

# ViroVac<sup>®</sup>

Surgical Smoke Evacuator

## Service Manual





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REVISION	DATE	AUTHOR	CHANGES
A	01/2018	Buffalo Filter LLC	

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# 1

## Introduction

### Purpose

The purpose of the ViroVac® *Surgical Smoke Evacuator* is to evacuate and filter surgical smoke and aerosols created by the interface of the surgical tools with tissue (examples: lasers, electrosurgery systems, and ultrasonic devices). The ViroVac® *Surgical Smoke Evacuator* has been designed to provide the appropriate suctioning using one of the three motor speeds to manage surgical smoke. The ultra-quiet motor is used to draw the surgical smoke from the surgical site through the vacuum tubing and into the filter where the surgical smoke is processed through four (4) stages of filtration. A single, completely enclosed, disposable filter is used to simplify installation and removal during filter changes to protect healthcare personnel from potential contamination during filter changes.

1. The first-stage filtration utilizes a pre-filter to trap and remove gross particulate and casual fluid.
2. The second-stage filtration is an Ultra Low Penetration Air (ULPA) filter with a high-tech patented design that captures particulates and micro-organisms from 0.1 to 0.2 microns at 99.999% peak efficiency.
3. The third-stage filtration uses the highest grade virgin activated carbon. The activated carbon is known to remove toxic organic gases and may provide optimal odor removal.
4. The fourth-stage filtration is a woven fiberglass filtration media used to reduce the amount of activated carbon fines from migrating out of the filters.

The intended use depends on the approval of the country. Refer to the instructions for use of the ViroVac® *Surgical Smoke Evacuator* and its accessories.

### Audience

This services manual is strictly for the use by a Buffalo Filter LLC trained technician.

This service manual contains essential information to safely and effectively service the ViroVac® *Surgical Smoke Evacuator*. Instructions for the operation of the ViroVac® *Surgical Smoke Evacuator* and related dangers, warnings, and cautions concerning electrosurgery are beyond the scope of this service manual. Before using and servicing, thoroughly review this service manual and the instructions for use as well as service manuals of all equipment which will be used during servicing. Use all equipment as instructed. Keep this service manual in a safe and accessible location. Any questions or comments about any information in this service manual shall be directed to Buffalo Filter LLC.

# Precautions

**NOTE:** All Warnings, Cautions, and Notices should be read and understood before servicing the ViroVac® *Surgical Smoke Evacuator*.

- Read this service manual thoroughly and be familiar with its contents prior to servicing the ViroVac® *Surgical Smoke Evacuator*.
- Confirm the operational setup of the ViroVac® *Surgical Smoke Evacuator* prior to a servicing procedure.
- Disconnect the ViroVac® *Surgical Smoke Evacuator* from the grounded electrical outlet prior to inspecting the ViroVac® *Surgical Smoke Evacuator* components.
- The ViroVac® *Surgical Smoke Evacuator* produces a strong vacuum, therefore, check the Motor Speed Indicator setting before activating.
- The filter and single-use accessories are completely disposable. Dispose according to the local codes or regulations and facility policy.
- Route the power cord to prevent a tripping hazard or crimping of cords, which could cause unreliable operation or electric shock.
- Route the pneumatic footswitch and any other attached accessories to prevent a tripping hazard or crimping of tubing, which could cause unreliable operation or electrical shock.
- Do not service or operate the ViroVac® *Surgical Smoke Evacuator* in the presence of flammable or explosive gases.
- The ViroVac® *Surgical Smoke Evacuator* may cause radio interference or may disrupt the operation of nearby equipment. It may be necessary to take mitigation measures, such as reorienting or relocating the ViroVac® *Surgical Smoke Evacuator* or shielding the location.
- The use of accessories, other than those specified by the manufacturer, as replacement parts for internal components may result in increased emissions or decreased immunity of the ViroVac® *Surgical Smoke Evacuator*.
- If adjacent or stacked use is necessary, operation of the ViroVac® *Surgical Smoke Evacuator* may be affected. Normal operation should be verified.
- Review the routine servicing by the qualified facility's biomedical technical personnel.
- To avoid risk of electric shock, the ViroVac® *Surgical Smoke Evacuator* must only be connected to a supply with a grounded electrical outlet.
- Using any other filter or accessory, not specified by the manufacturer, may cause damage and/or cause the ViroVac® *Surgical Smoke Evacuator* to be inoperable.
- Care must be exercised in the installation of tubing, adapters, and fluid collection devices. Failure to follow the procedures outlined in this service manual may result in overheating of the motor and may void the warranty.
- The ViroVac® *Surgical Smoke Evacuator* is not intended for evacuation of fluid. If fluid is expected to be aspirated, a fluid collection device must be installed onto the filter. Failure to install a fluid collection device could cause filter blockage and electrical damage.

## Precautions (continued)

- The filter should be changed according to the filter life Indicator. The filter should not be used for more than the filter life specified. Failure to change the filter may result in decreased efficiency and possible internal contamination.
- Do not block either the tubing or the filter during operation. An occlusion or significant restriction may cause the motor to overheat and the ViroVac® *Surgical Smoke Evacuator* to stop working.
- Installation of the ViroVac® *Surgical Smoke Evacuator* must be performed such that the intake and exhaust vents located on the bottom of the system are not obstructed. Failure to properly install the ViroVac® *Surgical Smoke Evacuator* may cause reduced performance, damage, and/or cause the ViroVac® *Surgical Smoke Evacuator* to be inoperable.
- The ViroVac® *Surgical Smoke Evacuator* must be located so there is 6 to 8 in. (15.24 to 20.32 cm) of clearance between the rear of the unit and any obstruction.
- Use only the power cord provided with the ViroVac® *Surgical Smoke Evacuator* and always connect it to a grounded electrical outlet.
- The ambient temperature during the operation of the ViroVac® *Surgical Smoke Evacuator* must be kept between 50 to 104°F (10 to 40°C).
- The relative humidity during operation of the ViroVac® *Surgical Smoke Evacuator* must be kept between 10% to 75%.
- An atmospheric pressure range of the ViroVac® *Surgical Smoke Evacuator* must be kept between 700 hPa to 1,060 hPa.
- Storage environmental ambient temperature of the ViroVac® *Surgical Smoke Evacuator* should be kept between 14 to 140°F (-10 to 60°C).
- Storage environmental relative humidity of the ViroVac® *Surgical Smoke Evacuator* should be kept between 10% to 75%.

## Warnings, Cautions, and Notices



### **DANGER**

Indicates an IMMEDIATELY hazardous situation which, if not avoided, WILL result in death or serious injury.



### **WARNING**

Indicates a POTENTIALLY hazardous situation which, if not avoided, CAN result in death or serious injury.



### **CAUTION**

Indicates a POTENTIALLY hazardous situation which, if not avoided, MAY result in minor or moderate injury.

### **NOTE:**

### **NOTE**

Indicates additional helpful information.



## Warnings, Cautions, and Notice (continued)

### Symbols



DANGER – HIGH VOLTAGE  
CAUTION – ELECTRICAL SHOCK HAZARD. DO NOT REMOVE COVER.  
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



WARNING



DANGER  
CAUTION – RISK OF EXPLOSION IF USED IN THE PRESENCE OF FLAMMABLE ANESTHETICS.



CAUTION



TYPE OF APPLIED PART

**IPX1**

PROTECTION AGAINST INGRESS OF WATER AS DETAILED IN IEC 60529



ALTERNATING CURRENT



PROTECTIVE EARTH GROUND



EQUIPOTENTIALITY



DENOTES THE DATE THE EQUIPMENT WAS MANUFACTURED



DENOTES THE MANUFACTURER OF THE DEVICE



NON-IONIZING RADIATION



CONSULT INSTRUCTIONS



REMOTE ACTIVATOR

# Glossary

Name	Description
A	Ampere, unit of electric current.
Automatic Activation Device	Device used to remotely operate the ViroVac® <i>Surgical Smoke Evacuator</i> to control the suction on/standby modes in conjunction with ESU activation saving filter life (sold separately).
CISPR	International Special Committee on Radio Interference
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
Filter	Completely enclosed device where surgical smoke is processed through four (4) stages of filtration.
Filter Life Indicator	A visual status indication of the life of filter in use.
Grounded Electrical Outlet	An electrical outlet that, in addition to the current-carrying contacts, has a third contact that serves for connection to a grounding conductor. Devices and equipment which are to benefit from this safety feature must have an appropriate three-prong plug which is inserted into this outlet. There are other possible arrangements for such outlets, including the use of lateral grounding contacts which make contact with metallic strips on the side of the plug. Also called by various other names, including grounding outlet, ground outlet, grounded receptacle, grounding receptacle, grounded socket, safety outlet, or three-prong outlet.
IEC	International Electrotechnical Commission
LED	Light-emitting diode (LED) is a two-lead semiconductor light source which emits light when activated.
Pneumatic Footswitch	Device used to remotely operate the ViroVac® <i>Surgical Smoke Evacuator</i> to control suction on/standby modes.
Power Cord	A cable used to connect the ViroVac® <i>Surgical Smoke Evacuator</i> to a grounded electrical outlet.
RF	A frequency or band of frequencies in the range $10^4$ to $10^{11}$ or $10^{12}$ Hz, suitable for use in telecommunications.
Suction On/Standby Button	Button to shift between two (2) modes of suction control: on and standby.
Surgical Smoke Evacuator	Device with one or more filters designed to evacuate surgical smoke and aerosol from the operative site, filter out the contaminants, and return filtered air to the operating room.
V(ac)	Volts Alternating Current

# Technical Support

## Customer/Technical Services:

+1 800.343.2324 (United States)

+1 716.835.7000 (International)

## Buffalo Filter LLC

5900 Genesee Street

Lancaster, New York 14086 USA

[www.buffalofilter.com](http://www.buffalofilter.com)

# Product Return

Perform the following procedures if the ViroVac® *Surgical Smoke Evacuator* is required to be returned to Buffalo Filter LLC:

1. Record the ViroVac® *Surgical Smoke Evacuator* model name and serial number.
2. Contact Customer/Technical Services at 1.800.343.2324, extension 266 (United States) or email at [bf.techsupport@filtrationgroup.com](mailto:bf.techsupport@filtrationgroup.com), and describe the problem.
3. If the problem cannot be resolved over the phone and the ViroVac® *Surgical Smoke Evacuator* must be returned for repair, a Return Material Authorization (RMA) number must be obtained from Customer/Technical Services before returning the ViroVac® *Surgical Smoke Evacuator*. The customer must print, fill out, and sign the return instructions form located at <http://buffalofilter.com/service-support/return-policy/>.
4. Use the original packaging material to return the ViroVac® *Surgical Smoke Evacuator* whenever possible. If the original packaging material is not available, ask Customer/Technical Services for advice on how to pack the ViroVac® *Surgical Smoke Evacuator* for return shipment.
5. A ship to address will be supplied by Customer/Technical Services.

# Disposable Part Orders

To order parts or accessories for the ViroVac® *Surgical Smoke Evacuator*, contact Customer Service.

Available accessories:

- Replacement Filters
- Fluid Trap
- Automatic Activation Device
- Tubing
- Reducer Fittings
- Electrosurgical Smoke Pencils & Adapters

# Replacement Part Orders

To order replacement parts for the ViroVac® *Surgical Smoke Evacuator*, contact Technical Services.

# 2

## System Overview

### General Description

The ViroVac® *Surgical Smoke Evacuator* is designed to evacuate and filter surgical smoke and aerosols created by the interface of surgical tools with tissue (examples: lasers, electrosurgery systems, and ultrasonic devices).

There are three (3) system models of the ViroVac® *Surgical Smoke Evacuator*:

MODEL	DESCRIPTION
VV120	ViroVac® 120V <i>Surgical Smoke Evacuator</i>
VV220	ViroVac® 220V <i>Surgical Smoke Evacuator</i>
DKVV220	ViroVac® 220V <i>Surgical Smoke Evacuator</i> with exhaust capture port

### Product Layout

The external instrument layout is the same for all the ViroVac® *Surgical Smoke Evacuator* models. See page 2-2 for the layout of the instrument from the front view (**Figure 2-1**) and the rear view (**Figure 2-2**). Descriptions of the instruments, which are located on the front and rear panels of the ViroVac® *Surgical Smoke Evacuator*, are denoted on page 2-3, and accessories are noted in (**Figure 2-3**) on page 2-4.

# Product Layout (continued)

## Front View

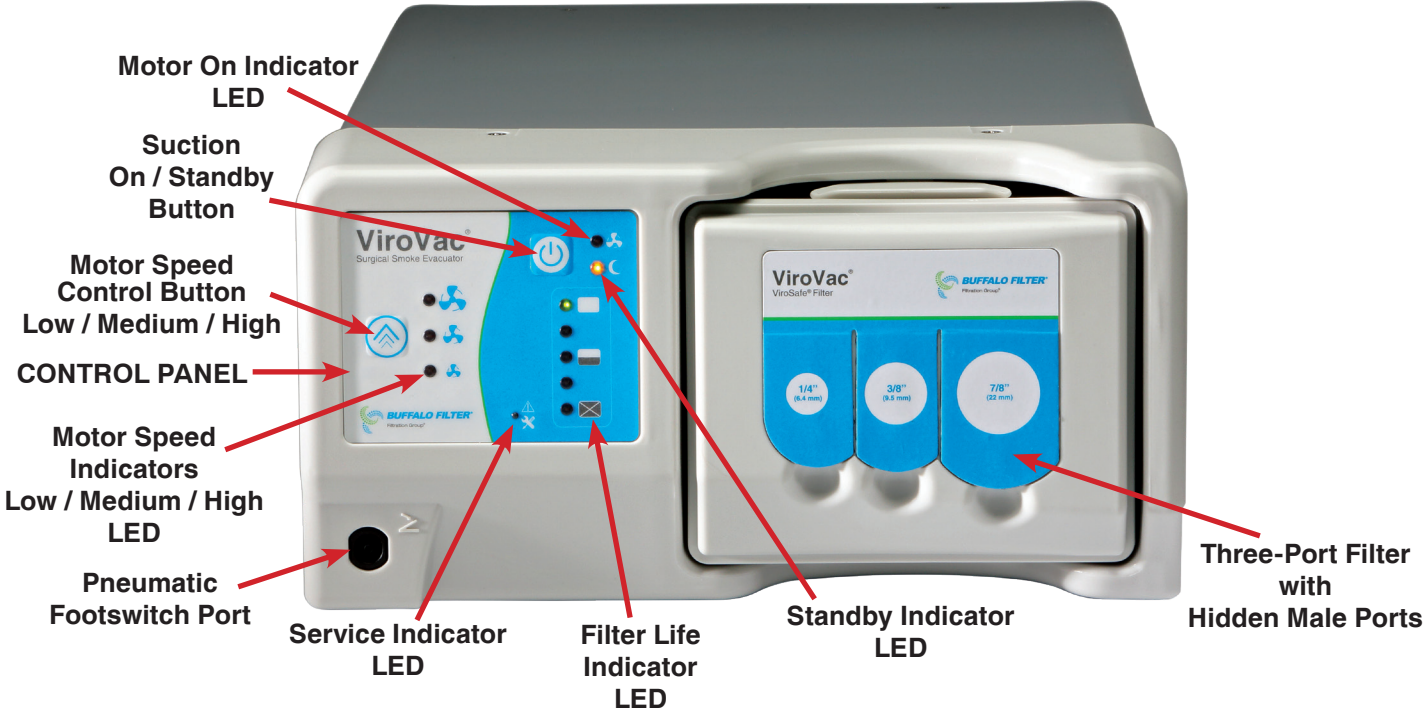


Figure 2-1

## Rear View



Figure 2-2

## Front and Rear Panel Instrument Descriptions

**NOTE:** The Control Panel contains the following LED indicators: Motor On, Standby, Motor Speed, Filter Life, and Service. Read all instructions before servicing or operating the ViroVac® *Surgical Smoke Evacuator* or installing accessories.

### POWER ON/OFF

To power on the ViroVac® *Surgical Smoke Evacuator*, connect the supplied power cord to a grounded electrical outlet and the power receptacle at the rear of the ViroVac® *Surgical Smoke Evacuator*. Once power has been applied, the Standby LED illuminates the color yellow. Turn the ViroVac® *Surgical Smoke Evacuator* main power off, by unplugging the power cord (**Figure 2-3**) on page 2-4 from the power receptacle on the ViroVac® *Surgical Smoke Evacuator* or the grounded electrical outlet.

### SUCTION ON/STANDBY BUTTON

Press the Suction On/Standby Button on the ViroVac® *Surgical Smoke Evacuator* to shift between the two (2) modes: On or Standby. The Suction On LED illuminates the color green and the Standby LED illuminates the color yellow.

### MOTOR SPEED CONTROL

Press the Motor Speed Control Button on the ViroVac® *Surgical Smoke Evacuator* to adjust between the three (3) motor speed settings: low, medium, and high. The motor speed should be set at the lowest practical setting to effectively remove the surgical smoke from the operative site.

### FILTER LIFE INDICATOR

The Filter Life Indicator on the Control Panel of the ViroVac® *Surgical Smoke Evacuator* provides a visual indication of the status of the life of the filter in use and will automatically adjust according to the motor speed setting selected.

**Low motor speed setting = up to 35 hours of Filter Life**

**Medium motor speed setting = up to 24 hours of Filter Life**

**High motor speed setting = up to 18 hours of Filter Life**

Install an unused filter into the ViroVac® *Surgical Smoke Evacuator* as per the installation instructions. When the Motor On LED is illuminated, the Filter Life Indicator will light up the uppermost green LED indicating 100% filter life. The indicator will progress through subsequent green LEDs to a yellow LED as time elapses and begin flashing RED to indicate the filter has expired and requires replacement.

When the maximum filter life has expired and the ViroVac® *Surgical Smoke Evacuator* is not powered off for greater than six (6) hours or if the main power is disconnected, a new filter is required to activate the ViroVac® *Surgical Smoke Evacuator* and to make it operational.

### PNEUMATIC FOOTSWITCH PORT

The ViroVac® *Surgical Smoke Evacuator* is equipped with a pneumatic footswitch (**Figure 2-3**) on page 2-4 as an alternative method to using the Suction On/Standby Button. The pneumatic footswitch may be inserted by plugging it into the pneumatic footswitch port located on the front of the ViroVac® *Surgical Smoke Evacuator*. The pneumatic footswitch may be controlled by depressing the footswitch pedal to shift between the Suction On and Standby modes.

### AUTOMATIC ACTIVATION DEVICE PORT

The Automatic Activation Device (sold separately) may also be installed by plugging it into the Automatic Activation Device port located on the rear of the ViroVac® *Surgical Smoke Evacuator*. For directions on using the Automatic Activation Device, please see the instructions that accompany the Automatic Activation Device.



# Accessories



120 Power Cord



220 Power Cord



Pneumatic Footswitch



CD Electronic Manual

Figure 2-3

# Major Assemblies

## Fascia Assembly

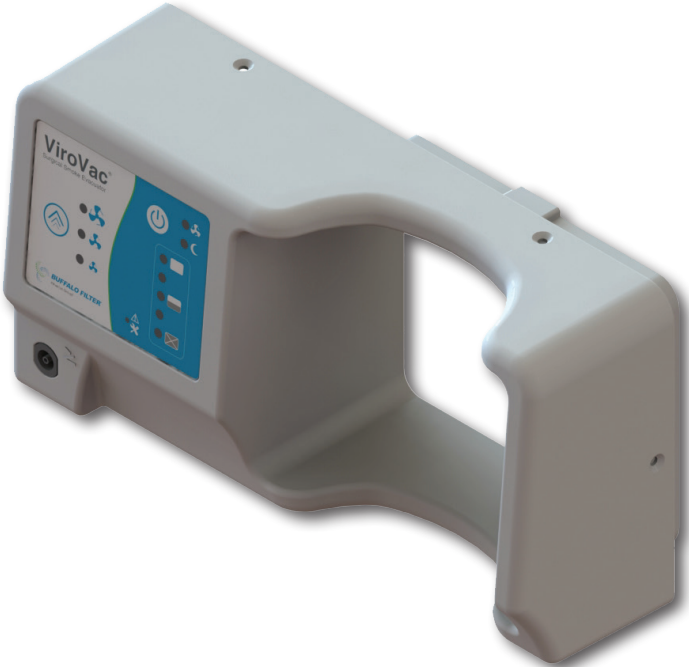
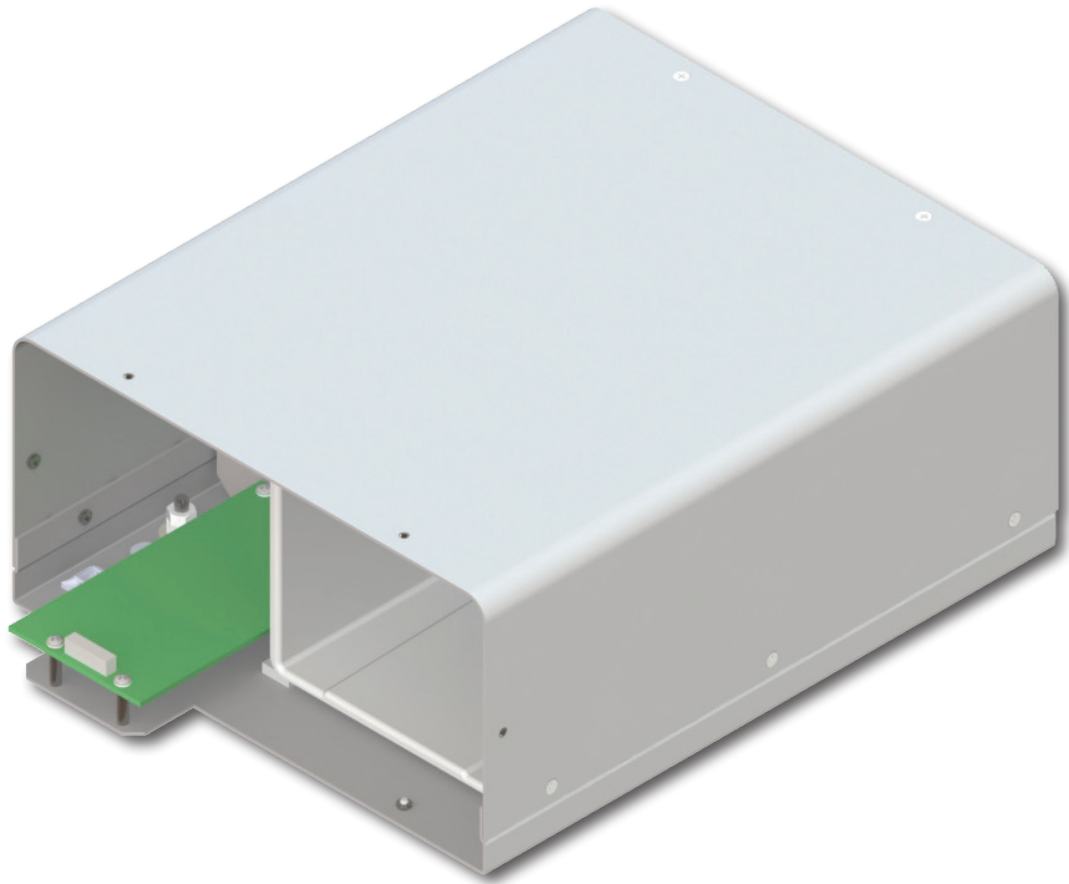


Figure 2-4

## Major Assemblies (continued)

### Body Assembly

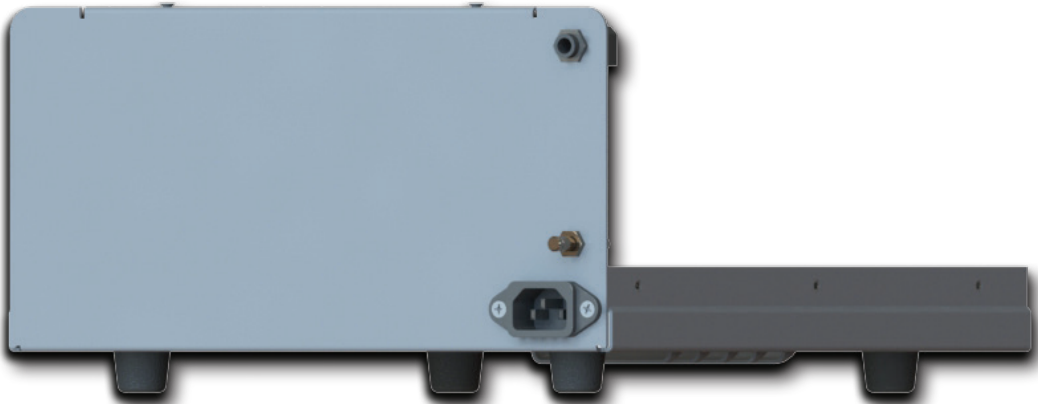


**Figure 2-5**

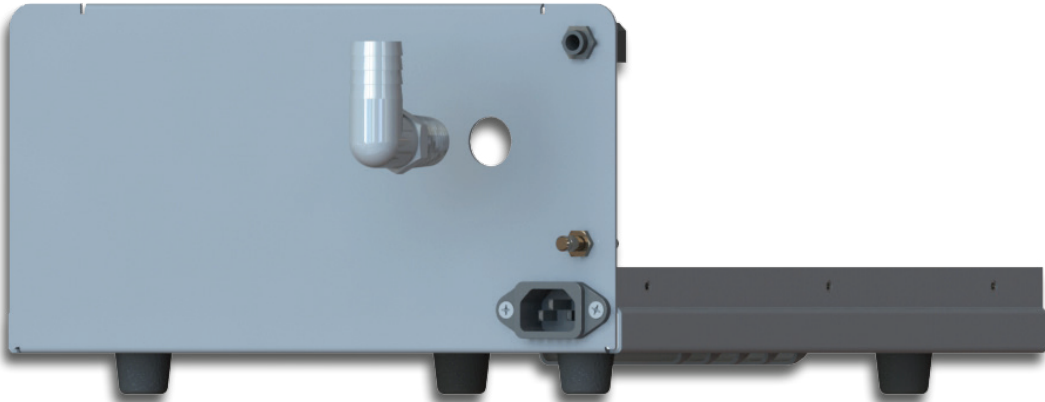


# Major Assemblies (continued)

## Bottom Assembly



Models VV120 and VV220

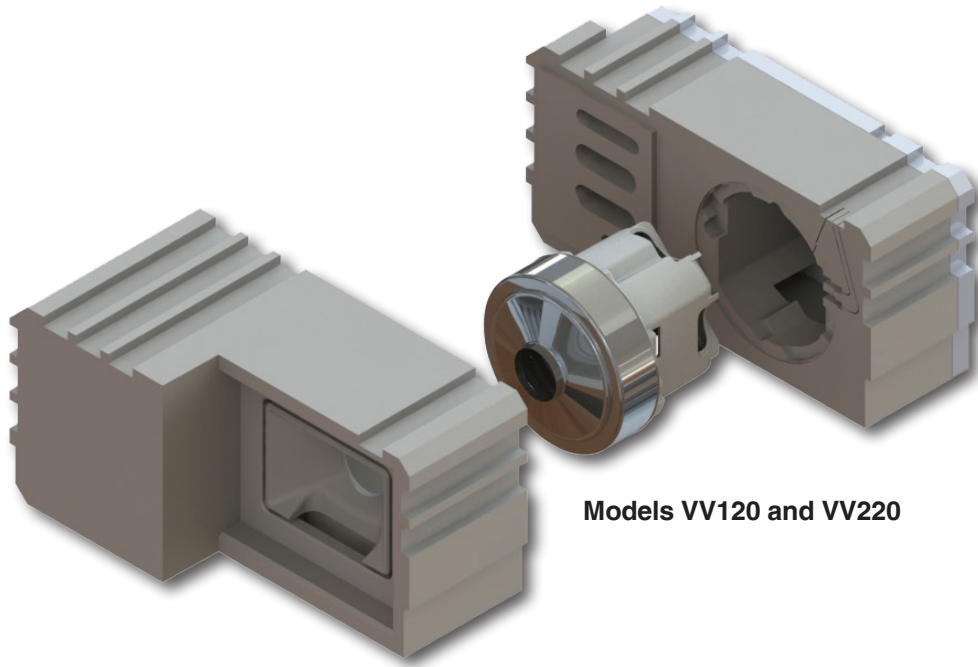


Model DKVV220

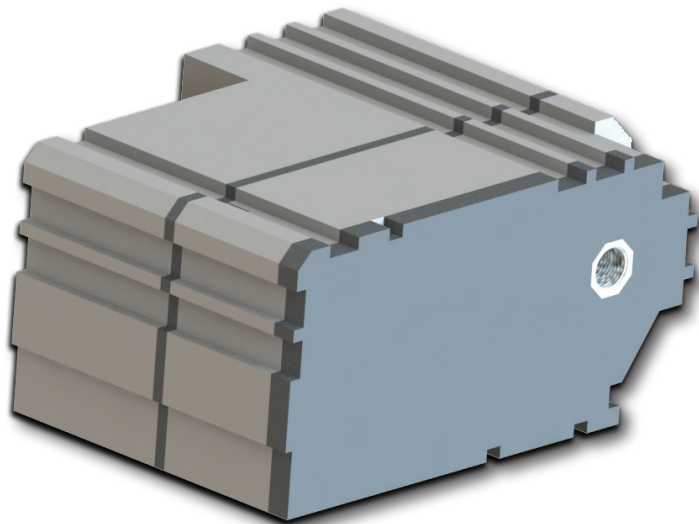
Figure 2-6

## Major Assemblies (continued)

### Motor Block Assembly



Models VV120 and VV220



Model DKVV20

**Figure 2-7**



# 3

## System Information

### System Specifications

Specifications pertain to the use of the ViroVac® *Surgical Smoke Evacuator*, both domestically and internationally:

- Both the 100/120 V(ac), 50/60 Hz and the 220/240 V(ac), 50/60 Hz ViroVac® *Surgical Smoke Evacuator* models comply with IEC 60601-1 electrical specifications.
- Type of protection against electrical shock (UL 60601-1, Clause 5.1): Class I
- Degree of protection against electric shock (UL 60601-1, Clause 5.2): Type CF Applied Part
- Degree of protection against ingress of water (UL 60601-1, Clause 5.3): IPX1
- Method of sterilization or disinfection recommended (UL 60601-1, Clause 5.4):
- Degree of safety of application in the presence of flammable anesthetic mixture with air, oxygen, or nitrous oxide (UL 60601-1, Clause 5.5): Not Suitable
- Mode of operation (UL 60601-1, Clause 5.6): Continuous
- The fuses on the circuit board are to be serviced by an authorized technician.
  - > 100/120 V(ac), 50/60 Hz use 10 A 250 Volt Fuse (Slo-Blo), (F1, F2)
  - > 220/240 V(ac), 50/60 Hz use 8 A 250 Volt Fuse (Slo-Blo), (F1, F2)
- The ViroVac® *Surgical Smoke Evacuator* requires special precautions regarding electromagnetic compatibility (EMC) and needs to be installed according to EMC information found in this manual.
- The ViroVac® *Surgical Smoke Evacuator* utilizes mobile radio frequency (RF) communications equipment that can affect medical electrical equipment.

## System Specifications (continued)

- Both the 100/120 V(ac), 50/60 Hz and the 220/240 V(ac), 50/60 Hz ViroVac® *Surgical Smoke Evacuator* models comply with IEC 60601-1 electrical specifications.
- Type of protection against electrical shock (UL 60601-1, Clause 5.1): Class I
- The ViroVac® *Surgical Smoke Evacuator* has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the ViroVac® *Surgical Smoke Evacuator* is operated in a commercial environment. The ViroVac® *Surgical Smoke Evacuator* generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the guidelines set forth by Buffalo Filter LLC, may cause harmful interference to radio communications. Operation of the ViroVac® *Surgical Smoke Evacuator* in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their expense.

The ViroVac® *Surgical Smoke Evacuator* operates in the following radio frequency specifications:

RX modulation: Pulse-width coded, AM 100% modulation

TX Frequencies: Manchester encoded, A =  $f_c \pm 423.75\text{kHz}$ , B =  $f_c \pm 484.29\text{kHz}$

Low bit: transition A to B

High bit: transition B to A

- To isolate the ViroVac® *Surgical Smoke Evacuator* from supply mains, unplug the power cord from the power receptacle on the ViroVac® *Surgical Smoke Evacuator* or receptacle in the wall. Position the equipment to allow for ease of unplugging the power cord.
- Potential Equalization Conductor: Terminal located on back panel for connection of potential equalization. The conductor complies with requirements per IEC 60601-1.
- The ViroVac® *Surgical Smoke Evacuator* and all Filters are not intended for contact with patients.
- In Europe, the ViroVac® *Surgical Smoke Evacuator* is a Short Range Device, RF Class I, per Commission Decision 2006/177/EC with no restrictions. This product operates at 13.56 MHz with an H-field strength of  $-4.61\text{dBuA/m}$  at 10 m. Hereby, Buffalo Filter declares that the ViroVac® *Surgical Smoke Evacuator* radio equipment is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: <http://www.buffalofilter.com/service-support/frequently-asked-questions/>.

## System References

### Performance References

<b>PERFORMANCE*</b>		
Model Name / Description		Models VV120 and VV220
Maximum Flow Setting (CFM-U.S.)		
Standard Hose I.D.		
	7/8 in.	25 CFM **
	3/8 in.	4.5 CFM
	1/4 in.	2 CFM
Standard Hose I.D.		
	22 mm	708 LPM **
	9.5 mm	130 LPM
	6.4 mm	57 LPM
Dimensions (H x W x D)	in.	6 x 11 x 15.5
Dimensions (H x W x D)	cm	15.2 x 27.9 x 39.4
Weight	lb	12.0
Weight	kg	5.0
Noise Level, dBA	maximum	55.0 dBA
Voltage Available		100/120 V(ac), 220/240 V(ac)
Frequency, auto sensed		50/60 Hz

\*For reference purposes only \*\*Using a new 7/8 in. (22 mm) tubing

<b>PERFORMANCE*</b>		
Model Name / Description		Model DKVV220
Maximum Flow Setting (CFM-U.S.)		
Standard Hose I.D.		
	7/8 in.	18.4 CFM **
Standard Hose I.D.		
	22 mm	521 LPM **
Dimensions (H x W x D)	in.	6 x 11 x 15.5
Dimensions (H x W x D)	cm	15.2 x 27.9 x 39.4
Weight with filter	lb / kg	12.0 / 5.0
Weight without filter	lb / kg	9.5 / 4.0
Voltage Available		220/240 V(ac)
Motor	watt	800 ± 40
Motor Static Suction	kPa (6.5 mm orifice)	21.10

\*For reference purposes only \*\*Using a new 7/8 in. (22 mm) tubing at the exhaust capture.

## System References (continued)

### Electromagnetic Compatibility Information

Table 1

<b>Guidance and Manufacturer's Declaration - Electromagnetic Emissions</b>		
<p>The ViroVac® <i>Surgical Smoke Evacuator</i> is intended for use in the electromagnetic environment specified below.</p> <p>The customer or user of the ViroVac® <i>Surgical Smoke Evacuator</i> should ensure that it is used in such an environment.</p>		
<b>Emissions Test</b>	<b>Compliance</b>	<b>Electromagnetic Environment - Guidance</b>
RF Emissions CISPR 11	Group 1	The ViroVac® <i>Surgical Smoke Evacuator</i> uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR 11	Class A	The ViroVac® <i>Surgical Smoke Evacuator</i> is suitable for use in all establishments, other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emissions IEC 61000-3-2	Class A	Not applicable.
Voltage Fluctuations/ Flicker Emissions IEC 61000-3-3	Class A	Not applicable.

## System References (continued)

### Electromagnetic Compatibility (continued)

Table 2


Guidance and Manufacturer's Declaration - Electromagnetic Immunity			
The ViroVac® <i>Surgical Smoke Evacuator</i> is intended for use in the electromagnetic environment specified below. The customer or user of the ViroVac® <i>Surgical Smoke Evacuator</i> should ensure that it is used in such an environment.			
Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electromagnetic discharge (ESD) IEC 61000-4-2	± 6 kV contact  ± 8 kV air	± 6 kV contact  ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines  ± 1 kV for input/output lines	± 2 kV for power supply lines  ± 1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV differential mode  ± 2 kV common mode	± 1 kV differential mode  ± 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions, and voltage variations on power supply input lines. IEC 61000-4-11	< 5 % $U_T$ (> 95 % dip in $U_T$ ) for 0.5 cycle  40 % $U_T$ (60 % dip in $U_T$ ) for 5 cycles  70 % $U_T$ (30 % dip in $U_T$ ) for 25 cycles  < 5 % $U_T$ (> 95 % dip in $U_T$ ) for 5 s	< 5 % $U_T$ (> 95 % dip in $U_T$ ) for 0.5 cycle  40 % $U_T$ (60 % dip in $U_T$ ) for 5 cycles  70 % $U_T$ (30 % dip in $U_T$ ) for 25 cycles  < 5 % $U_T$ (> 95 % dip in $U_T$ ) for 5 s	Mains power quality should be that of a typical commercial or hospital environment.  If the user of the ViroVac® <i>Surgical Smoke Evacuator</i> requires continued operation during power main interruptions, it is recommended the ViroVac® <i>Surgical Smoke Evacuator</i> be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.



## System References (continued)

### Electromagnetic Compatibility (continued)

Table 3

Guidance and Manufacturer's Declaration - Electromagnetic Emissions			
The ViroVac® <i>Surgical Smoke Evacuator</i> is intended for use in the electromagnetic environment specified below. The customer or user of the ViroVac® <i>Surgical Smoke Evacuator</i> should ensure that it is used in such an environment.			
Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the ViroVac® <i>Surgical Smoke Evacuator</i> including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	$d = 1.7 \sqrt{P}$ 80 MHz to 800 MHz
			$d = 2.3 \sqrt{P}$ 800 MHz to 2.5 GHz
			$d = [3.5/V1] \sqrt{P}$
Conducted RF IEC 61000-4-6	150 kHz to 80 MHz		Where P is the maximum output power rating of the transmitter in Watts (W) according to the transmitter manufacturer, and D is the recommended separation distance in meters (M).
			Field strength from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range.
			Interference may occur in the vicinity of equipment marked with the following symbol: 
<p>Field strengths from fixed transmitters, such as base stations for radio cellular / cordless telephones and land mobile radios, amateur radios, AM and FM radio broadcasts, and TV broadcasts cannot be predicted theoretically with accuracy.</p> <p>To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the ViroVac® <i>Surgical Smoke Evacuator</i> is used exceeds the applicable RF compliance level above, the ViroVac® <i>Surgical Smoke Evacuator</i> should be observed to verify normal operation.</p> <p>If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the ViroVac® <i>Surgical Smoke Evacuator</i>.</p> <p>Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</p>			

**NOTE:** At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

**NOTE:** These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structure, objects, and people.

## System References (continued)

### Electromagnetic Compatibility (continued)

Table 4

Recommended Separation Distance Between Portable and Mobile RF Communications Equipment and the ViroVac® Surgical Smoke Evacuator @ 3 Vrms			
<p>The ViroVac® Surgical Smoke Evacuator is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled.</p> <p>The customer or the user of the ViroVac® Surgical Smoke Evacuator can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the ViroVac® Surgical Smoke Evacuator as recommended below, according to the maximum output power of the communications equipment.</p>			
Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80MHz	80 kHz to 800 MHz	800 kHz to 2.5 GHz
	$d = \left[ \frac{3.5}{v_1} \right] \sqrt{P}$	$d = \left[ \frac{3.5}{E_1} \right] \sqrt{P}$	$d = \left[ \frac{3.5}{E_1} \right] \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.34	0.34	0.74
1	1.7	1.7	2.3
10	3.7	3.7	7.4
100	11.7	11.7	23.3
<p>For transmitters rated at a maximum output power not listed above, the recommended separation distance (D) in meters (M) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output rating of the transmitter in watts (W) according to the transmitter manufacturer.</p>			

**NOTE:** At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

**NOTE:** These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structure, objects, and people.



# 4

## System Operation

### Installation

1. Attach the power cord (**Figure 4-1**) on page 4-2 to the power receptacle on the rear of the ViroVac® *Surgical Smoke Evacuator* and into a grounded electrical outlet (**Figure 4-1**) on page 4-2.
2. Route the power cord to prevent a tripping hazard or crimping of cords, which could cause unreliable operation or electric shock.
3. Install the filter (see filter installation instructions on page 4-3).
4. Insert the pneumatic footswitch plug (**Figure 4-1**) on page 4-2 into the pneumatic footswitch port located on the front of the ViroVac® *Surgical Smoke Evacuator* (**Figure 4-3**) on page 4-2.
5. Ensure that any smoke evacuation capture accessory is fully installed in the filter port (**Figure 4-3**) on page 4-2.
6. Route the pneumatic footswitch (**Figure 4-1**) on page 4-2 and any other attached accessories to prevent a tripping hazard or crimping of cords, which could cause unreliable operation.
7. Activate the ViroVac® *Surgical Smoke Evacuator* by:
  - a. Pressing the Suction On/Standby Button on the control panel (**Figure 4-3**) on page 4-2.
  - b. Depressing and releasing the pneumatic footswitch (if connected) (**Figure 4-1**) on page 4-2.
8. Adjust the suction level to the desired setting by pressing the Motor Speed Control Button (**Figure 4-1**) on page 4-2 while the ViroVac® *Surgical Smoke Evacuator* is activated. Noise created by the ViroVac® *Surgical Smoke Evacuator* may be minimized by selecting the lowest vacuum setting that effectively clears the operative field of surgical smoke.
9. Deactivate the ViroVac® *Surgical Smoke Evacuator* by:
  - a. Pressing the Suction On/Standby Button on the control panel (**Figure 4-3**) on page 4-2.
  - b. Depressing and releasing the pneumatic footswitch (if connected) (**Figure 4-1**) on page 4-2.



See front and rear panel instrument descriptions on page 2-3 for additional operational details.



Figure 4-1



Figure 4-2

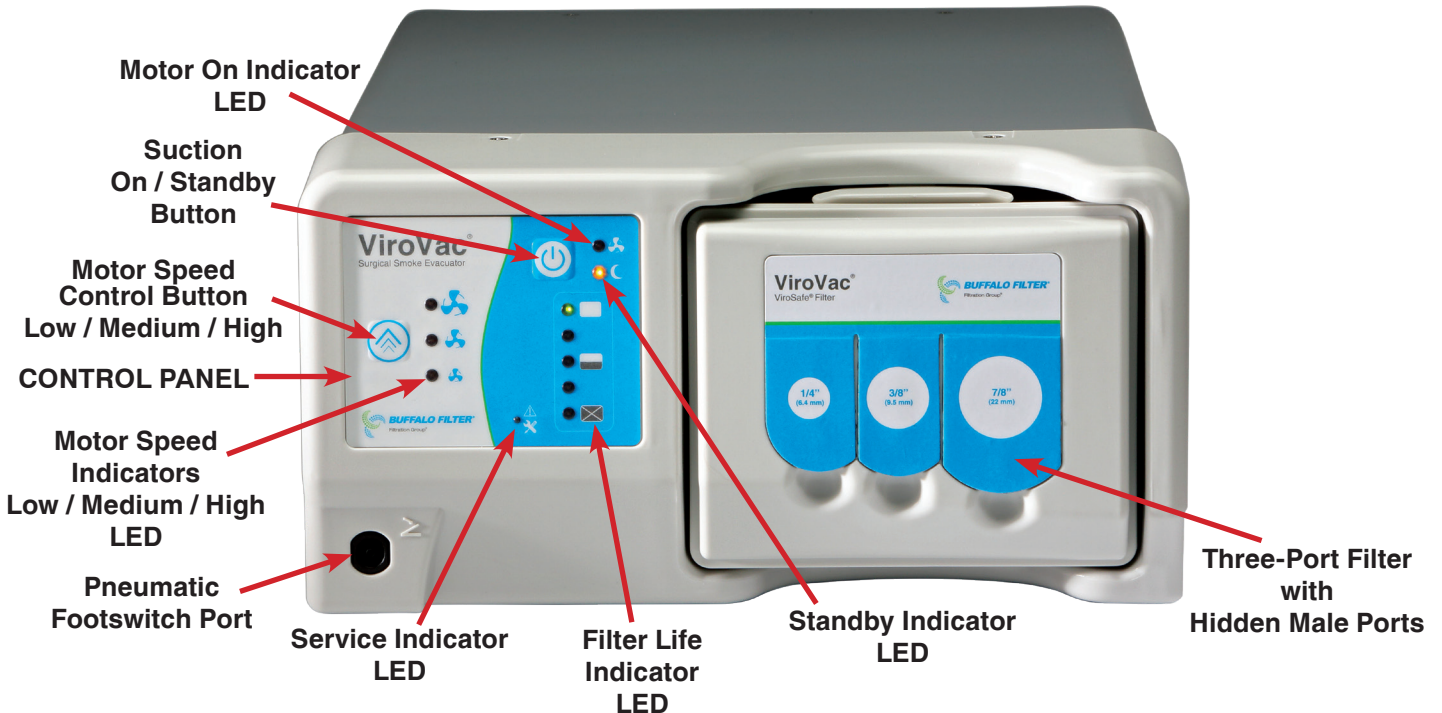


Figure 4-3

# Filter Instructions

## Filter Installation

**NOTE:** Failure to replace the filter when indicated, will result in the ViroVac® *Surgical Smoke Evacuator* to become inoperable until a new filter is installed. The ViroVac® *Surgical Smoke Evacuator* will continue to operate until it is turned off and it will not operate until a new filter is installed.

**NOTE:** Replace the filter when the filter life indicator LED (**Figure 4-4**) flashes red (0% life remaining). Failure to change the filter will affect the performance of the ViroVac® *Surgical Smoke Evacuator*.

**NOTE:** Before installing the filter, be sure that the ViroVac® *Surgical Smoke Evacuator* is placed in the standby mode by pressing the Suction On/Standby Button (**Figure 4-4**).



Using any other filter or accessory not supplied by Buffalo Filter LLC may cause damage to the system and/or cause the ViroVac® *Surgical Smoke Evacuator* to be inoperable.

1. Remove the filter from the shipping box and discard any protective wrapping.
2. Inspect the filter for damage, which may have occurred during shipping and storage. Do not install any filter with visible signs of structural damage.
3. Insert the filter into the filter chamber. Check that the filter is installed completely against the bottom of the filter chamber and that the filter lock is fully engaged (**Figure 4-5**) on page 4-4.



**Figure 4-4**



## Filter Instructions (continued)

### Filter Removal

**NOTE:** Before removing the filter, be sure that the ViroVac® *Surgical Smoke Evacuator* is placed in the Standby mode by pressing the Suction On/Standby Button (**Figure 4-4**) on page 4-3.



Failure to change this filter may result in decreased efficiency and contamination of the electric motor, vacuum pump, and sound absorbing media within the system, or non-operation of ViroVac® *Surgical Smoke Evacuator*.

1. After the filter life has expired, turn the ViroVac® *Surgical Smoke Evacuator* to the standby mode by pressing the Suction On/Standby Button (**Figure 4-4**) on page 4-3.
2. Remove all accessories attached to the filter.
3. Remove the filter from the ViroVac® *Surgical Smoke Evacuator* (**Figure 4-5**) and dispose of the filter according to your local codes or regulations and facility policy.
4. Clean the ViroVac® *Surgical Smoke Evacuator* with appropriate germicide prior to reuse and follow the indicated instructions for maintenance and installation of a new filter.



**Figure 4-5**

# 5

## System Maintenance

### General Maintenance

It is recommended that periodic inspection and performance testing be completed by a qualified facility biomedical technician to ensure continued safe and effective operation of the ViroVac® *Surgical Smoke Evacuator*.

### Cleaning



Disconnect the power from the ViroVac® *Surgical Smoke Evacuator* before attempting to clean the ViroVac® *Surgical Smoke Evacuator*.

- Unplug the ViroVac® *Surgical Smoke Evacuator*.
- Wipe the ViroVac® *Surgical Smoke Evacuator* with a damp cloth containing mild disinfectant solution or soapy water.
- Wipe the ViroVac® *Surgical Smoke Evacuator* with a dry clean cloth.
- Do not steam sterilize the ViroVac® *Surgical Smoke Evacuator*.

### Inspection

**NOTE:** The ViroVac® *Surgical Smoke Evacuator* should be visually inspected at least once every year. The inspection should include the checks listed below.

- Damage to the power cord or the power inlet module.
- Obvious external or internal damage to the ViroVac® *Surgical Smoke Evacuator* and the filter.
- Keep the bottom vents free from any obstruction to prevent overheating (**Figure 5-1** and **Figure 5-2**) on page 5-2.
- Keep the area around the unit free from obstructions that would prevent the ViroVac® *Surgical Smoke Evacuator* to exhaust.
- Change the hoses and the filter as needed.
- The service light will come on when the motor has reached 500 brush hours. This will indicate that the motor will likely need to be replaced.



# Inspection (continued)

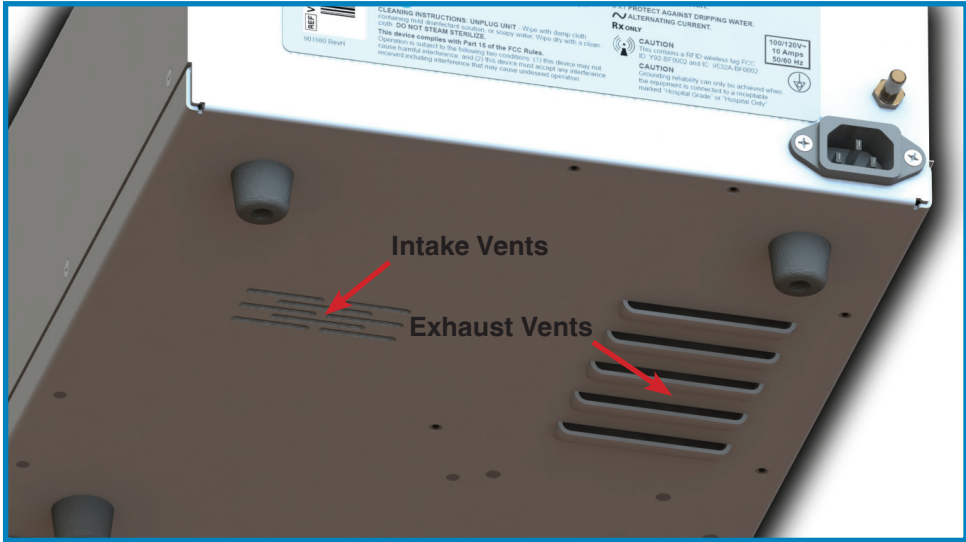


Figure 5-1



Figure 5-2

# 6

## Troubleshooting

### Troubleshooting Table

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
ViroVac® <i>Surgical Smoke Evacuator</i> is on but suction is minimal or none.	Filter is not seated completely.	Reinstall the filter, press firmly into place.
	Filter is clogged.	Replace the filter with a new filter from the manufacturer.
	Vacuum tubing is clogged.	Replace the vacuum tubing with the manufacturer's products.
	Motor/blower is obstructed.	Call the facility's biomed department or the manufacturer's Technical Services.
ViroVac® <i>Surgical Smoke Evacuator</i> does not function even though On/Standby Button is depressed. No lights or locked lights.	Not plugged into an electrical outlet.	Check the grounded electrical outlet connection and the power receptacle located at the rear of the ViroVac® <i>Surgical Smoke Evacuator</i> .
	Fuse(s) are blown.	Disconnect the power. Remove the fascia and the body. Check if one of the two fuses on the circuit board (PCB) are blown. Replace fuse(s).
	Electronic ViroVac® <i>Surgical Smoke Evacuator</i> failure.	Call the facility's biomed department or the manufacturer's Technical Services.
	Filter life has expired or invalid filter installed.	Replace filter.
	PCB is not functioning.	Apply the power directly to the motor. If the motor spins, the PCB is not functioning. Replace the PCB. Perform a hipot test and current leakage test after replacing the PCB or the motor.

## Troubleshooting Table (continued)

<b>PROBLEM</b>	<b>POTENTIAL CAUSE</b>	<b>CORRECTIVE ACTION</b>
Buttons not functioning on control panel.	Fuse(s) are blown.	Disconnect the power. Remove the fascia and the body. Check if one of the two fuses on the circuit board (PCB) are blown. Replace fuse(s).
	Key pad not connected firmly.	Once the fascia is removed, check if key pad is plugged in and fully seated. If seated, replace key pad.
	PCB is not functioning.	Apply the power directly to the motor. If the motor spins, the PCB is not functioning. Replace the PCB. Perform a hipot test and current leakage test after replacing the PCB or the motor.
Motor not spinning.	Fuse(s) are blown.	Disconnect the power. Remove the fascia and the body. Check if one of the two fuses on the circuit board (PCB) are blown. Replace fuse(s).
	PCB is not functioning.	Apply the power directly to the motor. If the motor spins, the PCB is not functioning. Replace the PCB. Perform a hipot test and current leakage test after replacing the PCB or the motor.
	Motor not functioning.	Apply the power directly to the motor. If the the motor does not spin, then replace motor. Perform a hipot test after replacing motor.
	Motor has stopped after being used for several hours.	Check the breather filter, the motors internal thermal fuse may have tripped. Check for any obstruction that may limit air flow. If the breather is clogged replace and allow at least 30 minutes for the motor to cool down and reset the thermal fuse. If the aforementioned does not solve the motor shutting down, then replace the motor. Perform a hipot test after replacing motor.

## Troubleshooting Table (continued)

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
Filter not being recognized.	The filter has exhausted its useful life.	Replace the filter.
	If a new filter does not resolve the issue, remove the cover and inspect the antenna connection.	Disconnect the power. Unplug the antenna from the PCB, and inspect the connector and wires. If there is any indication of a bad crimp, replace the antenna. If the issue still persists, replace the antenna.
	PCB is not functioning.	Apply the power directly to the motor. If the motor spins, the PCB is not functioning. Replace the PCB. Perform a hipot test and current leakage test after replacing the PCB or the motor.

**NOTE:** Two (2) 10A fuses for 100/120 ViroVac® *Surgical Smoke Evacuators* or two (2) 8A fuses for 220/240 ViroVac® *Surgical Smoke Evacuators* are located on the circuit board (PCB) (**Figure 6-1**) on page 6-4 within the housing of the system. The fuses electrically protect both the ViroVac® *Surgical Smoke Evacuator* and the operator from damage or injury. If the ViroVac® *Surgical Smoke Evacuator* is overheating or if there is an electrical surge, fuse(s) will break and the ViroVac® *Surgical Smoke Evacuator* will not operate.

**NOTE:** The fuses are CRITICAL COMPONENTS and must be replaced with exact parts. Contact Buffalo Filter LLC for fuses.



To check or replace fuse(s), see the fascia disassembly instructions and body disassembly instructions on pages 7-4 and 7-5, respectively.

# Troubleshooting Table (continued)

Fuse Locations

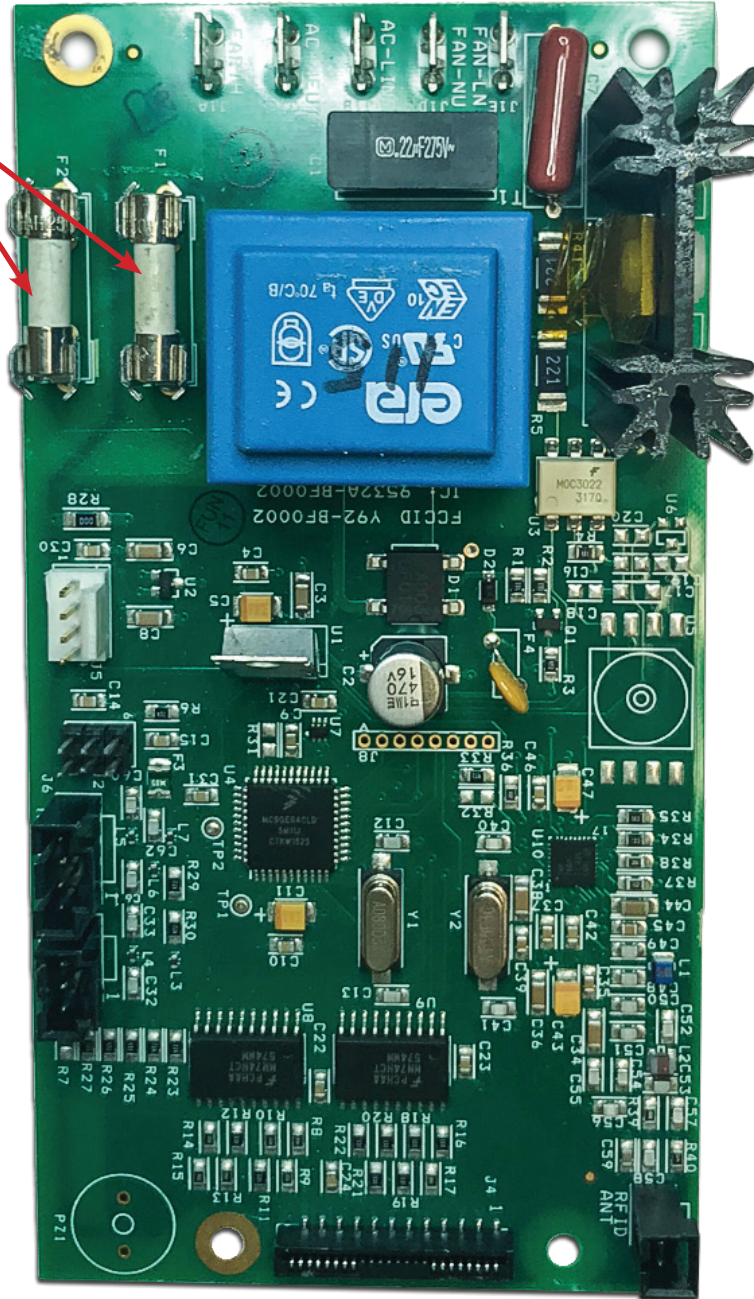


Figure 6-1

# 7

## Repair

### Precautionary Warnings

**NOTE:** Proper care and maintenance of the ViroVac® *Surgical Smoke Evacuator* is required to ensure safe operation and service. Function and operation of the ViroVac® *Surgical Smoke Evacuator* shall be checked after each replacement session to protect patient and user.



Always switch off and unplug the ViroVac® *Surgical Smoke Evacuator* before disassembling or reassembling.



Wait at least three (3) minutes to allow stored energy to dissipate after the power is disconnected before replacing any parts.



Do not touch any exposed wiring or conductive surfaces while ViroVac® *Surgical Smoke Evacuator* is disassembled and energized. Never wear a grounding strap when working on an energized unit.



Perform a hipot test and current leakage test if the following parts have been replaced:

- PCB
- Motor

## Precautionary Warnings (continued)



To prevent possible injuries during disassembly or assembly, avoid sharp edges of metal parts or the printed circuit board to avoid injuring yourself.



The ViroVac® *Surgical Smoke Evacuator* contains electrostatic-sensitive components. When repairing or servicing, work at a static-control workstation. Wear a grounding strap when handling electrostatic-sensitive components, except when working on an energized ViroVac® *Surgical Smoke Evacuator*. Handle circuit boards by their nonconductive edges. Use an antistatic container for transport of electrostatic-sensitive components and circuit boards.



When disconnecting cables, always hold the connector. Pulling the cable may result in damage of the wires.

## Tools

Name	Specifications/Remarks
Philips Screwdriver	Size #1
Socket with Extension or Nut Driver	5/16 in. socket and 7/16 in. socket
Multimeter	Continuity function
Needle-nose Pliers	
ESD Protection	When handling PCBs
Hipot Tester	3-wire product to perform an isolation test set for 1.5 kV at 1 second.
Electrical Safety Tester	Current is $\leq 3$ mA



## Tests

### Electrical Insulation Test

1. Connect the ViroVac® *Surgical Smoke Evacuator* with a hipot tester according to the tester's instructions.
2. Turn on the ViroVac® *Surgical Smoke Evacuator*.
3. Verify that the dielectric withstand is 1.5 kV at 1 second.

### Leakage Current Test

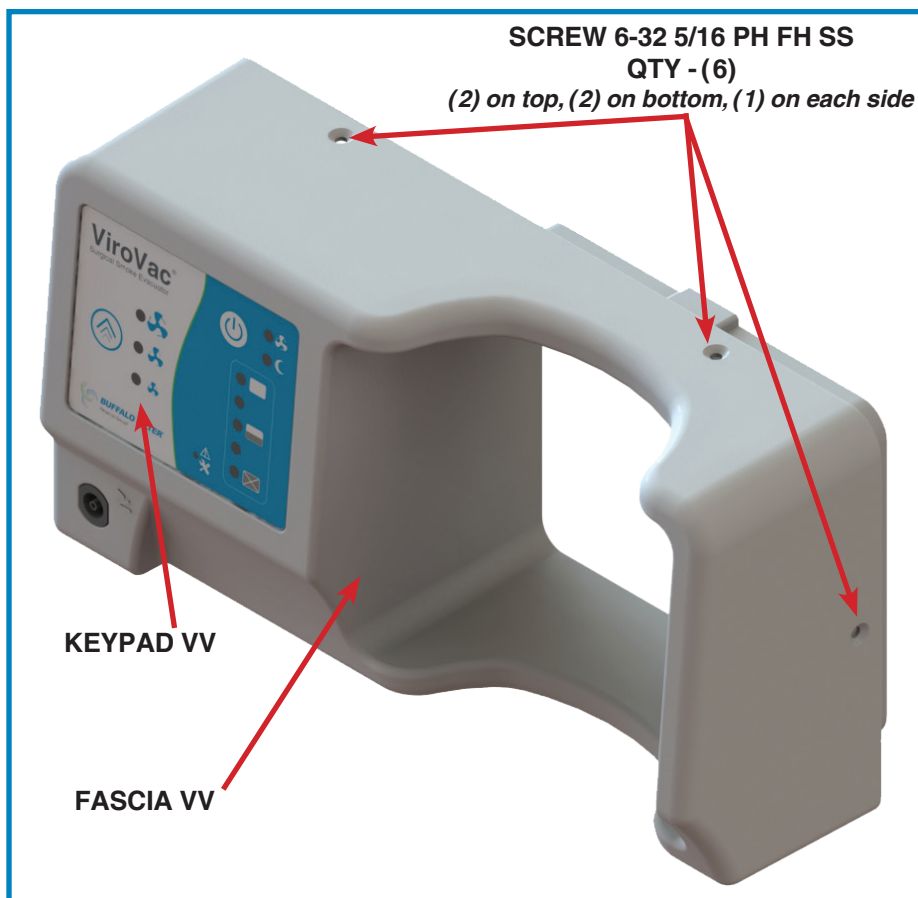
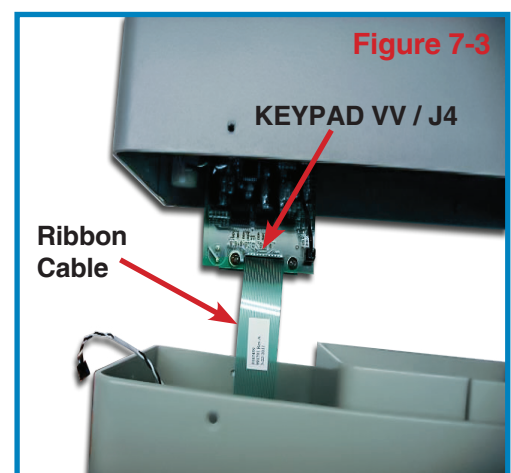
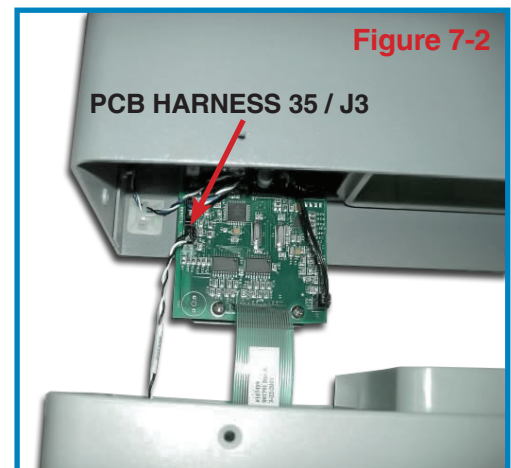
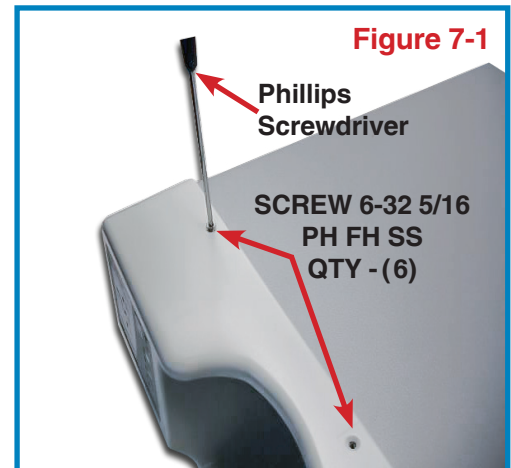
1. Connect the ViroVac® *Surgical Smoke Evacuator* with an electrical safety tester according to the tester's instructions.
2. Turn on the ViroVac® *Surgical Smoke Evacuator*.
3. Verify that the device leakage current is  $\leq 3$  mA.



# Disassembly

## Fascia

1. Remove the filter.
2. Locate and remove the six (6) screws which secure the fascia assembly to the body assembly using a phillips screwdriver (**Figure 7-1**).
3. Carefully remove the fascia from the body assembly. Taking care not to damage the connected wire harnesses.
4. Disconnect the PCB HARNESS 35 from the printed circuit board connector J3 (**Figure 7-2**).
5. Disconnect the ribbon cable tail of the KEYPAD VV from the printed circuit board connector J4 (**Figure 7-3**).
6. Remove the fascia assembly (**Figure 7-4**).



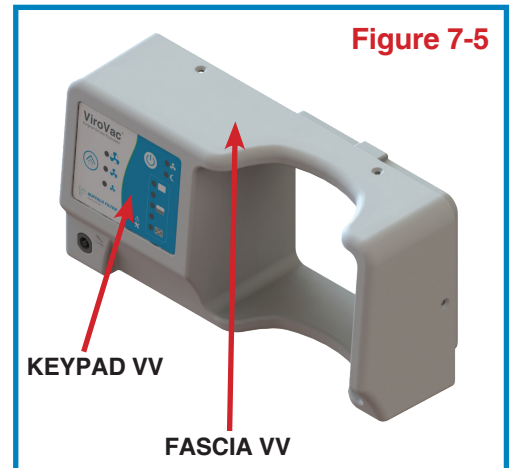
**Figure 7-4**

## Disassembly (continued)

### Keypad

**NOTE:** If keypad is removed, it cannot be reused.

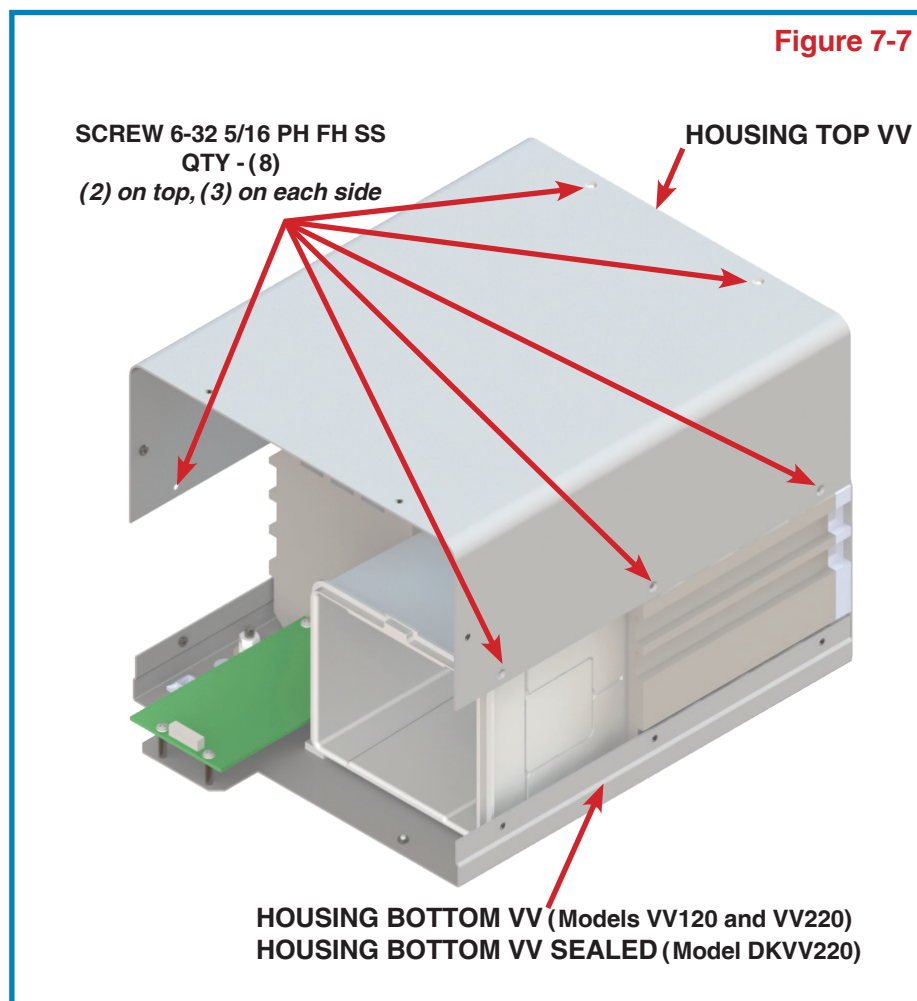
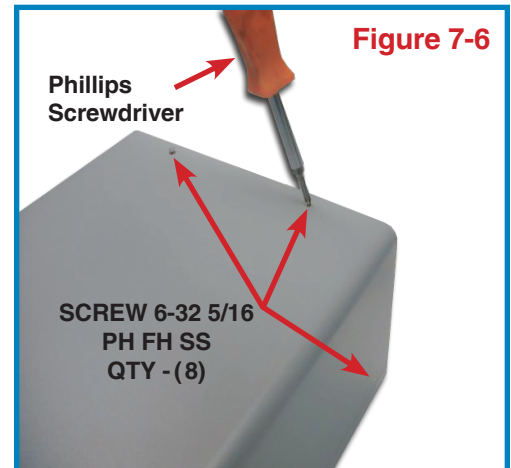
1. Remove the fascia assembly by following the Fascia Disassembly instructions on page 7-4.
2. Remove the KEYPAD VV by pulling it off of the face of the FASCIA VV. Remove the ribbon cable through the opening (**Figure 7-5**).



## Disassembly (continued)

### Body

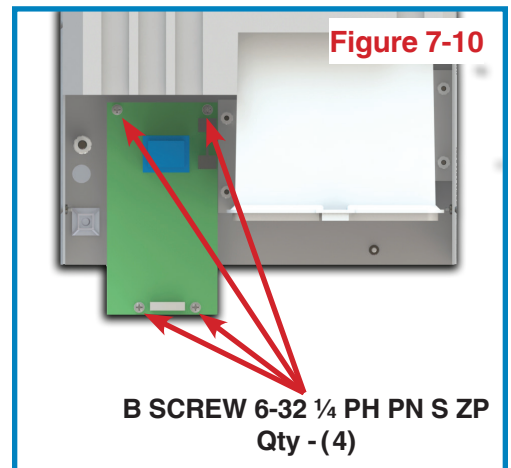
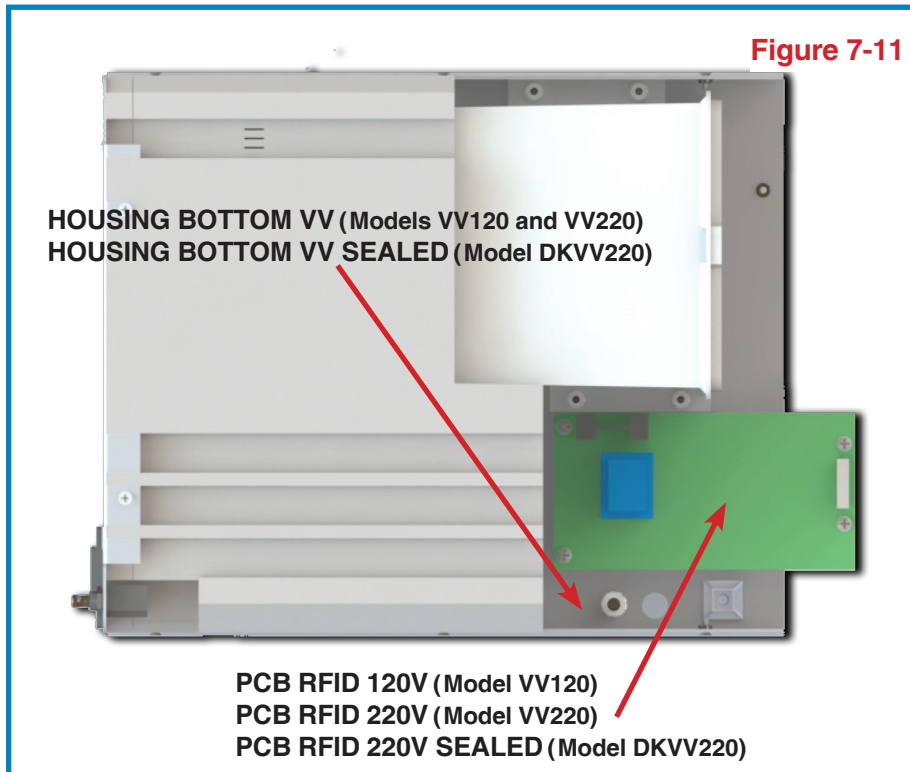
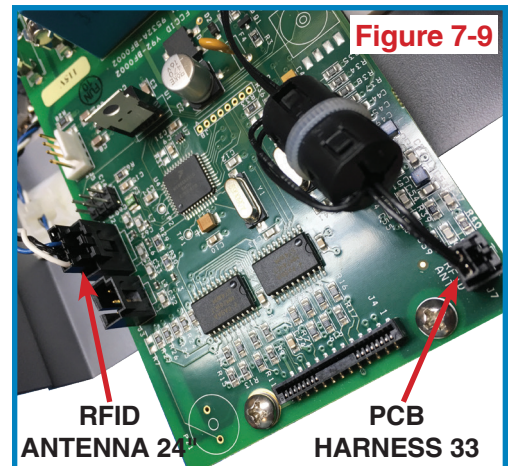
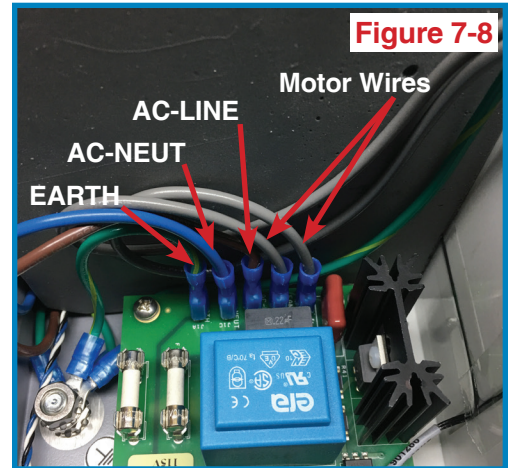
1. Remove the fascia assembly by following the Fascia Disassembly instructions on page 7-4.
2. Locate and remove the eight (8) screws which secure the HOUSING TOP VV to the housing bottom assembly using a phillips screwdriver (**Figure 7-6**).
3. Remove the HOUSING TOP VV from the housing bottom assembly (**Figure 7-7**).



## Disassembly (continued)

### Printed Circuit Board (PCB)

1. Remove the fascia assembly by following the Fascia Disassembly instructions on page 7-4.
2. Remove the HOUSING TOP VV by following the Body Disassembly instructions on page 7-6.
3. Locate the printed circuit board.
4. Disconnect the two (2) gray motor wires from the printed circuit board connectors J1E (FAN-LN) and J1D (FAN-NU) (**Figure 7-8**).
5. Disconnect the brown wire from the printed circuit board connector J1B (AC-LINE) (**Figure 7-8**).
6. Disconnect the blue wire from the printed circuit board connector J1C (AC-NEUT) (**Figure 7-8**).
7. Disconnect the green/yellow wire from the printed circuit board connector J1A (EARTH) (**Figure 7-8**).
8. Disconnect the PCB HARNESS 33 from the printed circuit board jack J6 (**Figure 7-9**).
9. Disconnect the RFID ANTENNA 24" from the printed circuit board jack J7 (RFID ANT) (**Figure 7-9**).
10. Locate the four (4) screws (**Figure 7-10**) securing the printed circuit board to the housing bottom assembly.
11. Remove the four (4) screws using a phillips screwdriver.
12. Remove the printed circuit board.

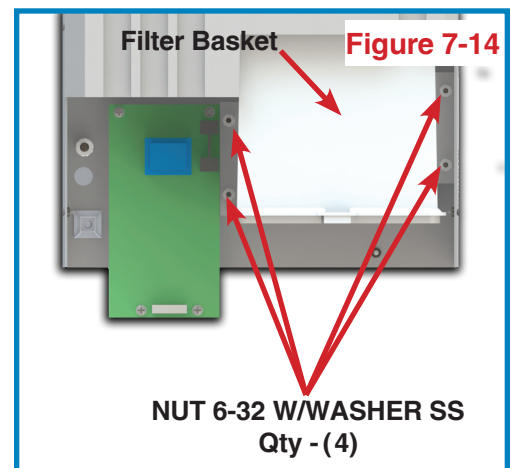
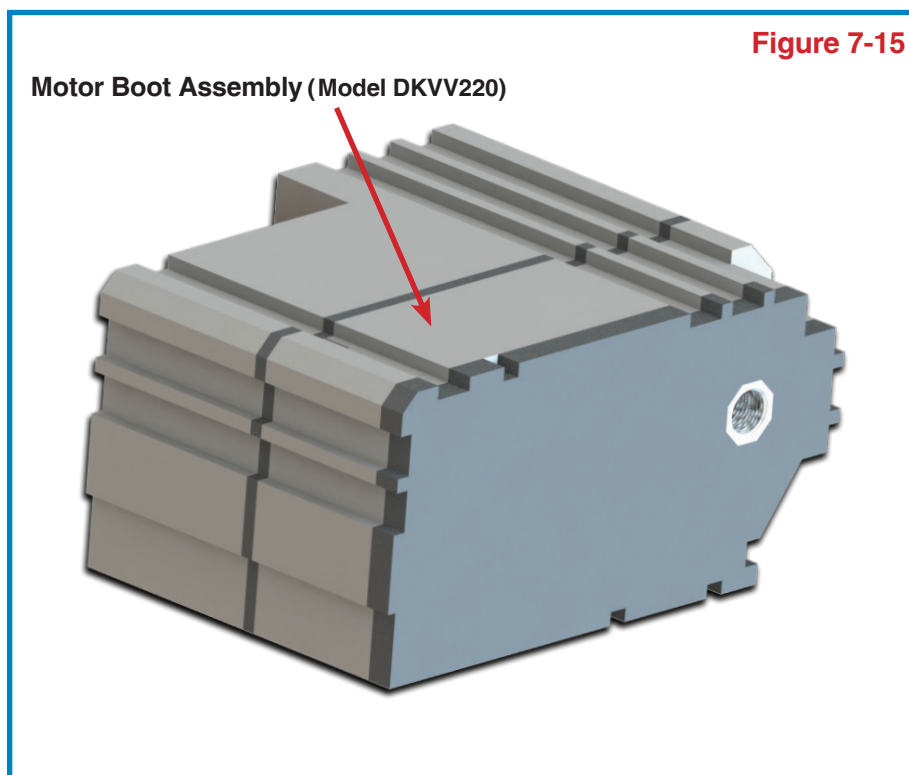
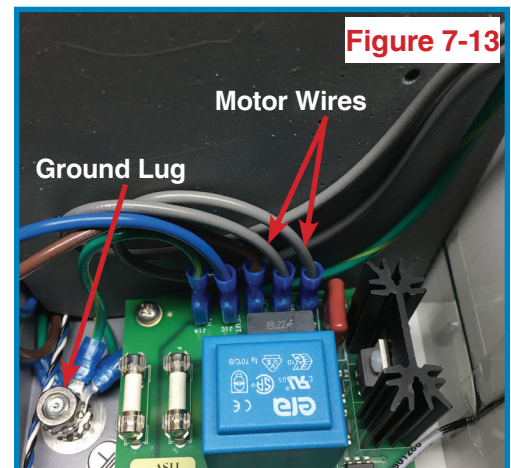
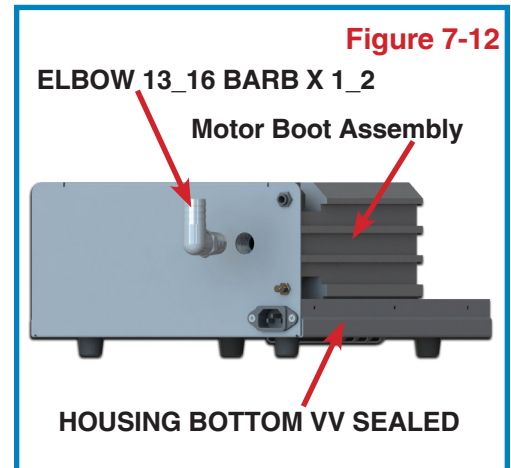




## Disassembly (continued)

### Motor Boot Assembly for Model DKVV220

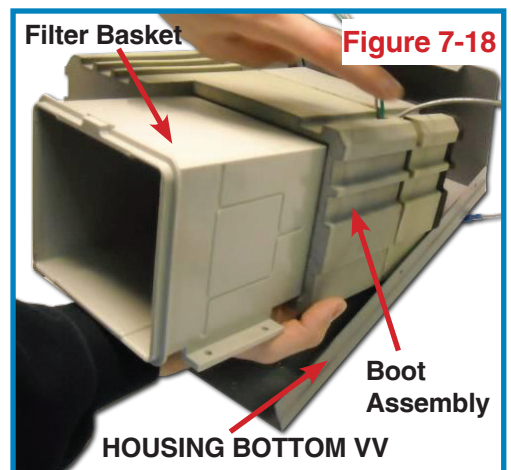
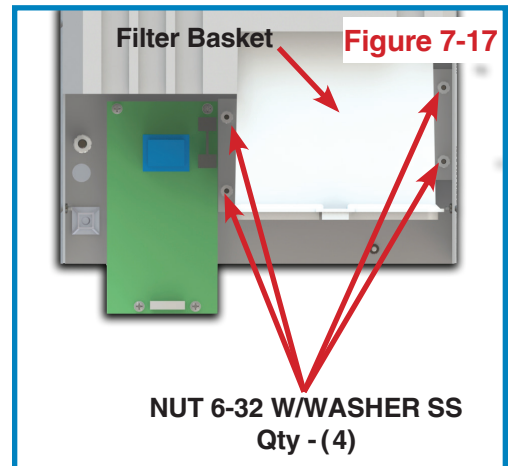
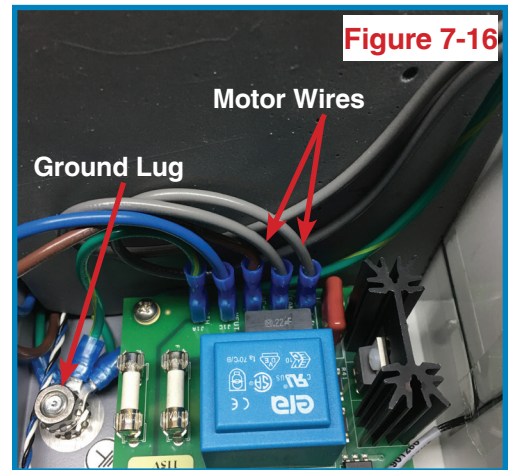
1. Remove the fascia assembly by following the Fascia Disassembly instructions on page 7-4.
2. Remove HOUSING TOP VV by following the Body Disassembly instructions on page 7-6.
3. Remove the elbow by unscrewing it from the rear of the housing bottom assembly (**Figure 7-12**).
4. Disconnect the two (2) gray motor wires from the printed circuit board connectors J1E (FAN-LN) and J1D (FAN-NU) (**Figure 7-13**).
5. Disconnect the green/yellow wires from the ground lug using a 7/16 in. nut driver (**Figure 7-13**).
6. Locate the four (4) nuts with washers that secure the filter basket to the housing bottom assembly and remove using a 5/16 in. nut driver (**Figure 7-14**).
7. Remove the filter basket and the boot assembly by lifting both the boot and the filter basket out of the unit.
8. Remove the filter basket from the boot assembly (**Figure 7-14**).
9. Remove the motor boot assembly if replacing the motor.



## Disassembly (continued)

### Motor Boot Assembly for Model VV120 and VV220

1. Remove the Fascia Assembly by following the Fascia Disassembly instructions on page 7-4.
2. Remove the HOUSING TOP VV by following the Body Disassembly instructions on page 7-6.
3. Disconnect the two (2) gray motor wires from the printed circuit board connectors J1E (FAN-LN) and J1D (FAN-NU) (**Figure 7-16**).
4. Disconnect the green/yellow wires from the ground lug using a 7/16 in. nut driver (**Figure 7-16**).
5. Locate the four (4) nuts and washers that secure the filter basket to the housing bottom assembly and remove using a 5/16 in. nut driver (**Figure 7-17**).
6. Remove the filter basket and the boot assembly by lifting both the boot and the filter basket out of the housing bottom assembly (**Figure 7-18**).

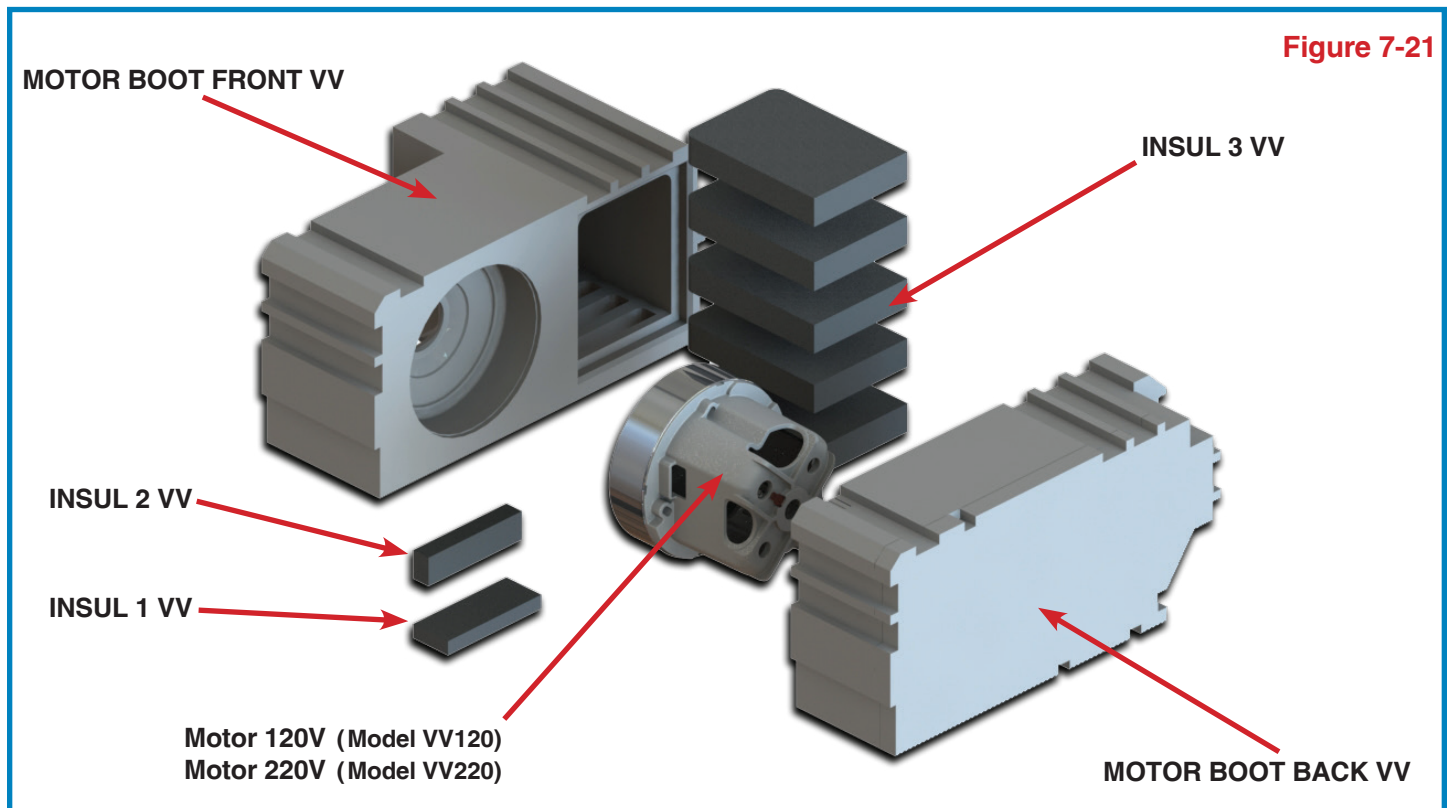
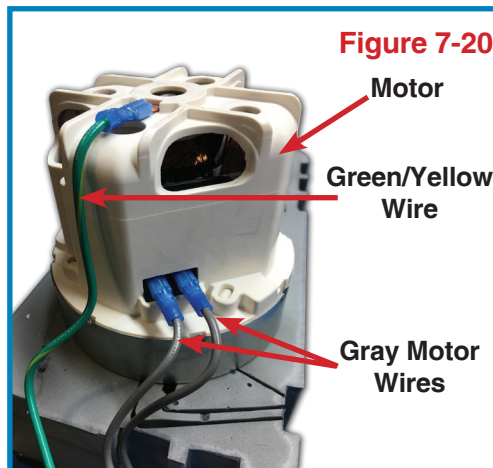
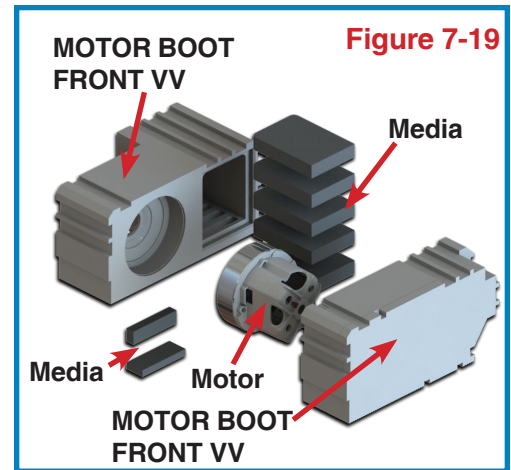


## Disassembly (continued)

### Motor Boot Assembly for Model VV120 and VV220

(continued)

7. Separate the front and the back halves of the boot assembly to expose the motor and media that can be replaced (**Figure 7-19**).
8. Pull the motor out of the boot bottom to gain access to the wires that are connected to the motor.
9. Remove the two (2) gray motor wires and green/yellow wire from the motor for reuse (**Figure 7-20**).
10. Remove the motor.



## Reassembly

### Motor Boot Assembly for Models VV120 and VV220

**NOTE:** When reinstalling the motor wires, make sure that the dimple on the Eterm is facing upwards towards the grounding ring on the motor. Press downward towards the top of the motor and inward to properly install the two (2) grey motor wires. This will reduce the risk of damage to the motor spades.

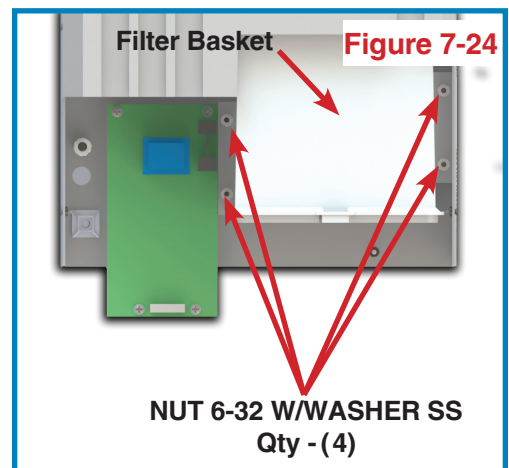
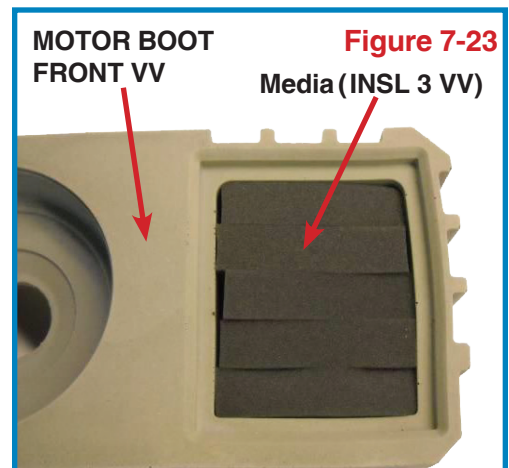
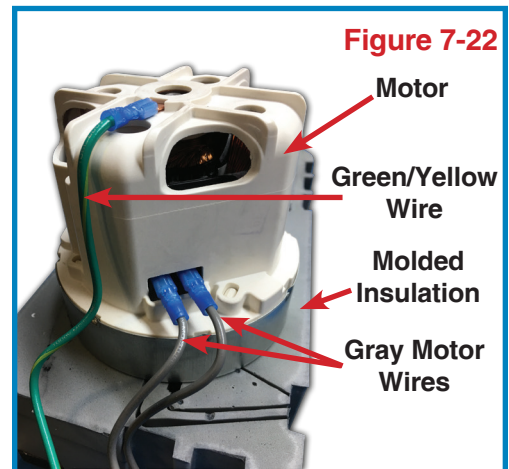
1. Connect the two (2) gray motor wires and green/yellow wire to the motor (**Figure 7-22**).
2. Insert the motor into the back half of the boot (**Figure 7-22**) and position wires in the slots provided on the molded insulation.
3. Insert the media into the MOTOR BOOT FRONT VV (**Figure 7-23**).
4. Insert the media (INSUL 1 VV and INSUL 2 VV) into the breather slots located on the bottom of the MOTOR BOOT FRONT VV making sure that the five (5) pieces of media are flush and fully inserted prior to mating the front and the back halves of the boot.

**NOTE:** It is recommended that all media be replaced when replacing the motor.

5. Secure the front and the back halves of the boot assembly together.
6. Slide the filter basket into the the boot assembly.
7. Place the filter basket and the boot assembly into the housing bottom assembly.

**NOTE:** Make sure none of the wires get trapped under the boot assembly.

8. Seat filter basket fully into the boot so that the filter basket holes line up with the PEMS on the housing bottom assembly (**Figure 7-24**).





## Reassembly (continued)

### Motor Boot Assembly for Models VV120 and VV220

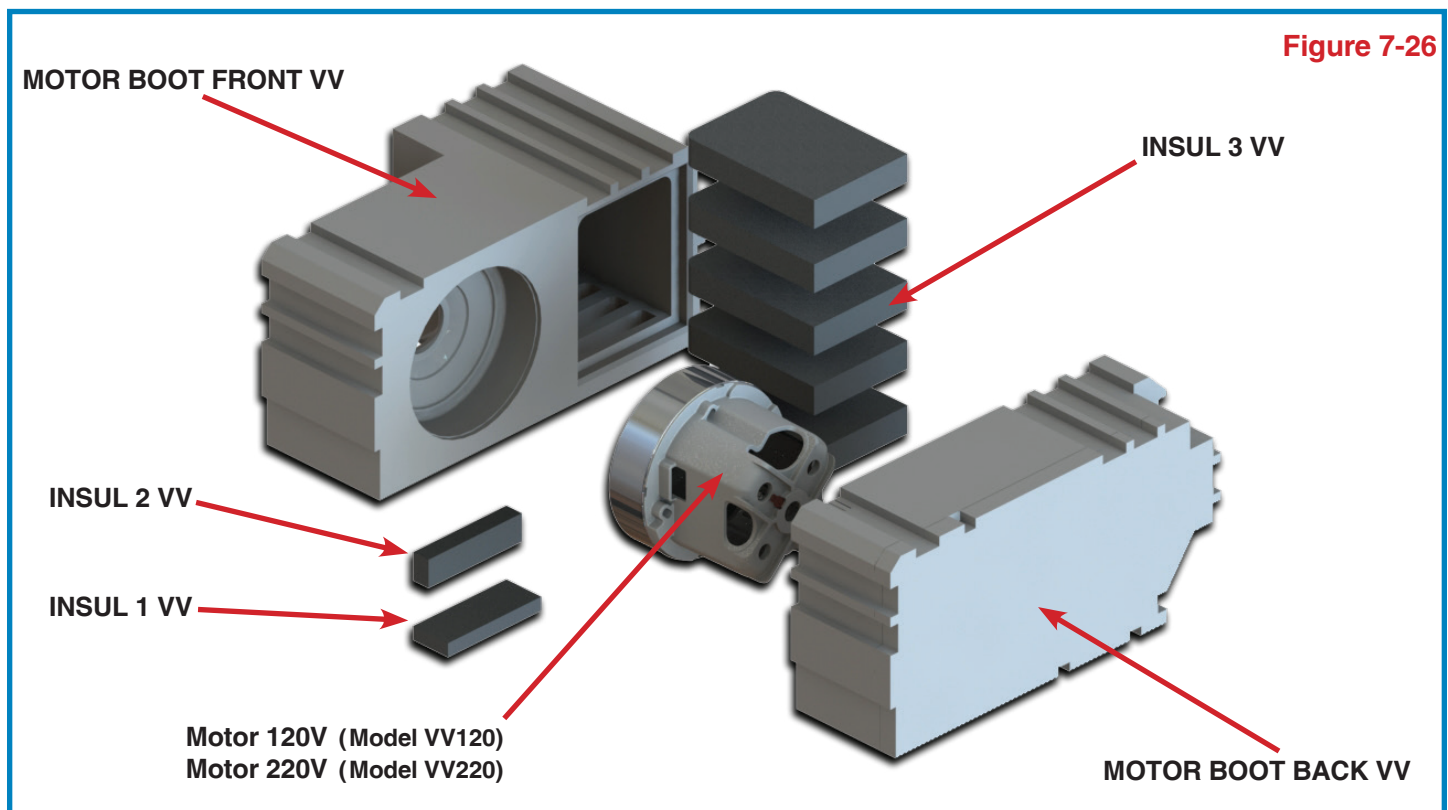
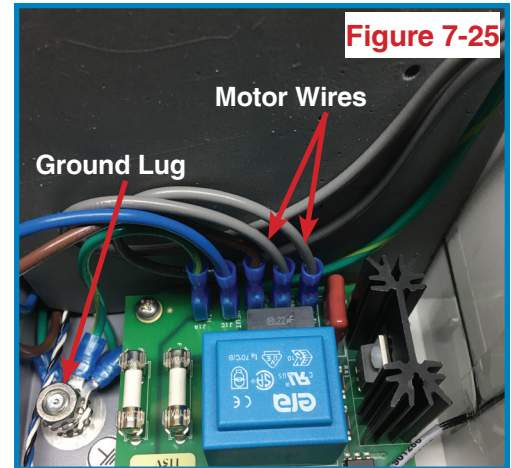
(continued)

- Secure the filter basket to the housing bottom assembly with the four (4) nuts with washers using a 5/16 in. nut driver.

**NOTE:** When tightening screws, do not exceed 10 inch-pounds of torque to reduce the risk of damaging the filter basket.

**NOTE:** Push in all the wires between the boot and the housing bottom assembly.

- Secure the green/yellow wires to the ground lug using a 7/16 in. nut driver (**Figure 7-25**).
- Connect the two (2) gray motor wires to the printed circuit board connectors J1E (FAN-LN) and J1D (FAN-NU) (**Figure 7-25**).
- Reassemble the HOUSING TOP VV by following the Body Reassembly instructions on page 7-16.
- Reassemble the fascia assembly by following the Fascia Reassembly instructions on page 7-18.



## Reassembly (continued)

### Motor Boot Assembly for Model DKVV220

1. Place the filter basket and the boot assembly into the housing bottom assembly (**Figure 7-27**).

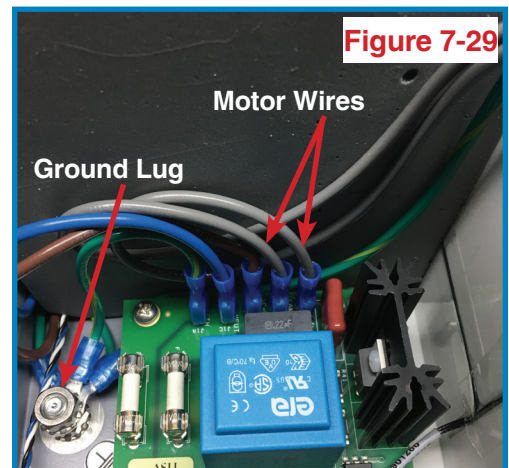
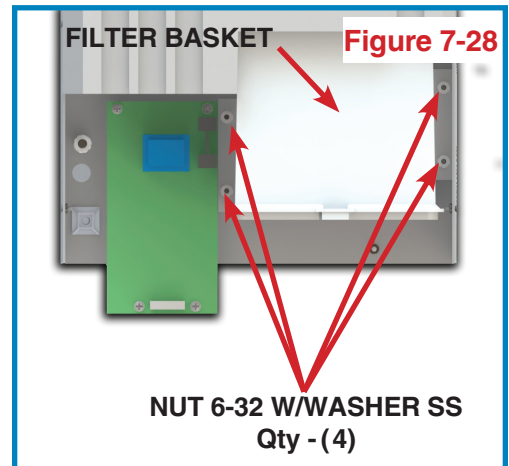
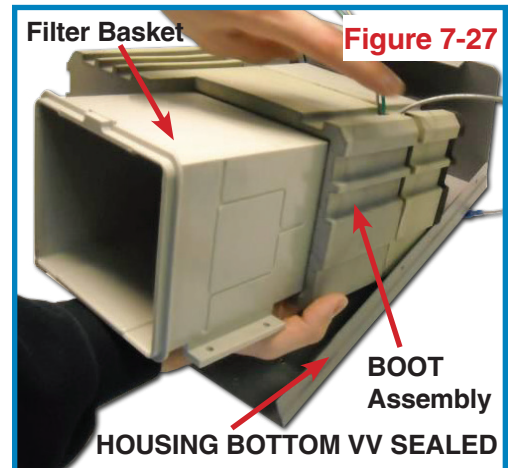
**NOTE:** Make sure none of the wires get trapped under the boot assembly.

2. Slide the filter basket to seat it fully into the boot and that the filter basket holes line up with the PEMS in the housing bottom assembly (**Figure 7-27**).
3. Secure the filter basket to the housing bottom assembly with the four (4) nuts and washers using a 5/16 in. nut driver (**Figure 7-28**).

**NOTE:** When tightening screws, do not exceed 10 inch-pounds of torque to reduce the risk of damage to the filter basket.

**NOTE:** Push in all the wires between the boot and the housing bottom assembly.

4. Secure the green/yellow wires to the ground lug using a 7/16 in. nut driver (**Figure 7-29**).
5. Connect the two (2) gray motor wires to the printed circuit board connectors J1E (FAN-LN) and J1D (FAN-NU) (**Figure 7-29**).



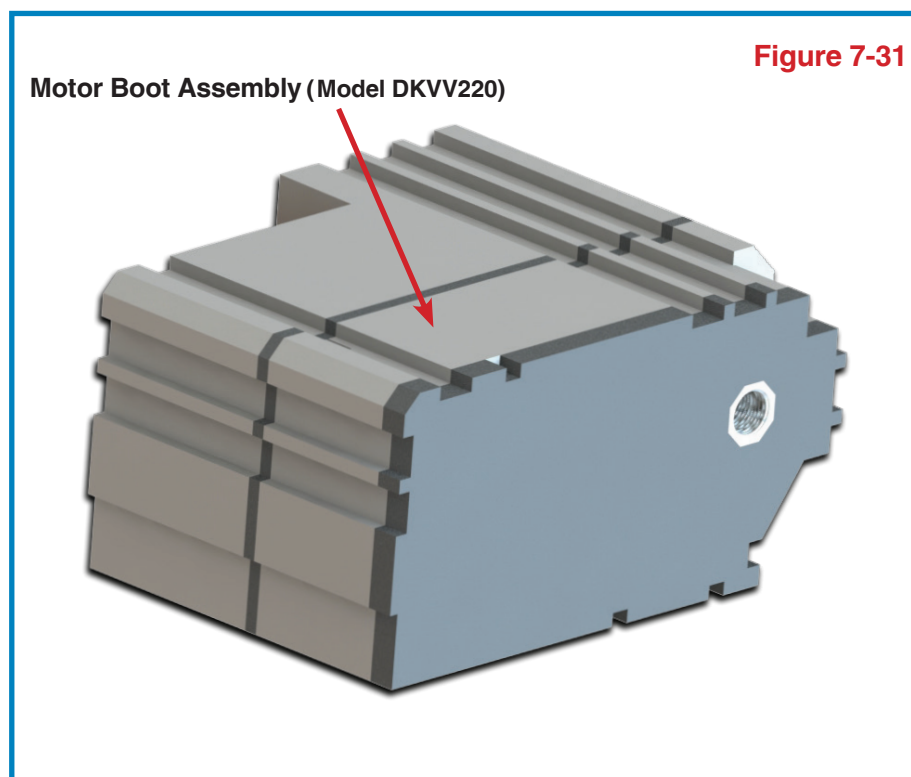
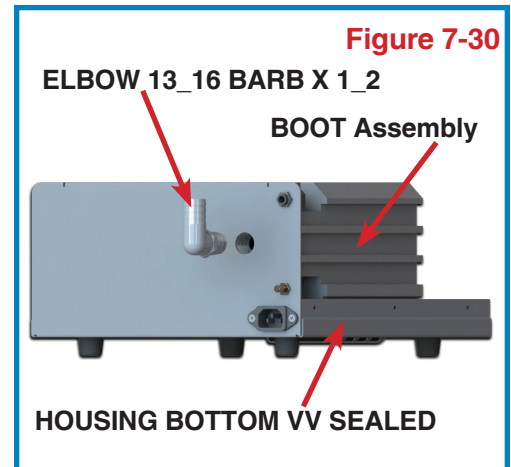
## Reassembly (continued)

### Motor Boot Assembly for Model DKVV220 (continued)

6. Install the elbow by screwing the elbow into the rear of the housing bottom assembly (**Figure 7-30**).

**NOTE:** During the installation of the elbow, it is critical to not over tighten as it could lead to failure of adhesive.

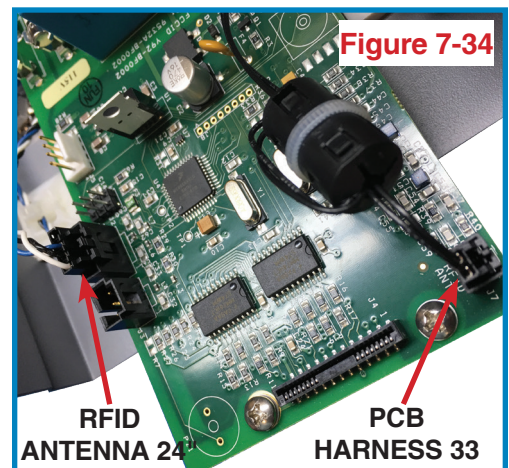
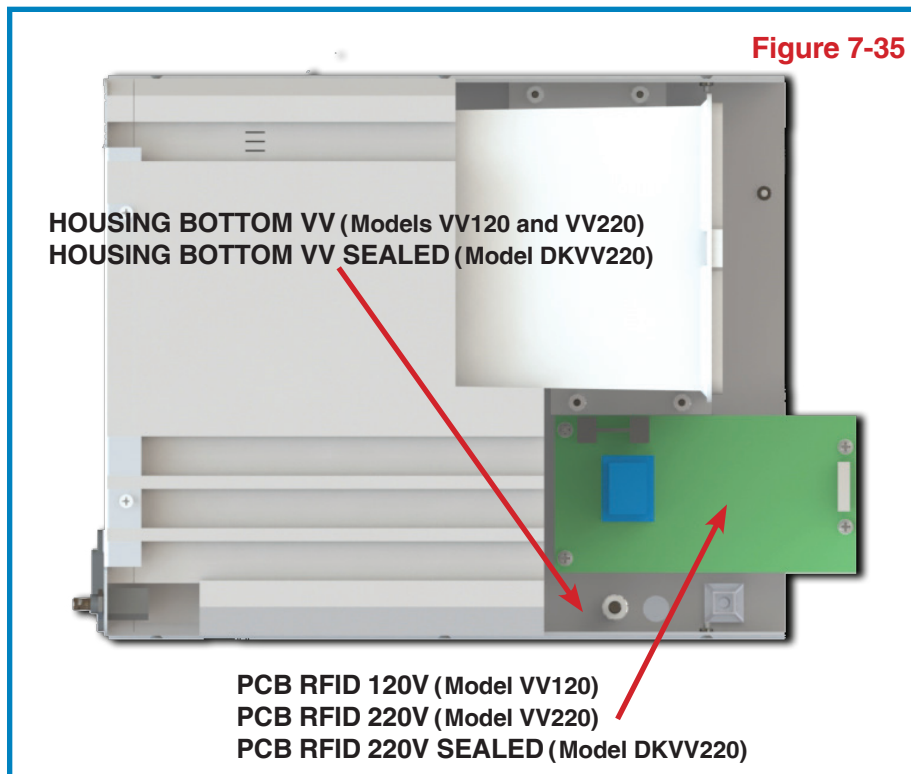
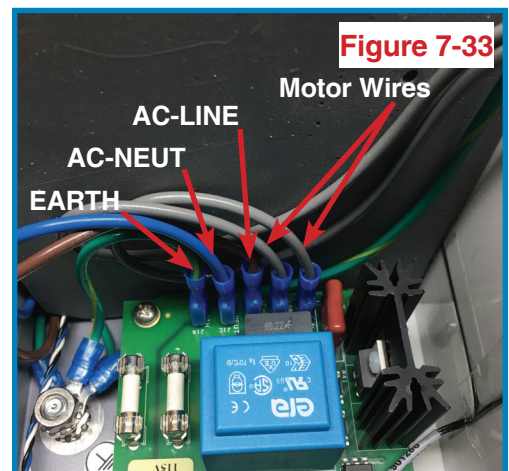
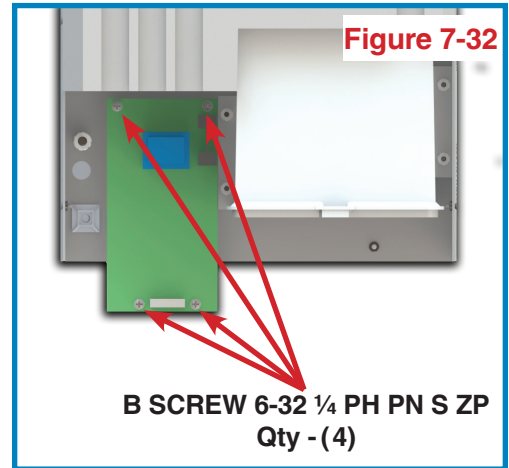
7. Reassemble the HOUSING TOP VV by following the Body Reassembly instructions on page 7-16.
8. Reassemble the fascia assembly by following the Fascia Reassembly instructions on page 7-18.



## Reassembly (continued)

### Printed Circuit Board (PCB)

1. Mount the printed circuit board to the housing bottom assembly with the four (4) screws using a phillips screwdriver (**Figure 7-32**).
2. Connect the brown wire to the printed circuit board connector J1B (AC-LINE) (**Figure 7-33**).
3. Connect the blue wire to the printed circuit board connector J1C (AC-NEUT) (**Figure 7-33**).
4. Connect the green/yellow wire to the printed circuit board connector J1A (EARTH) (**Figure 7-33**).
5. Connect the two (2) gray motor wires to the printed circuit board connectors J1E (FAN-LN) and J1D (FAN-NU) (**Figure 7-33**).
6. Connect the PCB HARNESS 33 to the printed circuit board jack J6 (**Figure 7-34**).
7. Connect the RFID ANTENNA 24" to the printed circuit board jack J7 (**Figure 7-34**).
8. Reassemble the HOUSING TOP VV by following the Body Reassembly instructions on page 7-16.
9. Reassemble the fascia assembly by following the Fascia Reassembly instructions on page 7-18.





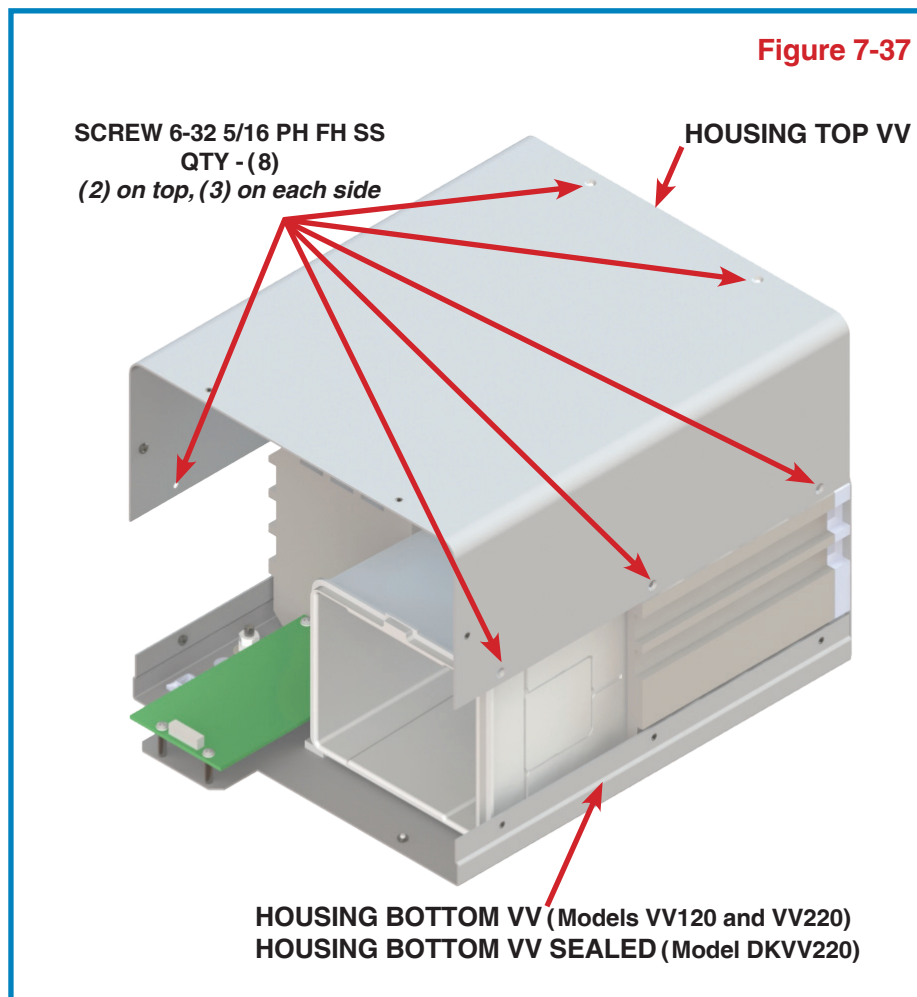
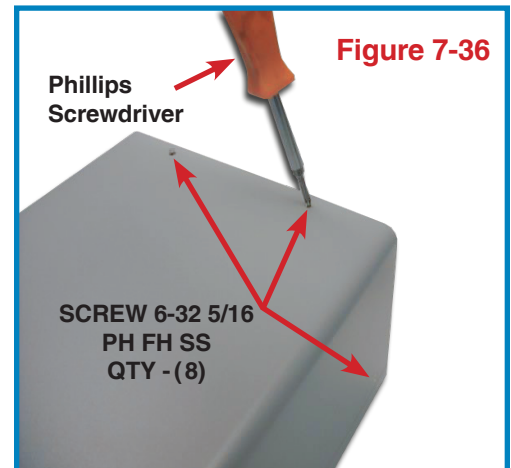
## Reassembly (continued)

### Body

1. Place the HOUSING TOP VV on to the housing bottom assembly (**Figure 7-36**).
2. Secure the HOUSING TOP VV to the housing bottom assembly with the eight (8) screws using a phillips screwdriver (**Figure 7-36**).

**NOTE:** When tightening screws, do not exceed 10 inch-pounds of torque to reduce the risk of damage to the HOUSING TOP VV.

3. Reassemble the fascia assembly by following the Fascia Reassembly instructions on page 7-18.

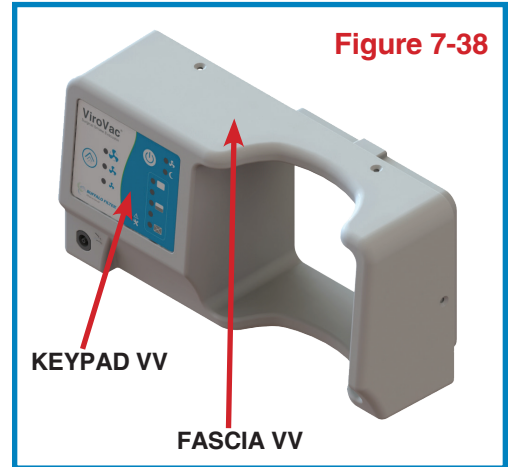


## Reassembly (continued)

### Keypad

**NOTE:** Be sure the surface of the fascia is clean before applying the new keypad.

1. Insert the keypad ribbon cable through the slot in the face of the FASCIA VV.
2. Remove protective backing on the new KEYPAD VV to be installed.
3. Carefully place the new KEYPAD VV into position and press firmly into place, making sure that the keypad ribbon cable is completely positioned through the slot in the FASCIA VV.
4. Reassemble the fascia assembly by following the Fascia Reassembly instructions on page 7-18.



## Reassembly (continued)

### Fascia

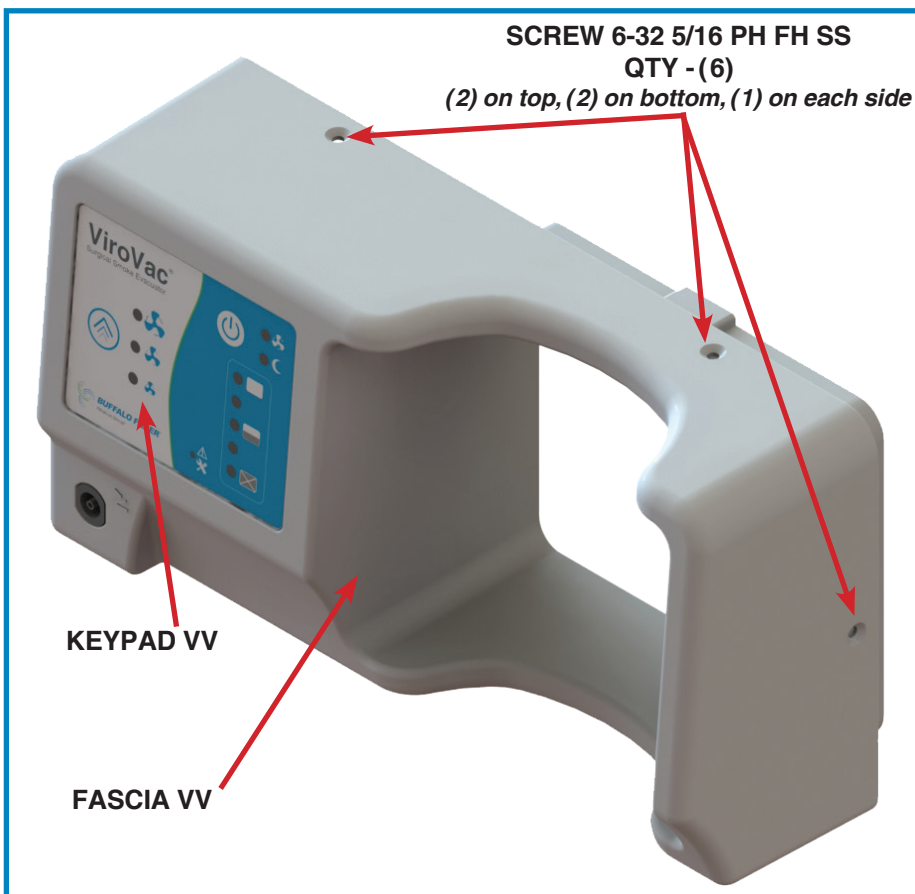
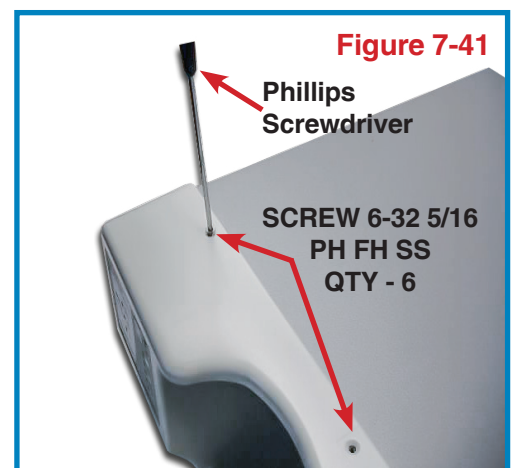
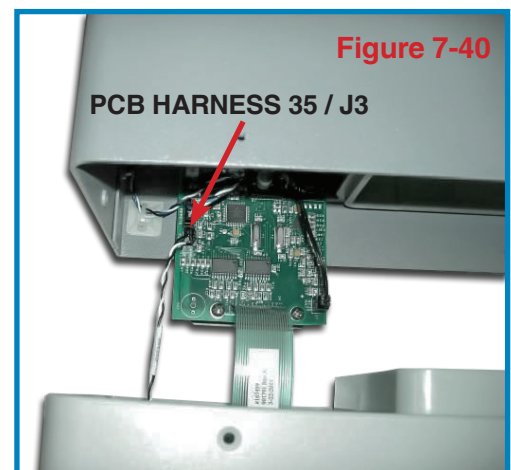
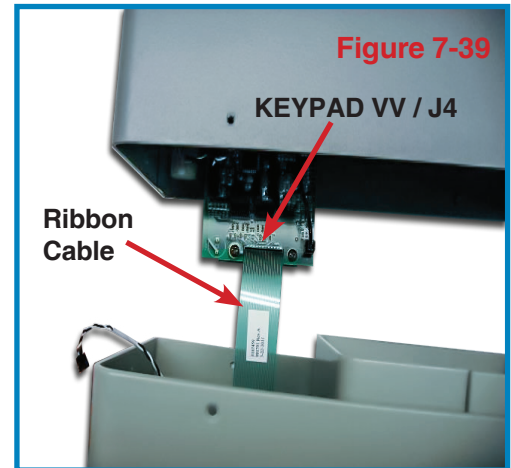
1. Connect the the ribbon cable tail of the KEYPAD VV to the printed circuit board connector J4 (**Figure 7-39**).

**NOTE:** Be sure the ribbon cable tail has no twists from the plastic to the printed circuit board.

2. Connect the PCB HARNESS 35 to the printed circuit board jack J3 (**Figure 7-40**).
3. Secure the fascia assembly to the body assembly with the six (6) screws using a phillips screwdriver (**Figure 7-41**).

**NOTE:** When tightening screws, do not exceed 10 inch-pounds of torque to reduce the risk of damage to the fascia.

4. Install the filter.



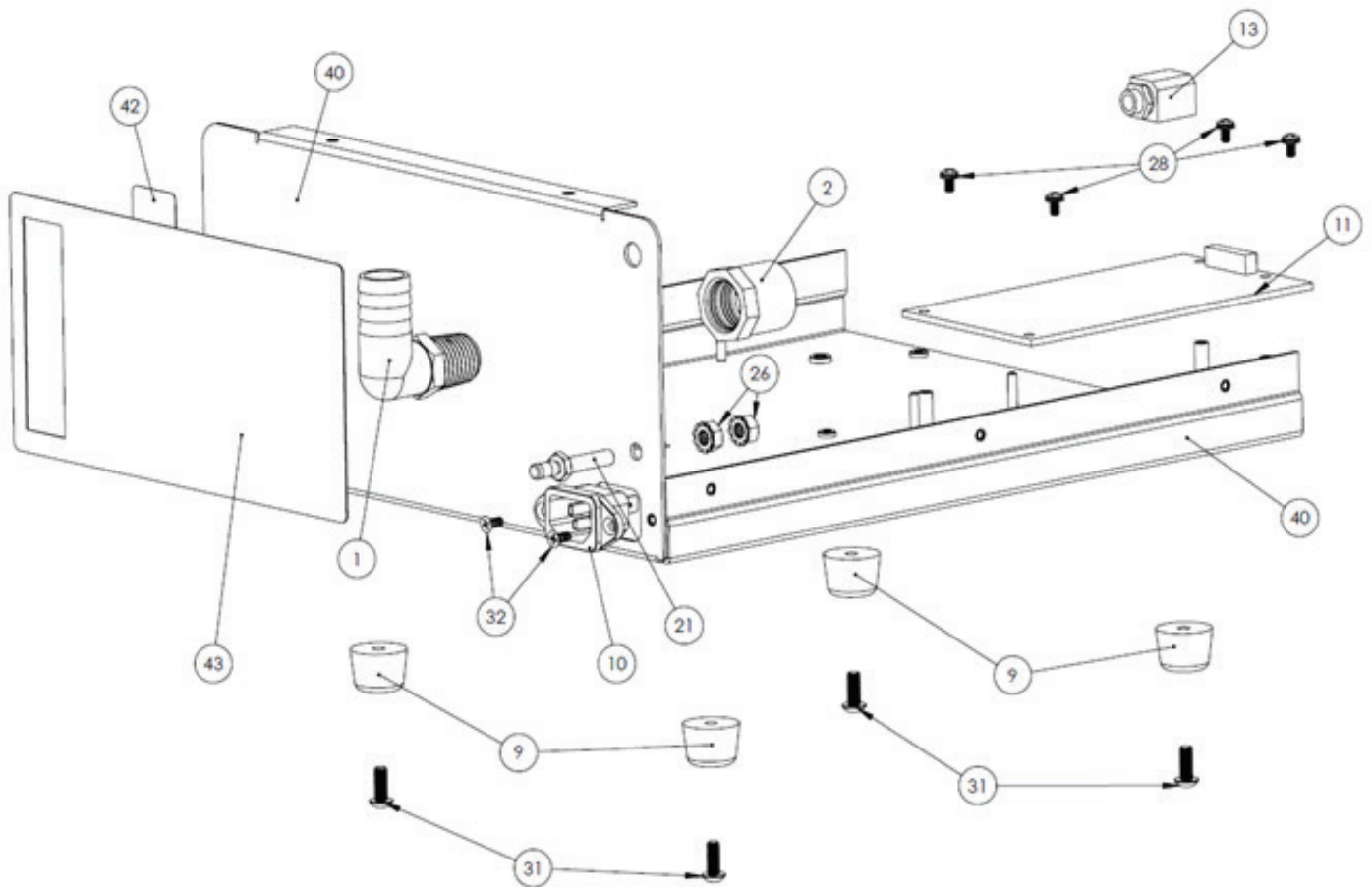
**Figure 7-42**

# A

## Appendix A

### Parts List

#### Housing Bottom





## Parts List (continued)

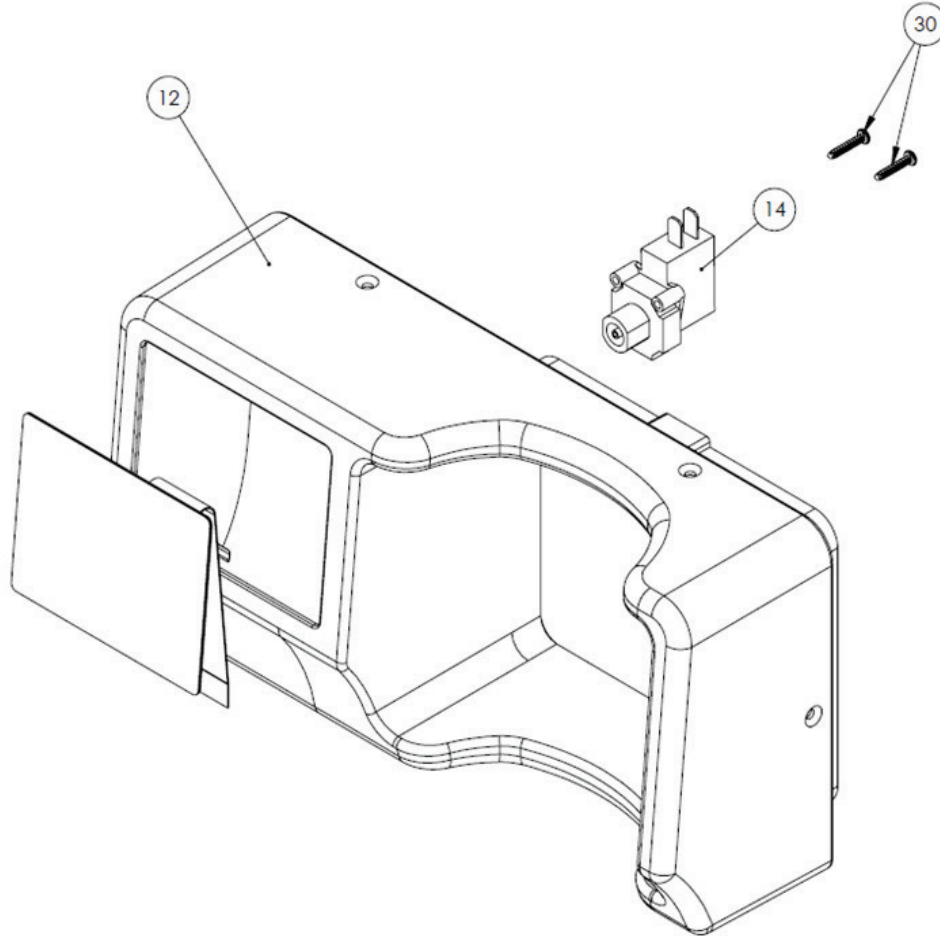
### Housing Bottom (continued)

CALLOUT	DESCRIPTION	REMARKS	QTY
1	ELBOW 13_16 BARB X 1_2		1
2	BUSHING 1_2 X 3_4		1
9	RUBBER FEET RV		4
10	POWER ENTRY MOD VV		1
11	PCB RFID 120V	VV120	1
11	PCB RFID 220V	VV220	1
11	PCB RFID 220V SEALED	DKVV220	1
13	PCB HARNESS 33		1
21	GROUND LUG POAG S5/25		1
26	M6 NUT WITH TOOTH WASHER		2
28	B 6-32 .25 PH PN S ZP		4
31	BOLT 10-32 1/2 PPSS		4
32	SCREW 6-32 5/16 PH FH SS		16
40	HOUSING BOTTOM VV SEALED	For DKVV220 only	1
40	HOUSING BOTTOM VV	For VV120 and VV220	1
42	VV120 WINDOW LBL	For VV120 only	1
42	VV220 WINDOW LBL	For VV220 only	1
42	DKVV220 WINDOW LBL	For DKVV220 only	1
43	LBL SERIAL VV 120	For VV120 only	1
43	LBL SERIAL VV 220	For VV220 and DKVV220	1

**NOTE:** If labeling in callout 42 and 43 need to be replaced, the current labeling must be surrendered or returned to Buffalo Filter.

## Parts List (continued)

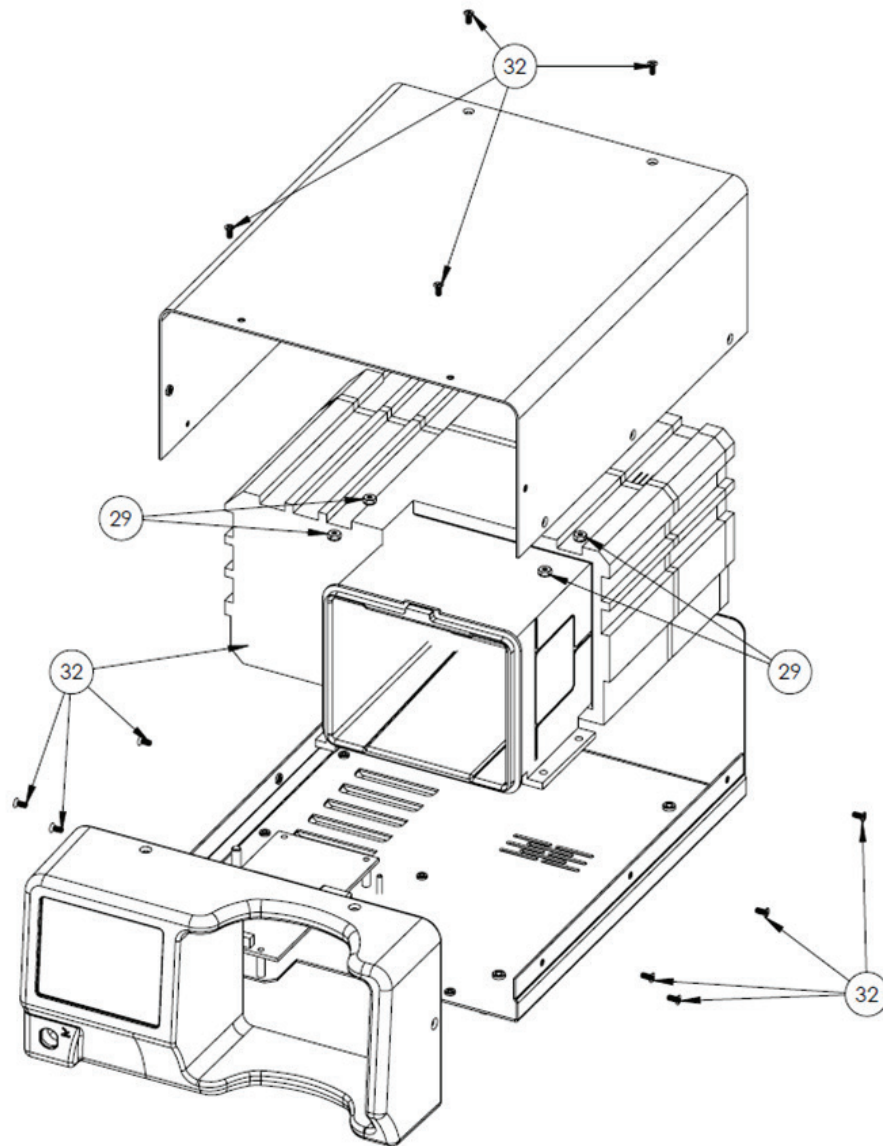
### Fascia Assembly



CALLOUT	DESCRIPTION	REMARKS	QTY
12	FASCIA VV		1
14	PCB HARNESS 35		1
30	SCREW 3-24 5/8 PH PN PL SS		2
—	KEYPAD VV		1

# Parts List (continued)

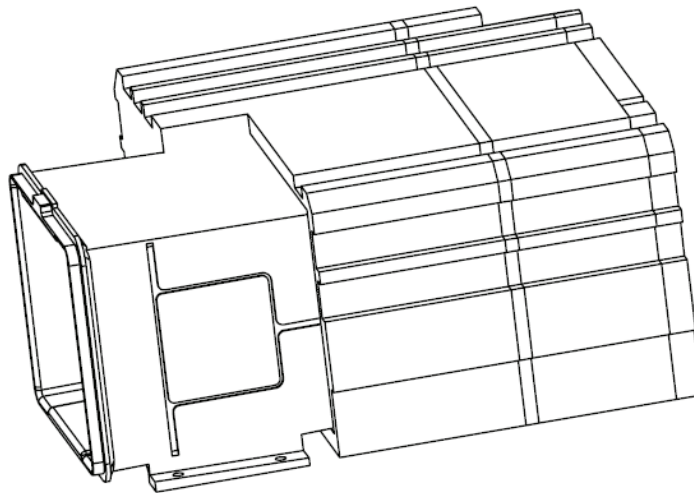
## Body



CALLOUT	DESCRIPTION	REMARKS	QTY
29	NUT 6-32 W/WASHER SS		4
—	HOUSING TOP VV		1
—	HOUSING BOTTOM VV	For VV120 and VV220	1
—	HOUSING BOTTOM VV SEALED	For DKVV220 only	1
32	SCREW 6-32 5/16 PH FH SS		16

## Parts List (continued)

### Motor Boot Assembly for Model DKVV220

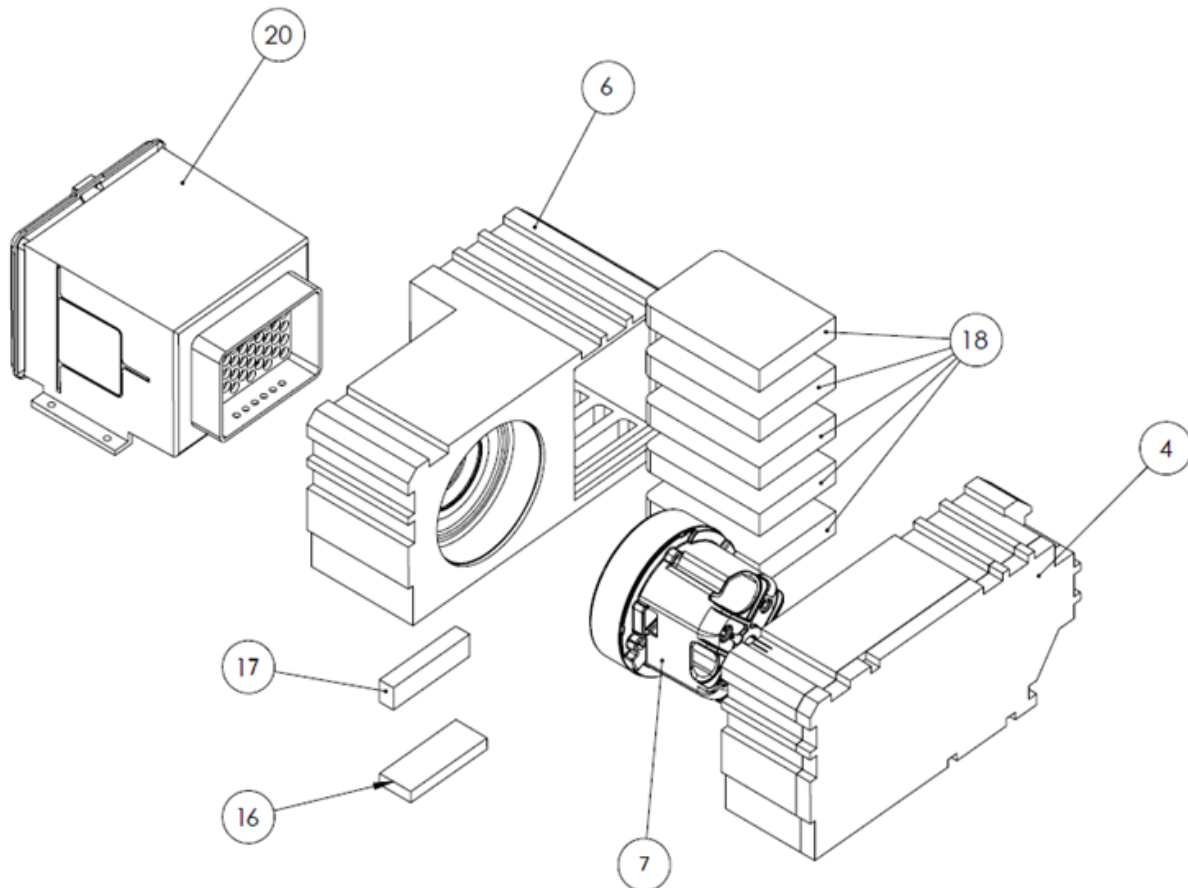


CALLOUT	DESCRIPTION	REMARKS	QTY

**NOTE:** There are no field servicable parts. This is a sealed unit. Filter basket (FILTER BASKET VV) is removable and will be retained when motor boot assembly is returned.

## Parts List (continued)

### Motor Boot Assembly for Models VV120 and VV220



CALLOUT	DESCRIPTION	REMARKS	QTY
4	MOTOR BOOT BACK VV		1
6	MOTOR BOOT FRONT VV		1
7	220V MOTOR	For VV220 only	1
7	120V MOTOR	For VV120 only	1
16	INSUL 1 VV		1
17	INSUL 2 VV		1
18	INSUL 3 VV		5
20	FILTER BASKET VV		1

For a period of one (1) year following the date of delivery, Buffalo Filter LLC warrants the ViroVac® *Surgical Smoke Evacuator* against any defects in material or workmanship. Buffalo Filter LLC will repair or replace (at Buffalo Filter LLC option) the same without charge, provided that routine maintenance as specified in this manual has been performed using replacement parts approved by Buffalo Filter LLC. This warranty is void if the product is used in a manner or for purposes other than intended.

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The revision level of this manual is specified by the highest revision letter found on either the inside front cover or enclosed errata pages (if any).

## **Manual Number 905140 Rev A**

MEDICAL – GENERAL MEDICAL EQUIPMENT AS TO ELECTRICAL SHOCK, FIRE, AND MECHANICAL HAZARDS ONLY IN ACCORDANCE WITH UL 60601-1, ANSI/AAMI ES60601-1 (2005, 3rd ed.), CAN/CSA C22.2 No. 601.1, AND CAN/CSA C22.2 No. 60601-1 (2008) 9D93  
ANSI/AAMI ES60601-1: A1:2012, 1:2009/(R)2012 and A2:2010/(R)2012, and CAN/CSA C22.2 No. 60601-1:14

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This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This product operates at 13.56 MHz with an H-field strength of -4.61 dB $\mu$ A/m at 10 m.

In Europe, the ViroVac® *Surgical Smoke Evacuator* is a short-range device, RF Class I, per Commission Decision 2006/177/EC with no restrictions. This product operates at 13.56 MHz with an H-field strength of -4.61 dBuA/m at 10 m. Hereby, Buffalo Filter® declares that the ViroVac® *Surgical Smoke Evacuator* radio equipment is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: <http://www.buffalofilter.com/service-support/frequently-asked-questions/>.