

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL



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IMPORTANT: READ AND SAVE THESE INSTRUCTIONS!

CONSUMER SAFETY INFORMATION

SAFETY DEFINITIONS



Indicates safety alerts. When this symbol is seen on the Air Handler and in all instructions and/or manuals, be alert to the potential for personal injury. Recognize signal words DANGER, WARNING and CAUTION. These words are used with the safety alert symbol.



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



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



Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.



This is used to highlight important information which will aid in installation, improve reliability or enhance operation.

SAFETY CONSIDERATIONS

Before any work is undertaken, it is imperative to observe all precautions as stated in this manual, on tags, and/or labels, together with any other safety measures that may apply.

- Wear safety glasses and work gloves.
- When practical, objects to be brazed shall be moved to a designated safe location or, if the objects to be brazed cannot be readily moved, all movable fire hazards in the vicinity shall be taken to a safe place, or otherwise protected.
- Use quenching cloth for all brazing and un-brazing operations.
- Suitable fire extinguishing equipment shall be immediately available in the work area and shall be maintained in a state of readiness for instant use.

Read these installation instructions carefully and adhere to all WARNINGS and CAUTIONS. Consult local building codes, Occupational Safety & Health Administration (OSHA) and Electrical Safety Authority (ESA) for special requirements. Improper installation, modification, service, maintenance, or use of Hydronic Systems can cause electrical shock, burns or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor for information or support. The qualified installer or agent must use factory authorized kits and/or accessories when installing this product. Refer to the appropriate RedZone™ literature for listing.



Before installing or servicing the Air Handler, always turn off all power to unit. There may be more than one disconnect switch. Electrical shock can cause personal injury or death.



Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing.

NOTICE

Application of this Air Handler should be indoors. Special attention should be given to unit sizing and piping, filling, and purging.

Read the entire instruction manual before starting the installation.

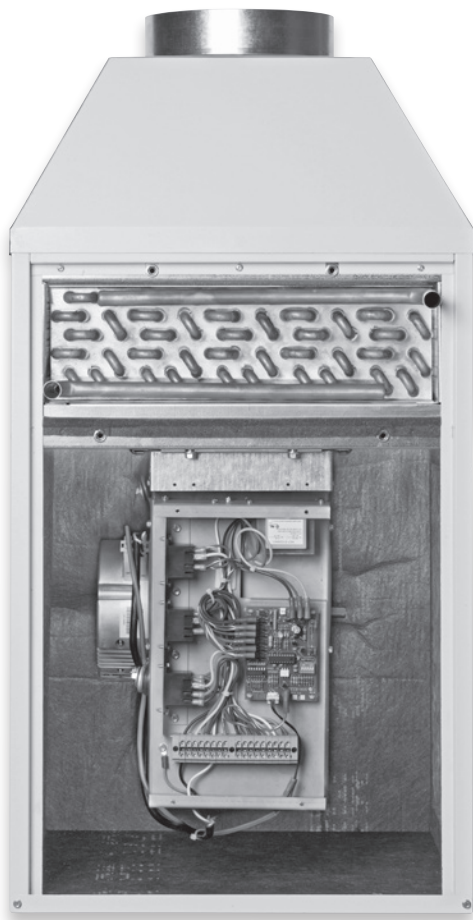
OVERVIEW OF THE REDZONE™ AIR HANDLER

INTRODUCTION

The optimum in hydronic technology: the newly designed RedZone™ multi-position Air Handlers offer a unique solution for a wide variety of small and medium sized residential and light commercial applications. They are compact and ready to fit in tight spaces which may include, but not limited to, basements, closets, crawlspaces and utility rooms.

The RedZone™ HVS unit has a flow restrictor to manage the water that's needed to heat. Therefore, domestic flow is not affected.

These Air Handlers will work with virtually any hot water heater, but are optimized to work with tankless water heaters.



CODES AND STANDARDS

It is the responsibility of the installer to follow all national codes, standards and local ordinances, in addition to instructions laid out in this manual. The installation must comply with regulations of the local building, heating, plumbing and other codes. Where local codes are not applicable, the installation must comply with the national codes and any and all authorities having jurisdiction.

The following is a suggested list of codes and standards for the United States and Canada:

General Installation

Installation of Air Conditioning and Ventilating Systems
NFPA 90A (latest edition)

Duct Systems

Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

2001 Fundamentals Handbook Chapter 34 or 2000 HVAC Systems and Equipment Handbook Chapters 9 and 16

US and CANADA: Air Conditioning Contractors Association (ACCA) Manual D

Acoustical Lining and Fibrous Glass Duct

US and CANADA: current edition of SMACNA; NFPA 90B as tested by UL Standard 181 for Class I Rigid Air Ducts

Electrical Connections

CANADA: Canadian Electrical Code CSA C22.1 (latest edition)

Plumbing Systems

US and CANADA: ICC International Plumbing Code (IPC); Uniform Mechanical Code (UMC); Uniform Plumbing Code (UPC)

RECEIVING AND CHECKING EQUIPMENT

IDENTIFY UNIT

The unit model number and serial number are located on the unit identification label (located on the left side of the unit). Check this information against shipping papers and job requirements.

INSPECT SHIPMENT

Upon receipt of a HVS Series Air Handler, the packaging should be checked for peripheral signs of transportation damage while unit is still in the shipping package. If unit appears to be damaged or is torn loose from its anchorage, the unit shall be immediately examined by the receiving

party before removal. If damage is found, the receiving party must sign the driver's delivery receipt noting all damage (i.e. carton damage and/or product damage) as well as contact the last carrier immediately, preferably in writing, requesting inspection by the carrier's agent. All claim papers **MUST** be forwarded to your local distributor for processing. In general, upon receipt of product, be sure to check all items against shipping list; if items are found to be missing, it should be noted as such on the driver's delivery receipt; and the receiving party shall also immediately notify the area distributor. To prevent loss or damage, leave all parts in original packages until installation.

INSTALLATION

The HVS Series Air Handler needs to be installed and commissioned by a knowledgeable qualified professional.

NOTES:

1. This Air Handler is approved for upflow, downflow, and horizontal configurations.
2. Clearance arrows do not change with Air Handler orientation.
3. **This Air Handler is for indoor installation only.**
4. Unit(s) shall be installed in such a way as to ensure that the electrical components are protected from any contact with water.
5. Unit(s) shall not be installed directly on any combustible material other than wood flooring.
6. This unit is designed to be used with an air distribution system (ductwork). Refer to the Air Distribution Ductwork section.
7. The installer shall provide ample space for servicing and cleaning. Always comply with minimum fire protection clearances shown in Figure 1.
8. The HVS units are designed to be installed vertically or horizontally on the floor; units may also be hung from the ceiling or wall. Be sure to allow appropriate clearances for wiring, piping and servicing.

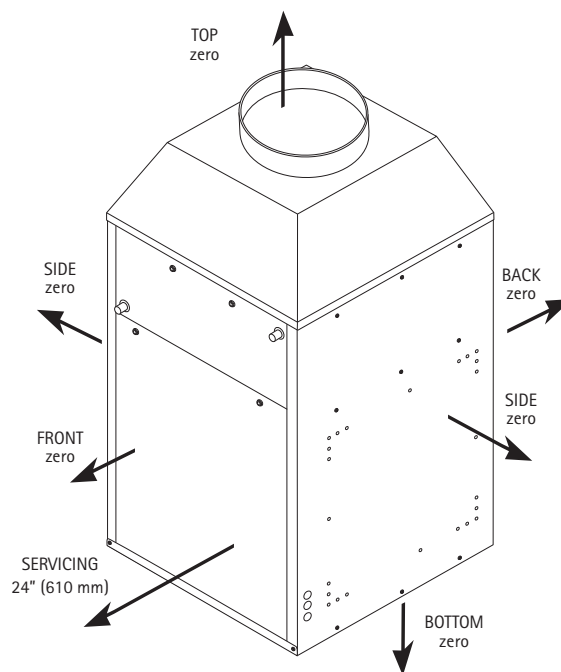


FIGURE 1 Minimum Clearance to Combustible Construction



WARNING

Do not install this unit if the unit is damaged.

Do not install this unit if any part or all of unit has been under water. Refer to the Receiving and Checking Equipment section.

Table 1 – Physical Data

UNIT SIZE	DIMENSIONS															
	A		B		C		D		E		F		G		H	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
HVS600	18	457	33.5	851	18.5	470	8	203	15.5	394	14.5	368	16	406	15.5	394
HVS800	18	457	33.5	851	22.5	572	8	203	19.5	495	14.5	368	16	406	19.5	495

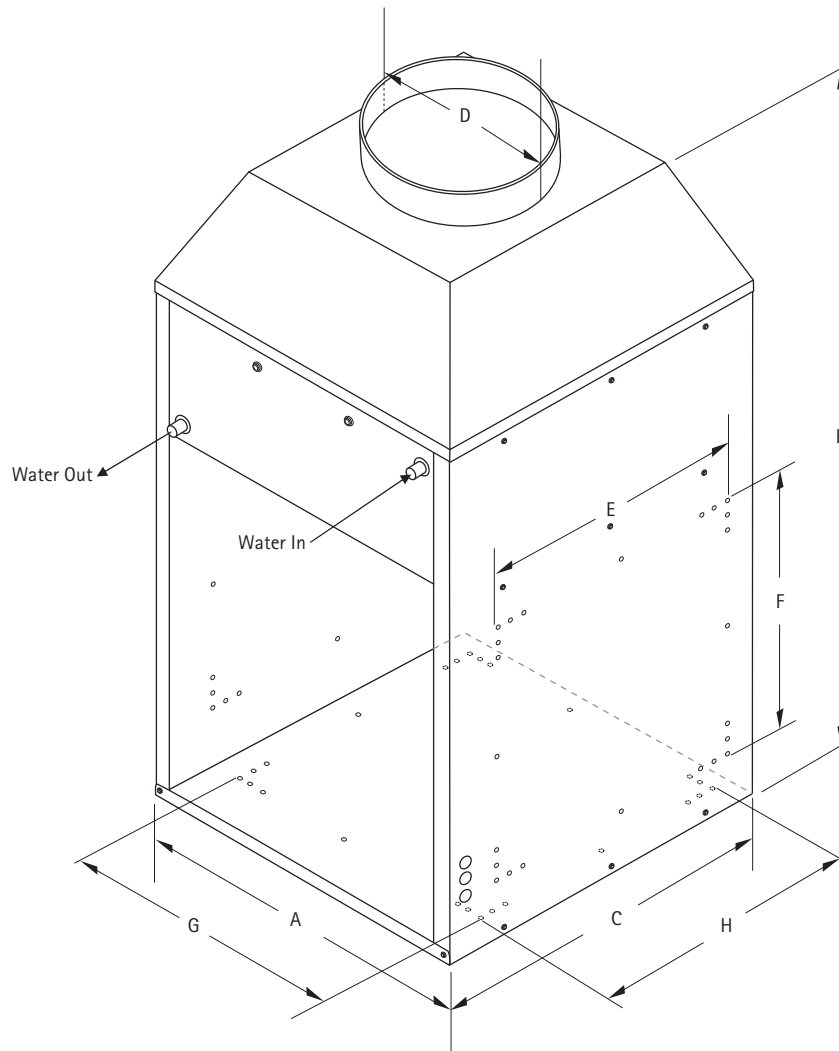


FIGURE 2

INSTALLATION

LOCATING AND MOUNTING THE AIR HANDLER

General

The multi-position HVS Series Air Handlers are shipped requiring only minor modifications to the cabinet. The appropriate return air opening must be cut out and a filter rack installed (not included). For instructions on required modifications and assembly refer to Figures 3 and 4.

NOTICE

You must consider how the A/C (evaporator) coil might be affected by the unit's orientation.

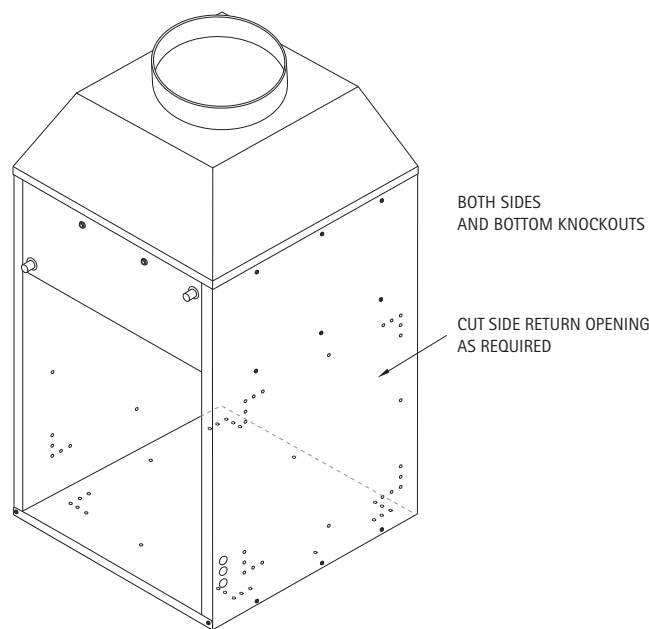


FIGURE 3 Modification of Unit to Accommodate Side Filter Rack Installation

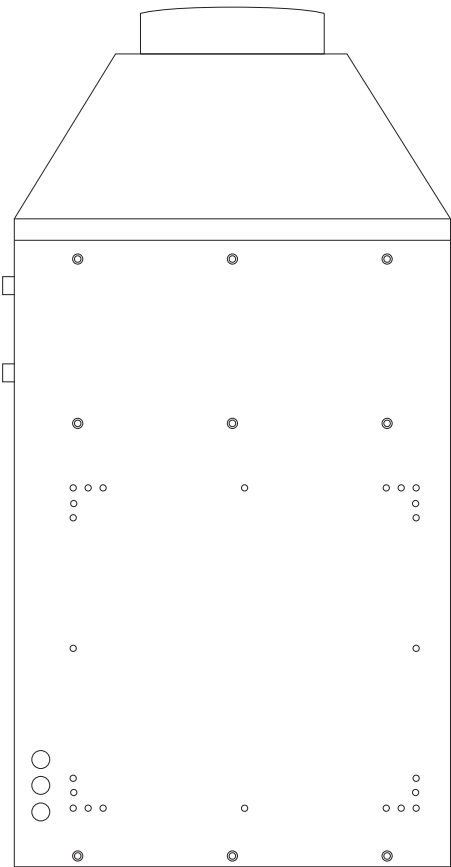


FIGURE 4 Side Filter Rack Installation
(See Figure 2 for dimensions)

INSTALLATION

Upflow Installations

The HVS Air Handler is ready to install once the appropriate return air panel is selected and cut out.

If you use the bottom return, the unit must be supported on the bottom only and set on a field supplied supporting frame or plenum. Supporting frame or plenum must be anchored to the unit and to the floor or wall.

Downflow Installation

The HVS Air Handler is ready to install once the appropriate return air panel is selected and cut out.

In a downflow installation the unit must be supported on the top only and set on a field supplied supporting frame or plenum. Supporting frame or plenum must be anchored to the unit and to the floor or wall. Mount the filter rack on the side or bottom of the cabinet that the return air knockout has been removed.

Horizontal Left and Right Installations

The HVS Air Handler is ready to install once the appropriate return air panel is selected and cut out.

In a horizontal installation the unit must be supported on the side only and set on a field supplied supporting frame. The supporting frame must be anchored to the unit and to the floor, wall or ceiling. Mount the filter rack on the side or bottom of the cabinet that the return air knockout has been removed.

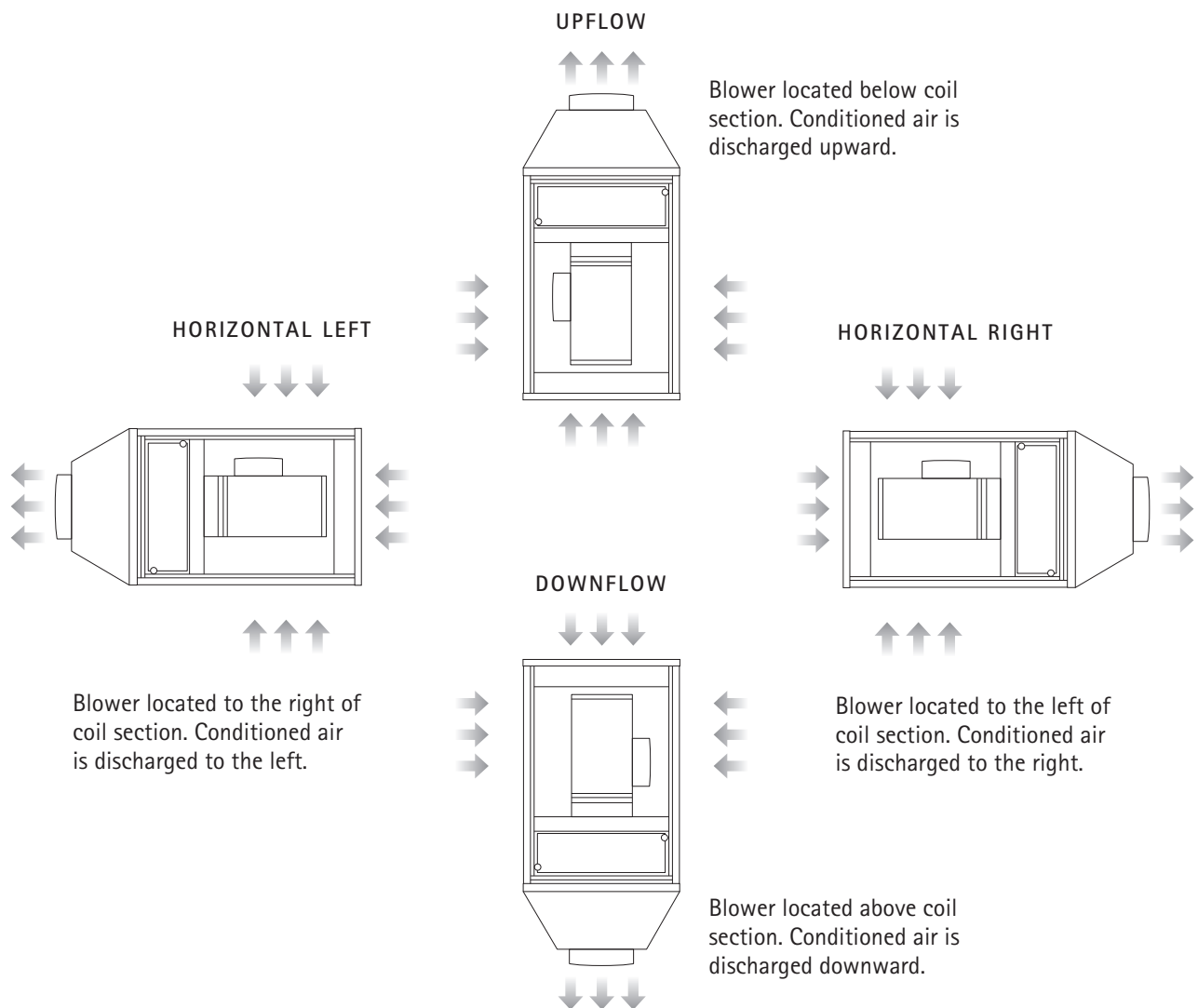


FIGURE 5 Multi Purpose Orientation

INSTALLATION

CLOSET INSTALLATION (RETURN AIR THRU OPENING OR GRILL)

The HVS Air Handler can be installed in a closet on a supporting stand or be mounted from the closet wall using the closet as the return air plenum. Unit should be high enough from the floor to provide unimpeded return airflow into the bottom of the cabinet.

Closet return air opening can be on the front (in closet door), side (thru the wall) or a combination of both, providing there is clearance on the sides between unit's cabinet and closet. Refer to ACCA Manual D or SMACNA for sizing and free area recommendations.

NOTE:

Local codes may limit application of systems without a ducted return to single story dwellings.

SUSPENDED CABINET INSTALLATION

If the cabinet cannot be supported on a frame or supported from the wall, it may be suspended.

Use metal strapping or threaded rod with angle iron supports under cabinet for support. These supports **MUST** run parallel with the length of the cabinet (see Figures 6 and 7).

Ensure that there is adequate room to remove service and access panels after installing supporting brackets.

If an auxiliary drain pan is required, the support is to be placed under a drain pan. In such installations, the unit will need to be supported on vibration isolators (rubber or Styrofoam blocks).

IMPORTANT:

When a HVS unit is matched with an evaporative type (cased coil/condensing unit) split system for cooling application and the system is installed above a finished ceiling and/or an occupied space, building codes may call for a secondary insulated condensate pan (by others) to be installed under the entire unit. In other instances, some local codes may allow the running of a separate, secondary condensate line in lieu of the required drain pan. It is the responsibility of the installer to consult local codes for compliance.



WARNING

It is the installer's responsibility to use an appropriate hanging method capable of supporting the unit's weight. Refer to the specification section of this document for the respective unit's installed weights.

NOTICE

For seismic hanging requirements, refer to local codes.

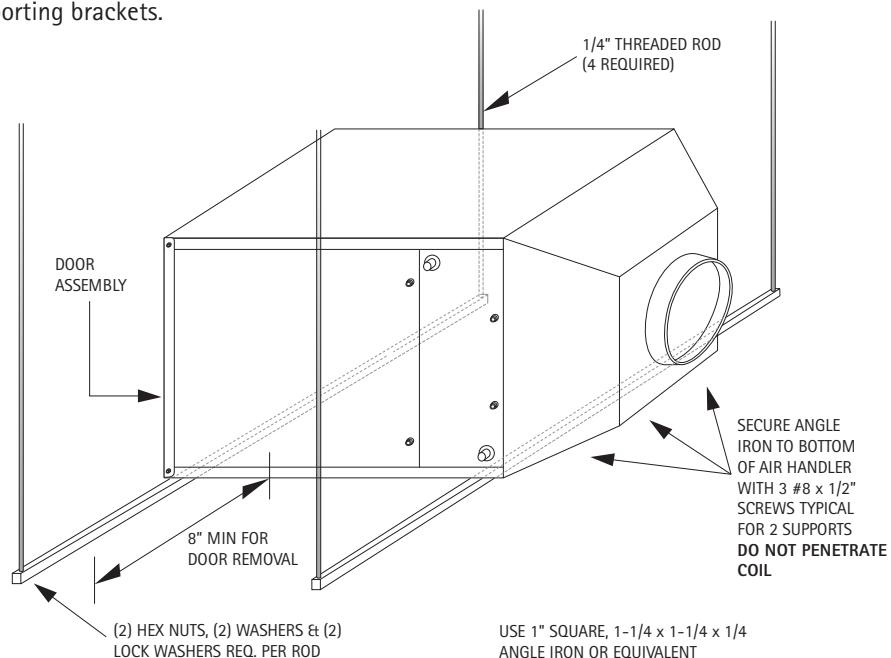


FIGURE 6 Horizontal Unit Suspension

INSTALLATION

Attachment Methods Using Straps

Method 1

Use (4) #8 x 1/2 sheet metal screws for each strap. The straps should be vertical against the Air Handler sides and not pull away from the Air Handler sides.

Method 2

Fold all straps under the Air Handler and secure with (4) #8 x 1/2 sheet metal screws (2 screws at the side and 2 screws at the bottom. (Care must be taken not to drive the screw through the coil.) **Do not penetrate coil.**

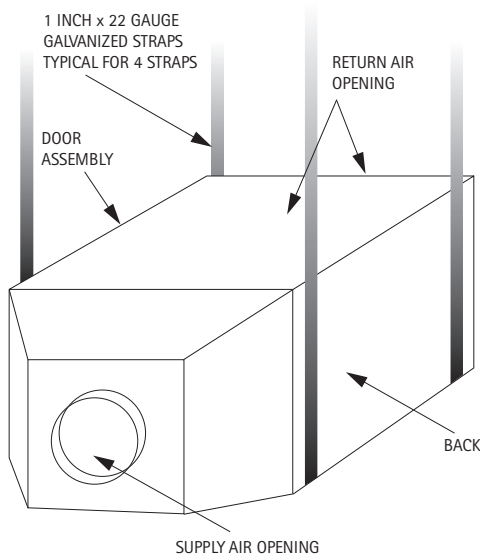


FIGURE 7 Horizontal Unit Suspension with Straps

DUCT CONNECTIONS

Supply Duct

The supply ductwork must be attached to the outside of the flange on the air discharge end of unit. Flexible connectors may be used if desired.

Return Duct

The return ductwork should be attached to the air return side (bottom or side) of unit using sheet metal screws or other fasteners.

For side return air inlet installation, see Figures 3 and 4.

AIR DISTRIBUTION SYSTEM

Existing Ductwork

It is the responsibility of the installer to inspect all previously installed air distribution system to determine its suitability for the new heating and/or cooling system. Existing ductwork may have to be modified and/or insulated to provide satisfactory air distribution.

Ductwork Installation

Connect the supply-air duct over the outside of the round flange on the unit's discharge side. Secure the duct to the flange with proper fasteners for the type of duct used. Support the duct independently.

Use flexible connectors (if desired between the ductwork and the unit to prevent transmission of vibration.

Use insulation with vapor barrier for ductwork passing through unconditioned spaces.

PROHIBITED INSTALLATIONS

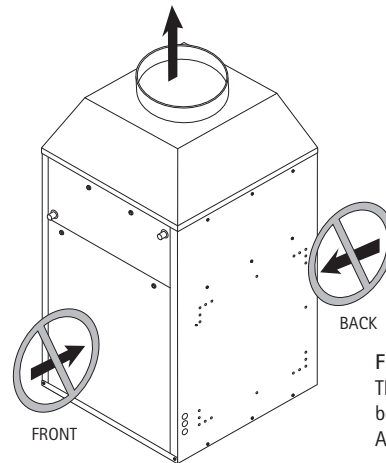


FIGURE 8

The air inlet is not allowed to be at the front or back of the Air Handler.

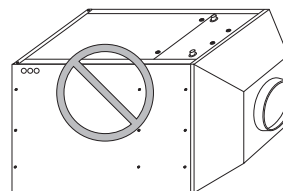


FIGURE 9

Do not position the Air Handler on its back or with its face down.

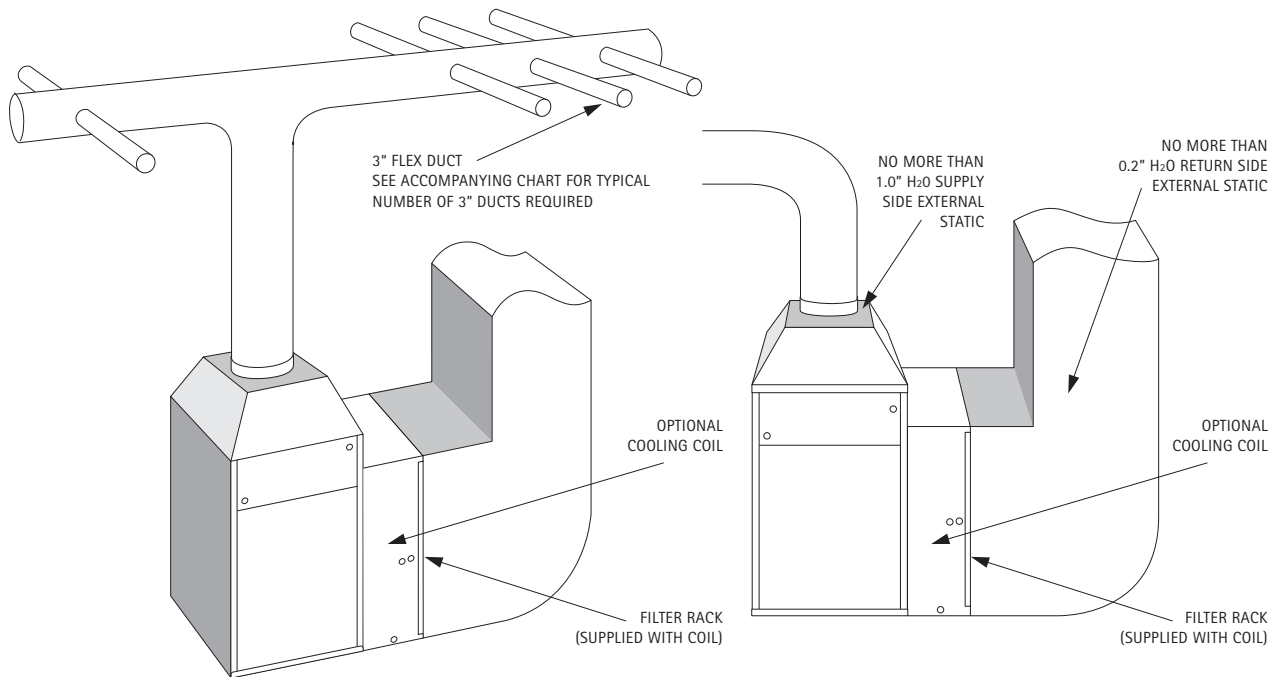


WARNING

Multiple Air Handlers configured for installation with a single Tankless Water Heater is prohibited.

INSTALLATION

TYPICAL HVS HIGH VELOCITY INSTALLATION WITH OPTIONAL COOLING COIL



TYPICAL DUCTING USING 3" DIAMETER FLEX						
			METHOD A		OR	METHOD B
MODEL	TYPICAL CFM	MAIN DUCT DIAMETER	MINIMUM # OF 3" DIA. FLEX DUCT RUNS	TYPICAL # OF 3" DIA. FLEX DUCT RUNS AT 6-10 FEET EACH		MAXIMUM EXT. STATIC ON SUPPLY SIDE
HVS600	600	8"	12	14		1.0" H ₂ O
HVS800	800	8"	16	18		1.0" H ₂ O

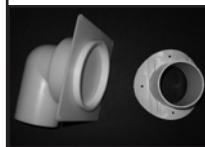
BRANCH DUCTWORK

After the floor and ceiling holes have all been located and drilled, it's time to install the 3" branch ducts. Run the 3" duct parallel to the joists whenever possible as this takes less space. The 3" duct should then be fastened to the joist with strapping material. If the 3" duct is in an unconditioned space, it must be insulated to local code then all connections must be tapped to ensure a continuous vapor seal. Do not damage the vapor barrier on the 3" duct. If it is damaged, the holes must be taped with foil tape. If possible run the 3" duct between the insulation and the vapor barrier. Use of non-insulated ductwork can be used in conditioned spaces.

The minimum length of 3" duct is 5' and the maximum ideal is 15'. If a run is shorter than the flex length, then the 3" duct can be coiled in the cavity. The minimum bend radius is 4". When installing a branch duct with a minimum radius ensure the duct is extended fully to allow full airflow through the elbow.

Please do not abuse the 3" flex as the helix will crush and unravel.

NOTICE



RZROUGHKIT
Rough-in Assembly
including Elbow,
Saddle and Dust
Cap



RZGRILL
Round Grill
including
Damper

The RedZone™ HVS Air Handler was tested with the above fittings. Use of other fittings may result in improper air flow and air noise.

INSTALLATION

When connecting the 3" duct to the 3" saddle, attach the fitting into the inner core of the 3" duct with 2 evenly spaced TEK screws. Ensure the head of the TEK screw is on the wire helix as the core will tear. Then pull the insulation and vapor barrier over the inner core and secure around the outside of the vapor barrier with tape, or a cable or wire tie. Tighten the tie securely around the connector tube, inner core and vapor barrier.

When installing the 3" flex duct in areas in which you must run counter to the direction of solid joists, some drilling may be required. It is recommended to drill the smallest hole possible in order to maintain the structural integrity. If possible run the flex duct under the joists and avoid drilling any holes.

NOTE:

When installing the rough-in kit, saddles, elbows and grills should be fastened in this manner.

PLUMBING

Codes:

Observe all local sanitary codes when installing water lines. The water supply mating connections to the HVS Air Handling Units are made via the two (1/2 in. Dia.) copper stubs on the front of the unit labeled "WATER IN" and "WATER OUT" (see Figure 2). Mating connectors to be two field supplied 1/2 in. FNPT-sweat ends or two field supplied 1/2 in. SharkBite type FNPT-push fitting ends or equivalent.

All associated hydronic piping **MUST** comply with ICC, UPC and any other local codes or ordinances having jurisdiction. **USE POTABLE GRADE COPPER PIPING AND BRASS APPURTENANCES ONLY.**

NOTE:

Recommended piping, fittings, valves and other appurtenances (exclusive of those indicted as accessories that are available through RedZone™ distribution) called for in piping schematics to be field-supplied.

Soldering Copper Tubing

The common method of joining copper tubing in hydronic heating systems is soft soldering. Plumbing codes do not allow solders containing lead to be used for domestic water service. **USE ONLY 95/5 tin/antimony solder** for all piping systems that incorporate a domestic water supply.



CAUTION

Use a wet rag around water inlet and outlet to ensure no damage to rubber grommet seal during soldering.

NOTE:

Precautions must be taken during soldering to avoid debris or solder from lodging in piping system.

Mechanical Joining of Tubing

Where used, refer to respective mechanical system manufacturer's installation instructions.

Tubing Insulation

Any tube conveying fluid at a temperature greater than that of the surrounding air releases heat.

Insulate all accessible hot water lines and associated valves with material, such as expanded neoprene or polyurethane 3/8-in. to 1/2-in. thick.

Match the pipe sleeve's inside diameter to the pipe's outside diameter for a snug fit. Place the pipe sleeve so the seam will be face down on the pipe. Tape, wire, or clamp insulation every foot or two to secure it to the pipe. If taping is desired, use acrylic or aluminum foil tape instead of cloth-type duct tape.

Copper Tubing Support

Copper tubing must be properly supported to prevent sagging or buckling. On horizontal runs with hard temper tubing, the following maximum support spacing is suggested:

- 1/2 in. to 3/4 in. tube: 5 feet maximum spacing

The above suggested spacing does not account for extra weight of piping components such as an expansion tank, etc. When such components are present, the piping should be supported immediately adjacent to the component.

On vertical runs, copper tubing should be supported at each floor level or at a maximum of every 10 feet.

Thermal Expansion of Piping:

In all hydronic systems, piping undergoes temperature swings as the system operates. This causes changes in the length of the piping due to thermal expansion.

If the piping is rigidly mounted, this expansion can cause annoying popping or squeaking sounds and in extreme cases, the piping can even buckle.

To counter expansion movement, design piping circuits with sufficient elbows, tees or expansion loops (only used in large systems) or piping supports that allow the tubing to expand and contract freely.

Another alternative is to install an expansion tank compensator fitting capable of absorbing the movement.

INSTALLATION

Hydraulic Resistance of Fittings, Valves, and Other Devices

Before the total hydraulic resistance of a piping circuit can be found, the individual hydraulic resistances of all fittings, valves, or other such components must be determined.

One approach is to consider each fitting, valve, or other device as an equivalent length of copper tube of the same pipe size (see Table 2).

By using the equivalent length of piping for all components in the circuit, the circuit can be treated as if it were a single piece of pipe having a length equal to the sum of the actual pipe length, the total equivalent lengths of all fittings, valves, or other devices. Refer to Figure 10 and the calculation of equivalent lengths.

Pipe Sizing Considerations

At water flow velocities of approximately 2 feet per second, flowing water will carry air bubbles along a vertical pipe. Average flow velocities of 2 feet per second or higher can draw along air bubbles in a downward flow. At the above stated velocities, air bubbles shall be routed to an air separator where they can be collected and discharged from the system.

Average flow velocities higher than 4 feet per second could cause flow noise and should be avoided.

Expansion Tanks

All liquids used in hydronic heating systems expand when heated. For all practical purposes, liquids are incompressible. Any container completely filled with a liquid and sealed from the atmosphere will experience a rapid increase in pressure as the liquid is heated.

To prevent this from occurring, all hydronic systems **MUST** be equipped with an expansion tank. Refer to expansion tank manufacture's instructions for proper sizing and installation.

INSTALLATION

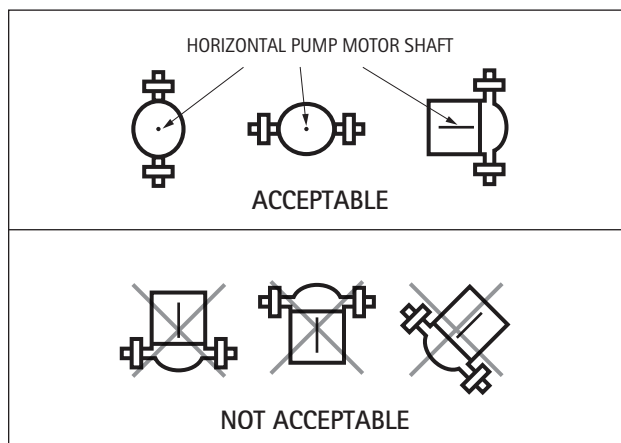
Piping Configuration

When employing a Tankless Water Heater in a hydronic system, the system is considered an Open Loop System when configured to simultaneously deliver both domestic hot water and space heating. By definition, if the circuit is sealed off from the atmosphere at all locations (as is true for most modern hydronic systems) it is called a closed loop system. If the circuit is open to the atmosphere at any point, it is called an open loop system. Current tankless products are not certified for closed loop applications.

External Pump Installation

The pump for the HVS Air Handler comes separate from the unit's cabinet and must be securely fastened to a ceiling, wall or other suitable supporting surface.

The pump must be installed using either of the acceptable orientations in diagram below. In all the pump motor shaft must remain horizontal.

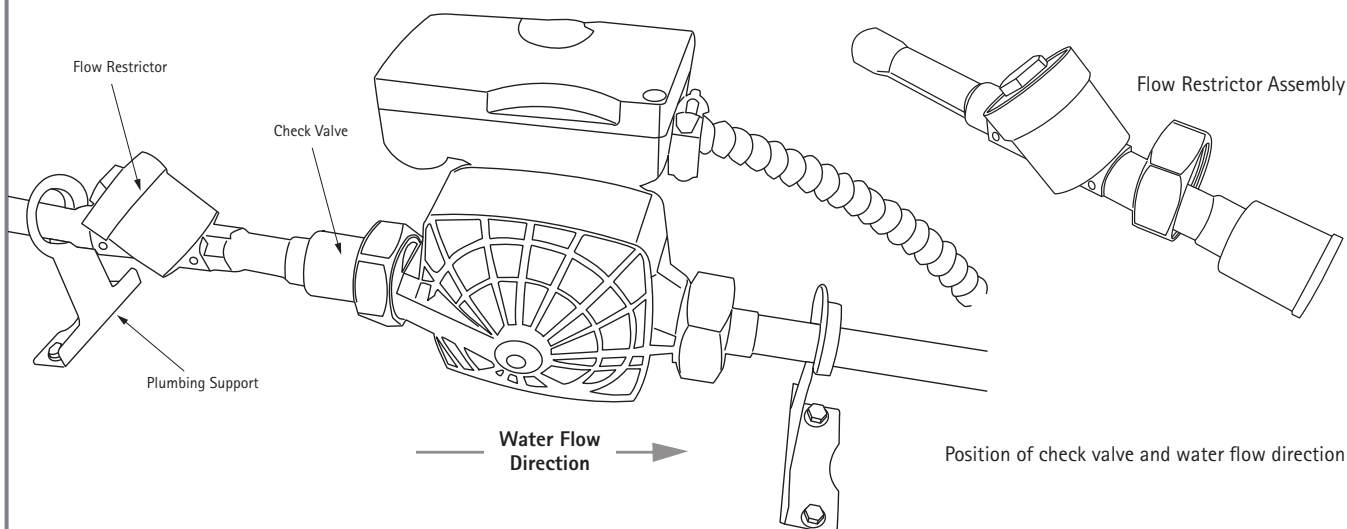


1. Solder copper pipe (not included) to the brass flange fitting contained in the pump fitting kit (supplied), and the flow restrictor assembly. Make sure to slide the nuts onto the pipe prior to soldering the copper pipe to the flanges. **Do not overheat.**
2. Once the brass flange fittings have cooled, insert the check valve into brass housing.
3. Install the pump remembering to use the flat rubber washers contained in the fitting kit. Ensure check valve and pump flow indicator are correctly oriented.
4. **IF NECESSARY**, the pump electrical box can be rotated by removing the 4 hex key bolts, separate the stator from the pump body, and rotate to desired position. Reinstall the 4 pump screws diagonally and evenly apply 4 ft-lb torque.
5. Ideally the cable entering the electrical box will be horizontal or downward facing so as to resist any water entry.
6. Remove the electrical box cover, then connect wires appropriately and fasten electrical box cover with screws provided.
7. Set pump to High speed.
8. For further detailed instructions, refer to the Grundfos UP Series Circulator installation and operation instructions.



CAUTION

Use a wet rag around flow restrictor, or remove internal components to ensure no damage to inside rubber parts of flow restrictor during soldering.



INSTALLATION

Open Loop System

If piping is done in accordance with the recommended schematic diagram shown in Figure 11, the following purge and priming procedure applies.

PURGING AND PRIMING THE SYSTEM

The following procedure describes how the RedZone™ system may be piped to eliminate the need for a “purge cart” to fill the system and remove entrapped air bubbles.

STEP 1: CLOSE ball valve 3 (BV3).

STEP 2: OPEN drain valve 3 (DV3) to which a hose **MUST** be connected and draining to a sink, drain or outdoors.

STEP 3: CLOSE drain valves 1 and 2 (DV1 and DV2) and OPEN ball valve 2 (BV2).

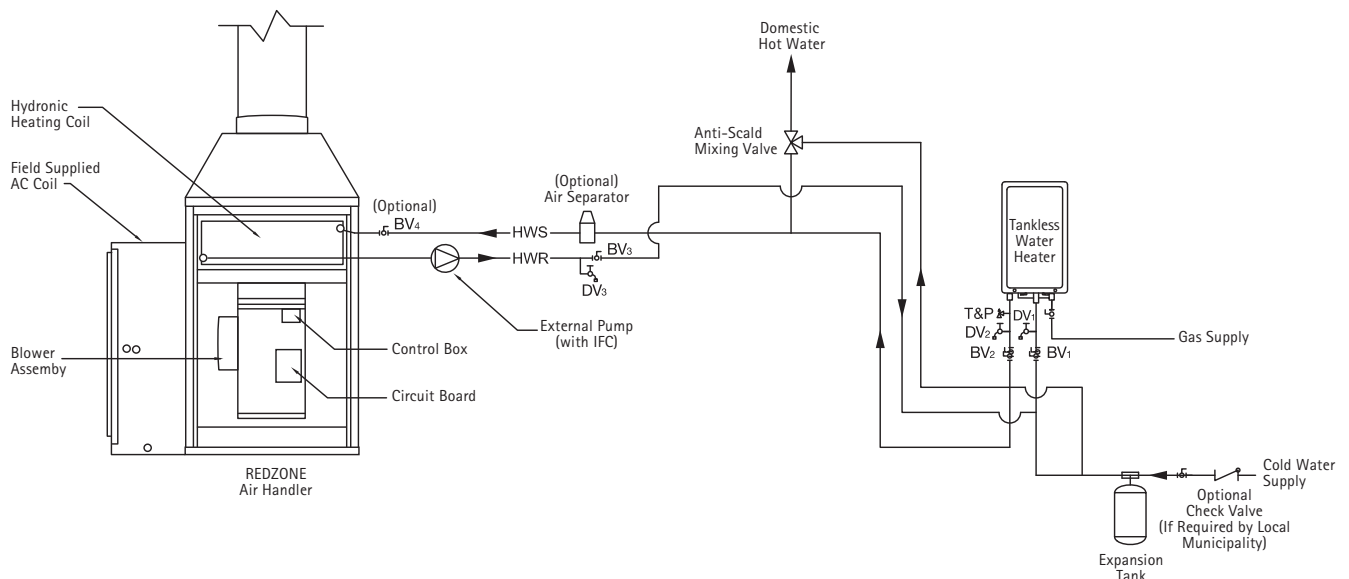
STEP 4: OPEN cold water supply main valve (ball valve 1 - BV1). The system will begin the prime/purge process using the street pressure. Entrapped air bubbles being pushed out of the system will be evident by a slight vibration of the discharge hose connected to drain valve 3 (DV3). The hose will stop vibrating when laminar flow is achieved.

STEP 5: CLOSE drain valve 3 (DV3).

STEP 6: OPEN ball valve 3 (BV3). The system is now purged, primed and ready to go.

NOTE:

For an open loop system, use expansion tank and mixing valve approved for potable water use only.



WARRANTY NOTICE

Expansion Tank and Thermostatic Mixing Valve must be installed with every open loop installation or warranty on product becomes null and void.

FIGURE 11
Typical Piping Arrangement For Direct Space Heating and Domestic Water Supply with Tankless

INSTALLATION

ELECTRICAL CONNECTIONS

Line-Voltage Connections

CANADIAN INSTALLATIONS: Make all electrical connections in accordance with Canadian Electrical Code CSA C22.1 and all authorities having jurisdiction.

Check all factory wiring per unit wiring diagram and inspect factory wiring connections to be sure none were loosened in transit.



WARNING

Before installing or servicing system, always turn off all power to system. There may be more than one disconnect switch. Electrical shock can cause personal injury or death.



CAUTION

If a disconnect switch is to be mounted on the unit, select a location where a drill or fastener will not contact electrical or hydronic components. Electrical shock can cause personal injury or death.

NOTE:

Prior to making any electrical connections, ensure that supply voltage, frequency, and phase are as specified on unit rating plate.

Check to ensure that the existing electrical service is adequate to handle the additional load imposed by the HVS Air Handler. Refer to unit wiring diagram for proper electrical connections.

All electrical connections **MUST** comply with NEC and any other local codes or ordinances having jurisdiction. **USE COPPER WIRE ONLY.** Provide separate branch electric circuit with field supplied disconnect switch.

Location of disconnect switch to be in clear site, accessible and in close proximity to the unit. Correct polarity **MUST** be maintained for 115 V wiring. If polarity is incorrect unit will **NOT** operate.

INSTALLATION

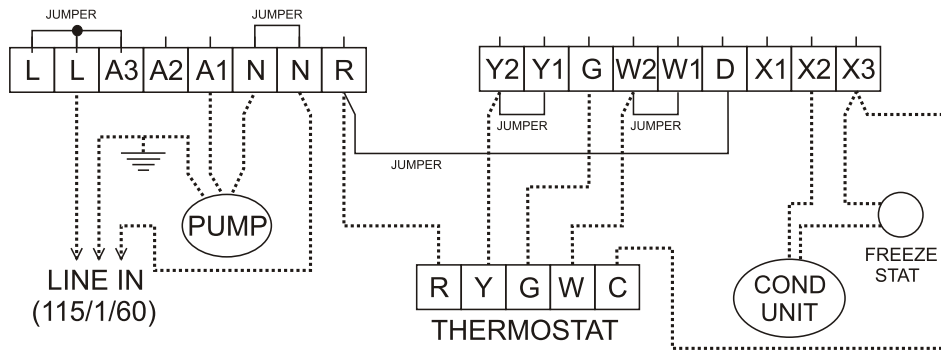


FIGURE 12
Single Stage HVS Field Wiring Diagram

AIR HANDLER CONNECTIONS

L - LINE VOLTAGE
A3 - AUX. RELAY COMMON
A2 - AUX. RELAY NORM. CLOSED
A1 - AUX. RELAY NORM. OPEN
N - NEUTRAL
R - 24VAC POWER
Y2/Y1 - COOLING TERMINAL
G - FAN TERMINAL
W2/W1 - HEATING TERMINAL
D - OPTIONAL AQUASTAT
X1, X2 - CONDENSER 24 VAC
X3 - 24 VAC COMMON

JULY 2016

..... FIELD INSTALLED WIRING



WARNING

You must use a Freeze stat if adding an AC Evaporating Coil.

Electrical Connection to Control Box

1. Route the Air Handler power wires through aligned holes in casing and Control Box and make field wire connections in Control Box. Use best practices for wire bushings, strain relief, etc. Field wiring to the unit must be grounded and conform to the National Electrical Code C22.1 Part 1 - latest edition. Use only CSA or UL listed conduit and conduit connectors to connect supply wires to the unit and provide appropriate grounding. Grounding may also be accomplished by grounding the control box per appropriate local codes. Electric wires that are field installed shall conform to the temperature limitation for 63° F (35° C) rise wire when installed in accordance with instructions. Refer to Table 3 in for specific Air Handler electrical data.
2. Route and secure field ground wire to ground wire in Control Box.
3. Connect line voltage leads as shown in Figure 12.
4. Reinstall cover to Control Box. Ensure that wires are not pinched between cover and edge of Control Box.

24V Control System Connections to Unit's Printed-Circuit Board (PCB):

Refer to Figure 12 for factory wiring details. For low voltage connections between the unit and the thermostat, use No. 18 AWG colour-coded, insulated (63° F / 35°C minimum) wires.

Low Voltage Connections

These units use a grounded 24 volt AC low voltage circuit and require at least a 1 stage heating and a 1 stage cooling thermostat.

The "R" terminal is the hot terminal and the "C" terminal is grounded.

"G" terminal is the fan input.

"Y" terminal is the compressor.

"R" terminal is 24 VAC hot.

"C" terminal is 24 VAC grounded.

"W" terminal is the heat input.



WARNING

Failure to follow this warning could result in a fire. Do not use aluminum wire between the HVS Air Handler and the disconnect switch. USE COPPER WIRE ONLY.

INSTALLATION

HVS CIRCUIT BOARD

RedZone HVS Air Handlers utilize a microcontroller based circuit board which directly controls the EC (Electrically Commutated) Motor. The motor is controlled with a PWM (pulse Width Modulation) signal through pre-programmed torque settings. All motor power/speed functions are selected through 5 dip switches on the circuit board. The board also has a multi-colour LED which indicates the current mode of operation.

The circuit board can be set to operate in single stage, two stage or timed two stage heating modes. The single stage heating and cooling discrete mode operating routines of the circuit board are explained in the tables on the following pages. Please contact Redzone Products Inc. for information on two stage and other possible wiring options.

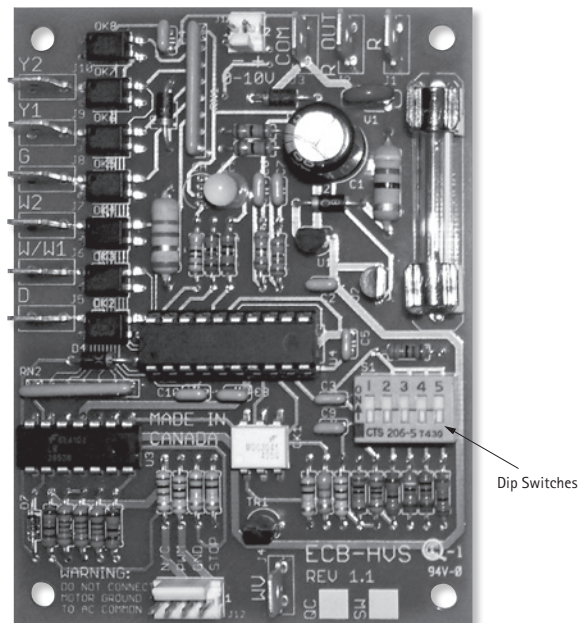
HVS Rev 1.1 Single Stage Dip Switch Settings

Switch	Function	Factory Setting
S1	Leave in OFF (■) Bottom Position	OFF (■) Bottom Position
S2	Table A / B Selection OFF (■) Table A ON Table B	OFF (■) Bottom Position
S3	Staged Heating Selection Leave in OFF (■) position for Single Stage Operation	OFF (■) Bottom Position
S4	Motor Torque Selection Switch IF S2 = OFF (■) See Table A IF S2 = ON See Table B	OFF (■) Bottom Position
S5	Motor Torque Selection Switch IF S2 = OFF (■) See Table A IF S2 = ON See Table B	OFF (■) Bottom Position

HVS Circuit Board Power On Routine

On power up, the circuit board will enter into a brief test mode. During this test mode, the following sequence of events occurs:

1. Phase 1 - The WV terminal is activated for 5 seconds to operate the pump relay to test the pump and pump relay. During this time the LED will be illuminated White.



2. Phase 2 - For 10 seconds a PWM signal is sent to the motor to test motor functionality. The blower motor will start to operate.

3. Phase 3 - 25 second Thermostat input test.

During the Thermostat input test inputs to the circuit board can be tested individually by applying a 24VAC signal to an input terminal and confirming its operation by watching the LED indicator on the board. **Note if a thermostat is connected set in the off position or not actively calling for heat, cooling, fan etc.**

NOTE:

Factory installed jumper R-D must be removed for this test.

- i. Y2 displays a dark blue light.
- ii. Y1 displays a light blue light.
- iii. G displays a green light.
- iv. W2 displays a red light.
- v. W/W1 displays a yellow light.
- vi. D displays a purple light.
- vii. Y2 and Y1 together displays a blinking dark blue light.
- viii. W2 and W/W1 together displays a blinking red light

Off Season Circulation Timer

All Redzone HVS models are equipped with a circulation timer. It is normal operation for these models to automatically run the circulation pump for a period of 2 minutes every 12 hours. The circuit board will call for a coil purge every 12 hours since the last time a call for heat was received. The board energizes the WV terminal to operate the pump.

INSTALLATION

Circuit Board Sequence of Operation for Single Stage Cooling and Heating Without an Aquastat installed

Conditions:

Single Stage Discrete Operation S1 = OFF (■), S3 = OFF (■). Factory installed W1-W2 jumper in place.
Factory installed Y1-Y2 jumper in place. Factory installed R-D jumper in place.(no Aquastat installed)

Thermostat Action	Behaviour
W	LED red, fan inactive for 15 seconds, fan active in selected motor torque setting (Table A or Table B as per DIP Switches)
G	LED green, fan active in low speed
Y and G	LED dark blue, fan active in low speed for 30 seconds, fan active in selected torque setting (Table A or B Dip Switch settings)

Note: When a call for heat has ended and no other features are active, the fan will remain active in low speed for a period of time to extract remaining heat from the heating coil. This feature is immediately overridden when any other feature is activated.

Table A – Single Stage Blower Motor Torque Selection

Set Motor Torque	(S1 = OFF (■), S2 = OFF (■) TABLE A Discrete Input States		
	G	Y1/Y2 & G	W1/W2
S4 = OFF (■) S5 = OFF (■)	20%	100%	100%
S4 = ON S5 = OFF (■)	20%	100%	80%
S4 = OFF (■) S5 = ON	20%	80%	80%
S4 = ON S5 = ON	20%	80%	45%

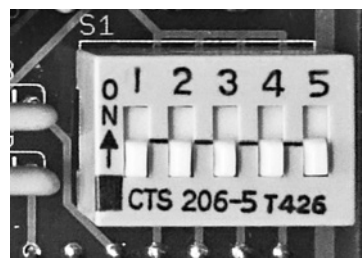
Table B – Single Stage Blower Motor Torque Selection

Set Motor Torque	(S1 = OFF (■), S2 = ON TABLE B Discrete Input States		
	G	Y1/Y2 & G	W1/W2
S4 = OFF (■) S5 = OFF (■)	20%	75%	75%
S4 = ON S5 = OFF (■)	20%	45%	45%
S4 = OFF (■) S5 = ON	20%	35%	35%
S4 = ON S5 = ON	20%	25%	25%

Example of HVS600 with Dip Switches in position for 20% Continuous circulation, 100% cooling air flow, and 100% heating air flow. All switches are in the OFF (■) Position (at the bottom).

NOTE:

Always leave switches 1 and 3 in the OFF (■) /Bottom position except for very specialized installations that will require further info/instructions from RedZone.



INSTALLATION

THERMOSTAT INSTALLATION

Safety Considerations

All wiring must conform to local and national electrical codes. Improper wiring or installation may damage thermostat.



WARNING

Before installing thermostat, turn off all power to unit. There may be more than one power disconnect. Electrical shock can cause personal injury or death.

INSTALLATION CONSIDERATIONS

Air Conditioner Model

Refer to Figures 12 through 13 for factory wiring details. It is recommended to use a common wire whenever possible. Do not use a power-stealing thermostat. If an evaporating coil is installed, then a Freeze stat **must** be installed to prevent potential freeze damage to the hot water coil and subsequent water escape.

Installation

Thermostat should be mounted:

- approximately 5 ft. (1.5 m) from floor;
- close to or in a frequently used room, preferably on an inside partitioning wall;
- on a section of wall without pipes or ductwork.

Thermostat should NOT be mounted:

- close to a window, on an outside wall, or next to a door leading to the outside;
- exposed to direct light and heat from a lamp, sun, fireplace, or other heat-radiating object which may cause a false reading;
- close to or in direct airflow from supply registers and return-air grills;
- in areas with poor air circulation, such as behind a door or in an alcove.

Refer to Figure 12 for thermostat wiring diagram and thermostat installation instructions for further details.

INSTALLATION

START-UP PROCEDURE (HEATING ONLY)

The following conditions must be met prior to unit start-up.

Debris from soldering and/or other installation activities can cause equipment failure. Ensure that all associated lines and appurtenances are free of debris.

Check to ensure that unit is secure.

Check that blower wheel rotates freely within the scroll housing.

Check all wiring to ensure that connections are tight.

Check all ductwork and pipe connections to ensure proper seal.

Check to ensure that all packaging wraps are removed from equipment.

Ensure that front access doors are properly installed.

Check to ensure proper airflow by adjusting circuit board dip switches. Refer to pages 17-20.

Perform all safety and start-up checks for Tankless Water Heater as per manufacturer's instructions.

Having verified all preceding checks, the Air Handler's Start-Up Procedure is as follows:

STEP 1: Purge and fill system; follow appropriate purging procedure as laid out in this manual in section titled "Purging and Priming the System".

STEP 2: Turn on power supply to Air Handler. Caution: blower and/or circulator may start to operate if thermostat is on and a call is present.

STEP 3: Turn thermostat on and switch system to the heating mode. The thermostat shall be set higher than the actual room temperature; this will cause the circulator to energize and initiate the heating cycle. (If the pump does not start, or the Air Handler is not producing heat, refer to the Troubleshooting Section in this manual).

STEP 4: Program room thermostat as desired by homeowner.

START-UP PROCEDURE (COOLING SYSTEM)

Refer to field supplied evaporator coil and outdoor unit manufacturer's Installation Instructions for system hook-up, start-up instructions and refrigerant charging method details.

TROUBLESHOOTING BLOWER AND/OR PUMP MOTOR AND CONTROLS



CAUTION

High voltage is at all times present at motor. Disconnect power to AHU before removing, or replacing, or servicing motor. Wait at least 5 min after disconnecting power before opening motor. Failure to follow this CAUTION could result in minor personal injury or product and property damage.

If blower and/or pump motor does not run:

Turn off power and check the following:

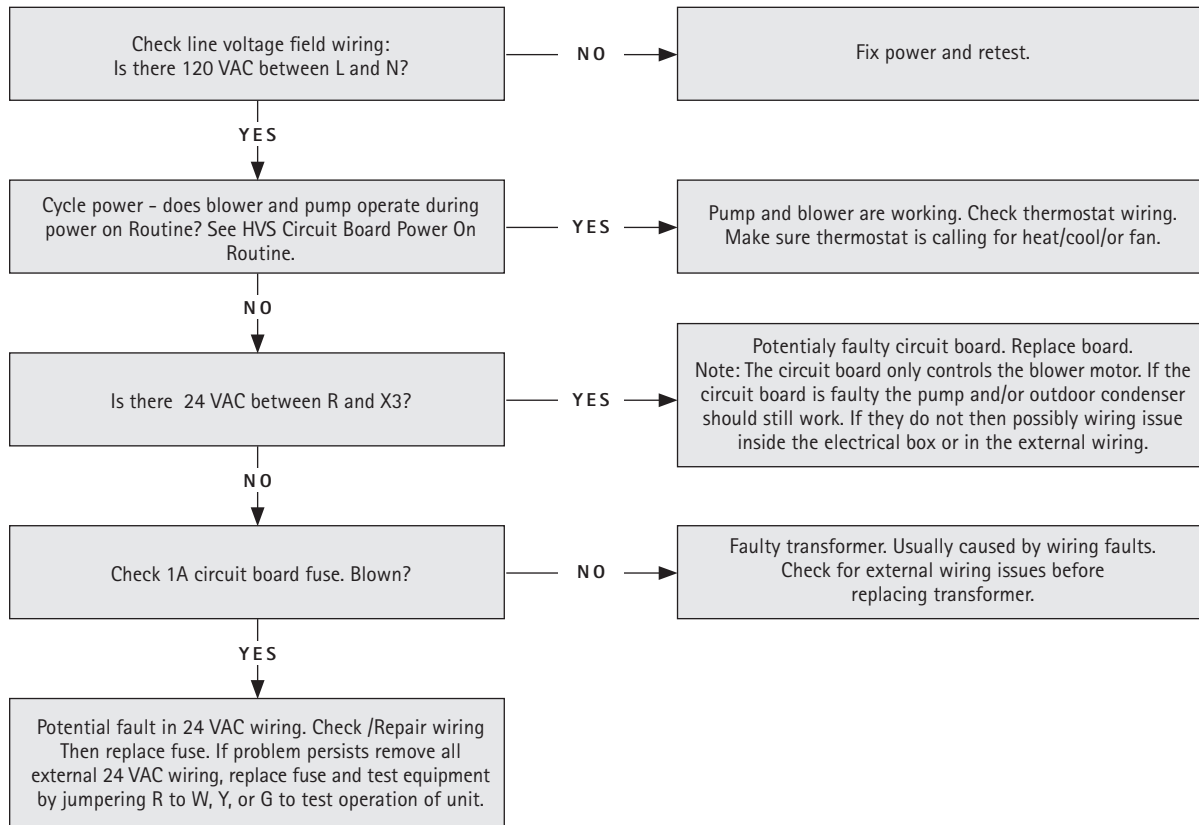
1. Check that power is supplied to unit.
2. Check for 24 VAC between R and X3 on terminal strip. If no voltage is present, check transformer.
3. Check all connections for kinks which could cause loose connections. Ensure connections are secure.
4. Verify that approximately 120 VAC is present across L and N.

TROUBLESHOOTING

Important:

- For system to operate properly power should be turned ON and all shut-off / isolation valves must be opened.
- Blower motor is supplied with power continuously even when not running. Disconnect power before unplugging or plugging in any motor cables.
- Circuit Board LED does not indicate power to the air handler. The LED colour signifies the Thermostat input to the board and subsequent motor torque.

Air Handler does not operate



Pump Noisy

Probably caused by air trapped in heating loop
See Purging and Priming the system. Purge the system.

Insufficient Airflow

- Wrong Blower motor torque setting selected. Check dip switches and adjust accordingly.
- Static pressure too high. Check Duct static pressure.
Are duct runs open and in sufficient quantity

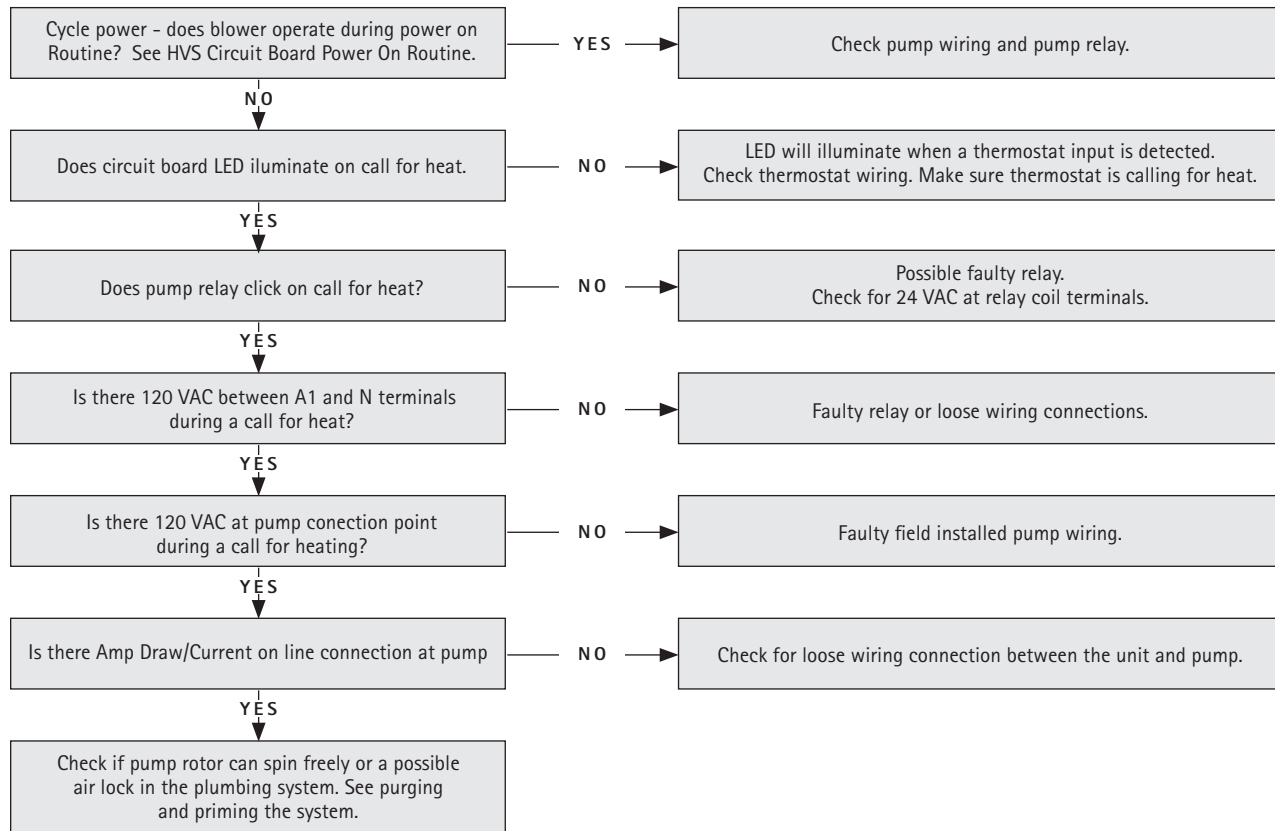
Insufficient or No Heat:

1. Air may still be trapped in heating loop. Purge air from the system as described under "start-up procedure".
2. Water heater thermostat not turned up high enough. (Remember, higher than 120 °F = mixing valve for domestic service).

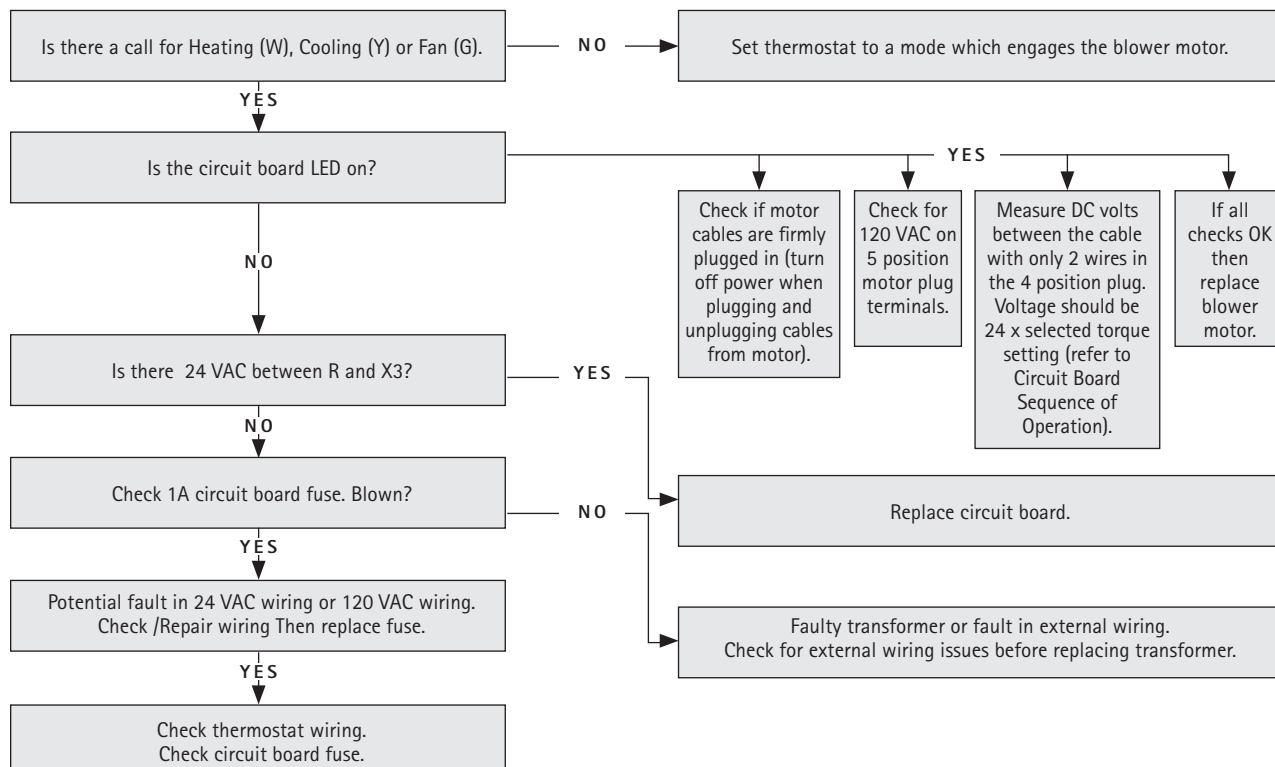
3. Inlet and outlet piping connection at the Air Handler may be reversed. See Figure 2.
4. Water heater thermostat not calibrated properly.
5. Excessive pressure drop caused by restriction somewhere in the hot water loop does not allow sufficient water to flow to Air Handler.
6. Air Handler not sized large enough for heat load.
7. Water heater not large enough to satisfy heat load.

TROUBLESHOOTING

Pump does not run



Blower Motor will not start



MAINTENANCE

Repairs should be performed by a qualified service technician. The appliance should be inspected annually by a qualified service technician. Verify proper operation after servicing.

CLEANING

It is important that compartments, filter and circulating air passage ways of the appliance be kept clean.

Clean as follows:

1. Turn off and disconnect electrical power. Allow to cool.
2. Replace the air filter. (Should be done at least quarterly. Refer to the Specifications section for sizes.)
3. Use pressurized air to remove dust from the components.
4. Use soft dry cloth to wipe cabinet.

SUPPLY AND RETURN AIR DUCT SYSTEMS

The supply and return air ducts should be inspected at least annually for blockages or damage.

MOTORS

The motor and pump are permanently lubricated and do not need periodic lubrication. Keep free of dust and dirt by cleaning annually.

INTEGRAL CIRCULATOR PUMP

Replacing Pump Motor Assembly:

1. Disconnect the electrical supply.
2. Reduce system pressure to 0 psi and allow system to return to room temperature. Isolate the circulator by closing the service valves or draining the system.
3. Remove the body bolts and swing motor assembly away from the body.
4. Install new motor, and reassemble circulator using the new gasket and bolts supplied.
5. Follow the "installation" procedure to start up the circulator.

Table 3 – Air Handler Specifications

UNIT MODELS		HVS600	HVS800
RATING AND PERFORMANCE	Descriptor (Typ.)		
Nominal Output Capacity (BTU/h) †		35,250	46,400
ELECTRICAL			
Power Supply	V-HZ-PH	115-60-1	
Total Amps	A	7.6	11.3
Maximum Fuse or CKT BKR Size	Amps	15	15
Transformer	20 VA (Primary: 120 VAC / Secondary: 24 VAC)		
INDOOR BLOWER MOTOR			
Type		Brushless DC Motor	
Motor HP		1/2	3/4
Add-on Cooling – Tons		1.5	2
CIRCULATING PUMP			
Type		Wet Rotor	
Volts-HZ-PH		115-60-1	
Pump Motor		3 Speed	
Fluid Temperature	°F (°C)	140 / 180 (60 / 82)	
PIPING CONNECTIONS – (QTY)			
Type		Copper Stubs	
Supply Diameter	Inches	1/2	
Return Diameter	Inches	1/2	
UNIT WEIGHT			
Shipping	lbs	90	100
Installed (with water)	lbs	91	103

† BTUs based on 140° F water temperature. See pages 25 to 29 to adjust BTU output.

FIELD SUPPLIED ACCESSORIES

1. Anti-scald Thermostatic Temperature Control Valve (Mixing Valve)

Anti-scald thermostatic temperature control valves are an important part of domestic water plumbing because they eliminate the scalding and cold water shocks that can occur in a shower when a toilet is flushed or a faucet is turned on. In an Open Loop system (dual function – space heating and domestic water heating), an anti-scald valve should be installed when the Tankless Water heater set thermostat is above 120°F (49°C); refer to local codes and/or all authority having jurisdiction.

For recommended piping configuration, refer to Figure 11. Anti-Scald valve shall be thermostatically controlled and meet at least the following specifications:

- Dual certification ASSE 1016-T and ASSE 1017
- IAPMO Approved
- CSA Approved

2. Expansion Tank

3. Air Separator – optional

4. Freeze Protection Thermostat for Installations with Air Conditioning (included with HVSCC Cooling Coil).

5. Filter Rack

HVS600 SPECIFICATION

Unit Technical Information

Power Requirements	120 VAC
Maximum Fuse	15 Amps
Total Amps	7.6 Amps
Transformer	20 VA
Blower Motor	1/2 HP ECM
Pump (external to cabinet)	GRUNDFOS - UPS15-58 RU
Return Opening - Side	15.5" w x 14.5" h
Return Opening - Bottom	16" w x 15.5" d

Heating Capacity

Airflow CFM	Water Flow GPM	Return Air Deg F	Supply Water Deg F	Output BTU	Supply Air Deg F	Leaving Water Deg F
600	2	70	120	25025	110	94
			130	30275	118	99
			140	35250	126	103
			150	40200	134	108
			160	45300	143	113
			170	50450	151	117
			180	55700	159	122

Blower Capacity

Motor Torque % Max	External Static Pressure (" H2O)	Airflow CFM
100%	1.2"	670
80%	1.2"	630
75%	1.2"	600
45%	1.2"	430

HVS800 SPECIFICATION

Unit Technical Information

Power Requirements	120 VAC
Maximum Fuse	15 Amps
Total Amps	11.3 Amps
Transformer	20 VA
Blower Motor	3/4 HP ECM
Pump (external to cabinet)	GRUNDFOS - UPS15-58 RU
Return Opening - Side	19.5" w x 14.5" h
Return Opening - Bottom	16" w x 19.5" d

Heating Capacity

Airflow CFM	Water Flow GPM	Return Air Deg F	Supply Water Deg F	Output BTU	Supply Air Deg F	Leaving Water Deg F
800	2.5	70	120	33100	110	93
			130	40150	118	97
			140	46400	126	101
			150	53100	134	106
			160	59900	142	110
			170	66800	150	114
			180	73600	158	118

Blower Capacity

Motor Torque % Max	External Static Pressure (" H2O)	Airflow CFM
100%	1.2"	810
80%	1.2"	750
75%	1.2"	640
50%	1.2"	520

PART LIST

Replacement Parts List		
	HVS600	HVS800
Relay	PTRA-1C-24C-T5-X	PTRA-1C-24C-T5-X
Transformer	HCT-01C0AA01	HCT-01C0AA01
Motor	HVS6-ECM	HVS8-ECM
Coil	BC12802A001	BC12889A001
Blower Housing	DCT1020-416-5	DCT1020-600-5
Pump	UPS15-58RU	UPS15-58RU
Check Valve	96806141	96806141
Flow Valve	Mesurflo 2517- 2.0GPM	Mesurflo 2517- 2.5GPM
Control Board	HVS6CB1.1	HVS8CB1.1

Wiring diagram located on Figure 13

LIMITED WARRANTY

WARRANTY INFORMATION

The installer is responsible for the correct installation of your Air Handler.

Please complete the information below to keep for your records:

Purchased from: _____

Address: _____

Phone: _____

Date of Purchase: _____

Model No.: _____

Serial No.: _____

Installed by: _____

Installer's License No.: _____

Address: _____

Phone: _____

Date of Installation: _____

To register your Air Handler, please visit www.redzone-products.com

For those without internet access, please call 1-844-202-7990.

LIMITED WARRANTY

Subject to the terms and conditions of this limited warranty, Enerzone Inc. (hereinafter "**Company**") extends a limited warranty (hereinafter "**Warranty**") for this product.

What is covered?

This Warranty covers any defects in materials or factory workmanship when the product is installed and operated according to Company's written installation instructions and in accordance with all applicable laws, regulations and codes, and when the product is operated only under normal use and service, subject to the terms and conditions of this Warranty. RedZone™ Air Handler should be installed by a qualified or licensed contractor. Improper installation may void this Warranty. This Warranty extends to the original purchaser, but only while the product remains at the site of the original installation. This Warranty only extends through the first installation of the product and terminates if the product is moved or reinstalled at a new location.

How long does coverage last?

Item	Period of Coverage (from date of purchase)
Parts	2 Years

LIMITED WARRANTY

What will Company do?

You must contact a qualified/authorized service provider for the repair of a product under this Warranty. For the name of a qualified/authorized service provider please contact your place of purchase, visit the RedZone™ website (www.redzone-products.com), or call 1-844-202-7990.

Proof of purchase is required to obtain warranty service.

You may show proof of purchase with a dated sales receipt, or by registering within 30 days of purchasing the product. To register your Air Handler, please visit www.redzone-products.com. For those without internet access, please call 1-844-202-7990. Receipt of registration will constitute proof-of-purchase for this product.

However, registration is not necessary in order to validate this Warranty.

As Company's only responsibility and your only remedy under this Warranty, Company will furnish a replacement part to the qualified/authorized service provider, without charge for the part only, to replace any part that is not in compliance with this Warranty. You must pay for any and all shipping and handling charges and other costs of warranty service for the replacement part. Company may, at its option, provide a credit in the amount of the then factory selling price for a new substitute part to be used by you towards the retail purchase price of a new RedZone™ Air Handler. Any new product purchase shall be at your sole cost and expense including, but not limited to, all shipping, removal and installation costs and expenses.

What is not covered?

This Warranty does not cover any failures or operating difficulties due to the following:

- accident, abuse, or misuse
- alteration
- misapplication
- force majeure
- improper installation (such as but not limited to inadequate water quality, condensate damage, or absence of a drain pan under the appliance)

- improper maintenance (such as but not limited to scale build-up, or freeze damage)
- incorrect sizing
- any other causes other than defects in materials or workmanship

This Warranty does not apply to any product whose serial number or manufacture date has been defaced. This Warranty does not cover any product used in an application that uses chemically treated water.

Limitation on warranties

No one is authorized to make any other warranties on behalf of Company or any of Company's suppliers or distributors. Except as expressly provided herein, there are no other warranties, expressed or implied, including, but not limited to warranties of merchantability or fitness for a particular purpose, which extend beyond the description of the warranty herein.

In no event, whether as a result of breach of warranty or contract, tort (including negligence), strict liability or otherwise, shall Company or any of Company's suppliers or distributors be liable for indirect, incidental, special, consequential or other similar damages that may arise, including lost profits, damage to person or property, loss of use, inconvenience, or liability arising from improper installation, service or use.

This Warranty gives you specific legal rights, and you may also have other rights, which vary from province to province.

Manufacturer:

Enerzone Inc.
22 Pegler Street London, ON N5Z 2B5

Distributor:

RedZone Products Inc.
5605 Timberlea Blvd., Mississauga, ON L4W 2S4

