

## Installation Overview



### AIR TECH CROSS REFERENCE

This guide contains site preparation and installation instructions for RAMVAC Bulldog QT and Bison



**Important**

## Step 1 Site Requirements

**Run Dedicated Exhaust Lines for each RAMVAC unit installed:**  
 DO NOT connect to plumbing vents.

**Size:** 2"

**Type:** Bulldog QT - PVC Sch 40, Sch 80, CPVC, or metal (**NOT tar coated**).  
 Bulldog QT with vacuum set stronger than 9" Hg, use Bison type.  
 Bison - Sch 80, CPVC, or metal (**NOT tar coated**).  
 (Option: PVC Sch 40 or equivalent after first 10 feet of run).

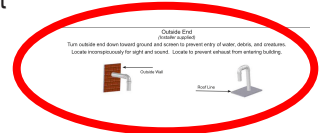
Dry Vacuum		RAMVAC	
Air Tech	Users	Bulldog QT (Lube Free)	Users
Mojave V3	3	Bulldog QT (Lube Free)	2/3
Mojave V3	3	Bulldog QT (Lube Free)	2/3
Mojave V5	5	Bulldog QT (Lube Free)	4
Mojave V7	7	Bulldog QT (Lube Free)	6
Mojave V9	9	Bulldog QT (Lube Free)	8
Mojave V10	10	Bulldog QT (Lube Free)	8/10
Wet Vacuum		RAMVAC	
Air Tech	Users	Bulldog QT (Lube Free)	Users
VacStar 40	4	Bulldog QT (Lube Free)	3
VacStar 40	4	Bulldog QT (Lube Free)	3
VacStar 80	8	Bulldog QT (Lube Free)	6
VacStar 80	8	Bulldog QT (Lube Free)	6

## Step 2 Tank Plumbing

**S-Type Exhaust Filter**  
 Standard on Bison 7 and 9.  
 Optional on Bison 3, 5 and all Bulldog models.

## Step 3 Exhaust

**Important**



## Step 4 Add Oil

## Step 5 Remote Switching

## Step 6 Electrical Power

## Step 7 Installation Checklist (Separate Document)



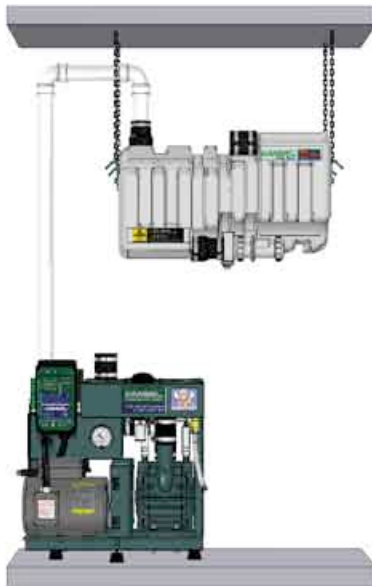


# Bulldog® QT Site Requirements



Comply with Local and National Electrical and Plumbing Codes.	Ambient Temperature 32° to 104° F (0° to 40° C)	Protect from Water. Controls are <b>NOT</b> waterproof. Motors are <b>NOT</b> Waterproof.	Humidity 0% to 95% No Condensing Moisture
Follow NFPA 99c Edition, Level 3 Vacuum System Recommendations.			

Common Installations Shown  
Contact RAMVAC for more options



Bulldog - 15 Gallon Otter Tank  
suspended

Bulldog - 15 Gallon Otter Tank™  
stacked



Bulldog -15-Gallon Otter Tank  
side by side



Product Dimensions	15-Gallon Otter Tank	Bulldog QT 1 & 2	Bulldog-15 Gallon Otter Tank Stacked
Nominal Width	25" (640 mm)	21" (520 mm)	25" (640 mm)
Nominal Depth	19" (490 mm)	17" (430 mm)	19" (490 mm)
Nominal Height	24" (610 mm)	25" (640 mm)	44" (1120 mm)
Nominal Height with S-Type Exhaust Filter	N/A	48" (1220 mm)	67" (1700mm)
Drain valve centerline to floor	8" (203 mm)	N/A	8" (203 mm)

**Add 6" (155 mm) to each dimension for working space**

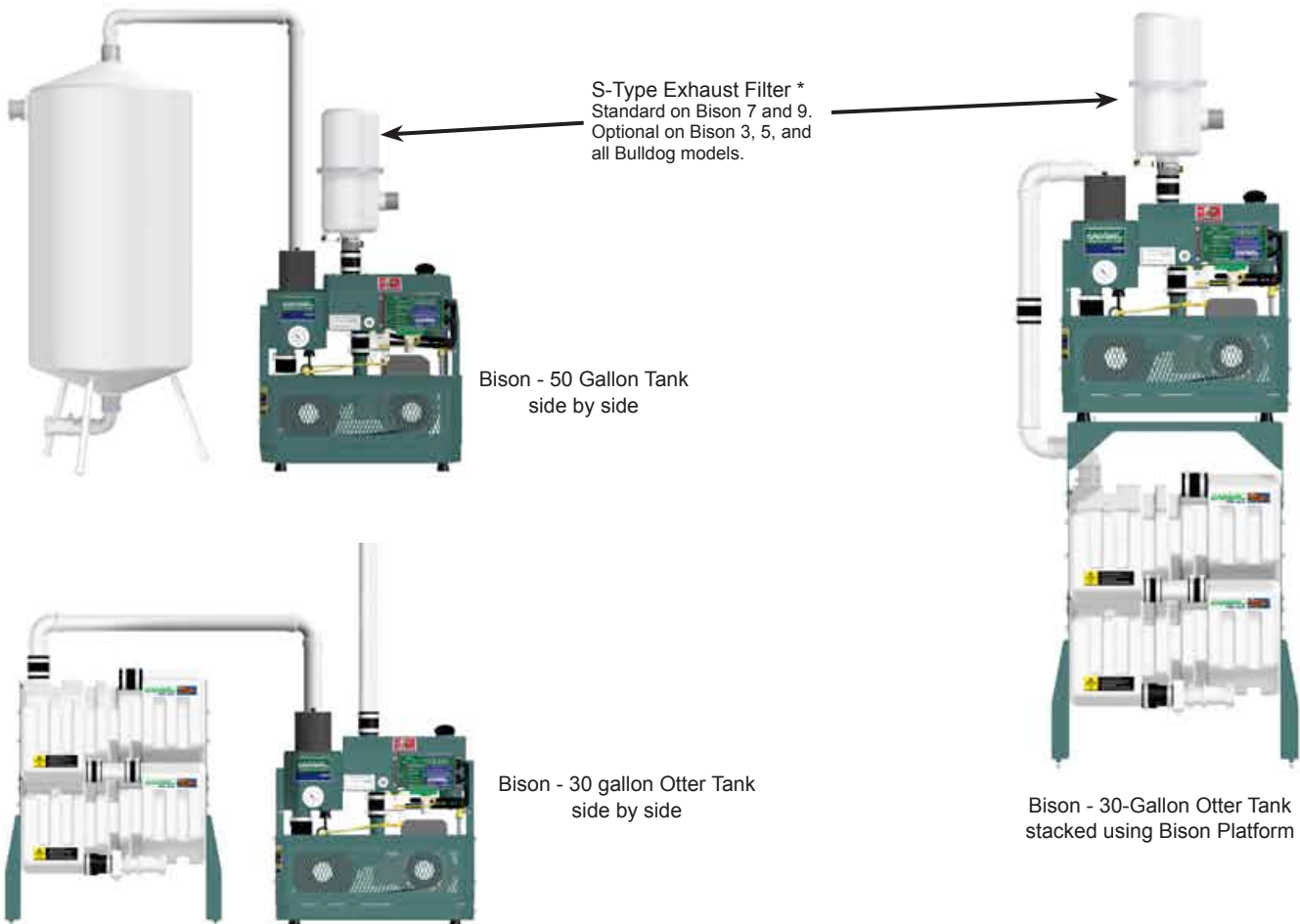


# Bison® Site Requirements



Comply with Local and National Electrical and Plumbing Codes.	Ambient Temperature 32° to 104° F (0° to 40° C)	Protect from Water. Controls are <b>NOT</b> Waterproof. Motors are <b>NOT</b> Waterproof.	Humidity 0% to 95% No Condensing Moisture
Follow NFPA 99c Edition, Level 3 Vacuum System Recommendations.			

Common Installations Shown  
Contact RAMVAC for more options



Product Dimensions	30-Gallon Otter Tank	Bison 3 & 5	Bison - 30 gallon Otter Tank Stacked	Bison 7 & 9	50-Gallon Cylindrical Tank
Nominal Width	29" (740 mm)	26" (660 mm)	32" (820 mm)	26" (660 mm)	22" (560mm)
Nominal Depth	21" (540 mm)	19" (490 mm)	21" (540 mm)	22" (560 mm)	22" (560mm)
Nominal Height	36" (920 mm)	30" (760 mm)	70" (1780 mm)	30" (765 mm)	62" (1580mm)
Drain valve centerline to floor	8" (203 mm)	N/A	8" (203 mm)	N/A	5" (130mm)

\* For S-type Exhaust Filters add 26 inches to height of Power Unit.

**Add 6" (155 mm) to each dimension for working space.**



# Tank Plumbing



## Facility Vacuum Lines

- Build Like a Drain Line:
  - Use DWV Fittings
  - Minimum slope  $\frac{1}{4}$ " per 10 ft (2 mm per 1m)
- Up to 5 rooms: 1-1/2" (or larger) PVC Schedule 40 or equivalent
- 5 to 15 rooms: 2" PVC (or larger) Schedule 40 or equivalent
- If an inline low spot is unavoidable, place it in a known location and incorporate a clean-out.
- For overhead piping, contact RAMVAC
- For nitrous oxide scavenging, contact RAMVAC
- Follow NFPA 99c Edition, RAMVAC Instructions, and local codes.

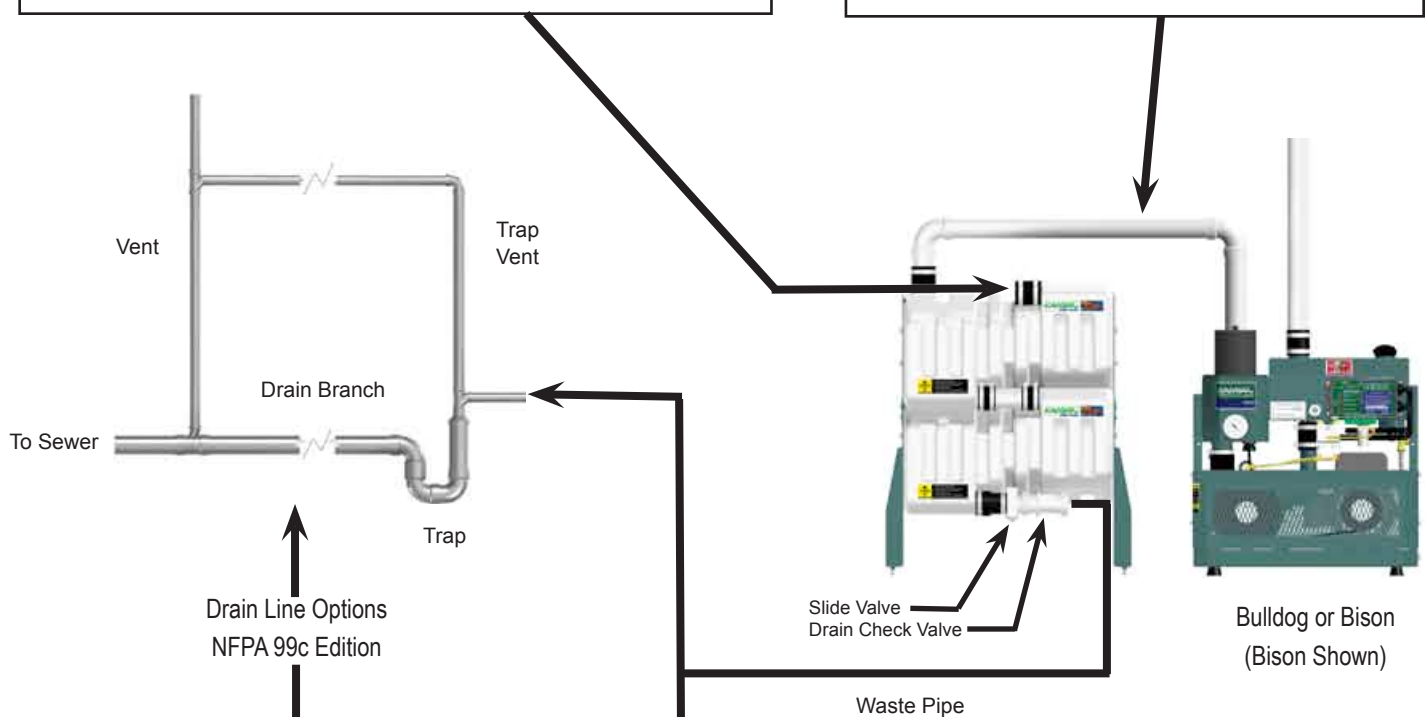
## Tank to Vacuum Power Unit

**Bulldog®** - 1 1/2" PVC Schedule 40 with DWV fittings or equivalent.

**Bison®** - 2" PVC Schedule 40 with DWV fittings or equivalent.

Use new, clean pipe to connect tank to Vacuum Power Unit.

**Do NOT reuse old or existing pipe.**



## Tank Drain Line

- Waste Pipe, Slide Valve, and Drain Check Valve
  - 1-1/2" PVC Schedule 40 with DWV fittings.
  - Min. slope  $\frac{1}{4}$ " per 10 ft (2 mm per 1m).
  - Use only RAMVAC supplied 1 1/2" drain check valve.
- Trap and Drain Branch
  - Trap and branch line 2 sizes larger than waste pipe.
  - Trap seal minimum 4" deep.
- Vents
  - Trap vent size no less than half the trap and drain branch size.
  - Vents no smaller than drain check valve.
  - Vents must extend minimum of 6" above tank top before turning horizontal.
- Follow NFPA 99c Edition, RAMVAC Instructions, and local codes.

Multiple Tank Setup Guide is packed with Tanks



# Exhaust Plumbing



## BIOHAZARD

Breathing Dental Vacuum System Exhaust May Be Harmful.  
Exhaust to Outside of Building.  
Follow NFPA 99c, RAMVAC Instructions, and local requirements.

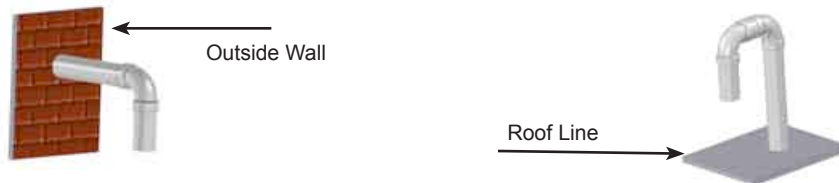


## Minimum Exhaust Length = 15 feet from RAMVAC pump to outside end.

Contact RAMVAC for shorter distances.

### Outside End (Installer supplied)

Turn outside end down toward ground and screen to prevent entry of water, debris, and creatures.  
Locate inconspicuously for sight and sound. Locate to prevent exhaust from entering building.



### Run Dedicated Exhaust Lines for each RAMVAC unit installed:

DO NOT connect to plumbing vents.

**Size:** 2"

**Type:** Bulldog QT - PVC Sch 40, Sch 80, CPVC, or metal (**NOT tar coated**).  
Bulldog QT with vacuum set stronger than 9" Hg, use Bison type.  
Bison® - Sch 80, CPVC, or metal (**NOT tar coated**).  
(Option: PVC Sch 40 or equivalent after first 10 feet of run).

### Support Loosely:

**DO NOT** allow piping to touch ductwork.  
**DO NOT** make solid attachment to building structure.

**Seal:** All joints must be oil tight.

**Slope:** All horizontal lines toward the vacuum unit, a standard plumbing slope.

### **Rubber Roofs:** Terminating an exhaust run over a rubber roof is not a recommended practice.

If exhaust termination above a rubber roof is necessary, protect the roof from contact with the exhaust oil vapor or droplets.

1. Terminate exhaust pipe a sufficient distance from rubber roof, or
2. Cover the rubber roof surface with material not sensitive to oil, and
3. Install a RAMVAC S-Type Exhaust filter.

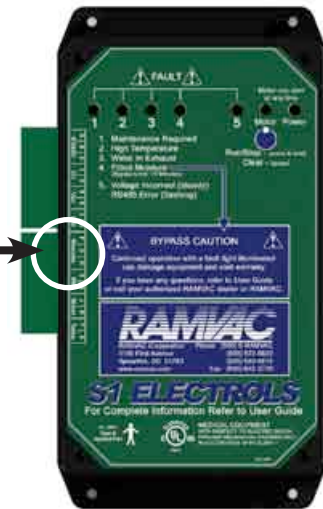
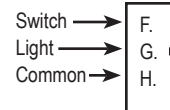
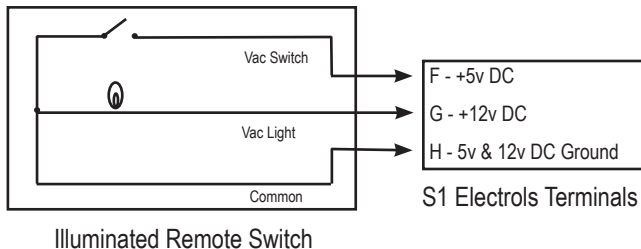
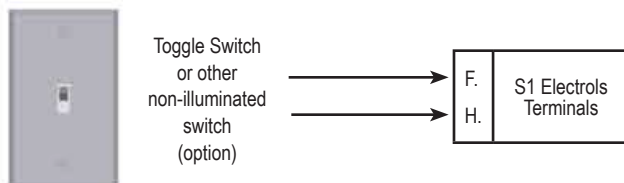
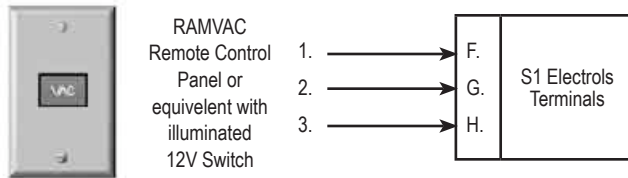






# Remote Switching Options

**OPTION 1 (RECOMMENDED):** Switch (low voltage) Remote Control Circuit F, G, H as shown below.



Maximum wire lengths  
18 gauge - 500 feet

**OPTION 2:** Use Run / Stop button on S1 Electrols if remote switch is not used.  
**Caution:** *This option may put Electrols into bypass mode.*

**OPTION 3 (USE WITH CAUTION):** When switching the ( **high voltage** ) power circuit, observe the following precautions:

- Major Safety Hazard and Code Violation, if neutral of 115v power or just one leg of 220v power is switched.
- Some S1 functions are lost.
- System will not always respond as described in User Guide.
- Contact RAMVAC for instructions if you elect to remotely switch a ( **high voltage** ) power circuit.



# Electrical Power



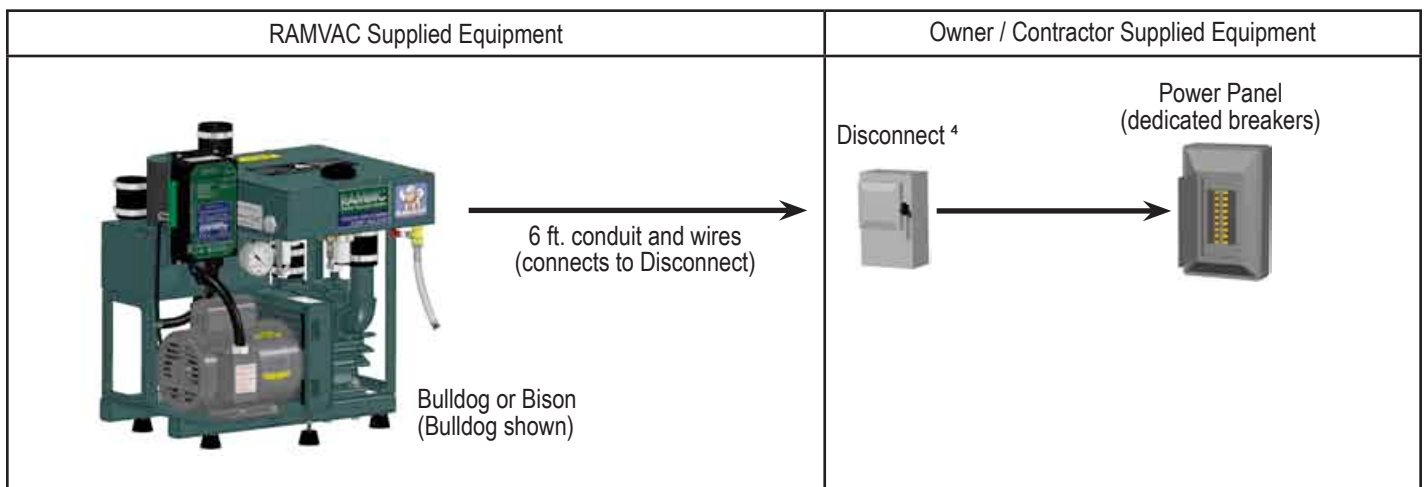
MODEL	MOTOR <sup>1</sup>				THHN WIRE SIZE <sup>2</sup>		PROTECTION <sup>2, 3, 4</sup>	
	Hp (kw)	Phase <sup>1</sup>	Voltage <sup>1</sup> (min - max)	Max Amps	50 ft.	100 ft.	Breaker <sup>2</sup>	Fusetron <sup>2, 3</sup>
Bulldog® QT 1, 2	1.0 (0.7)	1	115 (104-127)	13.4 @ 115V	12 ga.	10 ga.	20 amp	FRN 25
			230 (208-253)	6.7 @ 230V	12 ga.	12 ga.	15 amp	FRN 8
Bison® 3, 5, 7	3.0 (2.2)	1	230 (208-253)	16.0 @ 230V	10 ga.	10 ga.	20 amp	FRN 25
		3	230 (208-253)	8.3 @ 230V	12 ga.	12 ga.	15 amp	FRN 12
			460 (414 - 506)	4.2 @ 460V	12 ga.	12 ga.	15 amp	FRN 5
Bison 9	5.0 (3.7)	3	230 (208-253)	14.0 @ 230V	12 ga.	12 ga.	20 amp	FRN 25
			460 (414 - 506)	7.0 @ 460V	12 ga.	12 ga.	15 amp	FRN 10

## FOOTNOTES:

1. Motors are standard 230v, 1 phase, 60 Hz, except Bison 9 motors are 230v, 3 phase 60 Hz. Other models are available for other voltages, phase, and 50 Hz power.
2. Recommendation only. Ensure compliance with National and Local codes.
3. Fuses must have time delays or be otherwise suitable for motor circuit.
4. Disconnect must be fusible and sized per UL 98, UL 489, or UL 508. Must be supplied and installed by a licensed electrician.

## Single Phase Installation

For three phase power, see “Three Phase Startup”.





# Three Phase Startup

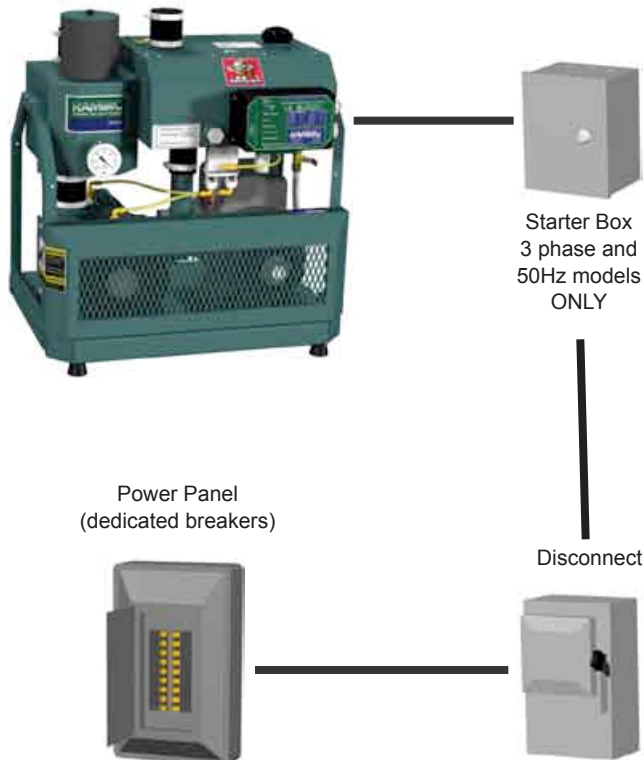


## Three Phase Vacuum Power Unit Startup

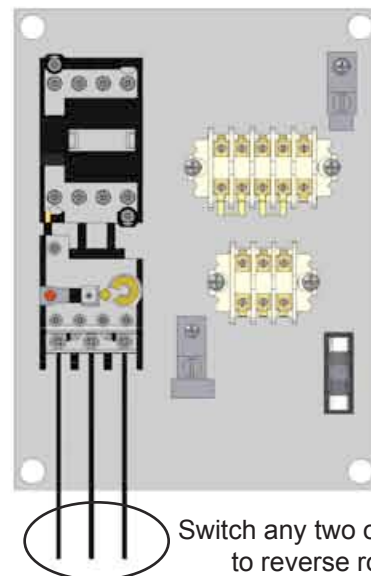
To verify proper pump rotation, use this procedure when starting a three phase vacuum unit for the first time.

**CAUTION:** Continuous improper rotation can permanently damage pump.

1. Lift Vacuum Controller up and out of Filtrols. (See Illustration)
2. Remove Main Air Filter from inside Filtrols. (See Illustration)
3. Check for correct rotation:
  - a. Place hand in Filtrols close to pump inlet pipe.
  - b. Run Power Unit just long enough to feel if inlet pipe is blowing or sucking air; then turn the Power Unit off.
4. If air blows out of inlet pipe:
  - a. Reverse any two motor leads on starter. (See bottom right illustration).
  - b. Repeat step 3.
5. If air sucks into inlet pipe:
  - a. Clean any oil or debris out of Filtrols.
  - b. Reinstall Main Air Filter.
  - c. Reinstall Vacuum Controller.



**Notes:**  
Contents inside motor starters will vary.  
For simplicity, not all starter box wiring is shown.







# INSTALLATION CHECKLIST

Print or Type	Dentist or Institution Name: _____	Dental Facility Name: _____
	Mailing Address: _____	
	(City) (State) (Zip)	
	Phone: ( ) _____ - _____ Facility person responsible	
	Installation Date: _____ for RAMVAC maintenance: _____	
	Email: _____	

Complete by Installer	Vacuum Unit <b>Model</b> No. <b>8 E. . .</b>	Tank <b>Model</b> No. <b>5</b>
	Vacuum Unit <b>Serial</b> No. _____	Tank <b>Serial</b> No. _____
	<b>Vacuum Plumbing</b>	<b>Electrical</b>
	____ Number of Treatment Rooms / Chairs	____ Breaker/Disconnect Amp Rating
	____ Number of Vacuum Sinks	____ Line Voltage
	____ Number of Vacuum Cuspidors	____ Running Voltage
	Piping Layout	____ Amps Lead 1 (all motors)
	<input type="checkbox"/> Overhead Lift Height _____ (Floor to Trunk Line)	____ Amps Lead 2 (all motors)
	<input type="checkbox"/> Below Grade	____ Amps Lead 3 (3ph motors)
	<input type="checkbox"/> Pipe Size _____	<b>Pump Lubrication</b>
	<input type="checkbox"/> Other _____	<input type="checkbox"/> Machine is installed level
	Tank Drain	<input type="checkbox"/> OK
	<input type="checkbox"/> All systems	<input type="checkbox"/> All systems
	<input type="checkbox"/> All systems	<input type="checkbox"/> All systems
	<b>Exhaust Plumbing</b>	<input type="checkbox"/> All systems
Y N Dedicated exhaust _____ to outside	<input type="checkbox"/> All systems	
Y N Exhaust pipes joints sealed	<input type="checkbox"/> All systems	
Y N Exhaust piping loosely supported to isolate vibration	<input type="checkbox"/> All systems	
Y N Outside end capped or turned down to prevent entry of rain or snow	<input type="checkbox"/> All systems	
Y N Outside end screened to prevent entry of animals	<input type="checkbox"/> All systems	
Exhaust Pipe Material	<input type="checkbox"/> All systems	
<input type="checkbox"/> PVC Sch 40	<input type="checkbox"/> All systems	
<input type="checkbox"/> PVC Sch 80	<input type="checkbox"/> All systems	
<input type="checkbox"/> Copper	<input type="checkbox"/> All systems	
<input type="checkbox"/> Other _____	<input type="checkbox"/> All systems	
I have demonstrated and explained Operation and Maintenance procedures, using the User Guide and hardware, to the facility person responsible for RAMVAC maintenance:		
_____ (Printed Name of Installer) (Dealer)		
Free Gift Certificate for Installers! Just complete information on back of white copy.		

Complete by Owner	<b>Warranty Initialization</b>
	<ul style="list-style-type: none"><li>I have a User Guide and I will comply with the operation and maintenance instructions or contact RAMVAC if I cannot.</li><li>I have a completed copy of the RAMVAC Installation Checklist.</li><li>I understand that RAMVAC warranty coverage depends on RAMVAC Corporation's receipt of this document.</li></ul>
	_____ (Printed Name of Owner or Authorized Agent) (Signature of Owner or Authorized Agent)



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