

### Safety Considerations

The equipment covered by this manual is designed for safe and reliable operation within its design specification limits. To avoid personal injury or damage to equipment or property while installing or operating this equipment, it is essential that qualified, experienced personnel perform these functions using good judgment and safe practices. See the following cautionary statements.

### Danger

**ELECTRICAL SHOCK HAZARDS.** All power must be disconnected prior to installation and servicing this equipment. There may be more than one power source present. Insure that all power sources have been disconnected to avoid electrocution or shock injuries.

**MOVING PARTS HAZARD.** Motor and blower must be disconnected prior to opening access panels. Motors can start automatically; disconnect all power and control circuits prior to servicing to avoid serious crushing or dismemberment injuries.

**BURN HAZARD.** Electrical resistance heating elements must be disconnected prior to servicing. Electric heaters may start automatically; disconnect all power and control circuits prior to servicing to avoid burns.

### Warning

Ensure that rigging and lifting equipment are of sufficient capacity to support the weight of the unit.

All assemblies must be secured during lifting and rigging with temporary supports and restraints of adequate size and strength according to local codes and ordinances until the equipment is permanently fixed in place.

All fastening devices must be capable of locking the assembly in place without loosening or breaking away due to system operation and vibration.

Nailor tests all risers and coil packages to 400PSI for leaks before shipping. However, during transit, vibration may cause loosening of connections. Therefore, all connections must be checked at time of installation. Any connection found to be loose must be tightened. Nailor will not be held responsible or accept any charges for tightening loose fittings. Backup wrenches must be used during the tightening process.

Should a hose swivel connection be disconnected after it has been tightened the gasket must be checked to see if it needs replacement and replaced, if necessary, before the hose is re-attached.

Female swivel fittings with gasket should not be tightened to more than 30 in-lb of torque.

Unit must be pressure tested before applying water.

Backup wrenches must be used during any tightening process to keep the copper tube or fitting from being damaged.

Nailor will not accept any responsibility for improper tightening procedures that damage the connections.

- 1) The Vertical Hi-Rise Fan Coil Unit is lifted into place directly above the unit on the floor below.
- 2) This unit has been set in place and ready to receive the unit above.
- 3) The top unit risers slip into the "swaged" sleeves on the risers of the units below. The pipes are then brazed together.
- 4) This procedure is duplicated from floor to floor until the installation is complete.

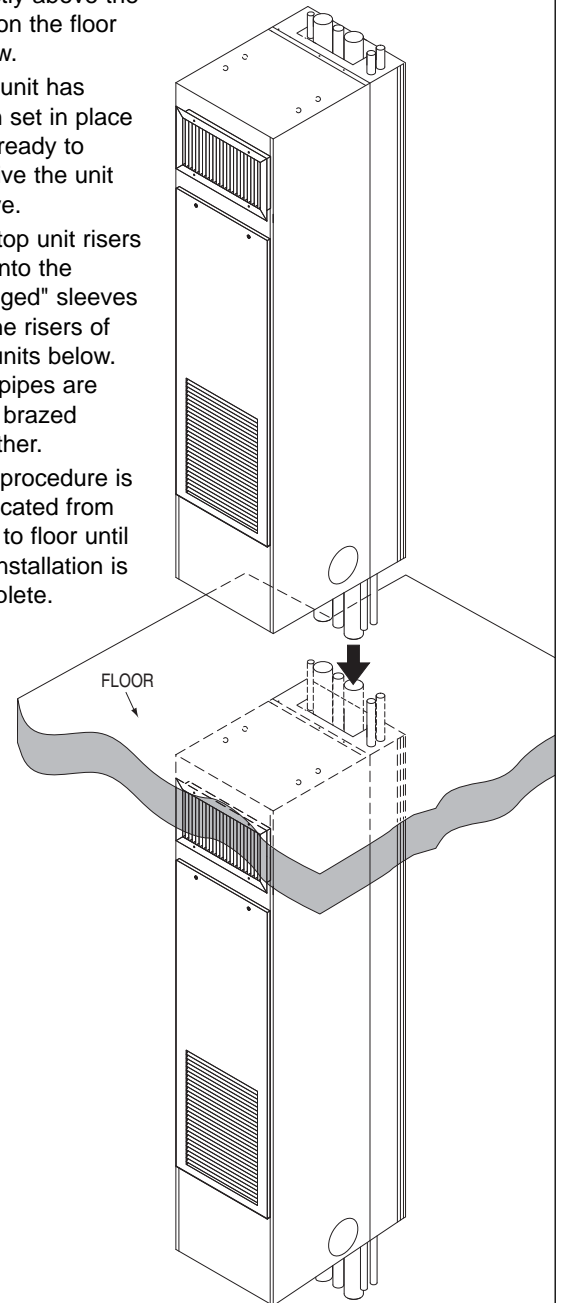


Figure 1. Stacking Assembly

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## Caution

Secure all dampers when servicing damper, actuator or linkages. Dampers may activate automatically; disconnect control circuits or pneumatic control systems to avoid injury.

Protect adjacent flammable materials when brazing. Use flame and heat protection barriers where needed. Have a fire extinguisher available and ready for immediate use.

The equipment covered by this manual is available with a variety of options and accessories. Consult the approved unit submittal, order acknowledgement and other manuals for details on the options and accessories provided with the equipment on each project.

Safe practices regarding mechanical equipment must be followed at all times when handling, installing or servicing any unit.

All power must be disconnected before any installation or service should be attempted. More than one power source may be supplied to the unit. Power to remote mounted control devices may not be supplied through the unit.

Never wear bulky or loose fitting clothing when working with mechanical equipment. Gloves should only be worn when required for proper protection from heat or other possible injury. Safety glasses or goggles should always be worn when drilling, cutting or working with chemicals such as lubricants

Never pressurize any equipment beyond specified test pressures.

The manufacturer assumes no responsibility for personal injury or property damage resulting from improper or unsafe practices during handling service or operation of any equipment.

## Preface

Nailor Industries fan coils represent an investment, which can, when installed and operated properly, give long and trouble free service.

Your equipment is initially protected under the manufacturer's standard warranty. However, this warranty is provided under the condition that the steps outlined in this manual for initial inspection, proper installation, periodic maintenance and everyday operation of the equipment be followed in detail. This manual should be fully reviewed in advance of any actual work being done on the equipment. Should any questions arise, please contact your local Sales Representative or the factory BEFORE proceeding.

## Unpacking and Inspection

All units have been carefully inspected, tested and packaged at Nailor's manufacturing facility.

It is the responsibility of the receiving party to inspect the equipment upon arrival. Any obvious damage to the packaging and/or its contents should be recorded on the bill of lading and a claim should be filed with the freight carrier.

After determining the condition of the unit's exterior, including all piping, each unit should be carefully removed from the package and inspected for hidden damage. Any hidden damage should be recorded and immediately reported to the carrier and a claim filed as before. Should a claim for shipping damage be filed, the unit, the shipping package and all packing must be retained for inspection by the freight carrier. All equipment should be stored in the factory shipping package until installation.

At the time of receipt, the equipment type and arrangement should be verified against the order documents. Should any

discrepancy be found the local sales rep should be notified immediately so that the proper action may be instituted. The factory must be notified about any questions concerning warranty repairs BEFORE any corrective action is taken. Should equipment require factory operations a Return Authorization Number will be issued. Any returns not marked with an authorization number will be refused. The manufacturer will not accept claims for expenses not authorized.

## Ship Loose Items

Several items are shipped loose for field installation. These items are shipped loose to offer protection against shipping and job site damage or by customer request. Refer to packing slip. These items require the same inspection as the unit.

## Handling & Installation

Even though the Nailor hi-rise unit is a sturdily constructed unit both in appearance and in fact, great care should be taken when handling it.

Care should be taken to protect the coil, risers, piping, and drain stub outs during handling. None of the piping should be used as handles for lifting or moving the unit. Units may also have delicate internal components that could be damaged by improper handling. Wherever possible the units should be maintained in an upright position and handled by the exterior casing. Care should be taken to prevent impact forces on the unit that may cause internal damage

The units covered in this manual are not suitable for outdoor installation and should never be used for that purpose. The units and risers should never be stored or installed where they may be subjected to a harsh environment such as rain, snow, or extreme temperatures

Care should be taken to prevent any foreign materials from being deposited in the risers, the space between the risers and the insulation, drain pan, heater, or motor and blower wheels of the unit. To prevent contamination, the units and risers should have some form of temporary covering placed over them during construction. When installed the unit should be plumbed in two directions using the unit frame as a reference. Care should be taken that the internal components of the unit are not damaged while using bolts or lag screws to anchor unit to the building.

After unit is mounted, the service connections such as water, drain and electrical can be made. At this time it should be confirmed that the proper types of services have been provided to the unit. The water connections should be checked for line size, temperature, and location. Electrical service to the unit should be compared to the unit nameplate to verify compatibility.

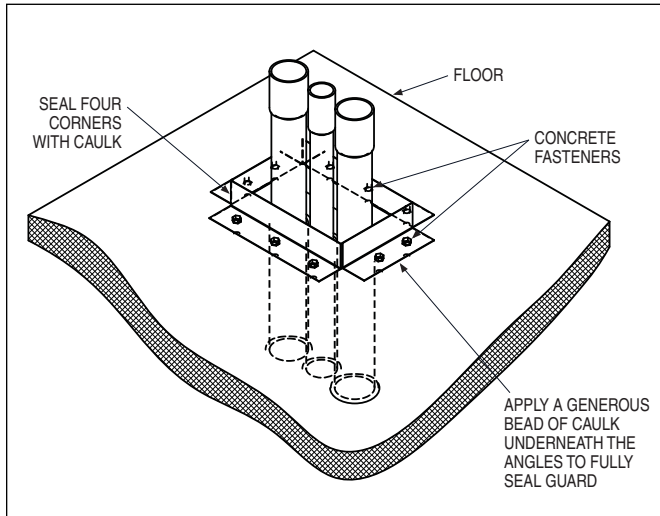
The routing, and sizing of all piping, the type and sizing of all wiring and other electrical components such as circuit breakers, disconnects switches, etc. should be determined by the individual job requirements and should not be based on the size or type connections provided with the equipment. All installations should be made in compliance with all governing codes and ordinances. This compliance to all codes is the responsibility of the installing contractor.

## Riser Precautions

**WARNING:** Should water, especially run-off water from the construction site, be allowed to enter the space between the insulation and the copper or the copper pipe itself, it is possible that the combination of water and certain chemicals like ammonia, nitrates or nitrites could cause stress corrosion cracking, which may cause catastrophic failure of the pipe. For

more information on stress corrosion cracking in copper pipes, "google" stress corrosion cracking and copper pipe.

Caution should be exercised to protect the risers from damage and adverse conditions during the construction phase. During the installation phase of the riser chase at the floor opening, it is recommended that a guard be constructed and installed around the opening to prevent foreign material, rain and/or snow from accumulating in the riser and riser insulation. This guard should be installed on every floor penetration. An example of the guard is shown in Figure 2.



**Figure 2. Riser Guard Detail**

When the risers from floor to floor are installed, the copper risers from the above stacked unit will slip into the expanded copper risers from the unit below. After the brazing process at this joint is completed, the bare copper at these joints must be insulated immediately with approved adhesive. If insulating immediately is not possible, adequately protect the area to avoid foreign material, including water or snow, from entering the space between the insulation and copper. If charring or overheating of insulation occurs during the brazing process, replace insulation to a distance sufficient to remove the affected area. Armacell suggest that a dam be created at least every 12 to 18 feet of riser to keep any water migration inside the insulation to a minimum should one section of insulation become damaged during construction.

Failure to comply with these instructions could result in catastrophic failure of the pipe.

## Cooling/Heating Connections

**CAUTION:** Toxic residues and loose particles resulting from manufacturing and field piping techniques may be present in the unit and piping system.

Special consideration must be given to system cleanliness if unit is to be connected to solar, domestic or potable water systems.

Submittals and Product Catalogs detailing unit operation, controls and connections should be thoroughly reviewed BEFORE beginning the connection of the various cooling and/or heating mediums to the unit.

All accessory valve packages should be installed as required, and all service valves should be checked for proper operation.

In cases where control valves are field installed care should be taken to ensure the valve body is not overheated when braze connections are made.

All pipe screw connections must be made using a "backup wrench" to ensure the copper tube is not twisted during the tightening sequence. If unions are used, over tightening should be avoided to prevent distortion to the union seal surfaces and destroying the union.

## Flex Hose

Nailor Industries uses Kevlar® reinforced braided stainless steel hoses for all water pipe connections between the risers and the unit. All supply and return risers are supplied with a ball valve (ball valve is available with memory stop). The ball valve is attached to the riser by a female pipe thread connection. All factory-supplied connections are tested, with air, to 400 PSIG during the manufacturing process.

During transit vibration may cause loosening of connections therefore all connections should be checked at time of installation. Refer back to the warning on page 1 for further details.

## Field Supplied Risers

On units with field-supplied risers, the ball valve must be connected to the riser prior to connecting the hose to the unit. All standard tapered pipe thread joints must have either Teflon® tape or a polyester pipe dope such as Rectorseal T+2® applied to them. Gaskets will be shipped with the unit hose assembly and must be installed before hose swivel connection is attached to the unit.

## Riser Connection

Risers will not be rigidly connected to the equipment after installation. Risers must be free to move with thermal expansion and contraction. Risers should accommodate as a minimum  $\pm 1"$  of vertical expansion/contraction. If total combined riser expansion/contraction exceeds 3" additional expansion loops or joints must be field supplied and installed. Remove riser-shipping straps prior to unit start up. Any building structure variation that necessitates the modification of the risers is the responsibility of the installer. All riser fire blocking is the responsibility of the installer.

In the case of field installation of chilled water valves and piping the chilled water valve cluster and riser pipe should be installed so that any dripping or sweating is contained in the drain pan.

After all connections have been made, and prior to furring in, the system should be pressure tested for leaks.

**CAUTION:** Maximum unit operating pressure is 350 PSIG.

**CAUTION:** All water coils must be protected from freezing after initial water fill. Even if the system is drained unit coils may still retain enough water to cause damage if exposed to temperatures below freezing.

In the event that any defective components are discovered the sales representative must be notified before any repairs are attempted.

When the system integrity has been established all of the piping must be insulated. This includes any valves not located over the drain pan. The drainpipe should be connected to an acceptable disposal point. A drain trap is an integral part of the unit and it is strongly recommended to prevent odor contamination.

## Ductwork Connections

All ductwork and/or return grills should be installed in accordance with the project plans and specifications.

All units must be installed in a non-hazardous area. Zero clearance to combustible materials is allowed.

Units provided with outside air ventilation should have some form of low temperature protection to prevent coil freeze up. The safest method being the use of glycol in the proper percent solution for the coldest expected air temperature.

The manufacturer assumes no responsibility for undesirable system operation due to improper field design, equipment or component selection, and/or installation of ductwork, grills, and other related components.

## Wall Framing

Wall framing is the responsibility of others.

Units are designed for field mounting a drywall enclosure around them. Care must be taken when fastening drywall to the unit.

1. Do not locate screws, nails, or mechanical fasteners where they can penetrate coils, risers, piping, electrical enclosures of other components.
2. Do not apply drywall or framing to drain pans.
3. Do not apply drywall to electrical enclosures.
4. Do not apply drywall to removable panels.

## Outside Air Connection

Outside air connections will be provided as per customer specification.

Vapor barriers or freeze control devices for outside air connections are the responsibility of the installer.

## Electrical Connections - Caution: Electrical Shock/Hazard

The unit nameplate lists the unit electrical characteristics such as the required voltage, fan and heater amperage, and required circuit ampacity. The unit-wiring diagram shows all unit and field wiring. Because each project can be different and each unit on a project may be different the installer must be familiar with the wiring diagram and nameplate on the unit before beginning any wiring. An adequately sized fuse, circuit breaker, or disconnect that meets local and national electric codes must be supplied. All electrical connections should be checked for tightness before startup.

All field-installed components should be located and checked for proper function and compatibility. All internal components should be checked for shipping damage and any loose connections should be tightened to prevent any problems during startup.

Any devices furnished by the factory for field installation must be wired in strict accordance with the applicable wiring diagrams. Failure to do so could result in personnel injury, or damage to the equipment and will void all manufacturers' warranties.

## Thermostats

Thermostats will be provided per customer request. Unit mounted thermostats will be furnished with a dry wall mud ring.

The manufacturer assumes no responsibility for any injury or damage resulting from the improper field installation of any components.

Any modification to the unit without written factory authorization will result in voiding all factory warranty and will nullify any agency listings.

## Start Up

### General

Before beginning any start up operation all start up personnel should familiarize themselves with the unit options, accessories, and control sequence to understand the proper system operation. All personnel should have a good working knowledge of the

general start up procedures along with the appropriate start-up guides and balancing guides available.

The building must be completely finished with all doors, windows, interior walls and insulation in place. The entire building should be as complete as possible before beginning any system balance. Before any start up operations occur a final visual inspection should be made of the system. Once it has been established that the installation is correct, complete, and no foreign articles have been left in the units or other areas the start up procedure can begin.

## Cooling/Heating System

Before the water system is started and balanced the chill/hot water systems should be flushed to remove any contaminant that might be collected in the system during construction. All unit service valves must be in the closed position during this operation to keep foreign matter from entering the unit and clogging the valves. Strainers should be installed in the piping mains to prevent this material from entering the units while they are operating.

During the filling of the system the vent valve on top of the coil should be turned clockwise one and one-half turns so any trapped air in the coil can escape.

CAUTION: The coil air vents are not to be used to bleed the entire system. The main piping must have air vents installed in it where potential air traps could be located.

Some systems may require repeated venting over a period of time to properly eliminate air from the system.

CAUTION: Do not exceed 350 PSIG operating pressure.

## Air System Balancing

All ductwork must be complete and connected, all grilles, filters, access doors and panels must be properly installed to establish system operating conditions **BEFORE** beginning air balancing operations. Balance specialists who are familiar with all procedures required to establish air distribution and fan system operating conditions should do the air balancing. Exposed units with no ductwork do not require air balancing other than selecting the desired fan speed. After proper system operation has been established the actual air delivery and motor amp draw should be recorded for future reference.

## Fan Adjustment

**Before starting the fan motor, make sure duct system is free of foreign objects, and filters are installed where required.**

- (1) Start motor and let it run-in at least 15 minutes. During run-in, check ductwork connections for leaks and repair if necessary.
- (2) These units are equipped with ECM motors. Set the fan as described on the ECM MOTORS IOM, page 1.

## Water System Balancing

Only qualified personnel with a complete knowledge of hydronic systems, their components, and the controls essential to proper water balancing should attempt to balance these systems. All components must be in operating condition **BEFORE** attempting to balance the system.

Every hydronic system has different operating characteristic depending on the devices and controls in the system. The actual balancing technique may vary from one system to the next due to these differences.

After establishing the proper system operation the appropriate system operating conditions should be recorded for future reference.

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## Controls Operation

All other systems should be operating properly before the controls function is tested.

Approved unit submittals, order acknowledgement, and other manuals should be consulted for detailed information regarding each individual unit and its controls. Care should be taken that the correct control procedures have been identified for the unit in question before any attempt is made to adjust the control sequence. For specific information on controls provided by other manufacturers contact the manufacturers local or national office. This applies whether the controls are factory or field mounted.

## Normal Operation & Periodic Maintenance

### General

Each unit on a job will have it's own unique operating environment and conditions that will dictate the maintenance schedule for that unit. A formal schedule and maintenance log and an individual unit log should be established and maintained to establish max performance and service life.

Information regarding safety precautions contained in the preface at the beginning of this manual should be followed during any service and maintenance operations.

### Motor Blower Assembly

Nailor uses permanently lubricated ECM motors to ensure a long trouble free blower life. However, should it become necessary, the blower assemblies in these units are easily removable. Before the blower assembly can be slid from the unit, the wiring harnesses between the motor and the unit must be unplugged.

To remove the assembly, first remove the two sheet metal screws securing the blower assembly. Next, slide the blower assembly out the front of the unit. To reinstall the blower assembly repeat the removal sequence in reverse order, making sure to reconnect all wiring harnesses.

Dirt and dust should not be allowed to accumulate on the blower wheel or housing. This can result in an unbalanced blower wheel and damage the wheel or motor. The wheel can be cleaned periodically with a vacuum cleaner and brush.

## Maintenance Procedures

### If fan motor does not run, do the following:

- Check for free rotation of blower wheel. Make sure no foreign objects are in fan. Look for signs of freight or job site damage.
- Check power supply. Disconnects should be in the "ON" position.  
Optional fusing should also be inspected. Check transformer for proper output.
- Check for proper control signals and fan relay function.

### Fan motor runs but emits excessive noise:

- Maximum airflow may be too high, or discharge static pressure may be incorrect.
- Blower may have clearance problems. Make sure all components are securely attached.
- Verify integrity of ductwork. Leaks or loose connections could cause noise. Check for rattling diffusers or rattling or incorrectly adjusted balancing dampers.

### Fan motor runs, but airflow too low:

- May be due to ductwork restrictions, dirty air filters, or clogged

water coils.

- Readjust fan speed control.
- Discharge static pressure may be incorrect.

## Coil

Coils may be cleaned by brushing the coil face with a soft brush. The brush strokes should be in the direction of the fin never across the fin. Cleaning with a vacuum cleaner should follow this. If compressed air is available the coil may be cleaned by blowing air through the coil from the leaving airside. Vacuuming should follow this procedure also. Even coils that have the filter changed on a regular basis still require cleaning periodically.

## Electric Resistance Heater Assembly

Electric resistance heaters typically require no normal periodic maintenance when unit air filters are changed properly. The two most important operating conditions for an electric heater are, proper air flow, and proper supply voltage. High supply voltage or insufficient airflow will cause the heater strips to cycle on the high side. The strip heaters are equipped with automatic reset switches to prevent overheating of the unit. Once the switches are tripped the heater will remain off until it cools past the lower set point for the trip switches to reset. If the trip switches actuate, the system should be checked and any problem found corrected.

## Electrical Wiring and Controls

The electrical operation of each unit is determined by the components and wiring of the unit and may vary from unit to unit. The wiring diagram for the unit in question should be consulted before attempting any repairs to the unit. When replacing any component such as fuses, contactors, or relays, the exact type, size and voltage should be used. All repair work must be done in such a manner as to maintain the equipment in compliance with governing codes and ordinances or testing agency listings. Any deviation will void all factory warranty.

The integrity of all electrical components should be verified at least twice during the first year of operation. Afterwards, all controls should be inspected regularly for proper operation.

## Valves and Piping

Valves and piping require no formal maintenance. Inspection should be made for possible leaks during the course of normal maintenance. Should a valve require replacement care should be taken to keep the valve cool during the brazing process.

## Filters, Throwaway

The throwaway filters used on a fan coil should be replaced on a regular basis. A log should show the time between filter changes so a maintenance schedule for changing the filters can be established.

## Drain

The drain should be checked for blockage at the initial start up of the unit and every year at the beginning of the cooling season. If clogging is discovered steps must be taken to clear it before the unit is started.

Periodic checks should be made during the cooling season to maintain free flowing condensate. Should algae and/or bacteria be a concern a local air conditioning and refrigeration supply organization familiar with local conditions should be consulted for what chemicals are available to control these agents.

Dimensions are in inches (mm).

## Replacement Parts

Factory replacement parts should be used wherever possible to maintain the unit performance, operating characteristics, and testing agency listings. Replacement parts can be purchased through the local Sales Representative. Any modification not authorized by the factory could result in personal injury, damage to the unit and will void all factory warranties.

When ordering parts the following information is required to ensure proper part identification:

1) Complete unit model number.

2) Unit hand connection (right or left hand). Hand is decided by standing in the entry air stream with the air striking the back of the head.

3) Complete part description including any numbers available on the part.

4) The SO# that appears on the nameplate label.

Any unit returned to the factory **MUST** have a Return Authorization Number, provided by the factory, marked on it.

**All equipment and components sold as replacement parts or sent as a warranty part are warranted for 12 months from the date they leave the factory.**

## Replacement Parts List

Model Series	Unit Size	ECM Motor			GE Blower Assembly Part No.
		HP	120/208/240V Part No.	277V Part No.	
39VH, 39L	6	1/3	VH1-0046B	VH1-0045B	VH1-900
	10	1/2	VH1-0046A	VH1-0046	VH1-904
	15	3/4	VH1-0045A	VH1-0045	VH1-904
	19	1	VH1-0046E	VH1-0045E	VH1-904

Model Series	Unit Size	PSC Motor				GE Blower Assembly Part No.
		HP	120V Part No.	208 - 230V Part No.	277V Part No.	
39VH, 39L	3, 5	1/10	VH1-1806	VH1-1807	VH1-1808	VH1-1809 (Size 3), VH1-902A (Size 5) VH1-900Z (Size 6), VH1-1983 (Size 8) VH1-904 (Size 10), VH1-1338 (Size 12) VH1-1925 VH1-1926 (Size 19), VH1-1925 (Size 21)
	6, 8	1/6	VH1-1806A	VH1-1807A	VH1-1808A	
	10, 12	1/3	VH1-1806C	VH1-1807C	VH1-1808C	
	15	1/2	VH1-1806D	VH1-1807D	VH1-1808D	
	19, 21	3/4	VH1-1806E	VH1-1807E	VH1-1808E	

Model Series	Unit Size	Standard Return Air Filters			Filters For Filter Grille Options		
		Nom. Filter Size	Throwaway Part No.	Merv. 7 Part No.	Nom. Filter Size	Throwaway Part No.	Merv. 7 Part No.
39VH, 39L	3, 5, 6	13 1/8 x 16 3/4 (333 x 425)	VH1-1842	VH1-1352	14 x 14 (356 x 356)	VHI-2000	VH1-1996
	8, 10	15 1/2 x 24 (394 x 610)	VH1-1843	VH1-1230	16 x 20 (406 x 508)	VHI-2001	VH1-1997
	12, 15	18 1/2 x 29 (470 x 737)	VH1-1969	VH1-1967	20 x 25 (508 x 635)	VHI-2002	VH1-1998
	19, 21	24 1/2 x 29 (622 x 737)	VH1-1970	VH1-1968	25 x 25 (635 x 635)	VHI-2003	VH1-1999

Fan Relays	Part No.	Airflow Switch	Part No.	P.E. Switch	Part No.	Fan Motor Fuses	Part No.
1 Pole, 24V	H1-666	AFS AFS Probe, 4" AFS Probe, 8"	VH1-236A VH1-242 VH1-245	Switch, P-E	H1-539	250V, 15A 250V, 20A 600V, 15A 600V, 3A 600V, 5A 600V, 8A	VH1-320 VH1-321 VH1-329 VH1-0011 VH1-965 VH1-967

Door Disconnect Switch	Part No.	Disconnect Switch	Part No.	Transformers	Part No.
3P, 25A, 600V 3P, 60A, 600V	VH1-204 VH1-205A	Toggle, 1P, 16A, 600V Toggle, 3P, 40A, 600V Toggle, 3P, 60A, 600V	VH1-212 VH1-211 VH1-213	208/240/24V, 50VA 277/24V, 40VA/50VA/75VA 346/24V, 40VA/50VA/75VA 480/24V, 50VA 120/208/240/480V, 75VA 120/24V, 40/50VA	VH1-685 VH1-675/674/677 H1-992/991/993 VH1-686 VH1-689 VH1-669/692



Dimensions are in inches (mm).

Houston, Texas  
Tel: 281-590-1172  
Fax: 281-590-3086

Las Vegas, Nevada  
Tel: 702-648-5400  
Fax: 702-638-0400

Toronto, Canada  
Tel: 416-744-3300  
Fax: 416-744-3360

Calgary, Canada  
Tel: 403-279-8619  
Fax: 403-279-5035