERMAX SURGICAL SUCTION PRODUCERS

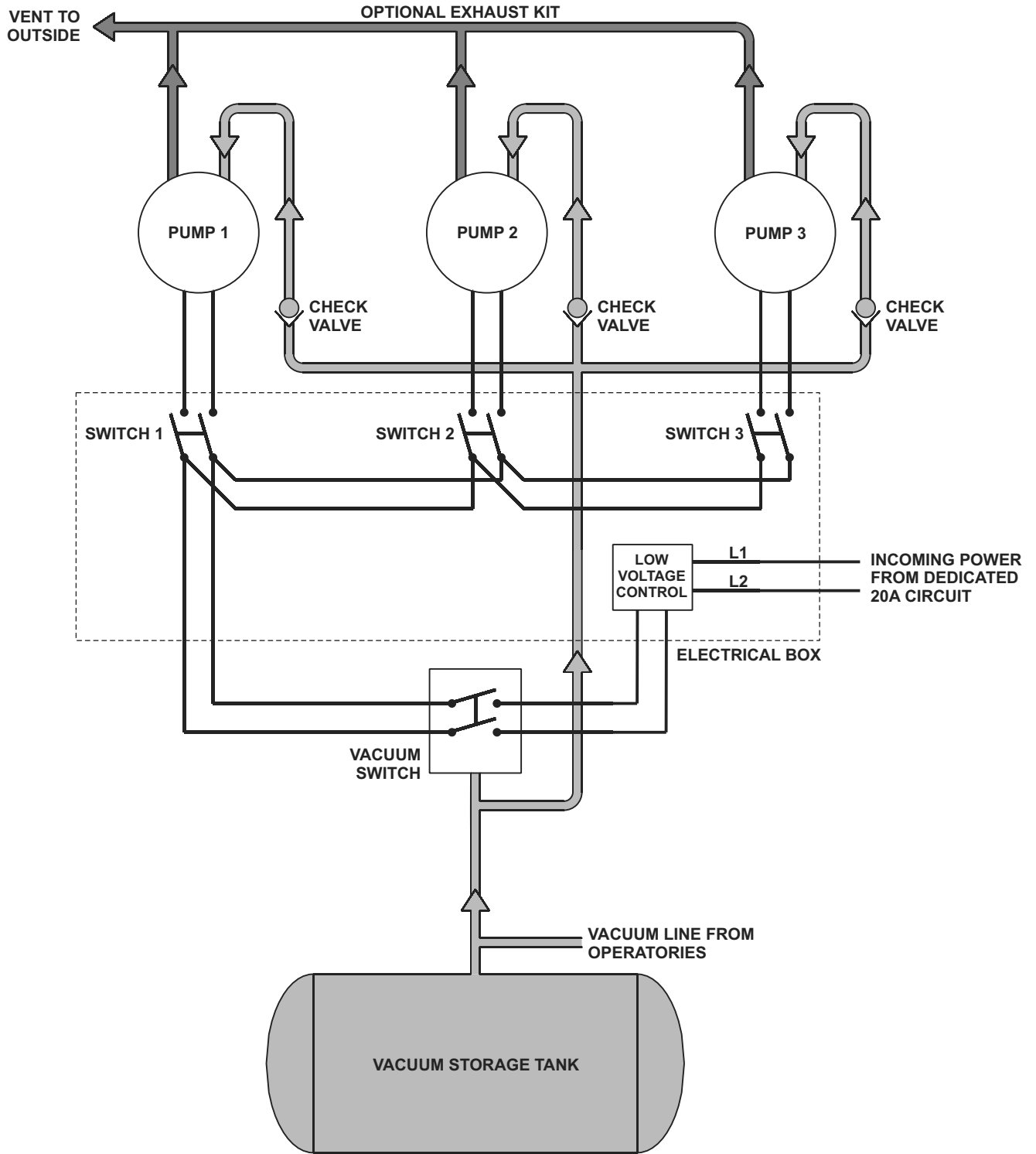


Figure 2. PowerMax Functional Schematic (Triple Head Model PM-4 Shown)

2.1 PowerMax Specifications

| | PM-1 | PM-3 | PM-4 |
|--------------------------------|--------------------|--------------------|--------------------|
| Part Number | 77000695 | 77000696 | 77000697 |
| Dimensions | 29”H x 33”W x 22”D | 29”H x 33”W x 22”D | 31”H x 44”W x 22”D |
| Ship Weight | 170 lbs | 210 lbs | 250 lbs |
| Horsepower | 1 @ 3/4 HP | 2 @ 3/4 HP | 3 @ 3/4 HP |
| Voltage (Nominal) | 208/230V, 50/60 Hz | 208/230V, 50/60 Hz | 208/230V, 50/60 Hz |
| Amperage | 5.1A | 9.7A | 14.3A |
| Elec. Service (Dedicated Line) | 12 AWG/20A Breaker | 12 AWG/20A Breaker | 12 AWG/20A Breaker |
| CFM Maximum | 8 cfm | 16 cfm | 24 cfm |
| Tank Capacity | 20 Gal | 20 Gal | 35 Gal |
| Suggested Number of Users | 1 | 2 to 3 | 3 to 4 |

2.2 Unit Selection Guide

The “Suggested Number of Users” column in section 2.1 provides a general guide for PowerMax model selection. For a more precise selection, complete the worksheet below.

| Device Type/Installation Requirement | Number of Devices in Use | X | Points per Device | Total Points per Device |
|--|--------------------------|---|-------------------|-------------------------|
| High-Volume Evacuation Outlet | | x | 2 | = |
| Saliva Ejector | | x | 1 | = |
| Hand Wash Station | | x | 2 | = |
| Nitrous Oxide Scavenger | | x | 1 | = |
| Main vacuum line longer than 50 Ft. | | x | 2 | = |
| Branch vacuum line extending more than 50 ft. beyond the main line | | x | 2 | = |
| Total Points | | | | |

Select PowerMax models according to:

| Recommended Model | PM-1 | PM-3 | PM-4 |
|----------------------------------|----------------|-----------------|-----------------|
| Total Points per Practice | 1 TO 10 | 11 TO 20 | 21 TO 32 |

For example, a practice with (3) high volume evacuation outlets, (3) saliva ejectors, (1) handwash station and (3) nitrous oxide scavengers would total: (3 x 2 pts) + (3 x 1 pt) + (1 x 2 pts) + (3 x 1 pt) = 14 points, requiring a Model PM-3 PowerMax.

3.1 Site Selection

Note: Installations must be made to local codes by licensed plumbers and electricians.

Select an installation site that meets the following requirements:

Temperature: Site must have an ambient temperature range of 40° to 104°F (4° to 40°C). Provide additional cooling or heating if necessary to maintain this temperature range.

Service Clearance: 30 inches clearance should be provided in front of the PowerMax unit, as well as 12 inches clearance at the sides, for service procedures.

The installation site will also require the following utilities to be installed:

Piping: Contractor or plumber to supply piping for vacuum from PowerMax to the operatories. See "Piping Connections", section 3.4.

Electrical Power: A dedicated circuit per section 2.1 is required for operation. See "Electrical Connections", section 3.3.

Remote Control Panel (not included): A Matrix CP-Series control panel is recommended for on-off switching of the system. The contractor or licensed electrician installs 3-conductor jacketed wire (provided) from the electrical box on the PowerMax to the remote control panel. See the Matrix Dental Equipment Catalog for additional information, and "Electrical Connections", section 3.3.

Exhaust access to outside of building: PowerMax exhaust can be vented outdoors to prevent exhaust from entering the equipment room and to ensure quiet operation of the PowerMax. Matrix offers an optional Exhaust Kit - See "Exhaust Kit Installation", section 3.5.

3.2 PowerMax Setup

1. Remove PowerMax from pallet.
2. Attach rubber feet to bottom of tank feet (see Fig. 3).
3. Position Powermax at selected site. The PowerMax need not be fastened to the floor unless required by local code.
4. When space is at a premium, a PowerMax PM-1 or PM-3 and an air compressor can be mounted with

one unit above the other using a Matrix StackRack, p/n 77000804 (see Figure 4). Either unit may be in the top position. See the Matrix Dental Equipment Catalog for additional information.

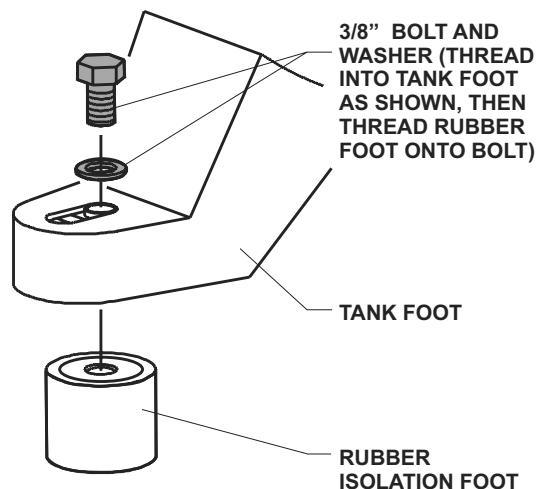


Figure 3. Installation of Rubber Feet

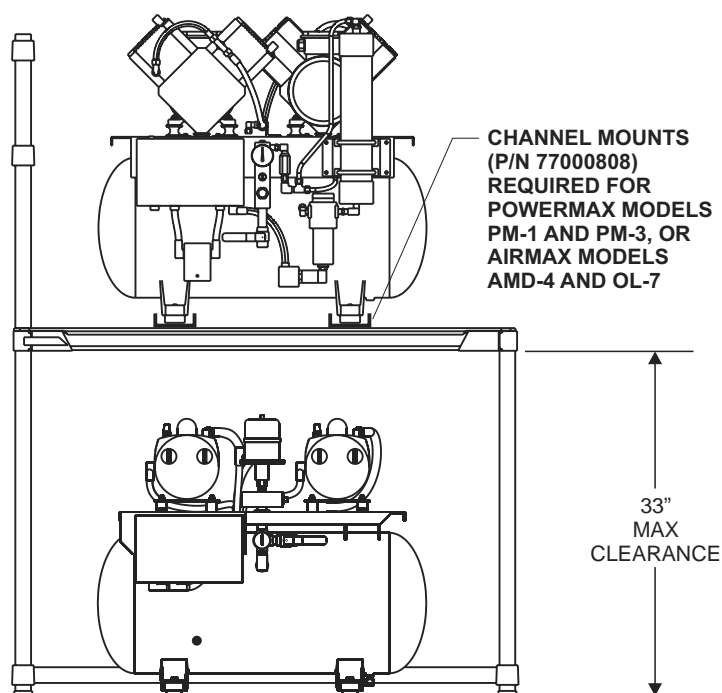


Figure 4. Installation Using StackRack

INSTALLATION

3.3 Electrical Connections

PowerMax requires the following electrical connections as shown in Figure 5:

Connect power from a dedicated branch circuit to power hookup leads as shown below. See section 2.1 for power requirements.

Connect low voltage control wires. If unit is to be operated remotely, connect 18/3 jacketed bell wire from the compressor low voltage leads to a Matrix CP-Series control panel. For installations without remote control panel, connect red and white low voltage leads together as shown.

3.4 Piping Connections

The vacuum line to the operatories should be type K or L copper tubing. Do not use flare or

compression fittings for vacuum lines. Select size according to PowerMax unit being installed:

| PowerMax Model | PM-1 | PM-3 | PM-4 |
|--------------------------|------|--------|--------|
| Nominal Copper Tube Size | 1" | 1 1/4" | 1 1/4" |

Connect one end of the vacuum hose to the 1/2"NPT ball valve at the PowerMax. Connect the opposite end to the copper vacuum line.

At the operator, the copper vacuum line typically terminates with a female 5/8" OD sweat fitting. This mates to the vacuum valve assembly at an outlet station. Install Matrix Surgical Operator Recovery Room Package (see Parts List, section 7). **Important: The vacuum system must terminate at a recovery package to prevent contamination of vacuum outlets and the PowerMax unit.**

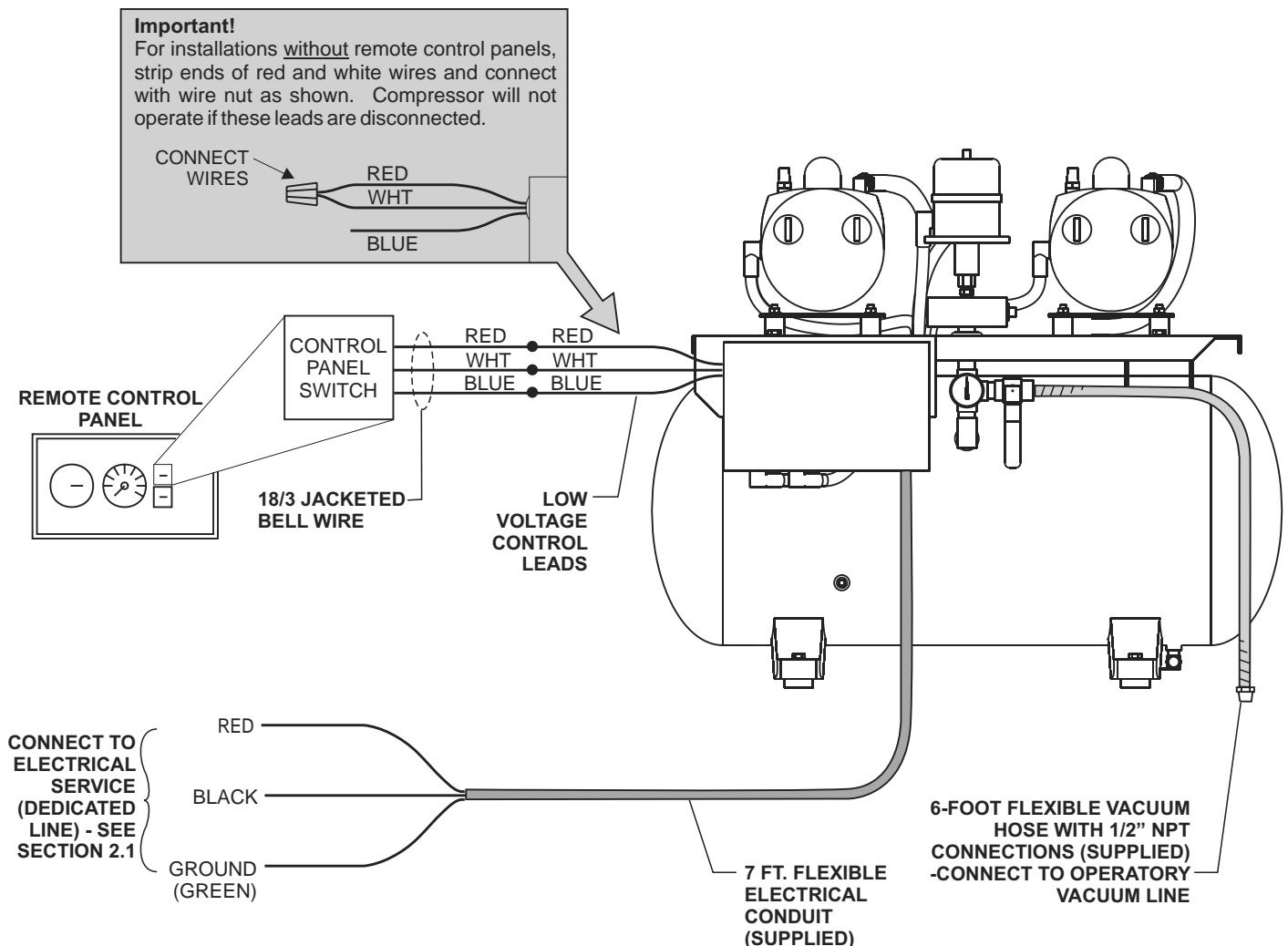


Figure 5. PowerMax Electrical and Piping Connections

INSTALLATION

3.5 Exhaust Kit Installation

Exhaust may be vented to the outside using an optional Exhaust Kit. To install:

Remove and discard mufflers installed in exhaust ports.

Thread elbow into first exhaust port as shown, and tees into exhaust ports of 2nd and 3rd pumps on multiple-pump units.

Connect fittings using pieces of silicone tubing (cut approx. 2" long). On multiple-pump units, a copper tube is installed between each head as shown.

Install 3/4" vent pipe (contractor-supplied copper tubing or conduit) from PowerMax to outside. Ensure that piping is sloped away from unit and has rain cap installed as indicated. Connect exhaust kit to vent pipe with silicone tubing.

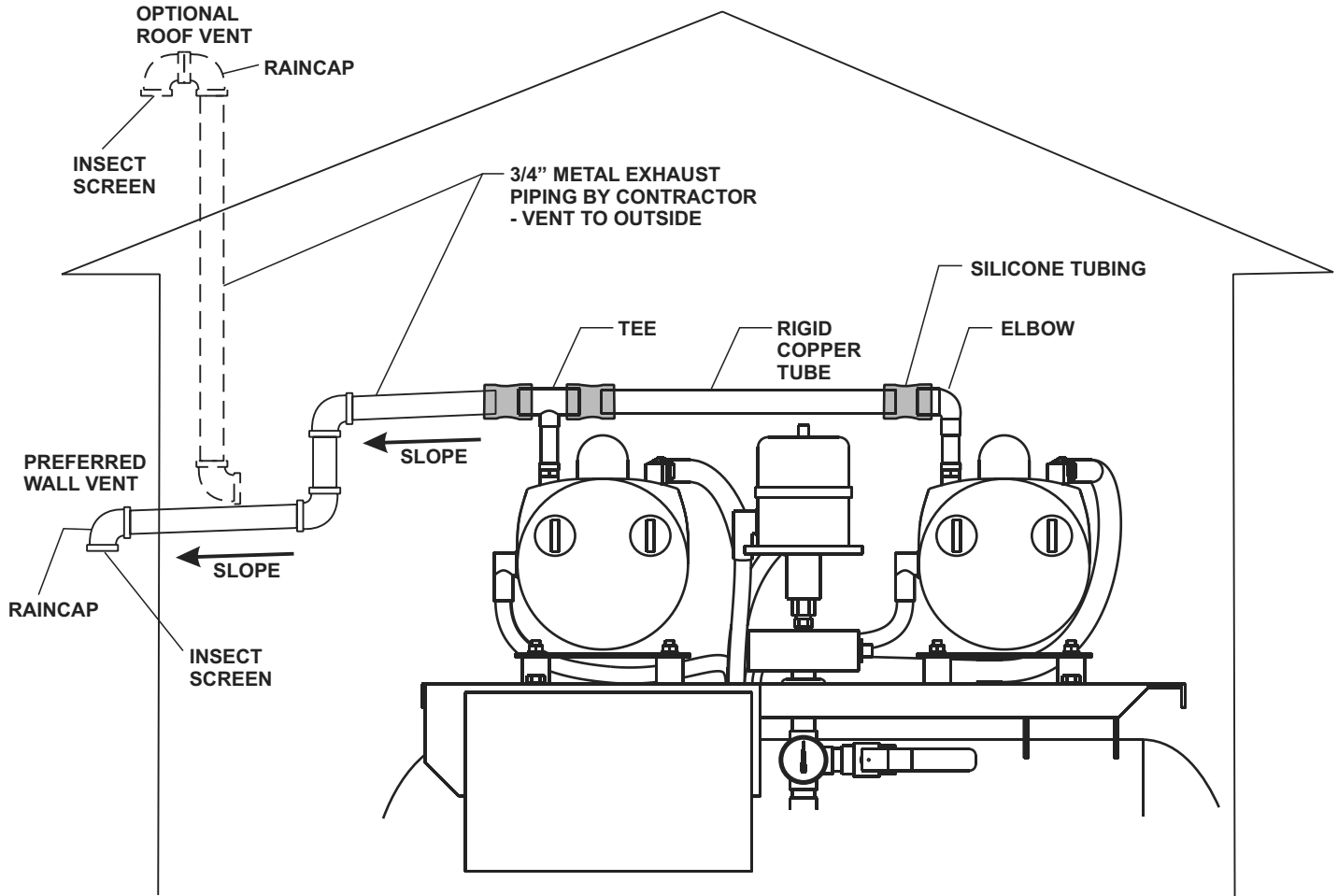


Figure 6. Exhaust Kit Installation

3.6 Installation Checkout

Perform initial checkout testing as follows:

Check system for leaks (see Troubleshooting, Section 5.0, for leak test procedure).

Check vacuum switch ON/OFF setpoints as follows:

With ball valve and drain valve closed, turn on power to PowerMax. As unit runs, observe vacuum gauge. Verify that unit goes "OFF" at 20" Hg. Open drain valve at bottom of tank. PowerMax should go "ON" at 13" Hg. If adjustment is required, see "Maintenance Procedures", Figure 7.

4.1 Operation

PowerMax is started by pressing the “VAC” switch on the remote control panel, or, for units without remote control panel, by switching on the main power circuit to the unit.

Note: Units with multiple pump motors must have all motors operating simultaneously during normal

operation. Always keep all service switches in the “ON” position.

4.2 Maintenance

Perform the following maintenance procedures at the specified intervals. **Disconnect power at branch circuit before servicing.**

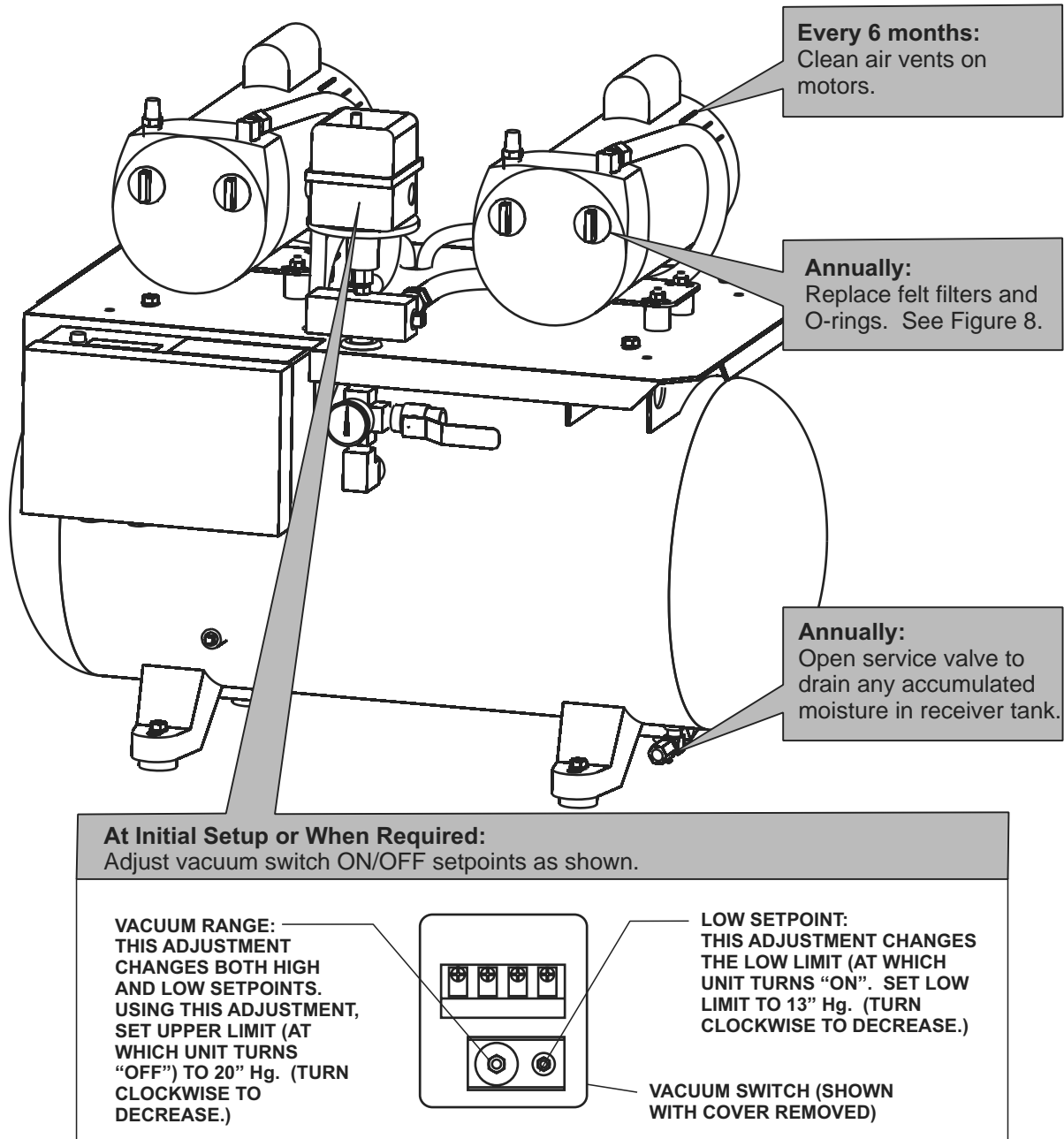


Figure 7. Maintenance Procedures

OPERATION AND MAINTENANCE

4.2.1 Filter Replacement

1. Shut off power at branch circuit.
2. Vent tank by closing inlet ball valve and opening service valve at bottom of tank. Allow pumps to cool.
2. Unscrew (2) end caps from each pump. Remove and discard felt filters and O-rings.
3. Install new filters (Matrx p/n 77000796) and O-rings (Matrx p/n 77000789).

4.2.2 Vane Replacement

To restore performance that has degraded due to normal wear, a vane rebuild kit is available for in-field vane replacement (Matrx p/n 77000540). To install:

1. Shut power off at branch circuit and lock out.
2. Vent tank by closing inlet ball valve and opening service valve at bottom of tank. Allow vacuum pump to cool.
3. Unscrew and remove end caps. Remove pump exhaust kit if present. Remove five muffler box bolts. Tap on muffler box with small hammer to break it free of the end plate.
4. Remove gasket from end plate and muffler box,

scraping if necessary to remove gasket completely.

5. Remove six end plate bolts. Remove end plate.
6. Observe direction of beveled edges of vanes in rotor. Remove vanes. (Do not remove rotor from motor shaft.)
7. Clean body and rotor slots.
8. Check end plate, rotor and body for scoring. Severe scoring or worn bearings will require unit to be returned to factory for servicing.

CAUTION: Do not lubricate PowerMax vacuum pumps. Lubrication will cause dirt buildup in the chamber and destroy carbon vanes.

9. Install new vanes into rotor, checking that beveled edges are in correct direction.
10. Replace end plate. Torque bolts to 90-120 in.lb.
11. Position new gasket on end plate. Reinstall muffler box, using washer gasket (supplied with kit) under the head of five bolts. Torque bolts to 90-120 in.lb.
12. Install new filters and O-rings.
13. Reinstall pump exhaust. Verify operation of pumps and check for leakage.

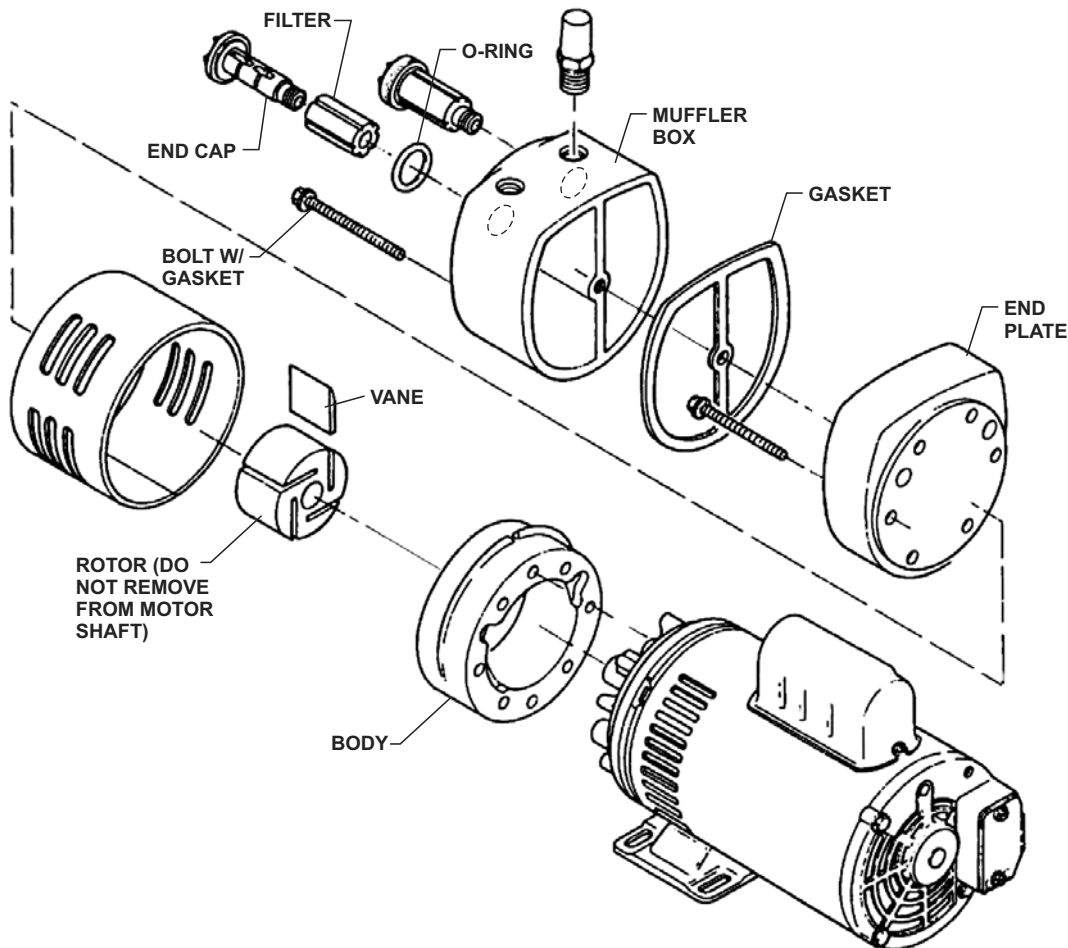


Figure 8. Filter and Vane Replacement

OPERATION AND MAINTENANCE

4.2.3 Vacuum Pump Flushing

PowerMax vacuum pumps can be flushed to remove deposits which build up on the pump vanes over time. Removal of these deposits will help to maintain proper vane performance. Follow the procedure below.

WARNING:

Use only Matrx Flushing Solvent (p/n 77000699). Do not use kerosene or any other combustible solvent to flush pump.

Always flush pumps in a well ventilated area.

Air stream from pump may contain solid or liquid material that can cause eye or skin damage. Wear eye protection.

Avoid prolonged or repeated contact with skin or breathing vapors.

1. Shut off and lock out electrical power to unit.
2. Unscrew and remove both end caps.
3. Screw in a 3/8" NPT x 4" long steel pipe nipple into each end cap port.
4. Restore power.
5. Start pump. Place towel over exhaust pipe to absorb solvent spray. Spray Matrx solvent (p/n 77000699) into inlet pipe (see Figure 9) for 5-10 seconds. Operate pump for one minute and repeat procedure until the desired performance is restored.
6. Remove pipe nipples. Inspect filters and O-rings. Clean or replace as necessary. (O-rings should be soft and flexible.) Reinstall end caps.

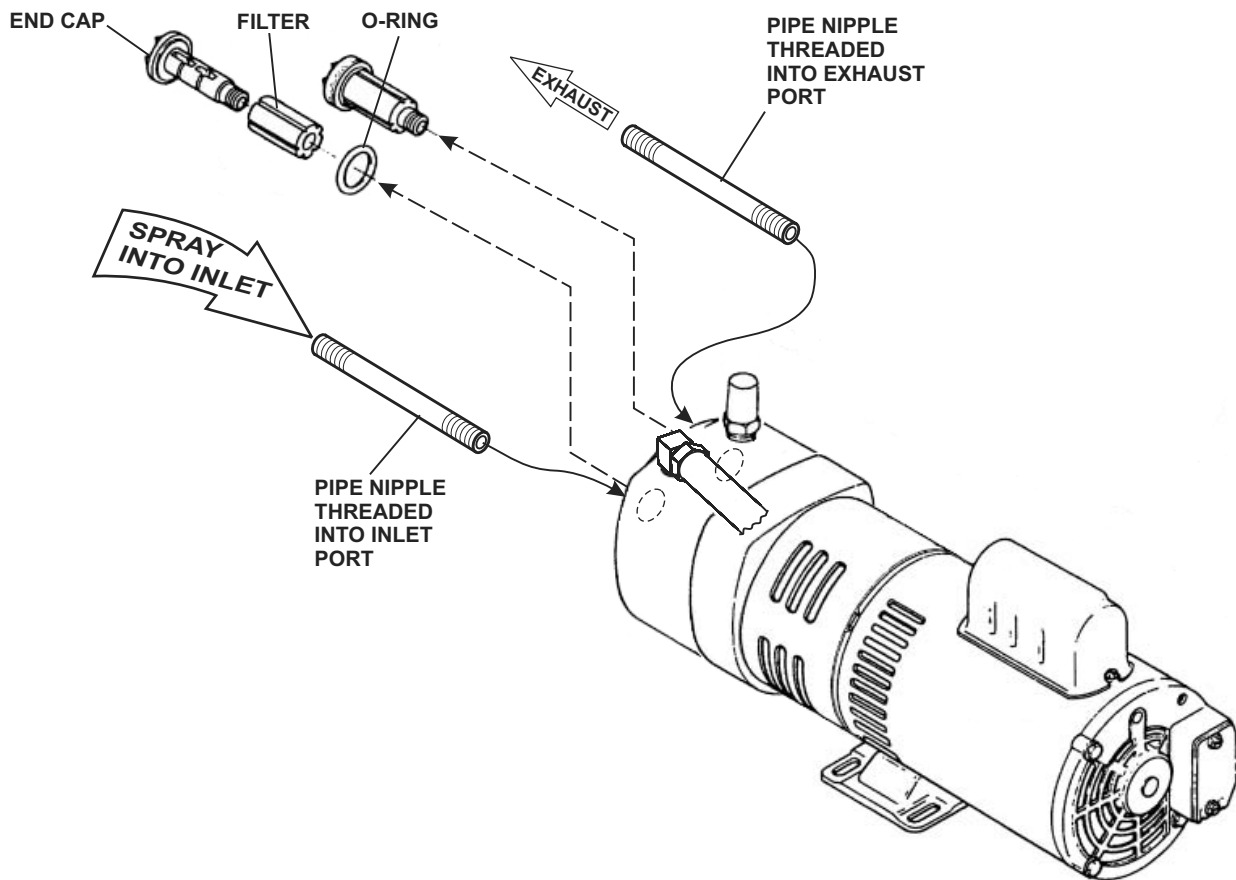


Figure 9. Vacuum Pump Flushing

Safety Warning - Read Before Servicing

WARNING: PUMP MOTORS ARE THERMALLY PROTECTED WITH AN AUTOMATIC RESET AND MAY START WITHOUT WARNING.

| Symptom | Possible Cause | Suggested Solution |
|--|--|---|
| Low suction in operatories | Pump filters dirty | Replace filters per Section 4.2.1. |
| | Vacuum lines plugged, damaged or collapsed | Repair lines. |
| | Pump vanes sticking | Clean pump with Matrix Flushing Solvent per Section 4.2.3. |
| | Pump vanes worn | Replace vanes per Section 4.2.2. |
| | Vacuum switch "off" point set too low | Adjust vacuum switch per Section 4.2. |
| | Disposable collection canister in operatory full | Replace canister. |
| High vacuum level at PowerMax | Pump filters dirty | Replace filters per Section 4.2.1. |
| | Vacuum lines plugged, damaged or collapsed | Repair lines. |
| | Vacuum switch "on" point set too high | Adjust vacuum switch per Section 4.2. |
| Pump overheats (operating temperature measured at pump exhaust is 180°F or higher) | Pump filters dirty | Replace filters per Section 4.2.1. |
| | Vacuum lines plugged, damaged or collapsed | Repair lines. |
| | Exhaust muffler dirty or exhaust piping plugged | Remove and wash sintered metal exhaust muffler. Disassemble, inspect and clean exhaust system as necessary. Verify outside exhaust vent is open. |
| | Dirt buildup in pump chamber | Clean pump with Matrix Flushing Solvent per Section 4.2.3. |
| | Pump vanes worn | Replace vanes per Section 4.2.2. |
| | Excessive ambient temperature in equipment room | Check that installation site is properly vented and, if necessary, air conditioned to prevent ambient temperature from exceeding 104°F/40°C. |
| PowerMax cycles with no vacuum being used | Pump check valve(s) leaking | Clean or replace check valve. |
| | Leak in PowerMax or piping system | Check for leaks by allowing PowerMax to reach 20 Hg and shut down. Close the receiver tank inlet valve to isolate unit from piping system. Do not use any vacuum from piping system for several minutes. If the vacuum gauge continues to drop while inlet valve is closed, the leak is within the unit. If the vacuum gauge maintains the same reading, but drops after opening the inlet valve, the leak is in the piping system. |

TROUBLESHOOTING

| Symptom | Possible Cause | Suggested Solution |
|--|---|--|
| Motor overheats; thermal overload shuts down motor (see warning at beginning of Troubleshooting section) | Motor overloaded due to problem with vacuum pump | See "Pump overheats" |
| | Motor bearings defective. Listen for noisy bearings. | Return unit to Matrix for repair. |
| | Motor dirty | Clean/vacuum motor vents. |
| PowerMax runs but there is no suction in the operatory | PowerMax inlet ball valve closed | Open inlet ball valve. |
| | Open or damaged vacuum piping | Repair vacuum lines. |
| | Tank drain valve open | Close drain valve. |
| PowerMax will not run | Service switches in PowerMax electrical box in "Off" position | Each PowerMax pump has its own on-off switch. Verify that each switch in the electrical box is in the "On" position. |
| | Electrical problem | <p>Check main circuit breaker. Turn off "fully" then turn on "firmly".</p> <p>If circuit breaker tripped, measure voltage at line side of pressure switch <i>while unit is running</i>. The voltage for Powermax is 208-230VAC. Voltage outside of this range may result in failure to start, circuit breaker tripping, overheating and pump damage. Install a buck or boost transformer as required.</p> <p>Check for excessive circuit lengths, as they can cause voltage drop during unit operation.</p> <p>On multiple-pump units: Isolate each pump by turning off one motor at a time. If each pump runs with the other turned off, but do not run together, the voltage is too low. A boost transformer is required.</p> <p>Check fuse at PowerMax electrical control box. When reinstalling fuse, firmly press fuseholder in place.</p> <p>Check all electrical connections.</p> <p>If using remote control: Disconnect red and white wires at compressor electrical box from the remote control wires and twist together to bypass switch. If compressor runs, replace remote switch or inspect remote control wiring.</p> <p>If not using remote control: Make sure the red and white wires at the compressor electrical box are securely twisted together.</p> <p>Momentarily press in the center button of the contactor (inside the electrical box). If PowerMax runs: Check the transformer output at the yellow and brown wires. If voltage is not approximately 24 volts, replace transformer. If voltage is 24 volts, replace contactor. Do not "jam" contactor button.</p> |

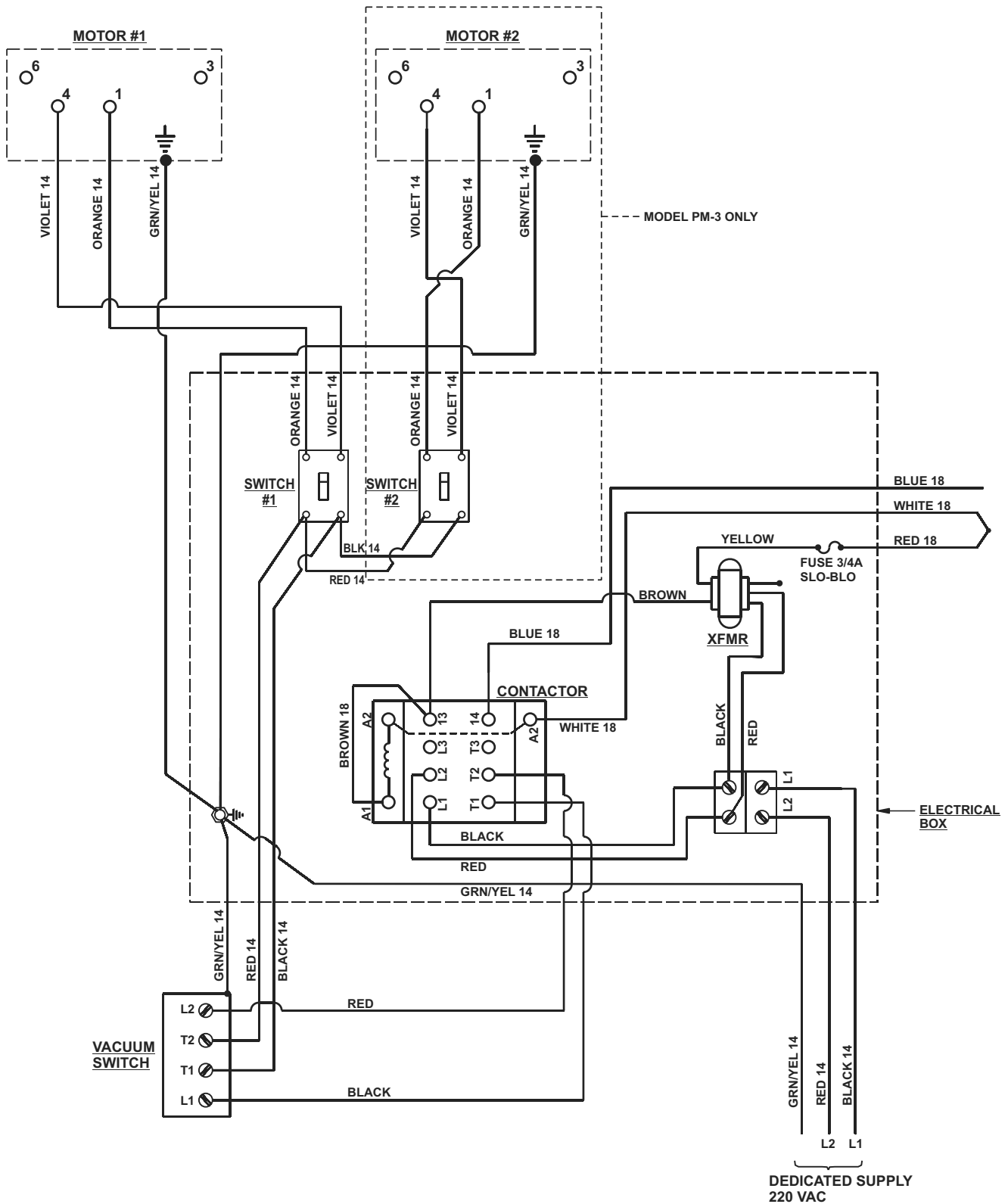


Figure 10. PM-1/PM-3 Wiring Diagram

WIRING DIAGRAMS

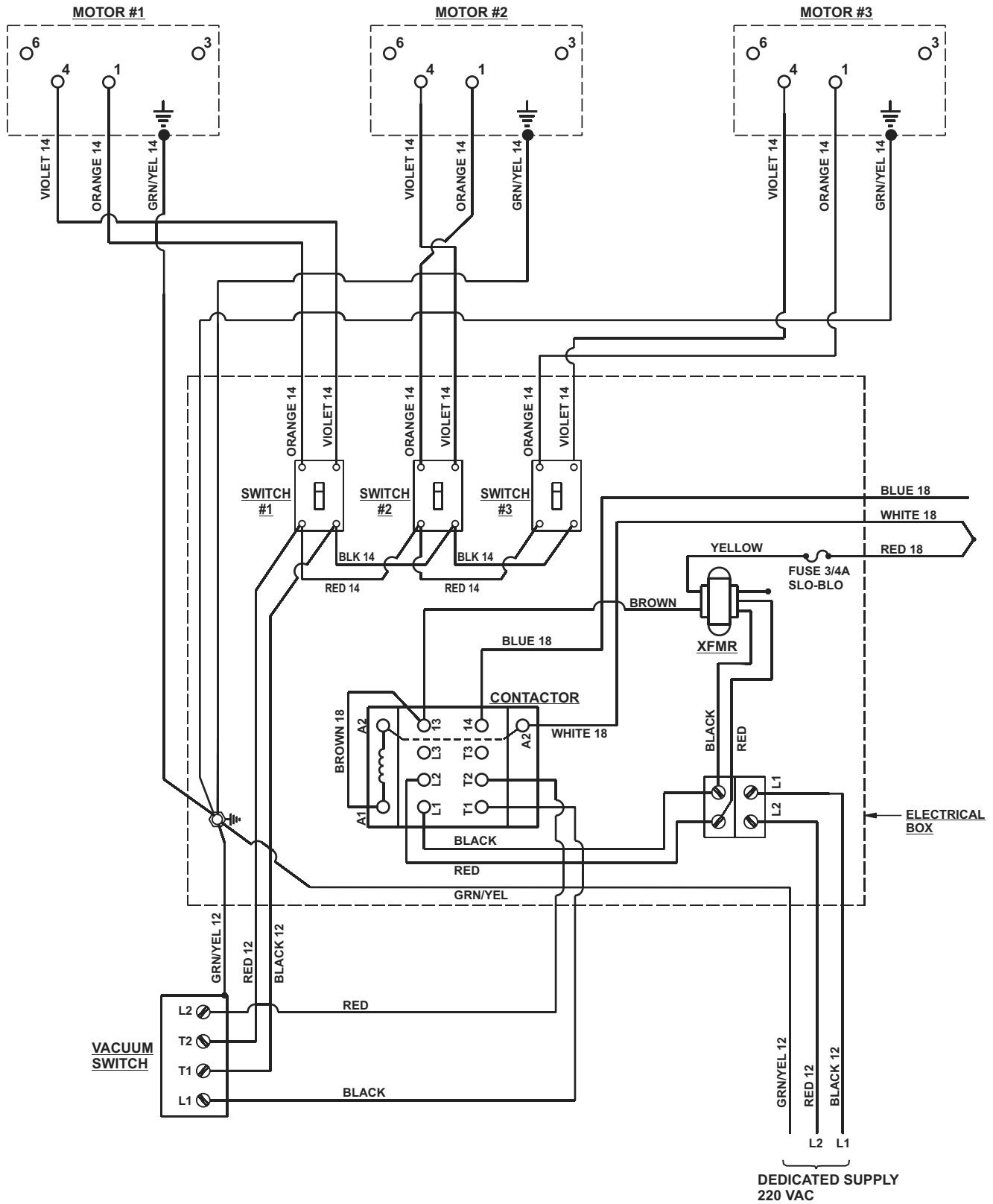
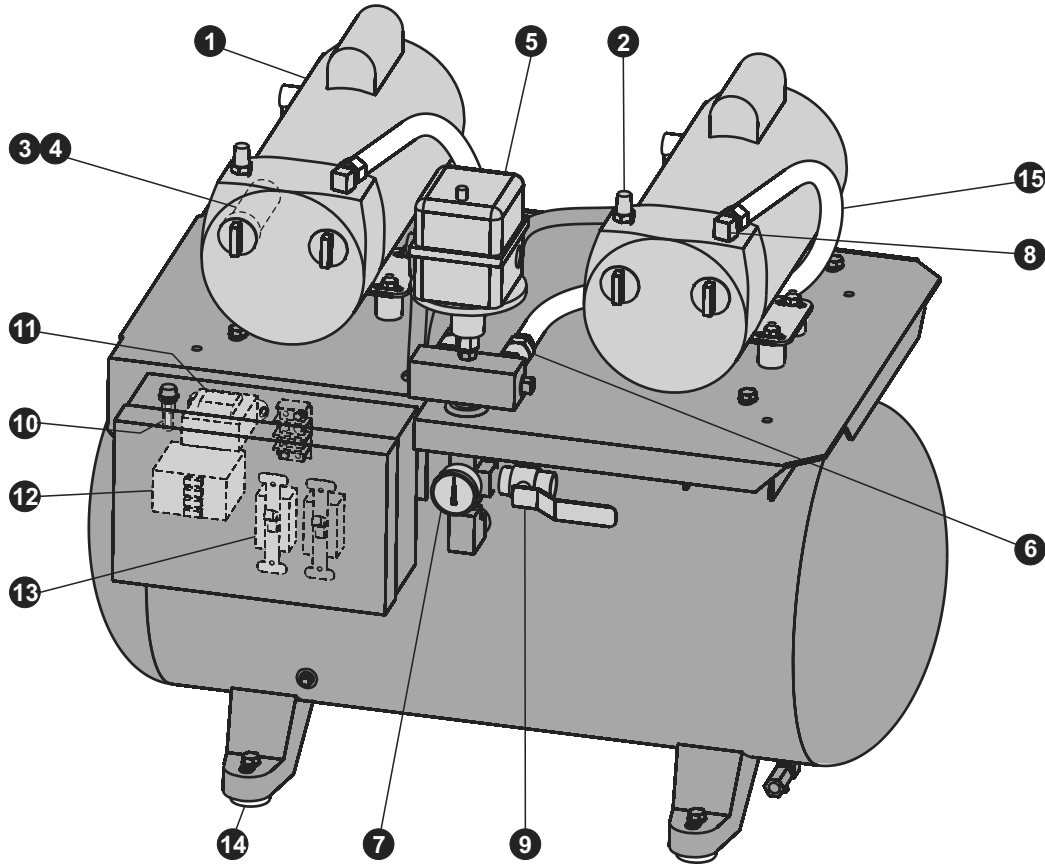


Figure 11. PM-4 Wiring Diagram

SECTION 7.0

REPLACEMENT PARTS & ACCESSORIES

The PowerMax parts identified below may be ordered by an authorized dealer from Matrix by contacting:
Customer Service, 800-847-1000 or 716-662-6650



| Item | Part Description | PM-1 | PM-3 | PM-4 |
|------|--|--|--|--|
| | | Single Head 208/230V 50/60 Hz p/n 77000695 | Dual Head 208/230V 50/60 Hz p/n 77000696 | Triple Head 208/230V 50/60 Hz p/n 77000697 |
| 1 | Vacuum Pump | 20169300 | 20169300 | 20169300 |
| 2 | Muffler, Pump Exhaust (Order 1 per head) | 77007063 | 77007063 | 77007063 |
| 3 | Felt Filter (Order 2 per head) | 77000796 | 77000796 | 77000796 |
| 4 | O-Ring for Filter Cap (Order 2 per head) | 77000789 | 77000789 | 77000789 |
| 5 | Vacuum Switch | 30126601 | 30126601 | 30126601 |
| 6 | Check Valve | 10378700 | 10378700 | 10378700 |
| 7 | Vacuum Gauge, 0-30" Hg | 62947800 | 62947800 | 62947800 |
| 8 | Elbow, 1/2 FTF x 3/8 MNPT | 62933902 | 62933902 | 62933902 |
| 9 | Ball Valve, 1/2 NPT | 10378600 | 10378600 | 10378600 |
| 10 | Fuse, 3/4 Amp Slow Blow | 77001402 | 77001402 | 77001402 |
| 11 | Transformer | 77001452 | 77001452 | 77001452 |
| 12 | Contactor | 62899901 | 62899901 | 62899901 |
| 13 | Motor Switch | 77001130 | 77001130 | 77001130 |
| 14 | Rubber Isolation Foot | 65962901 | 65962901 | 65962901 |
| 15 | Reinforced Vacuum Hose, 24" | 20169204 | 20169204 | 20169204 |
| | Reinforced Vacuum Hose, 31" | - | 20169205 | 20169205 |
| | Reinforced Vacuum Hose, 44" | - | - | 20169206 |
| NS | Exhaust Kit | 77000894 | 77000894 | 77000895 |
| NS | Vane Rebuild Kit | 77000540 | 77000540 | 77000540 |
| NS | Flushing Solvent | 77000699 | 77000699 | 77000699 |
| NS | Surgical Operatory Recovery Room Package | 77008037 | 77008037 | 77008037 |

All repairs unless otherwise specified should be performed by an authorized Matrix service representative.

Service

Call 1-800-Midmark (1-800-643-6275) for Customer Service and Technical Support.

Warranty

This warranty is given in place of all other warranties, expressed or implied, of merchantability, fitness for a particular purpose or otherwise.

No statement or claim about the product by any employee, agent, representative or dealer of Matrix shall constitute a warranty by Matrix or give rise to any liability or obligation of Matrix.

Matrix warrants that each product be free from defects in workmanship and materials, under normal use and with appropriate maintenance, for the time listed below, commencing from the date of delivery to the customer.

PowerMax Surgical Suction Producer: 2 years

Matrix's obligations for breach of this warranty, or for negligence or otherwise shall be strictly and exclusively limited to Matrix's choice of repair or replacement of the product. This warranty shall be void for any product on which the serial number has been altered, defaced or removed.

Matrix shall not be liable for any damage, injury or loss arising out of the use of the product, whether as a result of a defect of the product or otherwise, if prior to such damage, injury or loss, the product was (1) damaged, misused or misapplied; (2) repaired, altered or modified by persons other than Matrix; (3) not installed in strict compliance with applicable codes, instructions and ordinances or (4) not installed by Matrix or an authorized Matrix dealer.

UNDER NO CIRCUMSTANCES SHALL MATRX BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES AS THOSE TERMS ARE DEFINED IN THE UNIFORM COMMERCIAL CODE.



FM 40049

ISO-9001

Certified Manufacturer

