

RAMMAC[®]



DENTAL VACUUM SYSTEM

USER GUIDE

**Operation and Maintenance Manual
For Bison[®] with *S1 Electrols***

Thank you for selecting a RAMVAC Dental Vacuum System to serve your dental facility.

RAMVAC uses proven oil-lubricated rotary vane technology to set new standards in vacuum system performance, durability and economy. RAMVAC longevity means your vacuum should last for decades...with minimal effort on your part.

Here's all you need to do:

1. Take a few minutes to read the "Maintenance" section in this guide. Use these simple preventive procedures that will allow your RAMVAC to reach its service-life potential.
2. Take a few minutes to read the "Operation" section in this guide. Find out how to best control your RAMVAC and put its safety features to work for you.
3. Discover how to initiate the longest warranty in dental vacuum history. Check inside the back cover to discover our warranty commitment to you ...and what you need to do to receive warranty coverage.

We at RAMVAC appreciate your business and take a personal interest in your satisfaction. Please let us know how the system is working for you. Just give us a call or drop by our dental meeting exhibits. And please accept my personal invitation to visit our manufacturing facility.

Matt Olson
General Manager, RAMVAC Dental Products, Inc.
(800) 5-RAMVAC

Safety and Regulatory Information

RAMVACs meet the most current and highest safety standards. RAMVAC Vacuum Units are UL 2601-1 Listed, comply with NFPA 99C Level 3 vacuum requirements, and are manufactured in an FDA Registered, ISO 9001:2000 and ISO 13485:2003 certified facility.

Here's what you need to do to insure the safety potential of this equipment is achieved:

- **Make sure your equipment is installed according to our written instructions and the Installation Checklist is completed.** If you have purchased your RAMVAC from an authorized dealer, the dealer is responsible for presenting you with the completed checklist.
- **Exhaust from dental vacuum systems can be hazardous.** Make sure the exhaust pipe is terminated outside your building according to our written instructions.
- **Nitrous oxide and oxygen can be safely scavenged in the small concentrations typically encountered in dental analgesia.** The additional air drawn into a properly installed and operated Vacuum Unit will dilute these agents. Never use your RAMVAC to remove pure nitrous oxide, oxygen or other oxidizing agents directly from storage vessels or supply hoses. **Large concentrations may cause a fire in the Vacuum Unit and may cause an exhaust hazard.**
- **Never use your RAMVAC to scavenge flammable anesthetic gases.** Even small concentrations may cause a fire in the Vacuum Unit.
- **Never use your RAMVAC for housekeeping functions.**
- **Never use your RAMVAC to collect lab dust.**
- **Dispose of used lubricating oil responsibly as recommended in the maintenance section of the User Guide.**

"IPX0" designation on the S1 Electrols means the equipment must be protected from ingress of water.

The S1 Electrols label includes safety symbols with special meanings:



This means there is more information available in this User Guide.



This stands for a "Type B Applied Part", which means the equipment is approved for patient contact.

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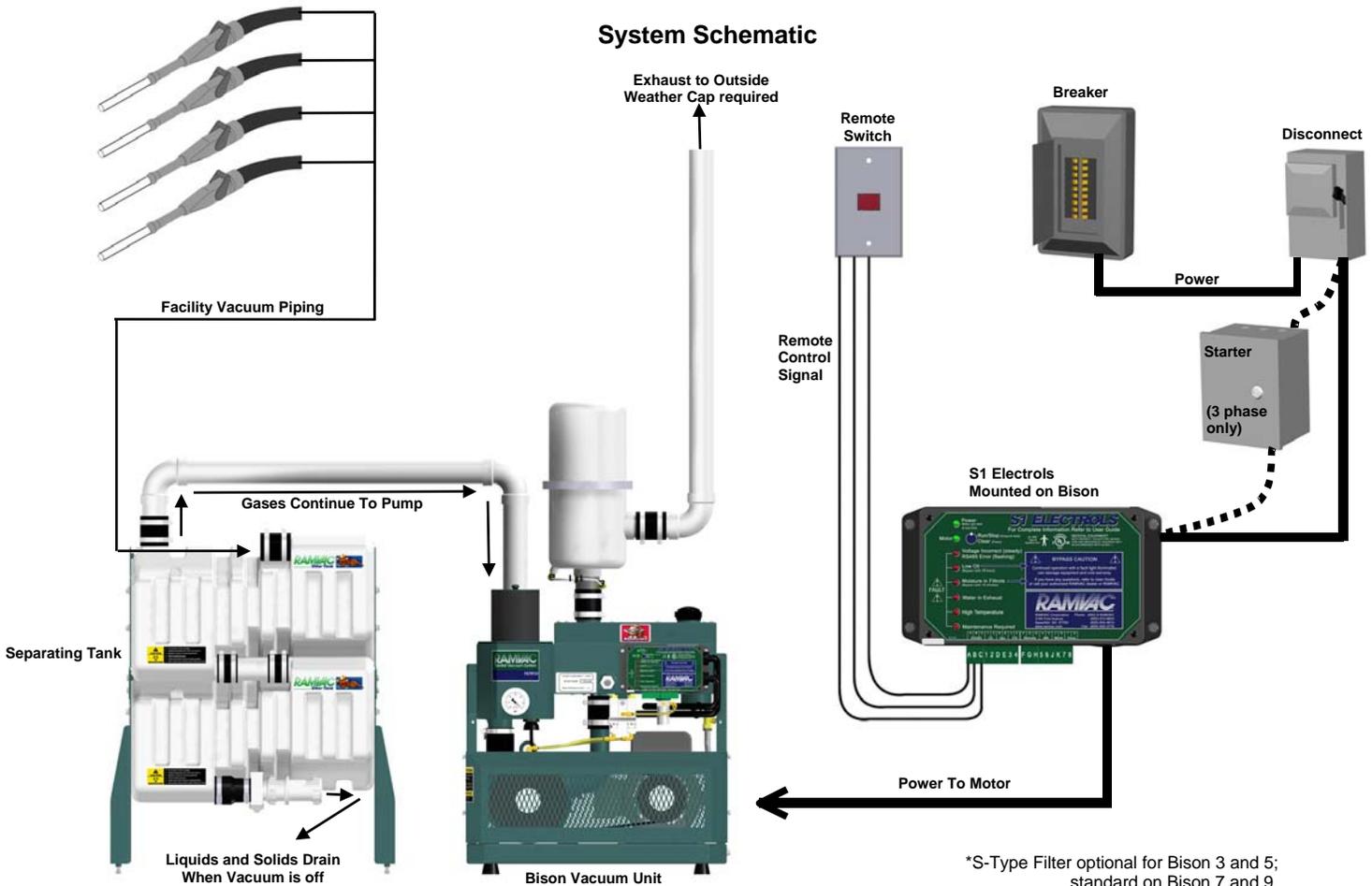
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Maintenance Overview

RAMVAC preventive maintenance is simple, clean, and inexpensive. It can help ensure your RAMVAC provides decades of predictable performance.

Key points for trouble-free operation:

- Rinse vacuum lines daily with the recommended quantity of liquid.
- Change oil and check filters on schedule.

Preventive Maintenance Schedule	
1st Week	Check Drip Rate See "Check Oil Drip Rate"
Daily	Rinse Vacuum Lines See "Cleaning the Vacuum System"
Every 1,000 hours*	Check Air Filters See "Air Filters" Check Drip Rate See "Check Oil Drip Rate"
Every 2,000 hours*	Change oil and check oil filter See "Oil Change" Check V-Belt See "Check V-Belts" Check S-Type Exhaust Filter See "S-Type Exhaust Filter"
<p>* The "Maintenance Required" LED on the Electrols will illuminate every 1,000 hours. A remote indicator, if installed, will flash slowly when the "Maintenance Required" LED illuminates.</p>	

Cleaning the Vacuum System

Clean vacuum lines daily. Just before turning off the **RAMVAC**, rinse vacuum lines first with *hot* water -- approximately one quart through each high volume line and a few ounces through each saliva ejector line. Then aspirate a few ounces of a dental vacuum line cleaner through each vacuum line. **SlugBuster™** is highly recommended. Cleaners should have these qualities:

- **Non-Foaming**
- **De-Odorizing**

Foam may cause a Filtrols Moisture Fault (See “Fault Response and Avoidance”) and shut down the Bison. Avoid interruptions by insuring your cleaner is truly “non-foaming”.

Test by shaking the mixed solution. True “non-foamers” will be bubble free.

Cleaning requirements will vary according to activity. After surgical procedures, aspirate a few ounces of an appropriate vacuum line cleaner, such as **SlugBuster**, through the lines.

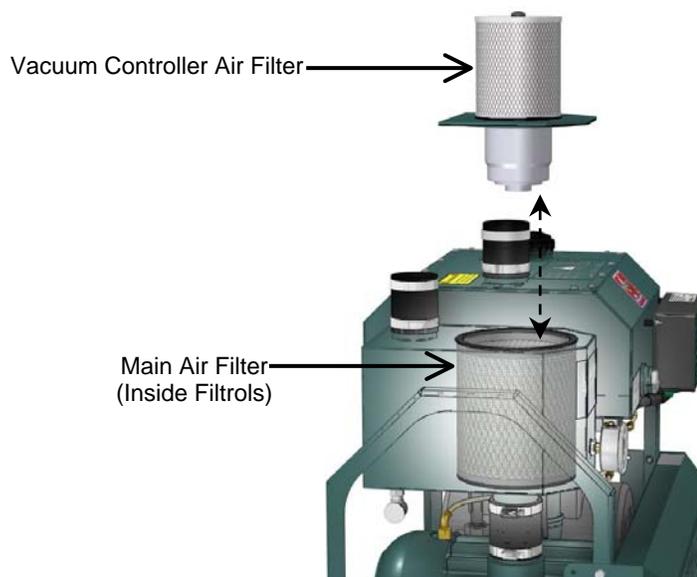
For overhead plumbing, be sure to allow air to follow liquids before closing vacuum valves.

Clean treatment room solids separator routinely. Check the treatment room solids separator routinely and clean when dirty.

Air Filters

Inspect air filters every 1,000 hours. The Main Air Filter is accessed by lifting the Vacuum Controller up and out of the Filtrols.

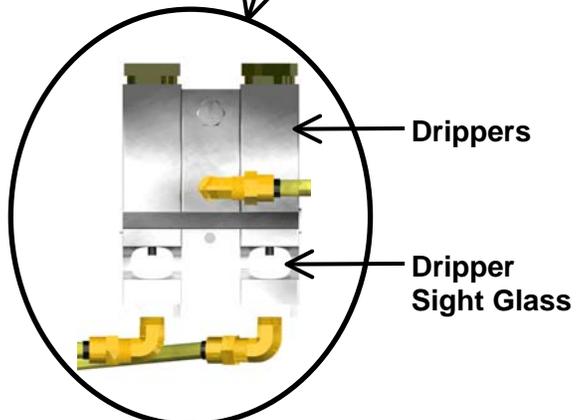
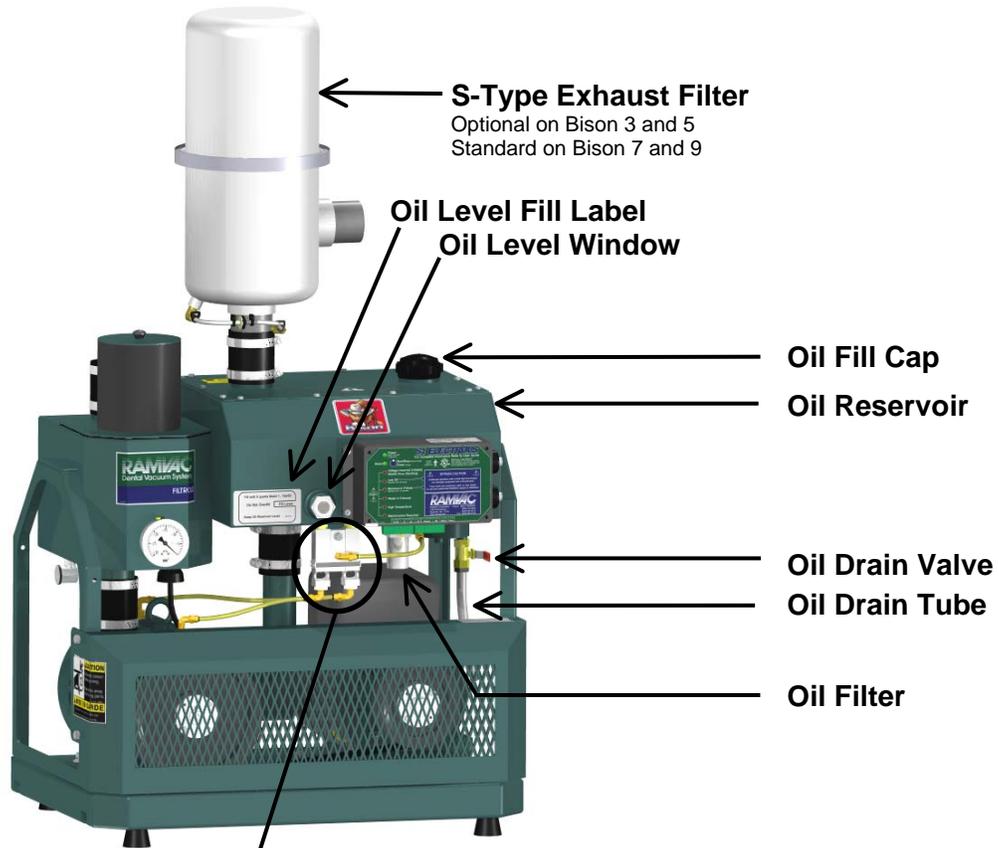
Replace filters every 2000 hours or when visibly dirty.



Lubrication System Components

One reason your **RAMVAC** can outlast every other dental vacuum system is its "Lubrication System". The "Lubrication System" supplies oil, drop by drop, through "Drippers" to the pump. Used oil is discharged back into the Oil Reservoir as a mist, separated from the exhaust, filtered and recirculated.

Change oil every 2,000 hours.



Bison 3 and 5 use a double Dripper Body.



Bison 7 and 9 use a triple Dripper Body.

Oil Change

Change oil every 2,000 hours.

The “Maintenance Required” LED on the S1 Electrols illuminates after every 1,000 operating hours.

Procedure:

1. Drain Used Oil

- Place empty oil container (minimum 6 quarts) under oil drain tube.
- Open oil drain valve. When oil stops draining, close valve.
- If you see water in the oil, contact your dealer or RAMVAC.

2. Check Oil Filter

- Unscrew oil filter and remove filter element.
- Normally your oil filter element will be clean. If dirty, contact your dealer or RAMVAC.
- Re-assemble oil filter. Hand tighten only.

3. Add Fresh Oil

- Remove oil fill cap.
- Add (normally 5 quarts) Mobil 1, 15w50 until oil level reaches the “Fill Level” mark on the “Oil Level Fill Label”.
- Use only recommended oil, available locally and also available from RAMVAC.
- Securely install oil fill cap.
- Check oil drip rate. See “Check Oil Drip Rate”
- Dispose of used oil at a gas station or lubricant recycling station.

Check Oil Drip Rate

Check the drip rate at the “Dripper Site Glass” every 1000 hours, after oil change and after the first week of operation.

Drip rate should be 1 to 3 drops per minute at each “Dripper” when the Bison vacuum unit is thoroughly warmed-up, the vacuum setting is 7” to 7.5” Hg, and ambient temperature is 70°F to 75°F.

Stronger vacuum and/or elevated temperature will increase the drip rate. Weaker vacuum and/or cooler temperature will decrease the drip rate.

If the drip rate is not as specified, contact your dealer or RAMVAC.

Check V-belts

Inspect V-belts for wear every 2,000 hours. Replace if cracked or frayed.

V-belt tension will not normally need adjustment. However, tension will need adjustment if belts squeak at start up. Contact RAMVAC for information.

S-Type Exhaust Filter

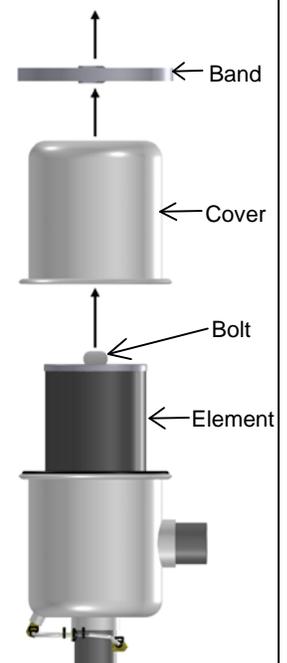
Check filter element every 2,000 hours.

Loosen band and remove cover, then remove bolt to inspect element inside surface for dirt build up.

Replace filter element when dirt is visible on inside surface.

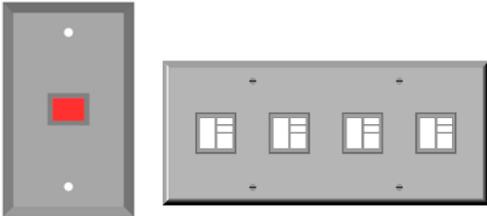
Elements can be expected to last 5 to 10 years if oil is uncontaminated by liquids and particulates. Unusually dusty environments, aspirating unusual quantities of air abrasives or other particulates, or pump flooding can dramatically shorten the element’s service life.

Failure to maintain filter element can increase amperage and possibly trip motor overload.



Turn the System ON / OFF

Your RAMVAC can be run continuously throughout the workday. To avoid wasting electricity, turn off the RAMVAC if vacuum will not be needed for an hour or more. **Note: The Separating Tank will drain only when no vacuum is present – Vacuum must be turned off at least once per day!**

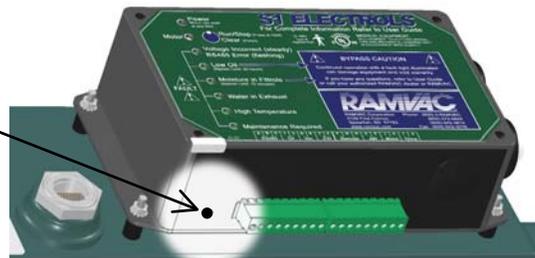
Illuminated Remote Control Switch	Non-Illuminated Remote Switches	Electrols "Run/Stop" Pushbutton
		
<p>Use to turn system on and off from a remote location.</p>	<p>Use to turn system on and off from a remote location.</p>	<p>Use this switch to turn system on and off:</p>
<ul style="list-style-type: none"> • Switch light is steady-on when system is running without "Fault". • Switch light flashes if a "Fault" has occurred. 	<ul style="list-style-type: none"> • Non-illuminated switches provide <i>no</i> indication for system status. 	<ul style="list-style-type: none"> • If you have no remote switch. • If you want to turn system on and off from the equipment's location. • If a "Fault" has occurred. <p>Caution: <i>Equipment Damage Possible if you bypass a Fault.</i></p>

Faults

Your RAMVAC is protected by the S1 Electrols' computerized Fault Notification System. **Faults Are Not Normal.** Make sure you determine the cause of all faults to avoid recurrences.

Fault:	System Status:	Corrective Action:
Voltage Incorrect	System will not run. Remote switch indicator will not illuminate.	Correct Input Voltage.
Low Oil	Can bypass for 20 hours. Remote switch indicator flashes rapidly.	Add Oil. See "Maintenance".
Filtrols Moisture	Can bypass for 15 minutes. Remote switch indicator flashes rapidly. WARNING! Continued operation bypassing Filtrols Moisture Fault can cause equipment damage not covered by the warranty.	See Next Page - "If You Get a 'Filtrols Moisture' Fault"
Water in Exhaust	System will not run. Remote switch indicator flashes rapidly.	See Next Page - "If You Get a 'Water in Exhaust' Fault"
High Temperature	Not active in this system.	
Maintenance Required	System runs normally. Remote switch indicator flashes slowly.	Perform "Preventive Maintenance". Press Reset Switch*

* Use tip of ballpoint pen to press reset switch. Access through hole left of green connectors on bottom of S1 Electrols.



Fault Response and Avoidance

Filtrols Moisture Faults Are Not Normal. This Fault occurs if liquid or foam is present in the “Filtrols” (normally a dry location).

Operating while there is a Filtrols Moisture Fault Can Damage Equipment and Void the Warranty. Bypass a Moisture Fault and continue to operate *only* if you are willing to accept possible damage to your equipment.

If a Moisture Fault recurs, call your dealer or RAMVAC.

If You Get a “Filtrols Moisture” Fault

1. **Press the S1 Electrols “Run/Stop” button.**
 - If the “Filtrols Moisture” light **stays on** and the RAMVAC starts, continue with step 2.
 - If the “Filtrols Moisture” light **goes out** and the RAMVAC starts, when convenient continue with step 4.
2. **You are Operating while there’s a Filtrols Moisture Fault. This can Damage Equipment and Void the Warranty.**
 - If you choose to continue working and possibly damage the equipment, you will have 15 minutes of operating time.
 - If you choose to protect the equipment, continue with step 3.
3. **Clear the Moisture.**
 - Press the S1 Electrols “Run/Stop” button to shut off the RAMVAC.
 - Allow the Separating Tank to drain.
 - Lift off the Vacuum Controller, remove Main Air Filter and clean out any moisture.
 - Remove Moisture Sensor (by twisting and pulling down) and dry contacts. See illustration at right.
 - Install Moisture Sensor, Main Air Filter and Vacuum Controller.
 - Press and hold the S1 Electrols “Run/Stop” button to turn on the RAMVAC.
 - When convenient, continue with step 4.
4. **Reset the Flashing Remote Switch Indicator.**
 - Cycle the remote switch off, then on.
 - As soon as possible, continue with step 5.
5. **Determine and Correct the Cause. Always Determine the Cause of a Moisture Fault!**
 - See “To Avoid Moisture Faults” below.



Moisture Sensor

To Avoid Moisture Faults

- Aspirate only non-foaming substances.
See Note at right.
 - Rinse lines with a known quantity of water.
 - Do not exceed your separating tank’s capacity.
- Note:** Check any suspicious substances by shaking in a glass container.
Be sure to check:
- Vacuum Line Cleaners (even those that say “non-foaming”)
 - Cold Disinfecting Solutions
 - Ultrasonic Solutions

If You Get a “Low Oil” Fault

- Add oil until level reaches the “Fill Level” mark on the “Oil Level Fill Label”. Press S1 Electrols “Run/Stop” button.
- If no oil available press S1 Electrols “Run/Stop” button. The RAMVAC starts and will continue to operate for 20 hours with the Low Oil Fault present so add oil as soon as possible.

If You Get a “Water in Exhaust” Fault

1. **Clear Water and Contaminated Oil out of the Oil Reservoir.**
 - Change the oil and check the oil filter see “Oil Change”.
 - If the Oil Filter has water in it, your oil lines and drippers may be contaminated. Continue with step 2.
 - If the Oil filter has only oil in it, continue with step 3.
2. **Clean Contaminated Oil Lines and Drippers.**
 - Contact your dealer or RAMVAC for further instructions.
3. **Return to Normal Operation.**
 - Press the S1 Electrols “Run/Stop” button to restart the RAMVAC.
 - The RAMVAC will restart only if the Oil Reservoir has been adequately cleared of water.
 - Check drip rate see “Check Oil Drip Rate”.
 - When convenient, continue on with step 4.
4. **Reset the Flashing Remote Switch Indicator.**
 - Cycle the remote switch off, then on.
 - As soon as possible, continue with step 5.
5. **Determine and Correct the Cause. Always Determine the Cause of a “Water in Exhaust” Fault!**
 - Contact your dealer or RAMVAC for further instructions.

To Avoid “Water in Exhaust” Faults

- Insure the RAMVAC exhaust plumbing is correctly terminated outside the building.
- Improper termination may allow water to enter the oil reservoir.
- In rare circumstances, excessive water condensation may occur in the exhaust plumbing.
- Avoid running exhaust plumbing through an environment colder than 32° F (0° C).

Problem	Possible Cause	Corrective Action*
Low or No Vacuum (motor running okay)	Separating Tank Drain Valve Blocked Open Clogged Vacuum Line Filtrols Check Valve Not Sealing Vacuum Leaks Loose or Broken Drive Belts Stuck Vanes	Clean Separating Tank Drain Valve Locate and remove clog Repair or replace Filtrols Check Valve Locate and fix leaks Tighten or replace Belts Clean and lubricate Vanes
Motor Does Not Run	"Tripped" Breaker or Fuse "Tripped" Motor Overload Motor Failure Failed Control Component..... "Voltage Incorrect" Fault "Low Oil" Fault "Filtrols Moisture" Fault "Water in Exhaust" Fault.....	Reset Breaker/Replace Fuse Reset Motor Overload Replace Motor Bypass then replace failed component Correct input voltage See "Fault Response and Avoidance" See "Fault Response and Avoidance" See "Fault Response and Avoidance"
Drip Rate Slow	Low Ambient Temperature Dirty Oil Filter Improper Oil.....	Raise Ambient Temperature Clean filter Change to recommended oil
Drip Rate Fast	High Ambient Temperature..... High Vacuum Improper Oil.....	Lower Ambient Temperature Lower vacuum Change to recommended oil
Oil Comes Out Exhaust	Incorrect Exhaust installation..... Oil Reservoir overfull Bypassed Moisture Fault	Correct installation Lower oil level See "Fault Response and Avoidance"
"Voltage Incorrect" Fault	Electrols connected to incorrect power source . Power out of specification.....	Connect Electrols to correct power source Call Power Company
"Low Oil" Fault	Oil Reservoir is low	Add Oil.
"Filtrols Moisture" Fault	Separating Tank overfilled Separating Tank Drain Valve Stuck Foaming Line Cleaner used..... Cold Sterilizing Solution aspirated	Drain Separating Tank Clean Separating Tank Drain Valve Use "SlugBuster" Line Cleaner Aspirate only non-foaming substances
"Water in Exhaust" Fault	Water entered from Exhaust Pipe..... (No moisture in Filtrols)	Drain water from Oil Reservoir Correct Exhaust Pipe installation
	Water Entered from Filtrols Side..... (System run in Bypass)	See "Fault Response and Avoidance"
Maintenance Required	Preventive Maintenance Due.....	Perform Preventive Maintenance

*Abbreviated information. For details contact your authorized dealer or RAMVAC, or refer to the "Support" section of ramvac.com.

The RAMVAC Warranty

We have done our best to produce the most durable dental vacuum system available. In addition to our engineering and manufacturing efforts, we are prepared to stand behind RAMVAC performance with a warranty period many times greater than any other dental vacuum system.

What's Covered

RAMVAC Dental Vacuum Systems are warranted by RAMVAC for a period of two years from the time of installation against defects in materials or workmanship under normal usage and the following terms.

The RAMVAC Vacuum Pump housing, rotor, shaft, vanes, and bearings are warranted for a period of ten (10) years from the time of installation against failure to meet stated nominal performance specifications.

What We Will Do

RAMVAC will, at its option, repair, replace or refund the purchase price of RAMVAC Dental Vacuum System equipment or related RAMVAC parts which prove to be defective in materials or workmanship, or fail to meet stated nominal performance specifications during the warranty period.

The customer is responsible for the costs of shipping the product to our manufacturing facility for evaluation. Products under warranty will be repaired, replaced or refunded at our sole discretion. Products that are repaired or replaced will be returned at our expense.

Parts repaired on a product under warranty will be warranted for the duration of that product's original warranty.

Limitations

This Warranty applies only to equipment installed, serviced and operated in accordance with the information provided in RAMVAC Installation Instructions, Service Procedures, and this User Guide. Proper installation includes RAMVAC's receipt of a completed Installation Checklist and Warranty Initiation form.

This Warranty applies only to the original purchaser and installation, unless RAMVAC agrees otherwise in writing.

RAMVAC makes no other warranties, expressed or implied. All implied warranties including any implied warranty of merchantability or fitness for a particular purpose are hereby disclaimed and excluded. In no event shall RAMVAC be liable for special, incidental or consequential damages, including loss of time, inconvenience, or loss of use of the equipment.

How to Initiate the Warranty

1. Ensure the Installation Checklist and Warranty Initiation form is completed and sent to RAMVAC.
2. Complete the form and send it to RAMVAC; or complete the online Warranty Initiation at the "Support" section of ramvac.com.

Please contact us if you have any questions.

RAMVAC
3100 First Avenue
Spearsfish, SD 57783

Phone	(800) 5-RAMVAC (800) 572-6822 (605) 642-4614
Fax	(605) 642-3776
E-mail	ramvac@ramvac.com



3100 First Avenue
(800) 5-RAMVAC

Spearfish, SD 57783
FAX (605) 642-3776

www.ramvac.com

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3100 FIRST AVENUE, SPEARFISH, SD 57783

TOLL FREE: **800-5-RAMVAC** (800) 572-6822

PHONE: (605) 642-4614 • FAX (605) 642-3776

e-mail: ramvac@ramvac.com

website: www.ramvac.com

Brand of



The Integrated Supplier
PHONE: (866-DTE-INFO)

Website: www.dentalez.com