# Vector Vortex Dry Suction System

Installation/User Guide


## Operation & Maintenance Manual

# IMPORTANT SAFETY INSTRUCTIONS

Dear Customer:

Congratulations on the purchase of your new Vector Vortex Dry Vacuum System from Vector Research & Development.
This system's intended purpose is for dental suction applications. It is to be used in accordance with UL60601-1 and NFPA 99C standards, along with all applicable codes. The system utilizes a dry vacuum re- generative blower that produces high air flow when connected to the dental operatory lines.

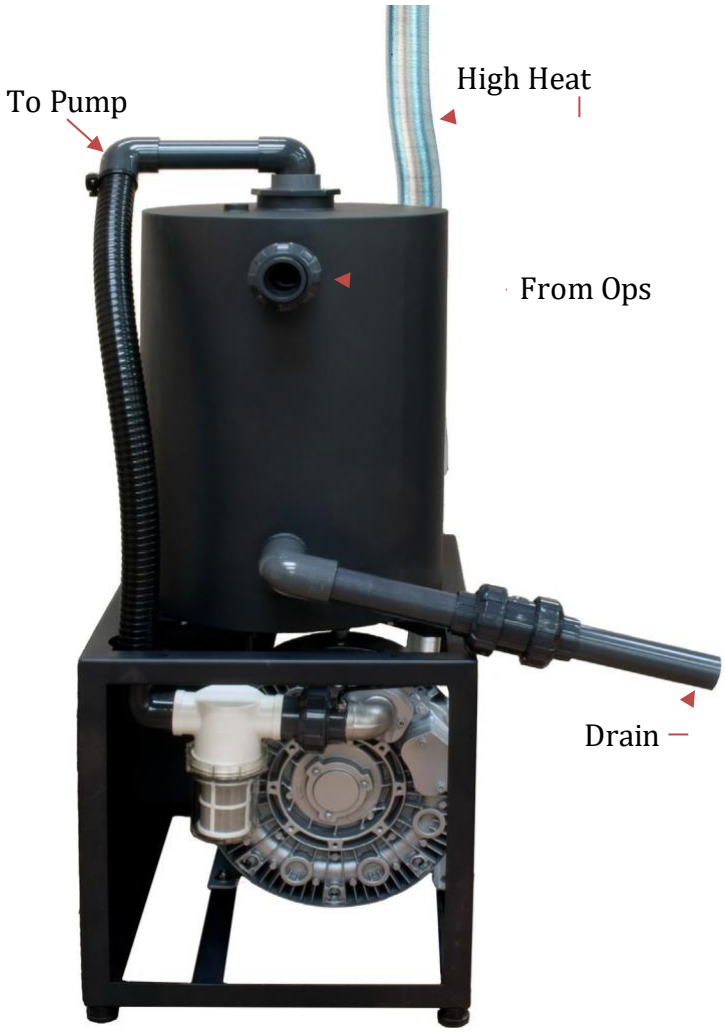
A vacuum electronic sensor and variable frequency loader are also included to maximize the system's effi- ciency by holding a constant vacuum level. This manual provides installation, operation and preventative maintenance guidelines that should be followed to ensure correct/reliable performance of

**WARNING: PLEASE READ THIS MANUAL COMPLETELY BEFORE INSTALLING AND USING THIS PRODUCT. SAVE THIS MAN- UAL FOR FUTURE REFERENCE AND KEEP IN THE VICINITY OF THE PRODUCT.**


Front Side

Back Side

Left Side




Right Side

## Table of Contents

## RELATED SAFETY INSTRUCTIONS AND REGULATORYS

To provide suction during general dental examinations and procedures conducted by qualified dental professionals. Vector Vortex Dry Vac systems meet or exceed the most current and highest safety standards, which are:

- CSA C22.2 601.1-M90 (2005)
- UL60601-1 classified revision 2006/04/26
- Classification: Class I, permanently fixed MAINS operated equipment
- NFPA 99C level 3 gas system requirements compliance revision 2005

**To ensure the safety potential of this equipment is achieved, please:**

Make sure your equipment is installed according to the instructions provided in this manual and make sure the installation checklist is completed prior to starting the equipment.
Equipment is not suitable for use in the presence of a flammable anesthetic mixture containing air/oxygen or nitrous oxide. DO NOT OPERATE THE EQUIPMENT IF THESE CONDITIONS EXIST.

**Protection against electrical shock:**

Provide proper grounding per NFPA 70 (NEC 2008). Do not become a current path for the equipment to ground through your body.

**Transportation/Storage Conditions:**

- Temperature range -28.5 °C to 50 °C / -20 °F to 122 °F
- Relative Humidity 95% (non-condensing)
- Barometric pressure minimum of 372 mm Hg (.49 atm).

**Important: Refer servicing to an authorized service representative**

## ECOPOWERVAC OUTLINES

## UNPACKING

1. Examine contents for damage prior to open shipping wooden box.
    a. If shipping damage is found, immediately contact the freight carrier to file a claim.
2. Carefully remove the suction unit from the wooden box.
3. Visually inspect the entire vacuum system for shipping damage.
    a. If shipping damage is found, immediately contact the freight carrier and supplier.
4. Verify that the installation parts were shipped with the system:

a. Installation parts shipped with all vacuum system models include the following:

- (3) Hoses
- (5) Hose clamps
- (1) muffler connected to hose
- (1) Ball check valve
- (1) O&M Manual (email)

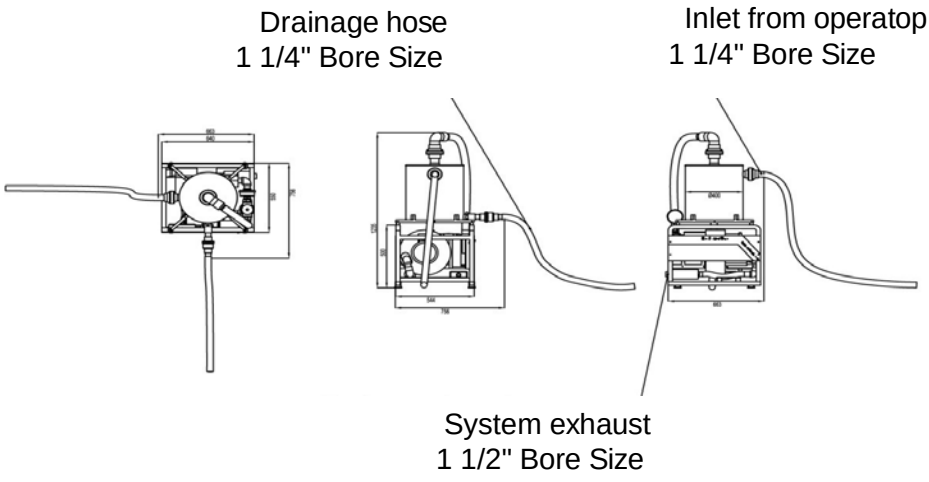
5. Remove the installation parts and set aside until the unit is ready to be installed.

**WARNING: DO NOT install on surfaces with more than a 5° incline.**

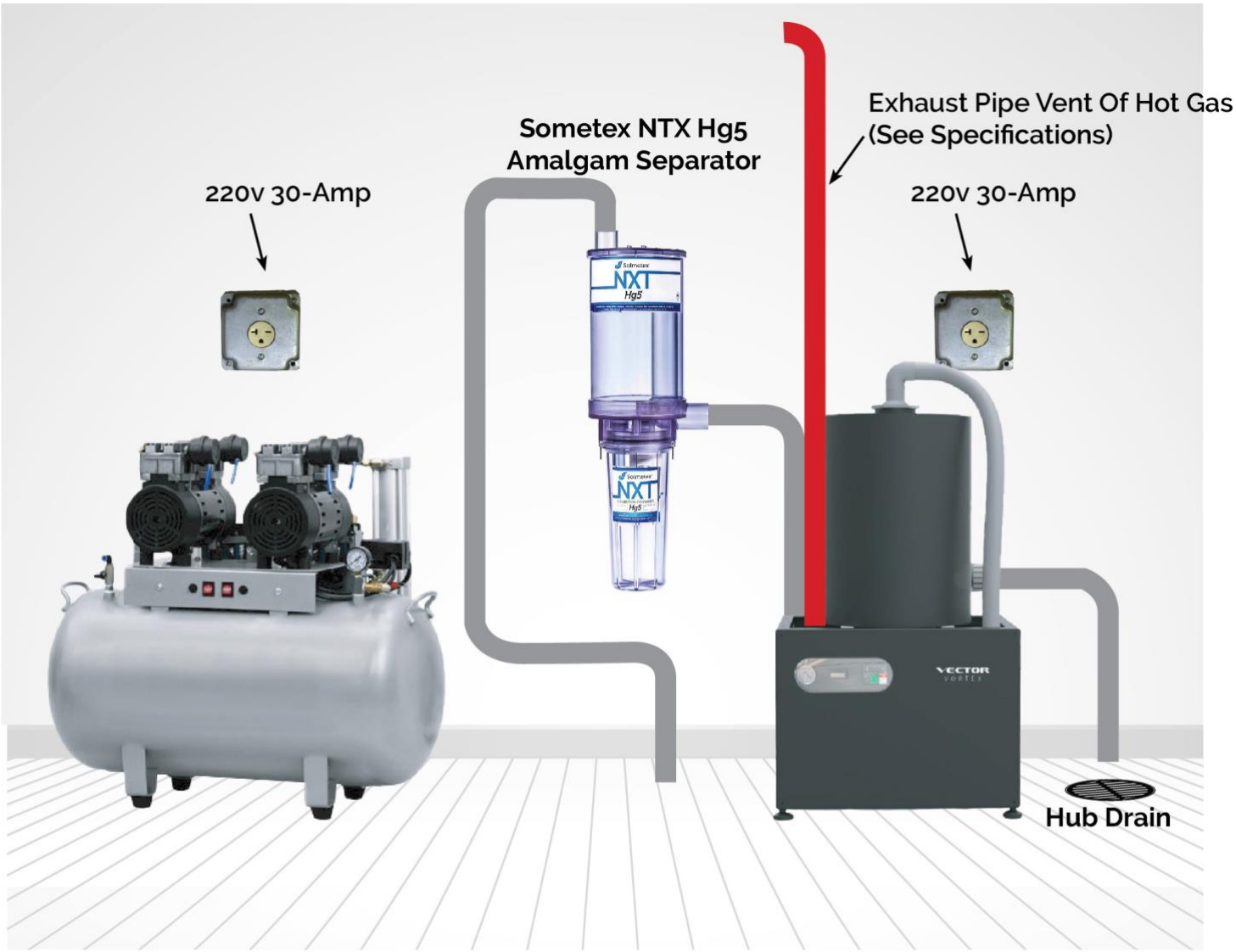
## INSTALLATION SAFETY

**INSTALLATION AREA REQUIREMENTS:**

- Indoor use only in dust free, climate controlled room.
- DO NOT install in an enclosed area where ambient temperature could exceed temperature specifications of below 4.5 °C / 40 °F, or above 40 °C / 104 °F while the vacuum system is running.
- Maintain minimum 6 inches of clearance around system. Maintain 12 inches of clearance on top of system.
- Vacuum systems are equipped with 4 rubber feet, to ensure unit stands firmly on the floor. Level the system in two plains prior to starting system.
- Assure proper external exhaust ventilation prior to starting the system (see SPECIFICATIONS). Indicates the ON and OFF position for the equipment power switch (system breaker) When **ON**, the main control box indicator light will illuminate.



## Example of Preferred Layout Mechanial Room Front View




**All Power outlets 220V -30Amp are dedicated circuits**

**ELECTRICAL REQUIREMENTS:**

- Follow NEC, NFPA 99C and all applicable local codes.
- Systems are shipped with appropriate electrical conduit to hardwire into stand alone breaker.
- Qualified personnel must install electrical wiring and outlets.
- Unit requires a dedicated (separate branch circuit only) 30 amp circuit, 220 VAC.
- Never operate unit outside the specified voltage range 208-240 VAC.
- See "SPECIFICATIONS" for more electrical information.
- There is an indicator light on the system which indicates the power is on located at control box.

**ELECTROMAGNETIC INTERFERENCE (EMI):**

The EcoPowerVac system is designed to avoid electromagnetic emissions/interference with surrounding electrical equipment. Due to the vast assortment of electrical equipment available, it is possible that some interference may be experienced by the end customer. If interference is experienced, the device that is creating interference should be removed from the room where the vacuum system is located. If the interference persists, then it may be necessary to confirm that both devices are connected to isolate (separate) circuits per "ELECTRICAL INSTALLATION INSTRUCTIONS" in this manual. If the problem still occurs, then the two devices should be moved as far apart as possible. Finally, if the problem can not be eliminated, contact an authorized distributor.

**CAUTION: Routinely inspect any and all power cords for cuts and abrasions. Discontinue use and have authorized service representative replace cord if damaged.**

INSTALLATION SUMMARIES

| **Dental Site Requirements** | **Vector Single Horsepower** | **Vector Duo Horsepower** |
|---|---|---|
| **Electrical** | | |
| Wire gauge (AWG) | #10 | #10 |
| Minimum circuit breaker current rating | 20 A | 30 A |
| **Plumbing** | | |
| Exhaust vent pipe to outside | 1 1/4" NPT | |
| Line from operatory | See applicable plumbing diagram | |
| Inlet hose barb on vacuum separator tank | 1 1/4" | 1 1/4" |
| Separator tank drain hose | 1 1/4" | 1 1/4" |

**Note: if alternate site pipe sizes are to be used, consult an authorized distributor**

## PLUMBING

For new installations, it is recommended to use the following guidelines.

**WARNING: The system should only be installed by qualified personnel. The system should be installed in a clean, dry, well ventilated area on a solid, level surface.**

1. Unpack system from wooden box, removing any wooden pallets. Set the unit in place and be certain it is level and cannot rock.
2. Remove foam from all parts.
3. Let the tank and tank support frame aligned and the 4 x thru holes of the support frame to the 4 threaded studs sticking through the holes on the top of frame (installed). Attach the support frame/tank to the frame by tightening the 4 x nuts (if previously removed) to the threaded studs.
4. Position the tank lid on the top of separated tank (installed), connect the tank lid assembly to the blower intake with a hose and two hose clamps as shown above. Locate exhaust pipe protruding from motor and position accordingly to customer's exhaust air vent. Exhaust vent connections should be made with a 40mm hose or pipe to the outside of the building.

   **WARNING: The exhaust plumbing must be connected to a vent which runs outside of the building per NFPA 99C Standards. The outside vent should be turned down and screened to protect from rain and animals.**

5. Position the tank's operatory inlet and drainage elbow/check valve accordingly by rotating the tank in its frame. It may be necessary to lift the tank from the frame and adjust the drainage elbow to align with waste disposal line and maintain alignment with the operatory inlet.

   **NOTE:** Tank lid must remain clocked in its factory set location. If the tank needs to be rotated, the lid must first be loosened by turning the (3) lid clamps until lid is loose.

   **NOTE:** After the tank and drainage elbow are properly positioned, the lid knobs should be tightened in a position which allows the plastic tubing, connecting the tank to the vacuum unit, to remain in a vertical position.
6. Check to make sure that the drainage elbow is tight in the tank. Connect 1-1/2" NPT female end of the drainage tube to the existing sewer drain line or floor sink. If existing line is not available, use 1-1/2" plastic hose to connect low pressure hose to floor drain. The system must be installed so that the tank drain is higher than the waste connection. This will allow the tank to gravity drain. Use a hose clamp to secure the hose to the barb.

   **WARNING: See local codes in reference to Amalgam disposal.**
7. Connect low pressure hose to operatory inlet on tank via a hose clamp. Assemble opposite end of hose to operatory plumbing with the remaining hose clamp.

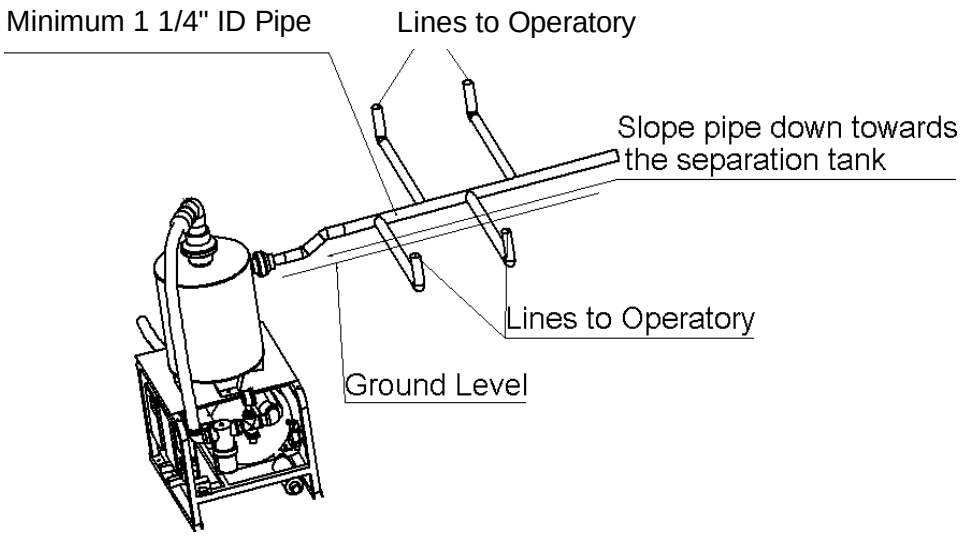
   **WARNING: Hose from the operatory inlet must be installed so that it exceeds the height of the tank lid.**

## INSTALLATION - BELOW GRADE PLUMBING

**Installation Guidelines**

Where possible, use 1 1/4" to 1 1/2" ID plumbing to connect operatory lines to separation tank.

- Plumbing lines should be sloped down to the separation tank as shown in the schematic (minimum slope of 1/32 inch per foot).
- Low spots in the line should be avoided to prevent flow restriction of vacuum loss. the separation tank Minimum 40mm ID Pipe Risers to Operatory Risers to Operatory Slope pipe down towards Ground Level Connection must be higher than tank inlet

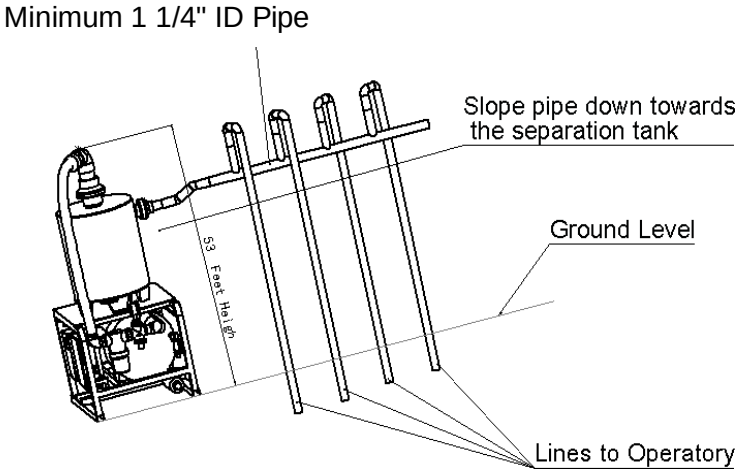



## INSTALLATION - ABOVE GRADE PLUMBING

**Installation Guidelines**

- Use 1 1/2" ID plumbing to connect operatory lines to separation tank.
- Plumbing lines should be sloped down to the separation tank (minimum slope of 1/32 inch per foot).
- A maximum of a 10-foot rise is recommended for above-grade plumbing. If more than 10 feet of rise is required, contact your distributor.
- Low spots in the line should be avoided to prevent flow restriction or vacuum loss.
- It may be necessary to upgrade to the next largest system for an operatory with above-grade plumbing.

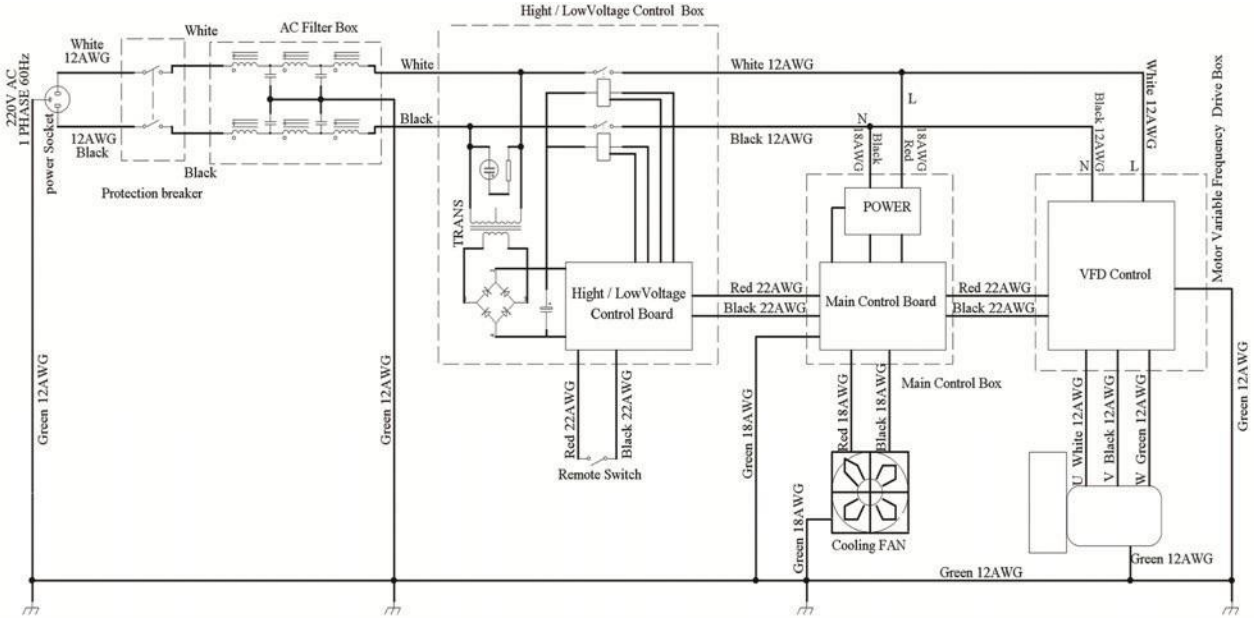
- All plumbing entering the main trunk line needs to be dropped in on the top of the trunk line, the separation tank Minimum 40mm ID Pipe Lines to Operatory Slope pipe down towards Ground Level Max 10 Feet Height Connection must be higher than tank inlet.




## INSTALLATION - ELECTRICAL CONNECTIONS

Refer to the 'Specification' sheet in this manual for Electrical Ratings.

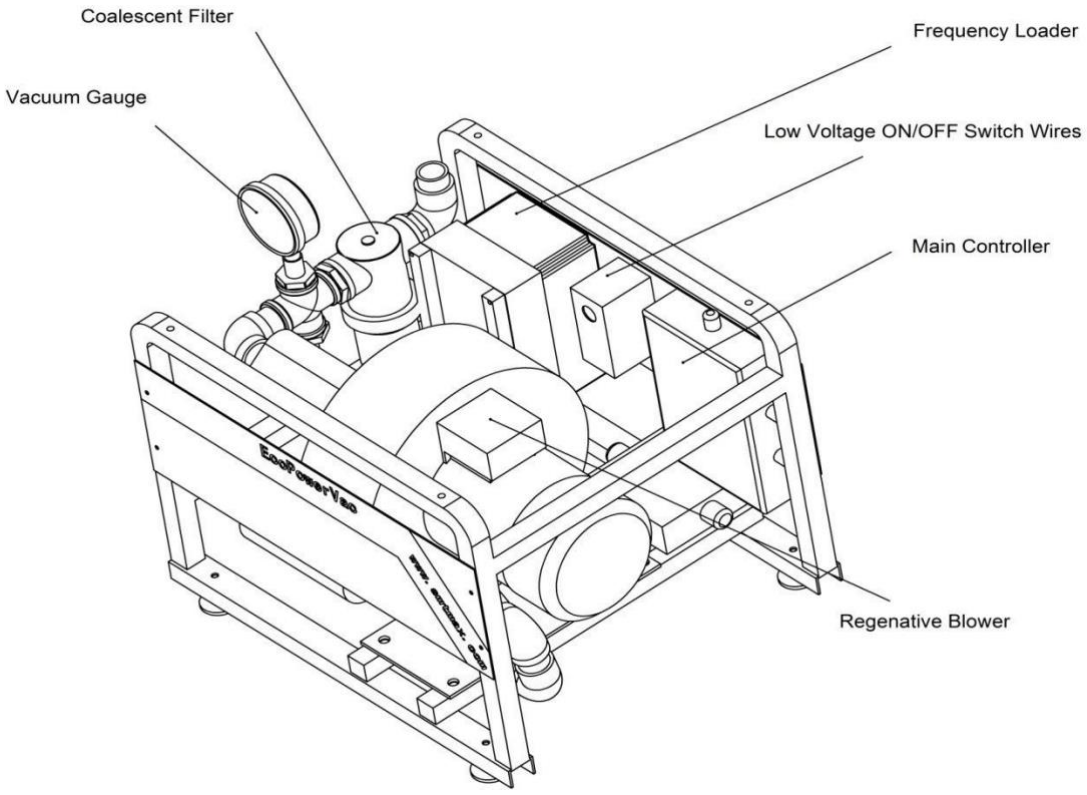
1. Connect remote panel wires to Low Voltage Control wires if applicable. If a remote panel is not used, connect the red and white remote switch wires and insulate the black wire.
2. Connect conduit cable to user supplied electrical box.
3. Install a dedicated 30 AMP (see electrical schematic) circuit protection breaker.



**NOTE:** If fuse replacement is required, then a 250 mA/0.320 ohm rated resistance time-delayed, 200% overload rated fuse should be used.

**WARNING: Line voltage must be within the specified voltage range 208-240 VAC. The 30 AMP breaker must be delay/slow blow type. The breaker must have a trip time of greater than 2 seconds @ 400% overload.**

**WARNING: Connect in accordance with NEC Class 2 wiring methods and all applicable local codes.**




## INSTALLATION - CHECKS AND TESTS

1. Check that all the hose clamps (5) and hoses are securely fastened to the corresponding plumbing.
2. Check that the exhaust plumbing is tight and supported within 2 feet of the sound enclosure exit point.
3. Check the incoming line voltage. It should be a minimum of 208 volts and should not exceed 240 volts. The voltage should remain within this range while the system is running. If the voltage does not remain within the specified range, install an appropriate buck-boost transformer and check to make sure the correct main circuit breaker and wire size gauge are being used.

4. Turn power on at system breaker.
5. Close all operatory lines and check the maximum vacuum level reading on the vacuum gauge. (Reference 'Specifications - Pneumatic').

**CAUTION: If the gauge does not read the respective vacuum limiter pre-set value, contact an authorized distributor (see 'Specifications' Section).**

6. Use soapy water to check for leaks around external plumbing (i.e. hose clamps, pipe fittings, etc.) Make sure all fittings/hoses/PVC pipes are tightly secured.
7. Vacuum 2-4 gallons of fresh water into the system through the operatory line.
8. Turn the system off and check the drainage line from the tank to assure there are no leaks.
9. Check that the hose connected to the inlet of the tank is connected to the operatory plumbing at an elevation higher than the tank lid. 2 feet max Drainage Line **Equipment Alert: Vacuum system must be installed per local plumbing and electrical codes. Equipment Alert: Verify all leaks are sealed. Air leaks are the main cause of inadequate system performance.**

## OPERATION

### STEP 1

A. The system may be turned on via the system breaker located on the middle of the front closed to frequency loader. A light of main control box will turn on to indicate that voltage is supplied to the system.

B. The system may also be turned "ON/OFF" from a single, convenient location within the dental office using a Remote Control Panel (if applicable). Remote wiring must be done by a licensed electrician in accordance with all applicable codes.

### STEP 2

The vacuum level is factory preset per the respective system limit (see 'Specifications'). This is the reading on the gauge when all operatory lines are CLOSED. Check the gauge reading to the specified pre-set level per the pneumatic specifications in this manual. If the setting is within + .25 in. Hg. / -.75 in. Hg. of the specified rating for your system, continue with normal operation. If this setting needs to be adjusted, contact an authorized distributor.

### STEP 3

Once the power is on and the vacuum preset level has been checked, the system is fully operational.

**NOTE:** The vacuum systems are capable of running continuously. **The system should be powered off when not in use to conserve electricity and reduce motor running time.**

**NOTE:** The separation tank has a working volume, capable of collecting waste fluids for a standard operating day (8 hours). If excessive waste is collected, the tank has a ball float that will stop the vacuum flow and allow automatic drainage. Once the tank is completely drained, the system should be powered down for **a minimum of 30 seconds**. This will allow the ball float to return to its normal operating position, at which point the system can be turned back on.

**STEP 4**

At the end of the day, the system should be powered down either at the remote panel or the system breaker (one or both of the controls should be moved to the "OFF" position). All waste collected will then automatically drain. One HVE should be left open overnight for adequate system ventilation to assure the tank will completely drain.

## PREVENTIVE MAINTENANCE

### System Cleaning

- The dental vacuum system should be thoroughly cleaned at a minimum of 20 hour intervals. This will help to keep the system sterilized and functioning properly.
- To clean the system, flush non-foaming cleaning solvent through all main lines, into the tank and out of the drain. Follow the solvent manufacturer's instructions.
- All hoses and liquid connections should be inspected at this time to ensure no leakage is occurring.
- The entire vacuum system (all operatory lines) should be flushed on weekly intervals.

### Vacuum Relief Valve

- Check the vacuum gauge level at one month intervals to assure the system limit is appropriate. To do this, close off all operatory lines and power up the system. Reference the vacuum gauge located on top of the system lid to check the maximum vacuum level for the system. If the gauge varies by more than the amount specified in the 'OPERATION' section of this guide for the factory preset value (see 'SPECIFICATIONS - PNEUMATIC'), contact your authorized distributor for adjustment.
- The valve should be cleaned at one month intervals to remove any clogs which can degrade the system's performance. To do this, blow out any solid deposits (using clean, low pressure air) that may be caught in the relief valve. Use compressed air and a nozzle to blow air over all surfaces of the valve for a minimum of 30 seconds.

  **WARNING: Do not exceed the OSHA requirements of 30 psig air for cleaning purposes.**
  **WARNING: Disposal of system or components (once deemed non-usable by the authorized distributor and end user) should be done in accordance with all local codes. Contact your local waste management authorities to determine proper disposal methods.**

### Preventive Maintenance

- During any service technician visit, routine checks should be made for general wear/degradation of components. Any recommendations for replacement parts should be followed to keep the vacuum system running in optimal condition.
- All operatory/vacuum lines should be cleaned with a non-foaming solvent prior to installation. Follow the solvent manufacturer's instructions.
- Separation tanks should be cleaned to remove solids at least once a year. The tank lid should be removed and the tank should be flushed with water until any solid buildup has been removed from

the tank and flushed down the drainage line. This should be done with the appropriate protective clothing.

**WARNING: Latex gloves, long sleeve shirt and face mask should be worn. If your skin or eyes come in contact with any tank liquids/solids contact your local BIOHAZARD authority immediately.**

- The cabinet fans should be checked monthly (and cleaned when dirty) to assure proper air flow over the vacuum pump. To do this, energize the system and visually check to make sure both fans are on and rotating. If the fans are not rotating, immediately contact your authorized distributor and turn the system off to prevent overheating. The fans are located on the back side of the system and can be viewed through the slots on the sound enclosure.

| Specifications | Vector Single Horsepower | Vector Duo Horsepower |
|---|---|---|
| **Electrical** | | |
| Voltage | 208 to 240 | 208 to 240 |
| Frequency (Hz) | 50/60 | 50/60 |
| Phase | Single | Single |
| Operating current (amps) | 6.3 A | 12.5 A |
| Starting current (amps) | 50 A | 70 A |
| Horsepower | 2 | 3 |
| Insulation class | F | F |
| **Pneumatic** | | |
| Max. vacuum (in Hg) | 7 to 10 | 7 to 10 |
| Vacuum limiter preset (in Hg) | 7.25 | 7.25 |
| Open vacuum air flow (CFM) | 60 | 80 |
| Separation tank capacity (working fluid) | 8 gallons | 8 gallons |
| Tank material | stainless steel | stainless steel |
| **Ambient Specifications** | | |
| Operating temperature | 4.5 °C to 40 °C [40 °F to 104 °F] | |
| Relative humidity (non-condensing) | 0 to 90 % | 0 to 90 % |
| Environment | clean and dust free | clean and dust free |
| **Dimensions** | | |
| Height (in) | 64 | 64 |
| Diameter (in) | 26 | 26 |
| Weight (lb) | 19 | 22 |

## TROUBLE SHOOTING CHART

| Problems | Possible Root Causes | Possible Solutions |
|---|---|---|
| Unit won't start on | a. Breaker is tripped (system or circuit) | Reset breaker, check voltage while system is running to verify voltage range. Check circuit breaker size compared to O&M recommended size |
| | b. Remote switch wired incorrectly | Check that the red and white remote switch wires are tied together and the black remote switch wire is insulated (no shortages) |
| | c. Motor thermal overload tripped | Re-set red thermal overload button on motor. Contact your authorized distributor if problem persists |
| | d. Failed transformer or contactor | Power unit down. Remove system electric panels and visually inspect contactor/transformer for damage (blackened components or burnt smell). Contact your authorized distributor for replacement parts |
| | e. Capacitor failed | Power down system. Manually confirm blower coupling rotates. Visually look for damage to capacitor, if seen contact distributor for replacement capacitor |
| Tank won't drain | a. Tank isn't full | Turn unit off and see if tank drains |
| | b. Drain line kinked / plugged | Remove clog or kink from drainage line |
| | c. Tank lid not properly seated or fastened to tank | Use soapy water to check for vacuum leaks on tank. Tighten tank lid if leaks are found |
| | d. Tank ball float failed | Remove tank lid, check to make sure all PVC is still attached to lid. If not, contact your authorized distributor for replacement parts |
| | a. Tank is draining | Turn system off. Allow minimum 30 seconds for system to drain then turn back on |

| | | |
|---|---|---|
| Unit on, low suction | b. Operatory HVE/SE lines are open | Close all operatory lines and re-check tank gage reading |
| | c. Tank lid not properly seated or fastened to tank | Use soapy water to check for vacuum leaks on tank. Tighten tank lid if leaks are found |
| | d. Low voltage | Check voltage of system while unit is running. Install appropriate buck-boost transformer |
| | e. Leaks in system/operatory plumbing | Use soapy water to check for vacuum leaks in plumbing. Replace leaking plumbing and assure that all hose clamps are tight on hoses |
| | f. Blocked operatory line | Run non-foaming cleaner through operatory lines and re-check vacuum level |
| | g. Relief valve is dirty (causing low relief vacuum level) | Clean relief valve (see procedure in O&M manual) and re-check vacuum setting on tank gage compared to O&M specified range |
| Unit cuts in and out | a. Tank drain is clogged, only allowing a portion of the waste material to go down the drain during the units off period | Clean and remove excess solid materials from tank drain by rinsing tank out with pressurized water |
| | b. Loose wire connection at remote switch, hardwire circuit joint or in system electrical box | Check that the red and white remote switch wires are tied together and the black remote switch wire is insulated (no shortages). Use O&M electrical schematic to assure all other wire connections are correct. |
| | c. Failed transformer or contactor | Power unit down. Remove system electric panels and visually inspect contactor/transformer for damage (blackened components or burnt smell). Contact your authorized distributor for replacement parts |
| Unit noisy | a. Exhaust plumbing not securely fastened to unit | Power unit down. Manually check to make sure exhaust plumbing is securely fastened to system and supported within two feet of the system |
| | b. No muffler Installed | Install muffler |
| | c. Short exhaust pipe run | Contact distributor about potential exhaust pipe option (secondary external muffler) |
| | d. Exhaust is not plumbed out of the building/room | Contact plumber to have exhaust plumbed outside of building per NFPA 99C standards |
| | e. Relief valve is continuously relieving | Open HVEs and/or SEs and check to see if the relief valve is still opening and if sufficient vacuum is supplied to the operatory lines, if so relief valve is functioning properly |
| | a. Loose pipe connections | Use soapy water to check for vacuum leaks in plumbing. Replace leaking plumbing as needed |

| | | |
|---|---|---|
| System leaks liquids | b. Tank lid not properly seated or fastened to tank | Use soapy water to check for vacuum leaks on tank. |
| | c. Tank drain line plugged due to excessive solids passing through system | Replace operatory strainer. Clean and remove excess solid materials from tank drain by rinsing tank out with pressurized water |
| | d. Tank ball float failed | Remove tank lid, check to make sure all PVC is still attached to lid. If not, contact your authorized distributor |
| | e. Tank check valve failure | Run 1-2 gallons of water into tank and turn unit off. If tank does not drain contact distributor or replacement parts or service repair of existing parts |

**OPTIONS AND ACCESSORIES**

| **Part no.** | **Description** | **Kit contents** |
|---|---|---|
| ECO-1 | Exhaust hose kit | • Instructions for use<br>• Exhaust air hose (high temp)<br>• Additional plumbing to connect hose between vacuum system and exhaust vent line of operatory. |
| ECO-2 | Buck and Boost transformer | • Instructions for use<br>• Transformer |

**WARRANTY POLICY**

If within the warranty time limits described below, the dental vacuum system or any of its components fail under normal use and service, the original user-owner must contact an authorized distributor with the product sale and service records. Should the distributor not be able to complete the repair, the distributor may contact Vector Research & Development. for disposition. The product's model and serial number, the installation date and the invoice number must be furnished. Transportation charges both ways must be paid by the distributor. If upon receipt at the factory, an examination reveals faulty or defective original parts, materials, or workmanship, Vector Research & Development. will, at its sole option, rebuild or replace. This warranty does not cover damages caused by misuse, abuse, accident, neglect, or improper operating conditions. Unauthorized alterations or repairs made outside our factory will cancel this warranty and charges for them

**DENTAL VACUUM SYSTEMS**

All dental vacuum systems sold and installed by authorized distributors are warranted to be free from defects in parts, workmanship, and materials for one (1) years from date of purchase, whichever comes first.

This warranty excludes add-ons such as remote panels and kits. Add-on accessories carry their own specific manufacturer's warranty.

## INSTALLATION CHECKLIST

Unpack and check system for shipping damage

Verify installation kit components

Remove skid mounting hardware

Relocate unit to operating location

Install per manual instructions

Check that all hoses and hose clamps are securely fastened

Check that exhaust plumbing is supported within two feet of system

Check incoming line voltage (minimum 208 V and maximum of 240 V)

Turn system on from DC switch (remote)

Check vacuum level reading

Check all lines for leaks