Hi-Velocity Systems™

Small Duct Heating, Cooling and
Indoor Air Quality Systems

www.hi-velocity.com

HE Series Installation Manual

Includes:

Hi-Velocity Fan Coils
Heating Coils/Modules
Cooling Coils/Modules
Add-ons and Options
Product Specifications

Manufactured By

Energy Saving PRODUCTS LTD

ESP-103.07-Hi-Velocity-Installation-Manual-051010

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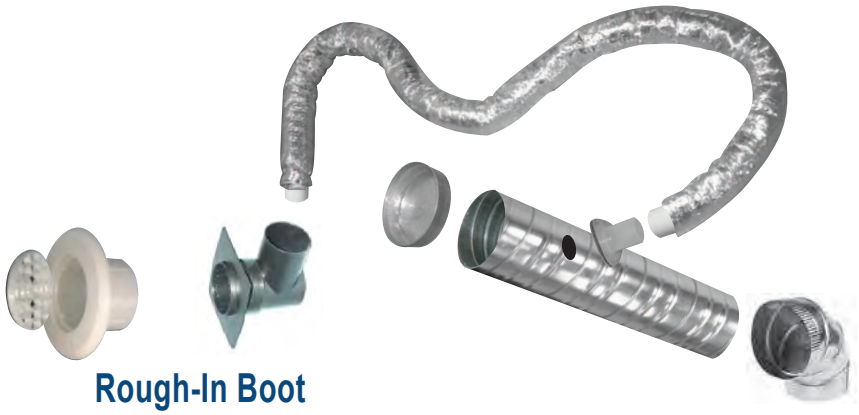
Common Parts*



Cooling Options

RPM-E Pre-Piped Cooling Module

Water Coil Module

Heating Options

Hot Water Coil

Electric Strip Coil

Other Options

PWM Zoning Controller

Hi-Velocity Air Purification System

HE Fancoil

*Example Configuration Only

Hi-Velocity HE Series Installation Manual

Thank You for Purchasing the Finest in Indoor Air Quality Systems.

The Hi-Velocity System is an energy efficient high pressure air delivery system that can be designed to provide heating, cooling, filtration, ventilation, humidification and dehumidification.

Ease of Installation

The Hi-Velocity System can be installed in 25 per cent less time than a traditional heating system and is equally suitable for commercial and residential, in both new construction and retrofit applications. For residential applications where every cubic foot of area is critical, the Hi-Velocity System is the solution to your heating and cooling needs. Being able to run duct work into places where standard duct work would not fit, allows heating, cooling and ventilation to be installed in applications where the options are very limited.

The Hi-Velocity System works on the principle of pressure rather than air velocity. It is quite different than a conventional furnace, the main difference being that the supply duct work is all “small diameter” or “mini duct”.

With a pressurized small diameter duct we condition the air differently than conventional forced air systems. With the use of a high pressure area to low pressure area, we continuously mix the room air, creating even temperatures from floor to ceiling. Because the plenum duct is pressurized, dust build-up within the duct work is eliminated. With continuous air circulation from the constant fan, airborne dust and other allergens can be easily filtered out of the air, and conditions that promote the growth of mold and mildew are reduced.

Our innovative fan coil and unique cooling module technology helps create a healthier and more enjoyable indoor living environment for the end-user, while saving money on monthly operating costs.

Powered by a variable-speed EPC motor, the Hi-Velocity System can be used for heating, cooling, or a combination of both. The EPC motor quietly drives the system’s fan continuously, limiting wear and tear and increasing the lifespan of the system.

We are confident that you will enjoy years of trouble-free service from your Hi-Velocity System. As with any product that requires installation and assembly, a good understanding of ALL the components and the final product is necessary to achieve the optimum result. This manual has been designed to be as concise and straightforward as possible.

Please read the ENTIRE manual before beginning installation as this will help avoid mistakes that may cost time and money.

Primary Applications:

Heating Up

To provide heating, the system can be used in conjunction with any water source (hot water tank, boiler or geothermal). Unlike traditional heating and air conditioning systems, it does not depend on the natural laws of convection. A network of smaller, flexible ducts operate under high pressure to continuously circulate air and ensure even heat distribution. When using a hot water tank, after going through the heating system, the hot water is recycled for household use. With a proper tank, the Hi-Velocity System can reduce energy requirements by up to 50 per cent.

Cooling Down

For air conditioning, a cooling module, condensing unit, chiller, heat pump or geothermal sytem can all be used. The high pressure distribution network cools each level of the structure evenly. Use of a lower CFM across the cooling coil means that the Hi-Velocity System can remove up to 30% more moisture from the air than conventional systems, leaving a constant and comfortable temperature on the skin surface.

Breathing Right

IAQ is integral to the comfort and health of a building’s occupants. The optional Hi-Velocity Air Purification System (HE PS) was designed to complement the heating and cooling system. It contains three powerful technologies. First, an electrostatic MERV-11 filter removes allergens. Photo-catalytic oxidation is then used to destroy toxic chemicals and eliminate odours. Finally, Ultraviolet Light is used to kill germs on contact. The result is clean, purified air, and unsurpassed Indoor Air Quality for your home or office.

For all of your heating, cooling, and Indoor Air Quality needs, the Hi-Velocity System is the right choice for you!

Quality Assurance

Fan coil units shall be a total indoor air quality system complete with heating, cooling, air filtration, and possibility of humidity control and fresh air make up. The fan coil must be factory manufactured, assembled and tested.

All equipment furnished under this specification shall comply with the following standards:

ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers

AHRI Air-Conditioning, Heating, and Refrigeration Institute

CSA Canadian Standards Association

CE European Conformity

DOE Department of Energy

UL Underwriters Laboratories

Refer to ***Module SPC - Specifications and Sizing*** for system specifications, measurements, etc. For more detailed specification pages please see our website, **www.hi-velocity.com.**

Also available on our Website:

- **Installation Videos**
- **Promotional Video**
- **Engineering Specifications**
- **Applications**
- **Downloadable Installation Modules**
- **Performance Graphs**
- **Brochures and Marketing Tools**
- **Complete Parts List**
- **Complete list of Agents/Distributors**
- **News and Newsletters**
- **Case Studies**

THE HI-VELOCITY SYSTEM IS NOT TO BE USED AS TEMPORARY HEATING/COOLING DURING THE CONSTRUCTION OF THE STRUCTURE. IF USED IN THIS CAPACITY ALL WARRANTIES WILL BE NULL AND VOID.

Warranty

One year limited warranty. The heat exchanger and blower are free from defects in workmanship for one year from date of purchase.

Three year limited warranty. The EPC Motor, EPC Controller, EPC Circuit Board and PWM Controller are free from defects in workmanship for three years from date of purchase.

Two year limited warranty. The electrical strip heater is free from defects in workmanship for two years from date of purchase.

This warranty applies only to the fan coil unit and does not include connections, attachments, and other products or materials furnished by the installer. This warranty applies only to the first purchaser at retail and excludes any damages caused by changes, relocation to, or installation in a new site. This warranty does not cover any defects caused by failure to follow the installation and operating instructions furnished with the fan coil, local building codes, and good industry standards. Failure to correctly install the fan coil, or material related to the unit, may result in improper system performance and/or damages and will void this warranty.

Terms and Conditions

- Any repair performed under warranty must be approved by Energy Saving Products Ltd. for this warranty to be valid.
- The manufacturer is not liable for any other damages, personal injury, or any other losses of any nature.
- The liability of the manufacturer is limited to and shall not exceed the cost of replacement parts and shall not include transportation to and from the factory, and field labour.
- Inoperative parts must be returned with serial number, purchase date, and a detailed description of the entire problem with an ESP RMA Form.
- This warranty replaces all other warranties expressed or implied.

Disclaimer

Energy Saving Products Ltd. reserves the right to discontinue, make changes to, and add improvements upon its products at any time without public notice or obligatiion. The descriptions and specifications contained in this manual were in effect at printing. Some illustrations may not be applicable to your unit.

BEFORE YOU BEGIN INSTALLATION:

A heat load calculation and duct layout is required before any installation can begin. See Module DES - Designing the Hi-Velocity System, before you begin installation. The layout is designed to provide you with the maximum benefit from your Hi-Velocity System. Small deviations may be necessary due to existing construction. However, please contact your system designer before proceeding if large deviations must be made such as:

- **Elimination of a vent from a room**
- **Moving a vent more than 10 feet (3.05m) from its specified location**
- **Re-routing the main plenum**

Outlet Installation

With the venturi effect of the Hi-Velocity system, you have more options in vent placement. Each vent has an effective throw of 18' (5.49m) and causes the air to constantly circulate. ***(Fig. 01)*** This allows for vent placement in floors, ceilings, or walls.

Constant circulation is very important to maintain room comfort. Do not install vents under/beside/on-top of objects that may hamper the cone of influence from circulating the room air.

Locating Vents

Outlets do not have to be located on an outside wall. Due to the venturi action of the Hi-Velocity System, the air in the entire room is gently circulated at all times. The outlets should be located six inches (152mm) on centre from any possible obstruction, seven inches (178mm) for HE outlets. ***(Fig. 02)***.

Fig. 01 - Cone of Influence

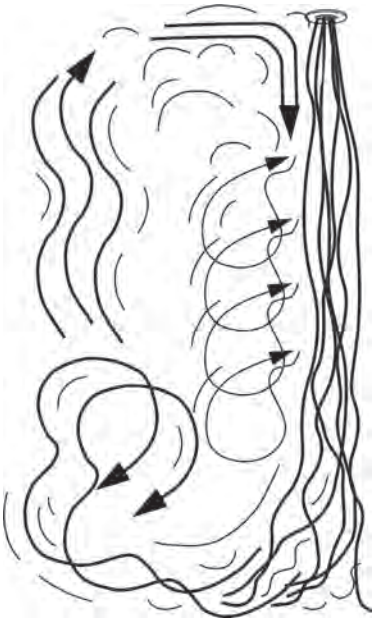
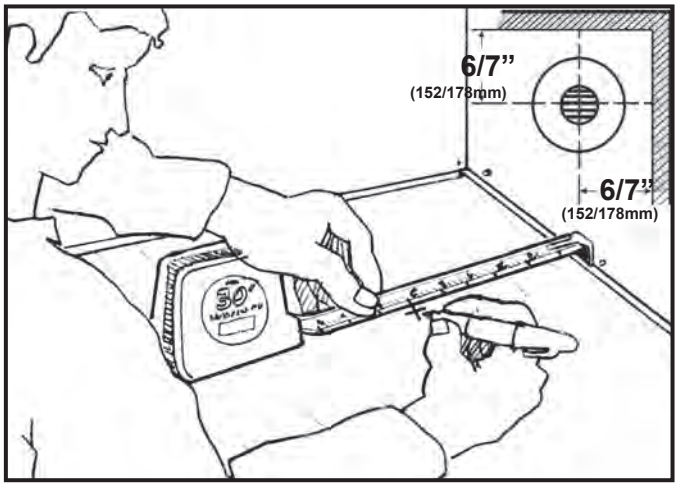


Fig. 02 - Six/Seven inches (152mm/178mm) on center



Please note: HE Flex Duct outlets CANNOT be used for 2" x 4" (51mm x 102mm) sidewall applications.

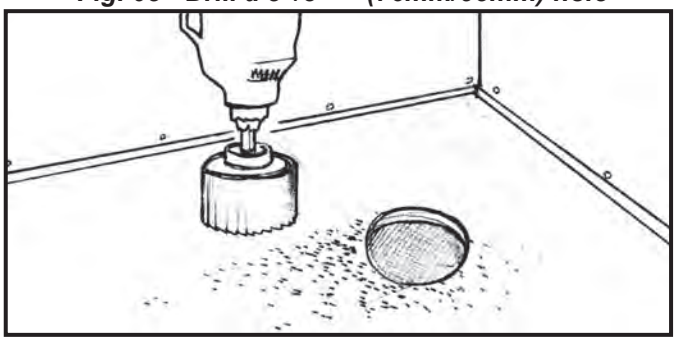
Proper location is critical to the operation of the Hi-Velocity System for optimum home comfort. The outlets should be located where it is considered to be a "low traffic area". Typical areas are in the corner of a room, or to the side of a window or door. When the vents are properly located, the home owner can expect to have a nearly draft free home.

Vent placement in outside walls of the structure should be avoided. Flexible duct that is run in outside walls may receive a substantial heat loss/gain. This can result in a higher operating cost for the structure while delivering an inferior air quality.

Installing the Rough-In Boot

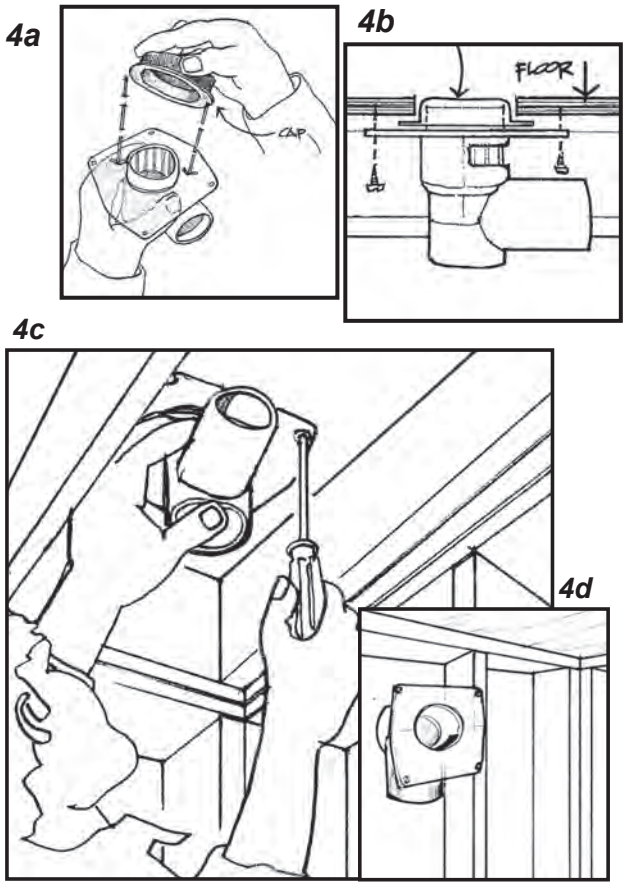
Once a suitable unobstructed location has been chosen for the vent placement, use a 3" (76mm) hole saw to drill an opening large enough for the Rough-In Boot with a Rough-In Cap ***(Fig. 03)***. For HE, use 3 3/4" (94mm) hole saw.

Fig. 03 - Drill a 3"/3 3/4" (76mm/95mm) hole



Before securing the Rough-In Boot, make sure to use a Rough-In Cap (Fig. 04).

Fig. 04 - Rough-In Cap Installation



4a - Rough-In Cap fits on Rough-In Boot
4b - Rough-In Boot installed with a Rough-In Cap
4c - Floor installed Rough-In Boot
4d - Wall installed Rough-In Boot

Vent caps are used during construction to prevent damage during construction from drywall dust, saw dust, stipple ceiling, paint and other small particles from clogging and damaging the and Rough-in Boot and Fan coil unit.

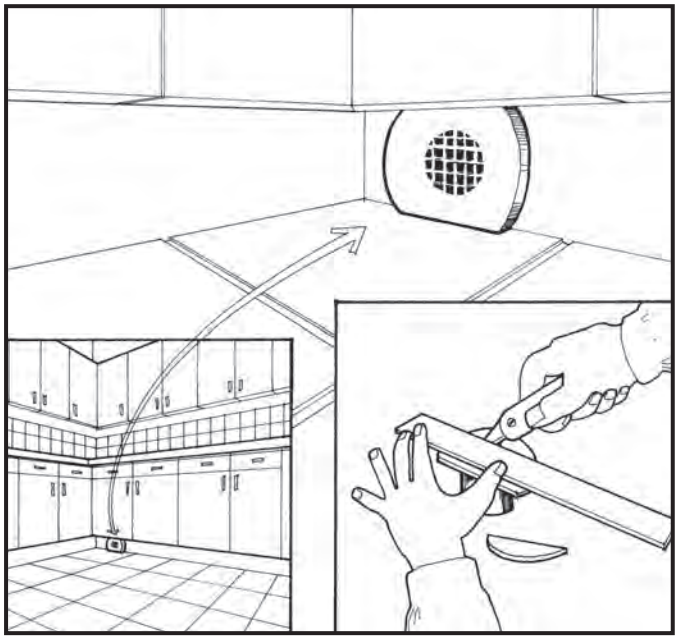
In floor applications simply place the cap over the boot before installing the boot. In ceilings or sidewall applications it may be necessary to tape the cap on to the Rough-in boot hold into place prior to installation. To prevent damage during construction, do not cut out the Rough-In Caps until the vent plates are ready to be installed.

Installing Vents in Kick Spaces

In kitchens and bathrooms, it is sometimes hard to find a "low traffic area", so an alternative is to locate the vents in the kick space under the counters. Our Vent plates have a 4" (102mm) and 5" (127mm) diameter, which may not fit in all kick spaces without trimming. This can easily be done by trimming the top and bottom of our vent plate so it fits. **HE outlets are not recommended for kick spaces.**

The easiest way to install the round vent plates in the kick space is to trim off two edges of the plate. ***(Fig. 05)***.

Fig. 05 - Trim the edges for kick spaces



By locating the vents in this position, there will now be horizontal airflow. Caution should be exercised when locating vents in the horizontal position. Avoid placing vents directly below sinks or other locations people will be for extended periods of time.

Fan Coil Placement

The Hi-Velocity System fan coil is manufactured with a direct drive permanently lubricated **EPC Motor** that is mounted within the blower. All HE fan coils are single side access. The blower assembly can easily be slid out by removing the three mounted bolts that attach it to the center plate. In some instances, the electrical box may need to be removed.

Location

The fan coil unit is to be placed according to the layout provided by the designer. As with vent placement, small deviations can be made in fan coil placement. If the fan coil has to be moved more than a few feet from it's pre-designed location, contact the designer before proceeding.

When installing the fan coil keep these points in mind.

- Serviceability and access to the unit.
- Maximizing usable floor space.
- Location of heat/cool source to fan coil.

The fan coil can be installed in many different configurations. The fan coil can be located in a Hi-Boy, Counter flow, or Horizontal position. In the Hi-Boy position, the supply air is delivered from the top of the unit ***(Fig. 01)***.

Fig. 01 - Hi-Boy

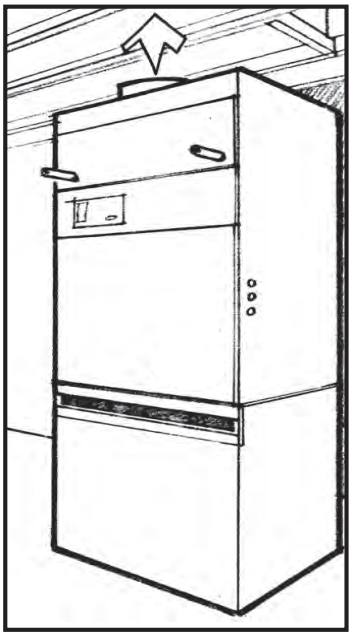
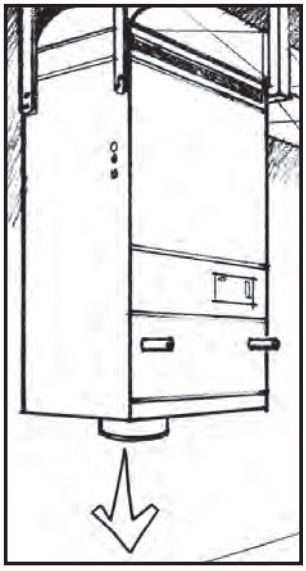
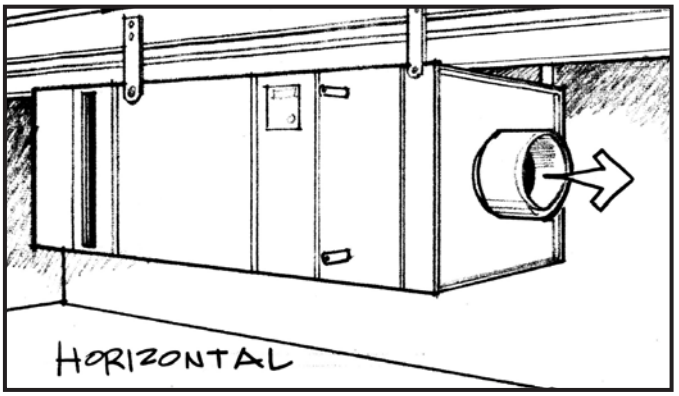


Fig. 02 - Counter flow



When placed in the Counter flow position, the supply air delivery is from the bottom of the unit ***(Fig. 02)***.

Fig. 03 - Horizontal installation



Quite often, the best location for the fan coil unit is suspended from the ceiling of the mechanical room, in the horizontal position ***(Fig. 03)***. This will allow for more floor space in the room, and will minimize the duct work needed to connect to the fan coil unit.

Clearances

Clearance is only needed on the access side of the units. However, ensure that there is a small space between the unit and any other surface to prevent vibration transfer. In order to maintain and service the fan coil unit, minimum clearances are required on the access side ***(Table 01)***.

Table 01 – Fan coil clearances

Unit	Inches
HE – 50/51/52	18" (457mm)
HE – 70/71	22" (559mm)
HE – 100/101	29"(737mm)

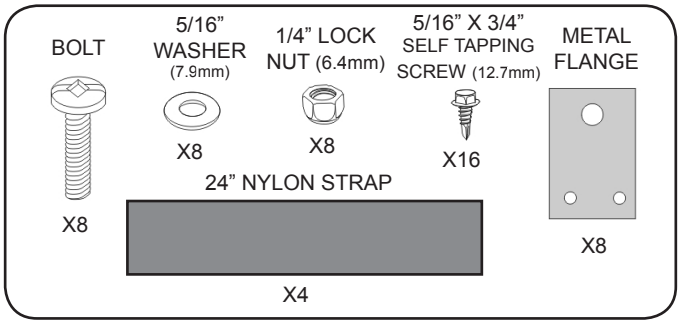
Add an additional 4" (102mm) for Electric Strip Coils

Hanging the Hi-Velocity Unit

Hanging Strap Kit

The Hanging Strap Kits are designed to suspend a horizontal or vertical fan coil. The nylon straps will absorb most of the vibration generated by the fan coil system, eliminating any sound transfer. Alternative hanging methods may be used, e.g. Reddy Rod or Unistrut.

Fig. 01 - Hanging Strap Kit Components



Hanging Fan Coil Unit Only

Attach the metal flanges to the four facing corners of the fan coil unit ***(Fig. 02)***.

Cut the nylon straps to the desired length (4"/102mm or more) and drill a 3/8" (7mm) hole 1" (25mm) from the end of each nylon strap. ***(Fig. 03)***

Fig. 02 - Attach flanges to Unit

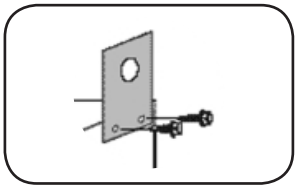
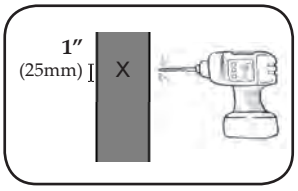
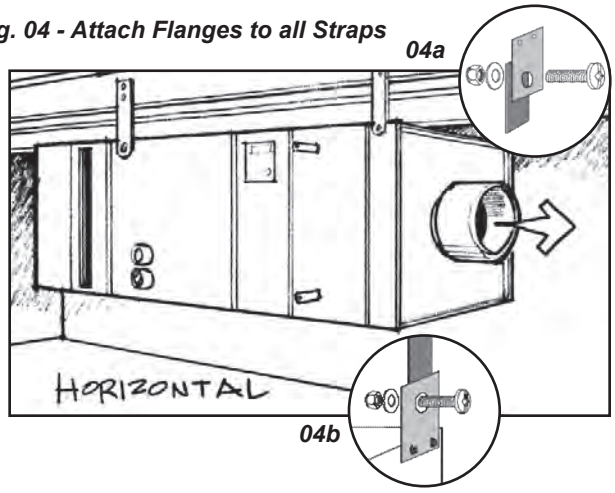


Fig. 03 - Cut Hole in Straps



Slide the 1¼" (32mm) bolt into the hole of the metal flange then into the nylon strap, secure with washer and nut. Repeat this at each end of the nylon straps ***(Fig. 04a,04b)***.

Fig. 04 - Attach Flanges to all Straps



Secure the nylon straps to the joist or support. It may be necessary to install a support across the joists to properly fasten the Nylon Straps ***(Fig. 05)***. The Nylon Straps are always installed in a vertical position; they should never be installed at an angle. It is acceptable to put a 90º twist in the Nylon Straps ***(Fig. 05a)***, do not exceed 90º.

Fig. 05 - Install Support if Needed

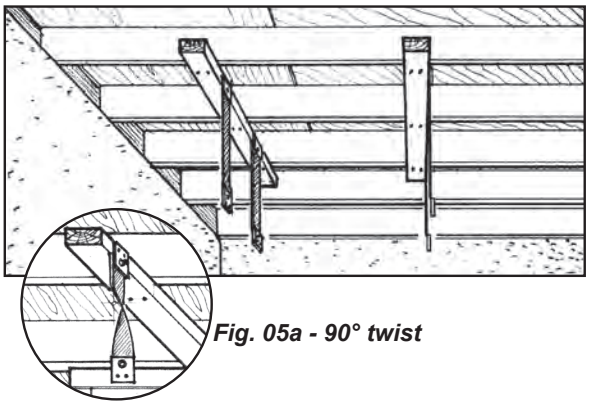


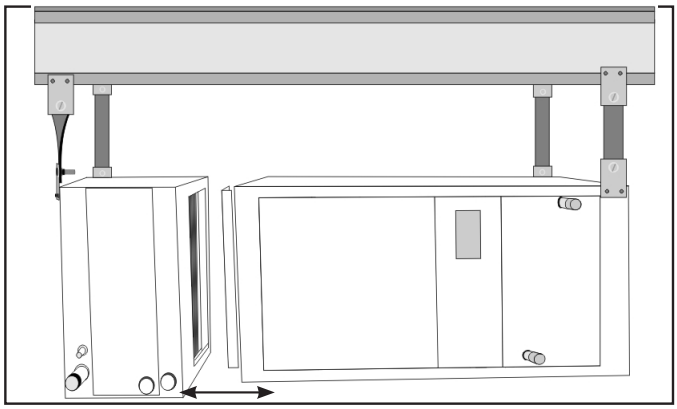
Fig. 05a - 90° twist

Lift the fancoil unit and slide the bolt into the metal flange located on the unit through the nylon strap, and finish with the washer and nut.

Hanging Fan Coil Unit with Cooling Coil

Using the "L" brackets provided with the cooling coil, attach the module to the return side of fan coil unit, using two sided tape for air seal between units. Assure that drain controls are on the bottom ***(Fig 06),*** and that no screws puncture the drain pan or coil. The **WCM and WM** chilled water coils are a horizontal airflow with a vertical position of the coil while the **RPM-E** is also a vertical coil with multiple air flow capabilities. See the corresponding manual included with the coil for detailed installation instructions.

Fig. 06 Attach Cooling Coil to Fan Coil Unit



Attach the metal flanges to the four facing corners of the fan coil and cooling coil assembly.

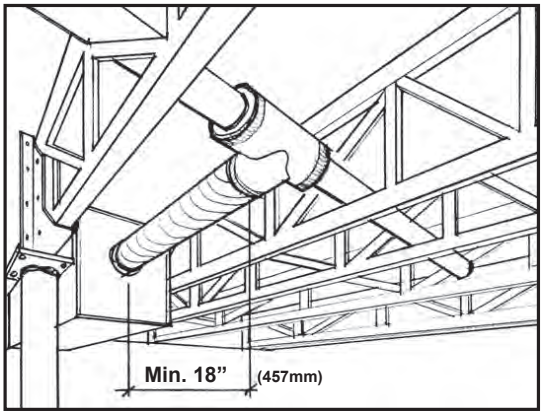
After attaching the metal flanges, follow the same steps for hanging fan coil unit only.

Plenum Duct

Location

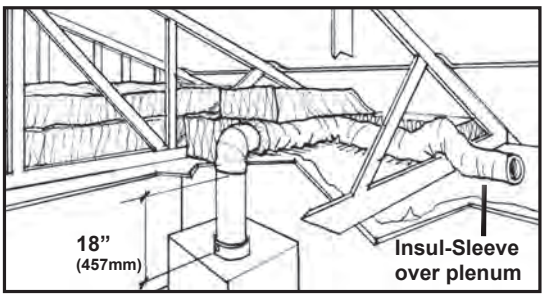
When locating the plenum duct, one of the main factors to consider is the integration of the duct work into the structure. The main supply duct can be located along the main beam(s) in the basement ***(Fig. 01)***.

Fig. 01 - Basement installation



The main plenum can also be easily installed in the attic space. ***(Fig. 02)***

Fig. 02 - Attic Installation



If the unit is installed in the attic, make sure that all ducts in the attic are insulated with a vapour barrier (All A/C systems main plenums need to be insulated and vapour barriered, check with local codes for required R-Value). This includes the Branch Take Off and the vent Rough-In Boot. All main plenum and flex runs should be installed ***under*** the attic insulation. If the duct work is run above the attic insulation, an extra insulation sleeve may be needed. Check your local building code for the ruling in your area.

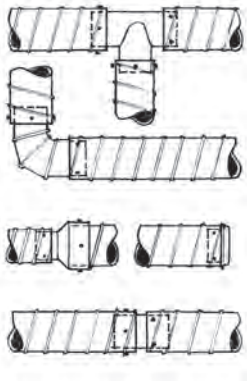
Flexible duct is NOT to be used for supply air plenum.

For any duct runs over 75% of the maximum allowable plenum length ***(Module SPC - Specifications and Sizing Pgs. 1, 2),*** it is recommended to insulate the main plenum. Insulating the main plenum will cut down on your duct loss, and form a vapour barrier. The attic insulation should be placed over all Hi-Velocity System ducts to further reduce any duct losses.

Main Plenum Connectors

There are five types of connections that are possible with the Hi-Velocity System.

Fig. 03 - Connectors

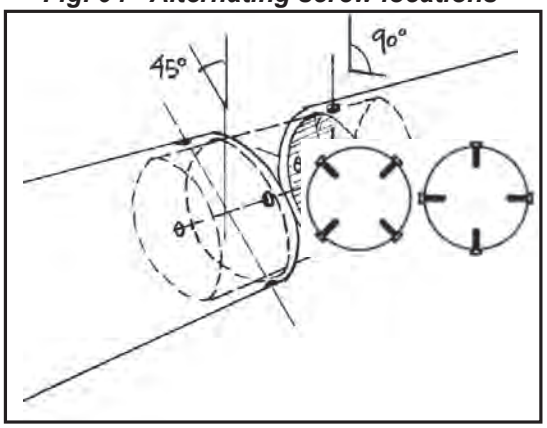


1. Tee Connection
2. Elbow Connection
3. Reducers
4. End Cap
5. Straight Connection

IF THE DUCT IS LOCATED IN AN UNCONDITIONED AREA, INSULATING SLEEVE IS REQUIRED ON THE MAIN PLENUM. IF USED FOR COOLING, IT IS ALSO RECOMMENDED TO INSULATE AND VAPOR BARRIER THE MAIN PLENUM AND FLEX DUCT FITTINGS. INSULSLEEVES ARE AVAILABLE AS AN ACCESSORY IN R4.2 FOR 6' (1.83m), 8' (2.44m) FOR 10' (3.05m) PLENUMS IN 10' (3.05m) LENGTHS.

All the connections are done as follows. Place the joint connector, cap, tee, or elbow inside the plenum you intend to connect. Push the plenum over the fitting as tight as possible. Use four screws on each side of the connector, alternating the screw locations as indicated in ***Fig. 04***.

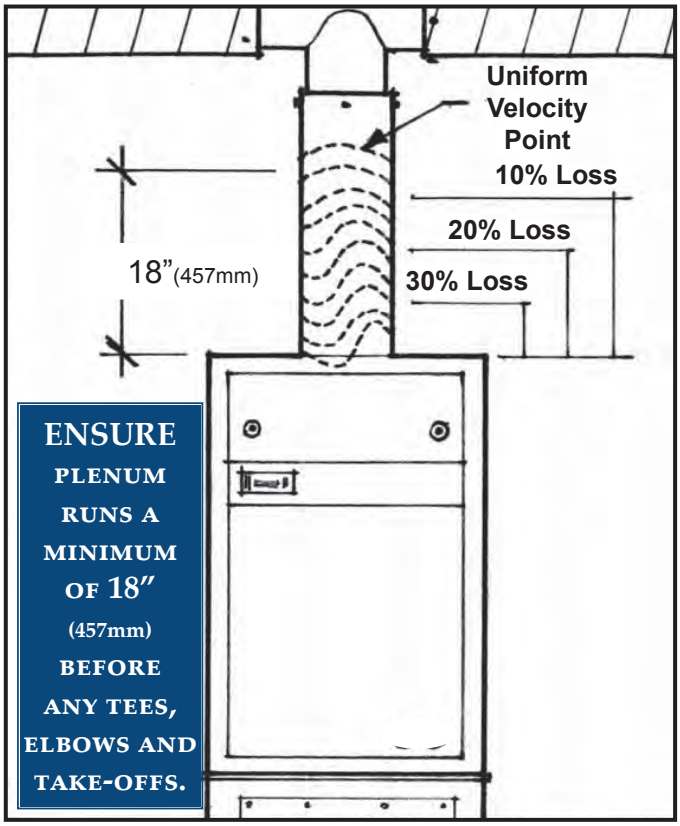
Fig. 04 - Alternating screw locations



Elbow and Tee Placement

Elbows and tees must not be placed any closer than 18" from supply outlet on the air handling unit. A significant loss of airflow can result if elbows or tees are installed closer than 18" (457mm). ***Figs. 06*** and ***Fig. 07*** illustrate a proper install with at least 18" of straight plenum after the unit supply outlet. ***Fig. 05*** shows the sigma velocity profile of the first 18" (457mm) of the main plenum and why it's important to allow the system to equalize air flow.

Fig. 05 - Sigma velocity profile



If elbows, tees, or Branch-Take Off's are placed closer than 18" (457mm) you may lose up to 30% of your airflow as illustrated in ***Fig. 05***.

Branch Tees

When branch tees are used, the plenum split is to be a 70/30 main/branch split ***(Fig. 06)***.

Fig. 06 - Branch Tee, 70/30 split

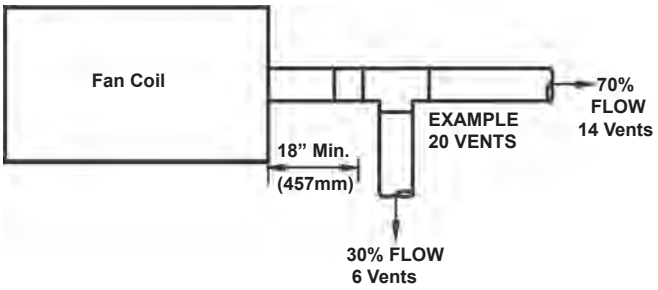
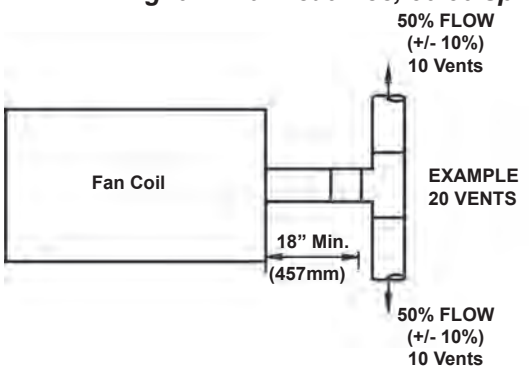


Fig. 07 - Bullhead Tee, 50/50 split

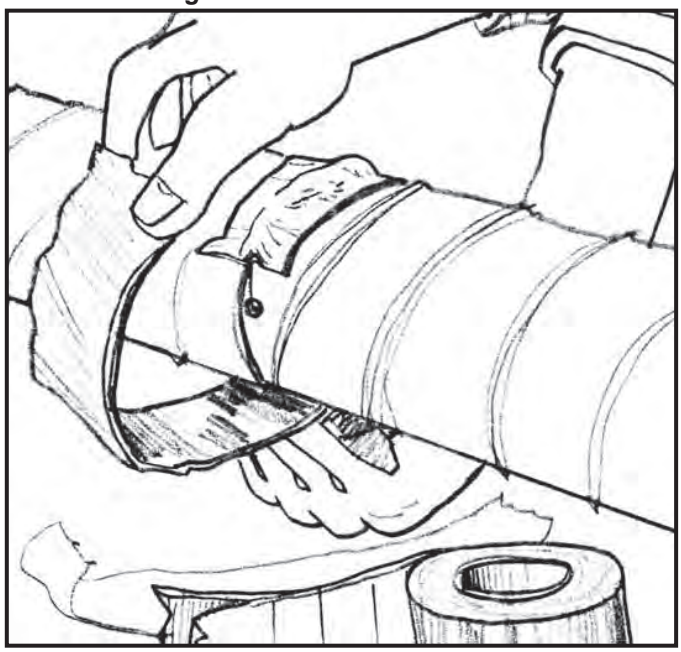


Bullhead Tees

Bullhead tees are to be maintained as close to a 50/50 split as possible, with a maximum 60/40 split ***(Fig. 07)***. For the best system performance, keep the number of elbows and tees to a minimum.

After any connection is made, including the joints of elbows and tees, foil duct tape or a duct sealant should be used to eliminate any air leaks.

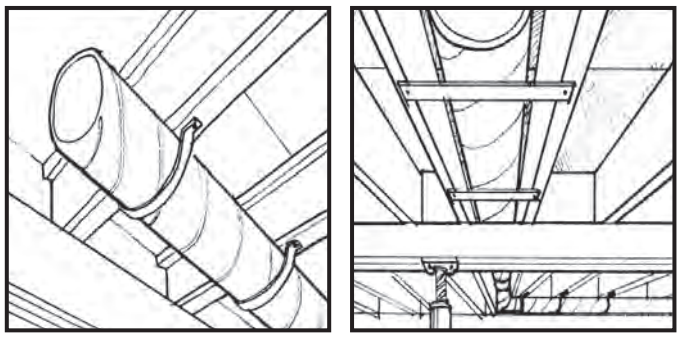
Fig. 08 - Seal all connections



Joist and Trusses

When running the plenum duct between joists in the basement, sheet metal strapping should be used (supplied by the installer, not the factory) to secure the plenum in place ***(Fig. 09)***.

Fig. 09 - Use metal strapping



When located in ceiling spaces, the duct may be laid upon ceiling trusses. Run the duct work low so that it can be covered with the house insulation ***(Fig. 02)***.

Insulation Sleeve

Any time the duct will be run in an unconditioned space (attic or crawl space) it must be insulated with a vapour barrier. It's also recommended to vapour barrier runs that exceed 75% of the total allowable distance ***(Module SPC - Specifications and Sizing Pgs. 1, 2)***.

To install the insulation sleeve over the main plenum, either tape the end of the duct or use an end cap. This will allow the sleeve to slide on easier, and prevent the insulation from catching on the sharp metal ends of the duct ***(Fig. 10)***.

Fig. 10 - Use an End Cap or Reducer

Branch Take-Off with Insulation Sleeve

After the insulation sleeve is installed, cut an X through the vapour barrier and insulation. Peel it back enough to allow you to drill your hole without ripping all of the insulation. Install the branch take-off as described in the Branch Take-Off section.

Fig. 11 - BTO with insulation sleeve

Connecting Plenum to Fan Coil

After the main plenum duct and the fan coil unit are in place, they can be fitted together. Do not permanently fasten the two together yet, as the plenum may need to be rotated in order to make the branch take-off connections. Once rotated into position, fasten and seal with duct sealant or foil duct tape.

Duct Reductions

In some installations, it is necessary to reduce the size of the main plenum. Caution must be used when reducing plenum size, since smaller ducts can handle less number of outlets. Also, when running the plenum duct past 75% of max distance, it is best to keep full size plenum duct to reduce restriction in the main plenum. Keep in mind that once reduced, the main plenum cannot be increased again. The Branch Take-Offs form easily to ducts in the 6" (152mm) to 8" (203mm) range; extra care must be taken with smaller sized ducts to ensure a proper air seal. For tee reductions, keep the tee to the full duct size, if reducing the plenum duct, reduce only after the tee. Keep the length of the smaller duct sizes to a minimum, since the friction loss is much higher. If a hole saw will be used to drill the Branch Take-Off holes, metal ducts are recommended to be 28 gauge steel.

Table 02 – Duct Reduction

Duct Size	# of 2" (51mm) Vents	# of Vents (HE)	Max Length
4" (102mm)	4	N/A	30'(9.14m)
5" (127mm)	6	3	40'(12.19m)
6" (152mm)	12	6	50'(15.24m)
7" (178mm)	19	9	60'(18.29m)
8" (203mm)	29	14	70' (21.33m)
10" (254mm)	48	24	100' (30.48m)

Flexible Branch Duct

With both the Main Plenum and Rough-In Boot installed, there is now only the connection of the two. This is done with the 2" (51mm) or HE Flexible Branch Duct. Keep in mind that the minimum duct length is 10 feet, with a maximum length of 25 feet (7.62m). Branch duct runs should be kept as short as possible to maximize the airflow through these runs. Energy Saving Products supplies the both the 2" (51mm) and the HE flexible duct in three different configurations:

- 2" (51mm) x 10' (3.05m) AFD (Assembled Flex Duct)
- 2" (51mm) x 15' (4.57m) AFD (Assembled Flex Duct)
- 2" (51mm) x 25' (7.62m) UFD (Unassembled Flex Duct)
- HE x 10' (3.05m) AFD (Assembled Flex Duct)
- HE x 15' (4.57m) AFD (Assembled Flex Duct)
- HE x 25' (7.62m) UFD (Unassembled Flex Duct)

All configurations are available in both R4.2 and R8 R Values.The 2" (51mm) and HE AFD come complete with the necessary components for one complete ten foot or fifteen foot branch run. The 25' (7.62m) UFD is to be used only to extend these runs if needed.

If extending branch runs longer than the minimum, contact the system designer, or reference ***Table 03*** for branch duct losses on extended runs.

Outside Diameters of Flexible Duct:

2" - R4 = 4.5" (114mm)

2" - R8 = 6.5" (165mm)

HE - R4 = 5.5" (140mm)

HE - R8 = 7.5" (191mm)

Table 03: De-rating Values

HE Series				
Tubing Length Adjustment Factor	10' 0%	15' 10%	20' 20%	25' 35%

HE Duct

HE Duct is designed as a direct alternative for ***two*** 2" (51mm) flex duct of the same length used in Hi-Velocity Systems. No changes are required to fancoil selection and main plenum duct sizing.

HE Duct utilizes the same selecting process as the standard 2" (51mm) flex duct, a complete and comprehensive heat loss/gain must be completed in order to select fancoil, plenum size, and outlet quantities. **The HE Duct is designed to directly replace two (2) standard 2" (51mm) outlets, therefore when an area requires multiple outlets, a single HE outlet can replace two of the standard 2" (51mm) ducts. Any combination of 2" (51mm) ducting, HE ducting, and drilled outlets can be used, following the minimum and maximum outlets as per unit selection.**

Flexible Duct

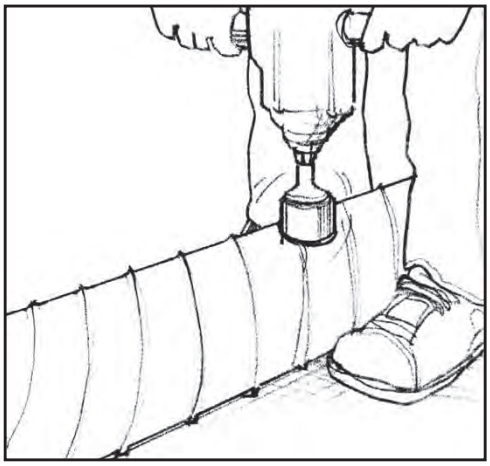
Duct Size	CFM Output
TWO 2" (51mm) Flex Duct	32 CFM X 2 (15 L/s X 2)
ONE HE Duct	65 CFM (31 L/s)

Example: If a 3 Ton Unit has 24 outlets of the normal 2" X 10' (51mm) flex duct, you can change to 12 HE X 10' Duct outlets, or 8 HE Duct and 8 2" (51mm) Duct outlets, or any combination to give you the equivalent. See **Specification & Sizing Pgs 1,2** for Air Flow data.

Branch Take-Offs (BTO)

The locations for the Branch Take-Offs should be determined before any drilling is done. Holes need to be drilled a minimum of 6" apart on center (152mm) for 2" flex, and 7" (178mm) apart on center for HE flex. Once all spots are marked for the Branch Take-Offs, a hole saw is used to drill the outlets - 2 1/4" (57mm) for 2" (51mm) Branch Take-Offs and 3" (76mm) for HE Branch Take-Offs. ***(Fig. 12)***.

Fig. 12 - Drill hole



It is **NOT** recommended to connect any Branch Take-Offs until all holes have been drilled, as it may be necessary to rotate the plenum to drill the outlets.

After all the holes have been drilled in the main plenum, the Branch Take-Offs are then installed. The Branch Take-Off is placed over the hole with the gasket in between ***(Fig. 13a)***. The curvature of Branch Take-Off is aligned so it matches the shape of the plenum. With the opening fully over the hole push the BTO tight against the main plenum and secure with four ¼" (7mm) self tapping screws ***(Fig. 13b)***.

Fig. 13a - Branch Take-Off

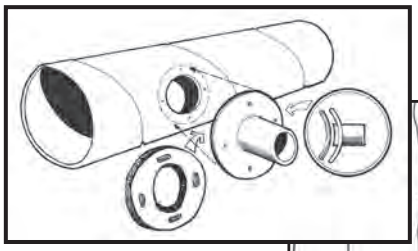
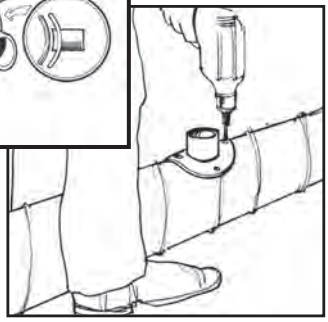


Fig. 13b - Securing

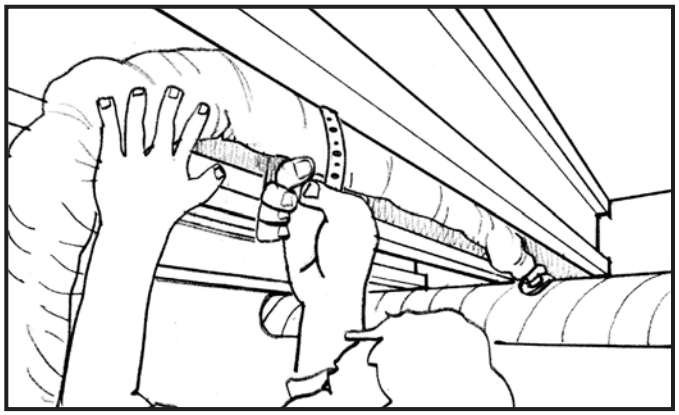


Flexible Duct Placement

After the all the Branch Take-Offs have been installed, the flexible duct can then be fastened to the joist with strapping material. Staples may be used, as long as the insulation sleeve isn't damaged or torn.

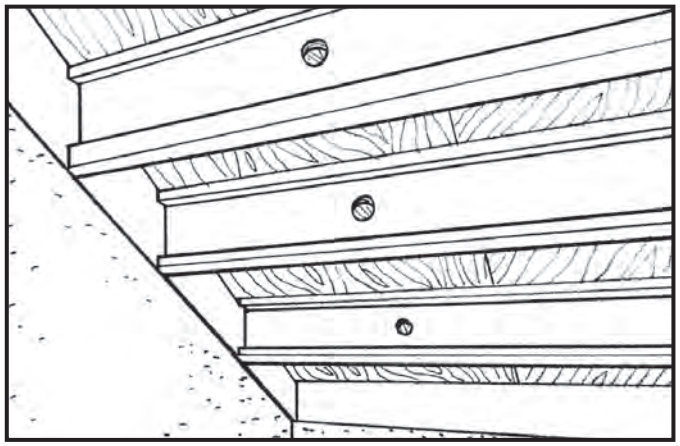
Only use staples if local code allows. If the insulation sleeve is damaged use foil duct tape to seal the sleeve, do not use cloth style tapes as they will not create a proper seal. Try to run the flexible duct parallel to the joists whenever possible as this takes less space ***(Fig. 14)***.

Fig. 14 - Use strapping to hold the Flexible duct



When installing the flexible duct in areas in which you must run opposite to the direction of solid joists, some drilling may be required. It is recommended to drill the smallest hole possible ***(Fig. 15)*** in order to maintain structural integrity. Check with local code laws and ensure that it is allowable to drill holes through the joists before proceeding. If possible, run the flex duct under the joists and avoid drilling any holes.

Fig. 15 - Through or under joists



When larger holes (4"/102mm) can be drilled, then the insulated flex duct may be pulled through whole. If code or the designer only allow for a 2 ¼" (57mm) or 3" (76mm) hole, the insulation must first be removed from the flexible duct ***(Fig. 16a)***. The insulation is then cut into lengths that correspond to the joist spacing. As the inner soft core of the flexible duct is fed into each hole the insulation is slid over the core ***(Fig. 16b)***.

***Fig. 16a - 2 ¼" holes* (57mm)**

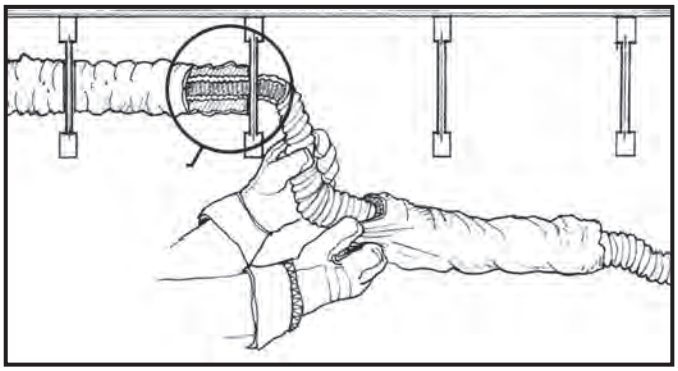
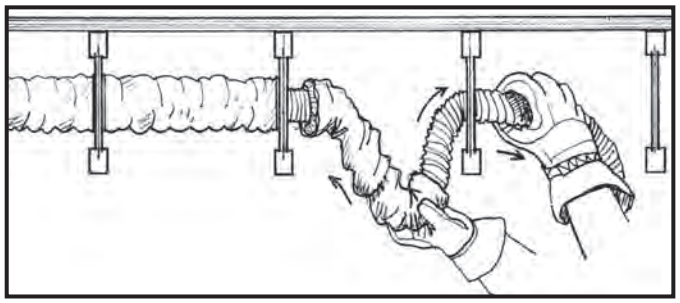


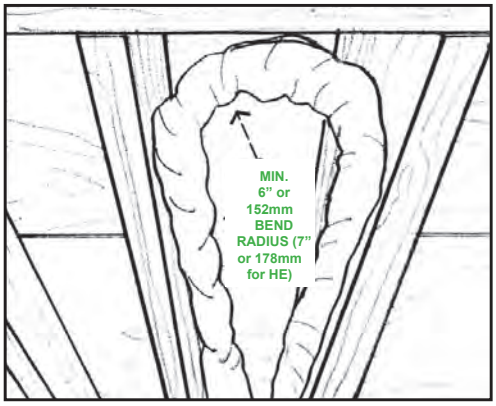
Fig. 16b - Add insulation at each joist



If a T-Bar ceiling is going to be installed, it is far easier to run the flexible duct in that space, rather than drilling through several joists.

The flexible duct should never be cut shorter than 10' (3.05m) in length. If the run to the outlet is less than 10' (3.05m) the flexible duct can be coiled up. The bends in the flexible duct shall have a minimum radius of 6" or 152mm (7" or 178mm for HE Duct) ***(Fig. 17)***. Sharp bends in the Flexible Duct will reduce airflow to that vent.

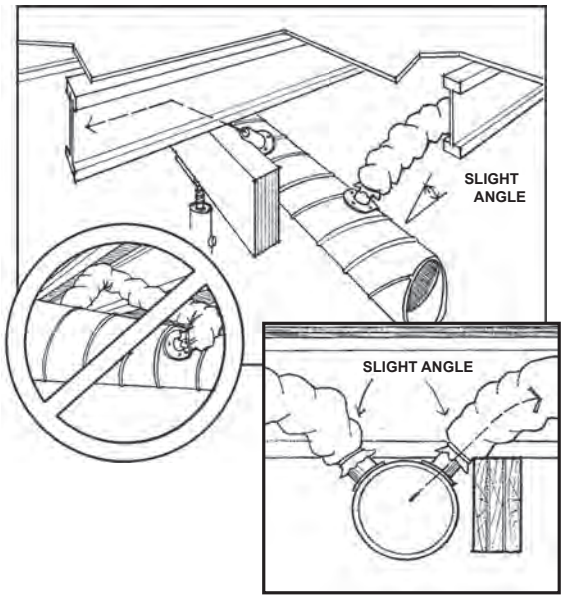
Fig. 17 - 6" (152mm) minimum radius on bends



Connecting to the Main Plenum

The Flexible Duct coupling is connected to the branch Take-Off, then mechanically fastened with at least one ¼" (6.7mm) self tapping screw. The connection then should be sealed with foil duct tape or an approved sealant.

Fig. 18 - Secure to plenum with gentle bends



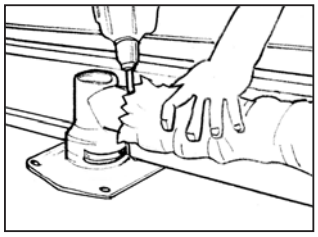
Hard angles should never be used when connecting to the main plenum or Rough-In Boot, keep the bends as gentle as possible ***(Fig. 18)***. A hard bend should never be created in the flexible duct as this will restrict airflow to the outlet.

Connecting to Rough-In Boot

The Flexible Duct coupling is connected to the Rough-In Boot, then mechanically fastened with at least one ¼" (6.7mm) self tapping screw ***(Fig. 19)***. The connection then should be sealed with foil duct tape or an approved sealant.

The Rough-in Boot can be insulated and vapor barriered using the insulation and vapor barrier that is around the flex duct. Cut the cable tie on the flex duct and pull the insulation and vapor barrier over the flange of the Rough-in Boot and replace cable tie. Tighten the cable tie securely around the boot, insulation and vapor barrier.

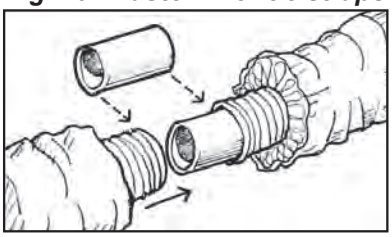
Fig. 19 - Mechanically Fasten



Extending the AFD with a UFD kit

When connecting the UFD to the AFD, attach the branch coupling into the inner core of the UFD with foil duct tape, connect the two branch couplings with the branch connector tube ***(Fig. 20)***. Now pull the insulation and vapour barrier over the inner core and secure around the outside of the vapour barrier with a cable tie. Tighten the cable tie securely around the branch connector, inner core, insulation, and vapour barrier.

Fig. 20 - Fasten with tie straps



Unconditioned Spaces

If the flexible duct is in an unconditioned space, then all connections must be taped to ensure a continuous vapour seal. This includes the Branch Take-Off and the vent Rough-In Boot. Try not to damage the vapour barrier on the flexible duct. If it is damaged, holes must be taped. If possible, try to run the flexible duct between the insulation and the vapour barrier.

Two Inch Metal Duct

Flexible duct is not to be used in concrete applications. Caution should be used when running metal or PVC pipe under concrete, to ensure pipe is not crushed. For certain applications in which hard pipe is needed, certain guidelines must be followed. All metal ducts run in a concrete slab must be sealed with an approved duct sealer. For vertical runs out of the floor, it may be necessary to extend the damper tube or vent plate collar ***(Fig. 23)***, to connect to the AFD Kit.

Flexible Duct Termination

To complete the installation, cut out the Rough-In Cap ***(Fig. 21)*** and install the vent plate by sliding the vent plate into the end of the damper tube ***(Fig. 22)***. Ensure the vent is in the ***fully open position***.

Fig. 21

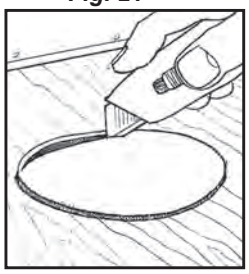
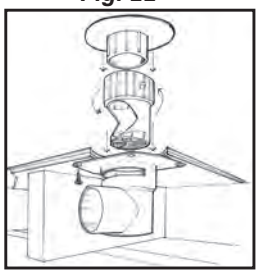


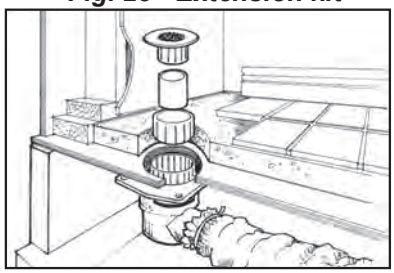
Fig. 22



Vent Plate Extensions

When the sub floor and floor finishing is too thick for the connection of the vent plate, it may be necessary to use an extension kit. Connect the vent plate extension to the branch connector tube and vent plate. The branch connector tube can be cut at different lengths so the vent plate sits flush with the floor finishing.

Fig. 23 - Extension kit

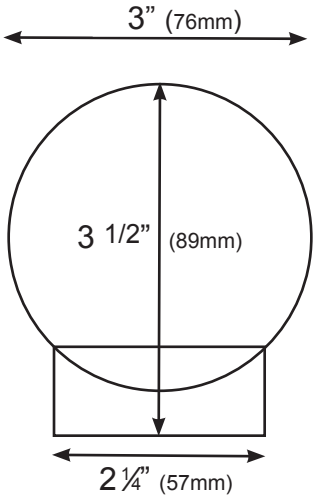


TEST SYSTEM FOR LEAKS BEFORE INSTALLATION OF DRYWALL.

Installing 2" Vents in Retrofits

For ease of installation, it is recommended to use the 2" (51mm) flexible duct and vents for retrofit applications. With the proper preparations, installing vents into finished walls and ceilings is quick and simple.

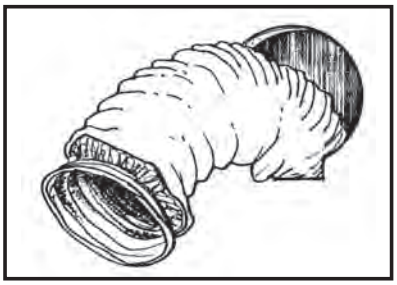
Fig. 24 - Dimensions



Using a 3" (76mm) hole saw, drill a hole where the vent outlet is to be placed ***(Fig. 24)***. The hole needs to be enlarged in the direction of the incoming flexible duct. This is done by creating a 2 ¼" (57mm) x ½" (13mm) rectangle, which will allow the Rough-In Boot to slide easily into the wall.

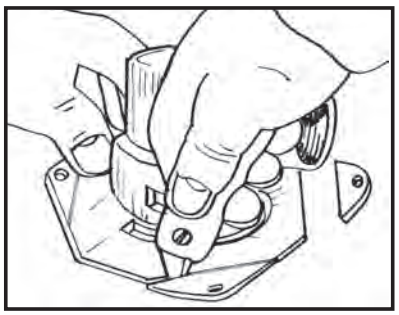
Once the hole is finished, run the flexible duct through the wall/ceiling to the vent outlet. If installed in drywall, care must be taken when pulling the flex out of the opening ***(Fig. 25)***. Too much force can result in damage to the dry wall.

Fig. 25 - Run flex through opening



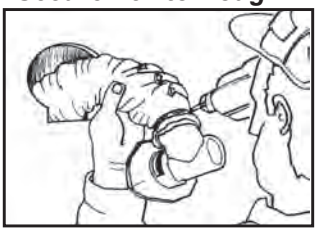
The Rough-In Boot needs a little preparation before it can be mounted to the flexible duct. The corners need to be trimmed along the score lines of each corner ***(Fig. 26)***. This will allow the Rough-In Boot to be completely hidden with a beauty ring ***(Fig. 32)***.

Fig. 26 - Trim off the 4 corners



The Rough-In Boot is then connected to flexible duct and mechanically attached with a self tapping screw ***(Fig. 27)***.

Fig. 27 - Secure flex to Rough-In Boot



Next the flex is fed back into the wall and Rough-In Boot slid into the hole ***(Fig. 28)***.

Fig. 28 - Feed the flex back into the wall

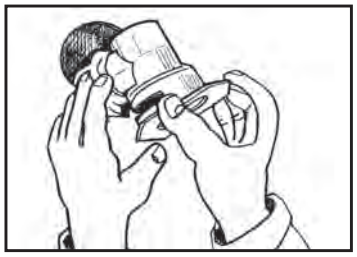


Fig. 29 - The Top

The Rough-In Boot is placed at the top of the hole; top is the opposite side of the cut out rectangle ***(Fig. 41)***.

If being installed in drywall, with the boot seated firmly against the top, 3 pilot holes need to be drilled for 1/4" (6.7mm) drywall anchors ***(Fig. 30)***.

In drywall applications, 3 drywall anchors (1/4" or 6.7mm) should be used to secure the Rough-In Boot to the wall ***(Fig. 31)***.

Fig. 30 - Pre-drill for anchors

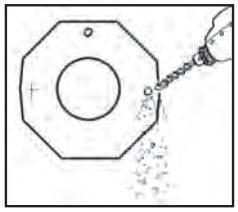
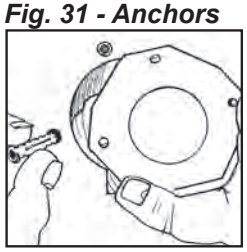


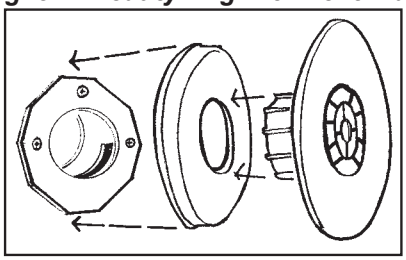
Fig. 31 - Anchors



Once drywall anchors are installed, screw down the Rough-In Boot and secure it in place.

The hole and Rough-In Boot can be completely hidden if a beauty ring is used in conjunction with a vent plate ***(Fig. 32)***.

Fig. 32 - Beauty ring with Vent Plate



Linear Grills

Installations in areas that have a high heat loss/gain require multiple vents. Multiple vents can be installed into linear grills for a more esthetically pleasing look. Installing in a high sidewall/ceiling or floor makes little difference ***(Fig. 33)***. A ***Straight Vane*** vent grill is the ***only*** type of linear grill that can be used with the Hi-Velocity System ***(Fig. 34).*** Linear grills must be purchased from a third party vendor.

Fig. 33 - Linear Grills

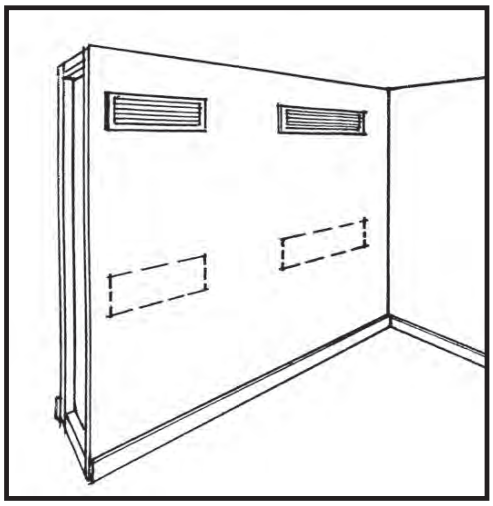
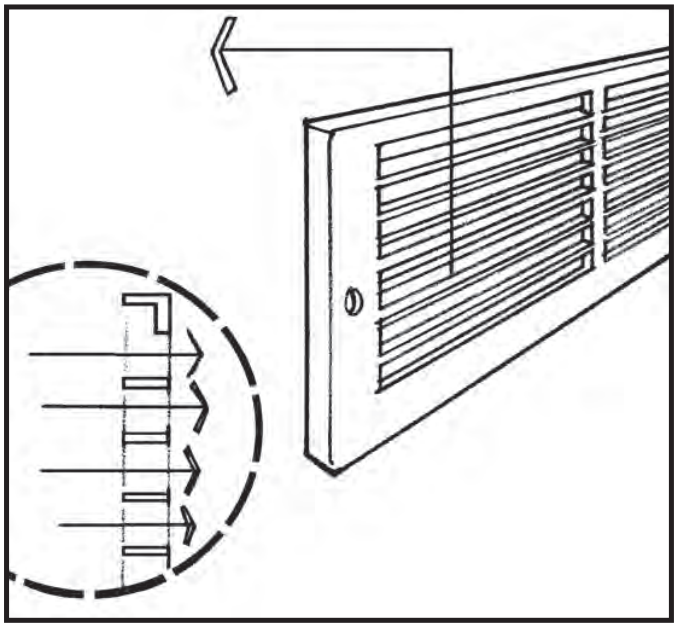
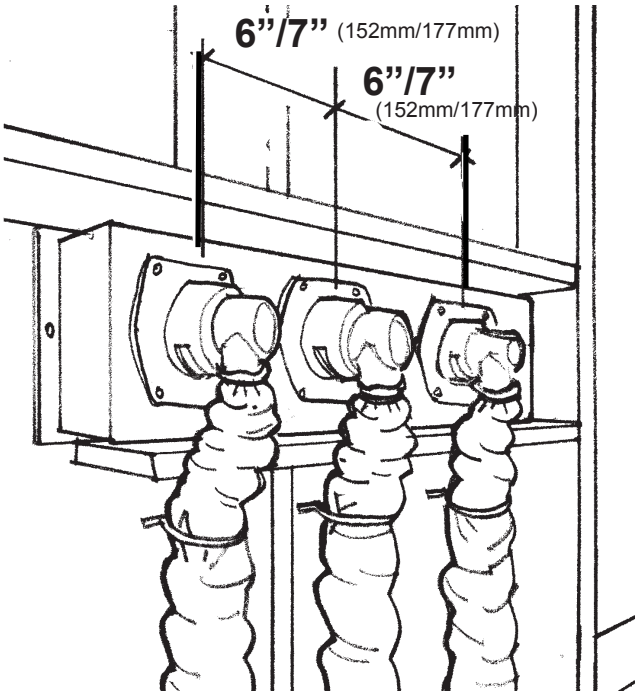


Fig. 34 - Straight vanes only



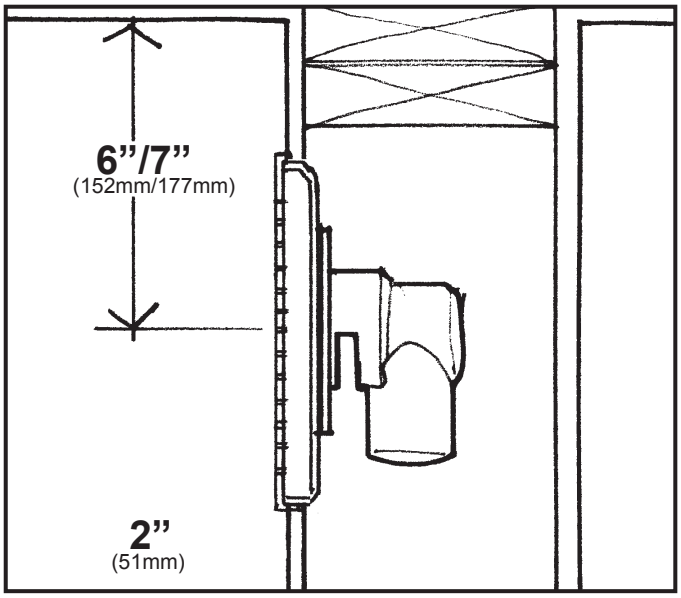
When installing multiple vents into linear grills, the 2" (51mm) vents must be a minimum of 6" (152.4mm) on center from each other, 7" (178mm) for HE vents. ***(Fig. 35)***. Same rules apply for vents in linear grills as a single outlet installation; see **Module OTL - Outlet Installation** for more information on vent placement.

Fig. 35 - 6"/7" Apart on Center (152mm/178mm)



The outlet of the Rough-In Boot must be no more than 2" (51mm) away from the grill ***(Fig. 36).***

Fig. 36 - Outlet no more than 2" (51mm) from grill



Installing the vents around the room will allow for the room air to mix. This will give the room a more even air temperature and better distribution.

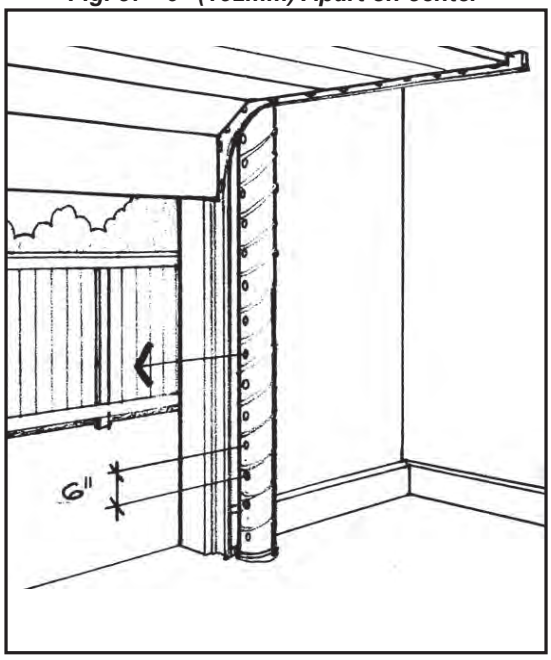
Drilled Outlets

Caution must to be used when not using the flexible duct, the air velocity from the drilled outlet may create noise. Drilled Outlets ***CANNOT*** be installed in a residential structure; too much noise may be generated from the outlets. In commercial areas with large ceilings the sound can be absorbed by the room or is not a concern because of the ambient noises.

Drilled outlets are commonly used to supply a large area with heating and cooling. Drilled outlets can also be used to create a pressurized air curtain for bay doors, or large openings to the outside environment. When drilled outlets are used with the Hi-Velocity System a few points to remember:

- When multiple 1¼" (32mm) or 2" (51mm) holes are used, they need to be a minimum of 6" (152mm) apart on center ***(Fig. 37)***.
- One 1¼" (32mm) drilled hole is equivalent to a single 2"x10' AFD kit (2"/51mm Rough-In Boot attached to a 10'/3.05m piece of flex duct). With the 1¼" (32mm) drilled outlet the throw from the outlet is up to 18' (5.49m).
- One 2" (51mm) drilled outlet is equivalent to two - 2"x10' AFD kits (2"/51mm Rough-In Boot attached to a 10'/3.05m piece of flex duct). With the 2" (51mm) drilled outlet the throw from the outlet is up to 30' (9.14m) in distance.
- Using drilled outlets larger than 2" (51mm) is not recommended; with too large of an opening in the main plenum the static pressure may drop to an unacceptable level.

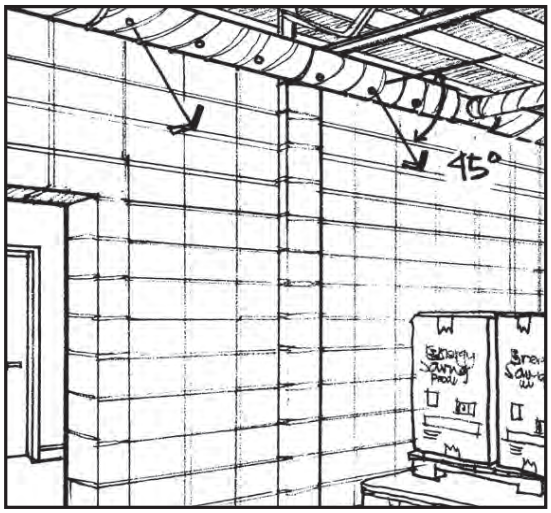
Fig. 37 - 6" (152mm) Apart on center



Plenum Runs on Ceiling

When drilled outlets are used in a ceiling install, drill the outlets at a 45° angle to properly circulate the room air ***(Fig. 38)***.

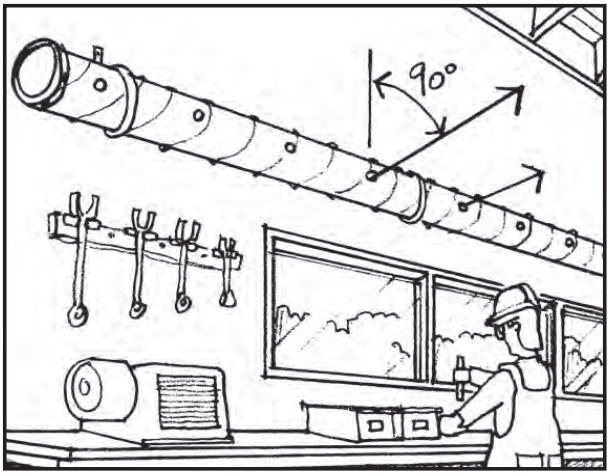
Fig. 38 - Airflow 45° angle to floor



Plenum Runs on Sidewall

For sidewall installations the outlets are drilled parallel to the floor (Horizontal airflow). When the vents are in this configuration, they can be used to create a pressurized air curtain.

Fig. 39 - 6" (152mm) Airflow parallel to floor



If there is an air velocity noise coming from the drilled outlets, a static pressure reading from the plenum duct should be taken. This reading is to be taken no closer than 18" (457mm) from supply air outlet of fan coil. Static pressure readings are taken from the inside edge of the plenum; do not insert pitot tube deeper than ¼"(6.7mm) from the inside surface of the plenum.

If the static pressure is high, drilling more holes into the main plenum will lower the static pressure and the noise level of the system. The standard supply pressures for the Hi-Velocity System runs between 0.7 H_2O (174 pa) and 1.2 H_2O (299 pa). Do not allow the static pressure to drop below 0.7 H_2O (174 pa) as this can cause a low airflow.

Return Air

When designing the return air for a Hi-Velocity System, there are a few things to consider. It is common to use centralized return air with systems that have rooms that are within a common area. Separate floors or rooms that have high loads and require a large amount of supply air flow should have their own return air, or be tied into the centralized return air to allow the air to return back to the fan coil. Rooms or areas that cannot be tied into the return air should have an air transfer grill to allow the air to escape the room and flow back to a centralized return air.

The Hi-Velocity System is a pressure supply duct system that forces the air into rooms through supply outlets. A closed room will pressurize, and air will escape through the undercut of a door back to a centralized return air. (**i.e.** a typical bedroom with two outlets will deliver 64 cfm into the space, a 1/2" undercut door will provide 15 square inches of r/a from the space at a transfer velocity of 4 fpm, sufficient to provide comfortable r/a.) If more than four 2" or two HE vents are installed in a room, or if there is a sealed door in the room, an air transfer grill or return air should be installed to allow the air back to the fan coil.

The return air duct is not supplied with the Hi-Velocity System. It is to be supplied and installed by the contractor. The return air and fresh air make-up ducts are to be installed according to local building code.

The return air duct from the air handling units is to be acoustically lined for sound absorption, for the first five feet, or for the line of sight. This only applies on short return air duct work of less than 10 feet (3.05m).

Duct Sizing

The return air is to be sized on a 0.15 static pressure (37 pa) as compared to 0.10 static pressure (25 pa) for conventional forced air systems. The maximum length for an individual return air duct is fifty feet (15.24m).

Please note: It is VERY important NOT to undersize the return air, as this can create noise and increase motor power consumption

Table 01 has recommended return air sizes for round and rectangular ducts. A variance of **plus 20%** is allowable for sizing return ducts that connect to the Hi-Velocity Systems unit.

Table 01 – Return Air Duct Sizes

Unit	Round Duct	Rect. Duct Equiv. in Sq. Inches (Sq. cm)
HE-50/51/52	12" (305mm)	120 (774cm)
HE-70/71	12" (305mm)	120 (774cm)
HE-100/101	14" (356mm)	168 (1084cm)

It is recommended to install a grill that is 10 - 20% larger than specifications require, this will ensure that there is no air velocity noise at the grill. Where allowed by local codes, a single return air grill may be used.

Important: When using flexible duct for return air, use one duct size larger due to the higher friction loss.

Return Air Cutout

Once the placement of the return has been decided, the return air knockout(s) can be cut. ***(Fig. 01)*** The pre-measured guide cuts supplied with the fan coil should always be used; this will guarantee maximum airflow across the coil.

Fig. 01 - Return air cutout

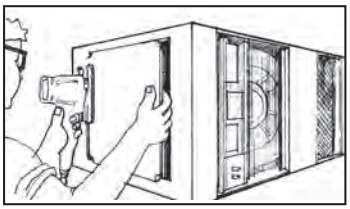
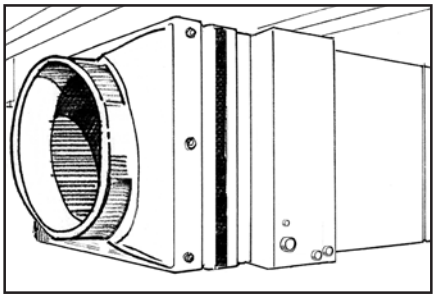


Table 02 – Return Air Cutout Dimensions

Model	Dimensions
HE-50/51 H/BU	$9^{1/2}$" X $13^{1/2}$" (241mm X 343mm)
HE-70/71 H/BU	14" X $13^{1/2}$" (356mm X 343mm)
HE-100/101 H/BU	20" X 14" (508mm X 356mm)

Once the return air has been cut out, a transition will be needed to attach the return air duct to the fan coil ***(Fig. 03)***.

Fig. 02 – Return Air using a transition



A round or square return air duct can be used; they must be sized for the Hi-Velocity Systems according to **Table 01**. Before the return air can be attached to the transition, the first five feet (from the fan coil) is to be acoustically lined for sound absorption.

Return Air Base

Energy Saving Products manufactures a return air base with a built in filter rack that matches up to the fan coil units.

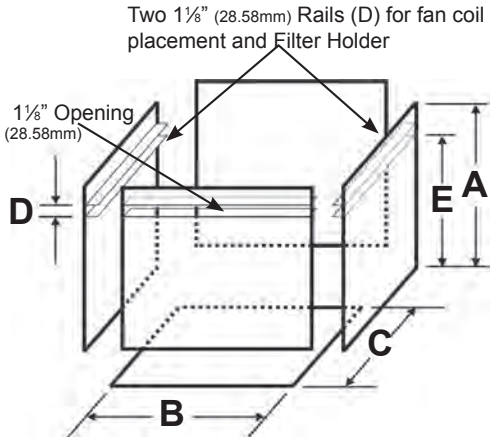
The return air base comes complete with a one-inch (25mm) filter and one-inch (25mm) filter rack. The filter is a 3 medium filter approximately 14% efficient, and can be replaced with any aftermarket filter. All the Return Air bases come acoustically lined with half-inch sound absorbing insulation.

For filter options and other Add-Ons available from Energy Saving Products, see ***Module OPT - Options and Add-Ons***.

Table 03 – Return Air Base dimensions

	A	B	C	D	E
HE-50/51/52	24" (610mm)	18½" (470mm)	14½" (368mm)	1⅛" (28.6mm)	21¾" (552mm)
HE-70/71	24" (610mm)	18½" (470mm)	19½" (495mm)	1⅛" (28.6mm)	21¾" (552mm)
HE-100/101	24" (610mm)	18½" (470mm)	25½" (648mm)	1⅛" (28.6mm)	21¾" (552mm)

Fig. 03 - Return Air Design



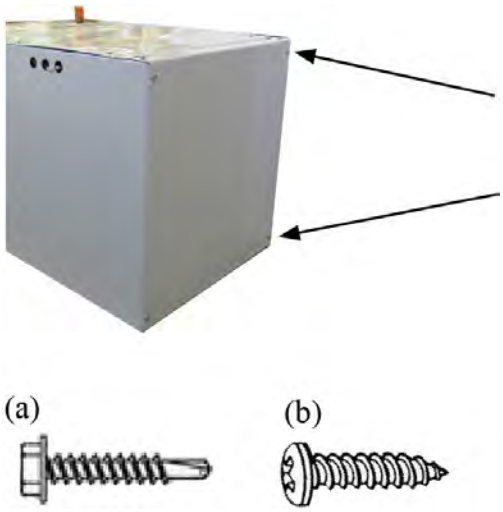
For installation of Heating and Cooling Add-Ons, Refer to:

- ***Module RPM - Refrigerant Module Installation***
- ***Module HWC - Hot Water Coil Installation***
- ***Module WCM - Chilled Water Coil Installation***
- ***Module ESH - Electric Strip Coil Installation***

These manuals are included with the coils, and are also available online at www.hi-velocity.com.

Mounting Additional Components

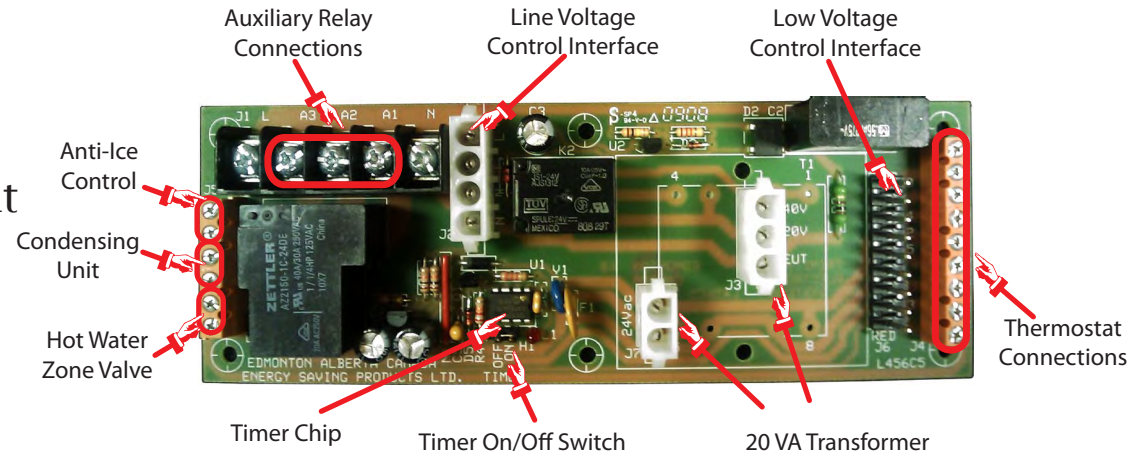
When mounting additional components onto the back of the unit, (Filter Rack, Return Air Base etc.) the hex head ***(a)*** screws (4 or 6 depending on unit size) can be replaced with flat head ***(b)*** screws for a flush fit.



Hi-Velocity Systems HE EPC Circuit Board

Energy Saving Products Ltd. now utilizes automatic voltage and frequency recognition circuitry designed for the national and international market. This unique feature will automatically recognize and adjust to the voltage and frequency input. It doesn't matter if it is 115 or 230 volt, 50 or 60 cycle, our electronics will adjust to the input automatically.

EPC Circuit Board



The Hi-Velocity Circuit board makes wiring of the unit a quick and simple task. With clearly labeled connections, it is easy to wire in the thermostat. The fan coil is prewired for both heating and cooling with no additional relays typically required. The Circuit board works as a relay system to the heating and cooling components connected within the system. The Circuit Board supplies the thermostat with 24v power, which works as a signal to the circuit board to operate the EPC Control board to its designed variable fan speeds that controls the motor.

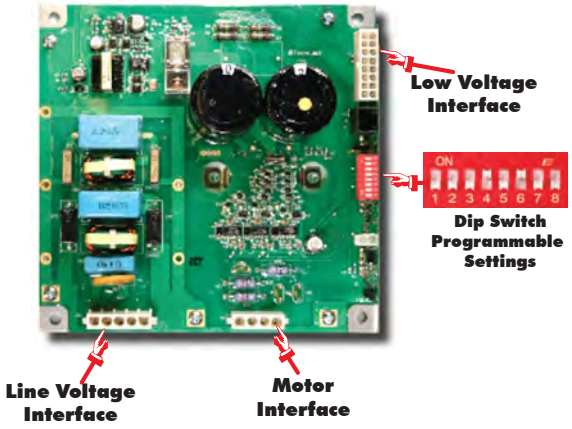
The Circuit board is pre-wired to send control signals to heating sources such as boilers, dual purpose hot water heaters, heat pumps, and geothermal systems, as well our manufactured slide-in electric module (ESH). The circuit board is also designed to send control signals to cooling sources such as condensing units, chillers, heat pumps and geothermal systems.

The circuit board features an Auxiliary Relay with Dry Contact connections, so that any application requiring 24 volt, 110 volt, 230 volt, or dry contacts (boilers, hot water heaters, heat pumps, humidifiers) can be automatically started when there is a call for heat. A dynamic pump duty cycle chip is also provided to prevent water stagnation in potable water systems, and to provide pump rotor protection for water source heating and cooling.

The Circulator Timer Chip on our circuit board will energize the pump for 5 minutes every 24 hours. This timing cycle starts when power is turned on to the fan coil unit, and will be engaged at the same time every day. If you wish to have the timer cycle operate at a specific time of day, simply turn off power to the fan coil unit for three seconds at that time, and then turn the power back on. If you do not need to use the timer circuit, move the jumper header from the ON pins to the OFF pins and it will be disabled.

Hi-Velocity Systems HE EPC Motor and Control Board

EPC Control Board



Unit Configuration

Energy Saving Products Ltd. HE unit utilizes mass flow technology and will provide a constant CFM throughout the programming range; environmental conditions will no longer dictate how the system will run, our new controller will adjust voltage and frequency to maintain its programmed CFM (L/s). The Hi-Velocity HE Systems are field programmable from 1.5 to 5 tons (5.3 to 17.6 kW) of cooling with the use of a single motor and controller assembly. The tonnage is set by the pin settings 1,2,3 and 4 on the controller board, see the Dip Switch Control graphic for reference. Detailed information on pin settings is supplied on ***Module WIR - Wiring and Dip Settings Pg. 7 of 8***.

Dip Switch Control:

(Factory Setting, set for 1.5 tons/5.3kW)

Each programmed tonnage will have up to 5 adjustments for on-site fine tuning which is changed using pins 6,7 and 8. If you need to adjust the CFM (L/s) output of your selected tonnage reference ***Module WIR - Wiring and Dip Settings Pg. 8 of 8*** for pin settings to increase or decrease the output CFM (L/s).

The HE Fan Coil uses Single Phase Power and the Control Board converts the power from Single Phase to 3 Phase for the EPC Motor. The Heavy Duty 3 Phase Motor provides years of reliable service, as the heavy duty construction and power limiting function of the EPC controller minimizes motor stress and wear. The new inverter drive technology offered by the EPC motor and controller reduces power consumption by up to 70%, with an average overall yearly reduction of 50% over standard PSC motors. Noise related to excess power input is eliminated.

The mass flow program senses the airflow and changes voltage and phase to maintain constant pressure and CFM. The EPC controller will compensate for long or short duct installation, filter condition, wet/dry coils and a variety of variables that effect outlet CFM. The program also compensates for high static filters and other inline devices. Airflow related noise is reduced.

Service parts are limited for ease of maintenance – there is one motor, one controller, and one circuit board for all HE Fan Coil units. The add-on Pulse Width Modulating Input (PWM Controller) provides total motor control making multiple zoning easy without the need of by-pass air flow. The pressure sensing PWM Controller will adjust the motor performance to maintain constant pressure in supply plenum. Cooling, Heating, and Constant fan mode to compensate for damper operation and changing airflow demands, all while maintaining peak energy efficiency with the variable frequency drive technology.

HE Fan Coil - EPC Wiring Diagram

This wiring diagram is included on all of the Hi-Velocity-HE models. The power inputs as well as the various connection terminals are identified, helping you to quickly wire in the required devices.

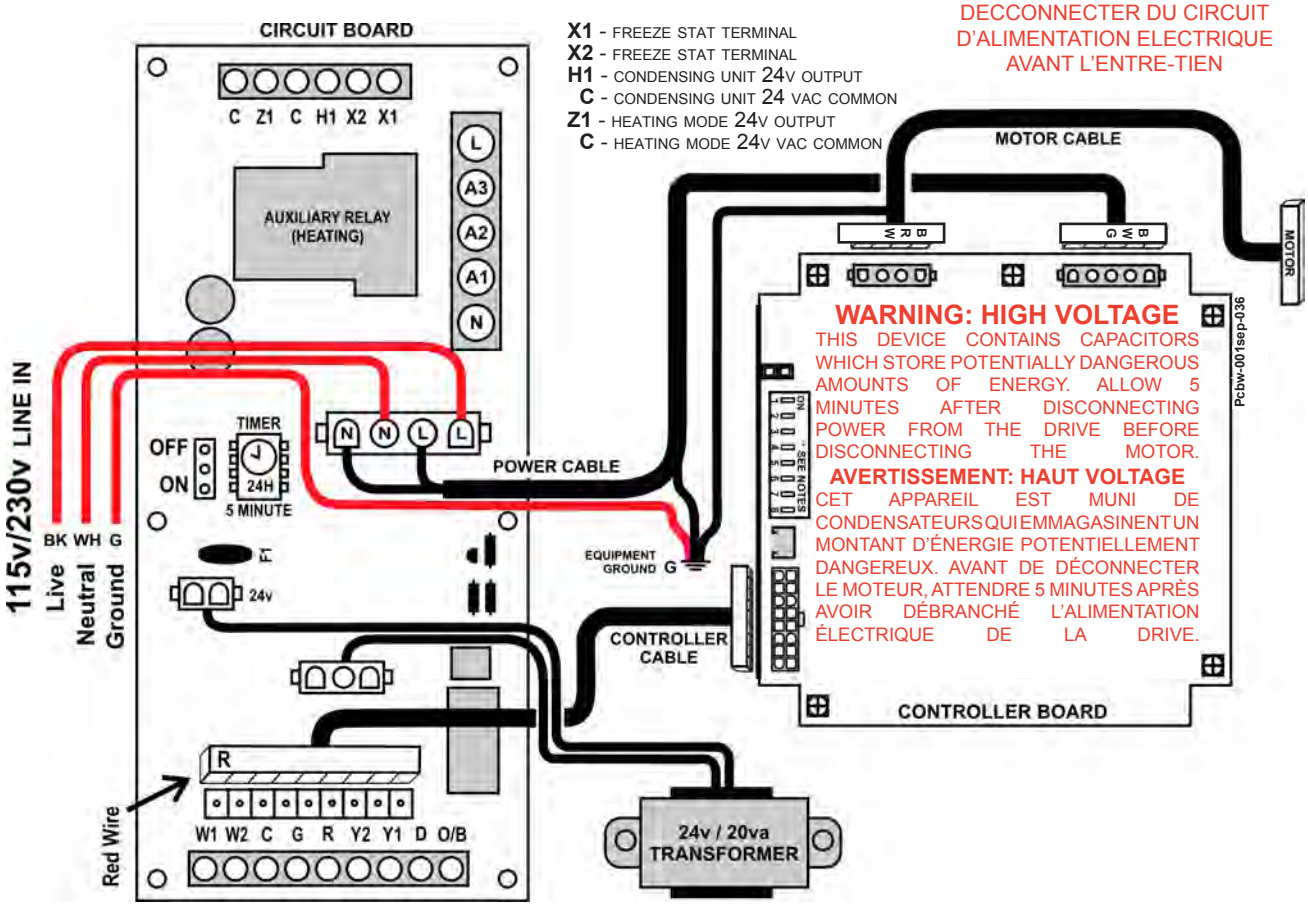
FOR SINGLE STAGE OPERATION USE W2 & Y2 TERMINALS

N - NEUTRAL
L - LINE VOLTAGE
A1 - AUXILIARY NORMALLY OPEN
A2 - AUXILIARY NORMALLY CLOSED
A3 - AUXILIARY COMMON

X1 - FREEZE STAT TERMINAL
X2 - FREEZE STAT TERMINAL
H1 - CONDENSING UNIT 24V OUTPUT
C - CONDENSING UNIT 24 VAC COMMON
Z1 - HEATING MODE 24V OUTPUT
C - HEATING MODE 24V VAC COMMON

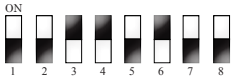
CAUTION
DISCONNECT THE ELECTRIC POWER BEFORE SERVICING

ATTENTION
DECCONNECTER DU CIRCUIT D'ALIMENTATION ELECTRIQUE AVANT L'ENTRE-TIEN



MINIMUM FACTORY DIP SETTINGS
(BLACK INDICATES DIP SWITCH SETTING)

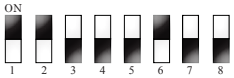
HE-50 5-15 kW
(2 Ton Dip Setting)



HE-70 5-18 kW
(3 Ton Dip Setting)

HE-100 10-20 kW
(4 Ton Dip Setting)

HE-100 10-23 kW
(5 Ton Dip Setting)



NOTES:

1) USE THERMOSTAT FAN SWITCH TO DISABLE/ENABLE CONTINUOUS FAN.

2) 'C' TERMINAL ON THERMOSTAT (COMMON) IS NOT NEEDED FOR SOME THERMOSTATS. CONSULT THERMOSTAT INSTRUCTIONS FOR DETAILS.

3) A3 (AUXILIARY RELAY COMMON) CAN BE USED WITH A1 AND/OR A2 AS DRY CONTACTS, ARMED 24v FROM THE 'R' TERMINAL, OR ARMED FROM THE 'L' TERMINAL.

4) AUXILIARY RELAY TIMER ACTIVATES CIRCUIT FOR 5 MINUTES EVERY 24 HOURS STARTING WHEN POWER IS APPLIED TO THE UNIT. RED LIGHT IS ON WHEN AUXILIARY RELAY IS ACTIVATED.

5) SEE INSTALLATION MANUAL FOR MORE DETAILED WIRING DIAGRAMS AND DIP SWITCH SETTINGS.

6) FAILURE TO READ AND FOLLOW ALL INSTRUCTIONS CAREFULLY BEFORE INSTALLATION COULD CAUSE PERSONAL INJURY AND/OR PROPERTY DAMAGE.

HE Fan Coil - 24V Wiring Controls

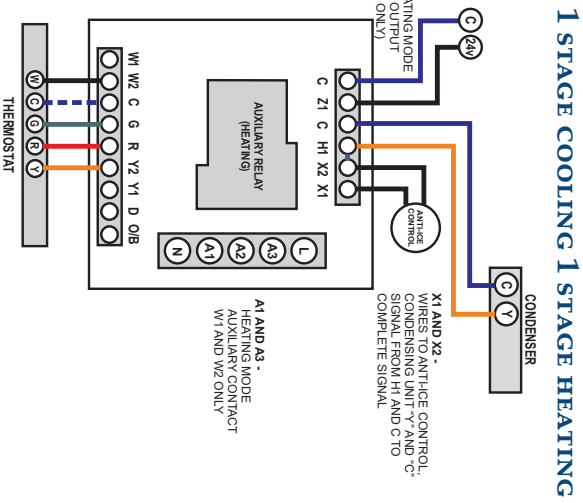
W1	W1 input to 1st (low stage) heat calls. Active when R is applied. Activates 1st stage heat fan and Auxiliary Relay. (W1 operates at 60% of W2 Fan Speed)
W2	W2 input to 2nd (high/primary stage) heat calls. Active when R is applied. Activates 2nd stage heat fan, Auxiliary Relay and 24V to Z1 (W2 operates at 200 CFM per ton (94 L/s), refer to dip setting)
C	24V supply common
G	G input for thermostat fan switch. Active when R is applied (G operates at 50% of Y2 Fan Speed)
R	24V supply
Y2	Y2 input to 2nd (high/primary stage) cooling or heat pump call. Active when R is applied. Activates 2 stage cooling fan speed, activates X1 with 24V for freeze stat and condenser connections (Y2 operates at 250 CFM per ton (118 L/s), refer to dip setting)
Y1	Y1 input to 1st (low stage) cooling or heat pump calls. Active when R is applied. Activates 1 stage cooling fan speed. (Y1 operates at 60% of Y2 Fan Speed)
D	24V input required from dehumidistat switch activates blower system to 200 CFM per ton (94 L/s) from dip setting. Y2 must be activated from thermostat. (D operates at 200 CFM per ton (94 L/s), refer to dip setting)
O/B	Blind contact for condenser heat pump from thermostat
X1	24V Signal with calls from Y2, powers Freeze Stat
X2	Freeze Stat connection return signal
H1	24V Signal to Y on Condenser
C	Common for Condensing Unit
Z1	24V supply on W2 call
C	Common

***Note:** **X1 to X2** recommended to be wired to Freeze Stat (Anti-Ice Control) If Freeze Stat is not used, a jumper between X1 to X2 must be installed to complete the H1 - 24V Signal to Y on Condenser (i.e. Chilled Water Systems)

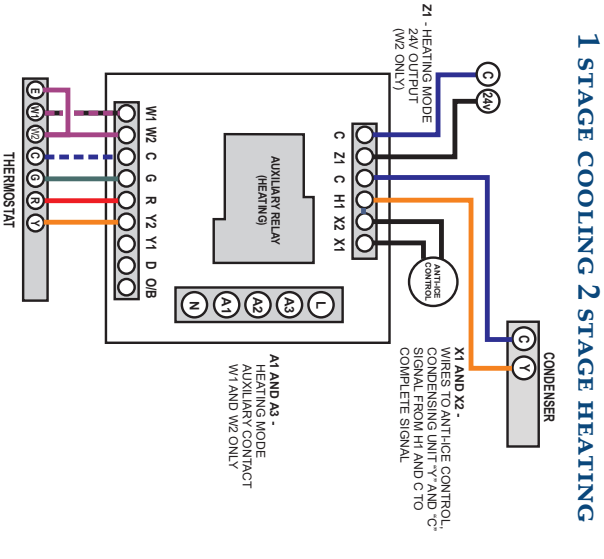
HE Fan Coil - Extended Wiring Diagrams

Extended wiring diagrams for the various applications the Hi-Velocity-HE model can be used for. If you don't find the wiring configuration you require, please call the technical department at Energy Saving Products Ltd. for further assistance.

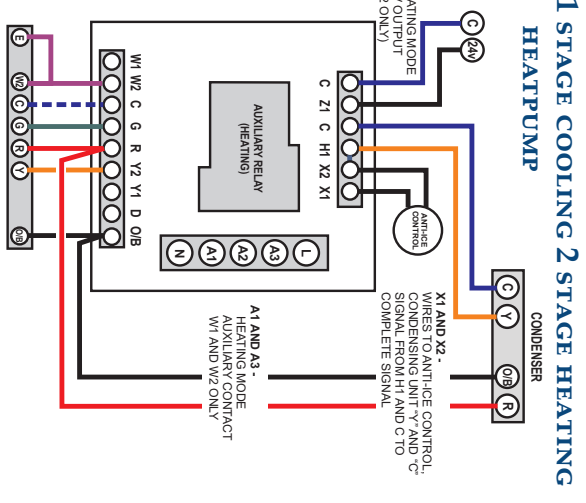
1 Stage Cooling 1 Stage Heating



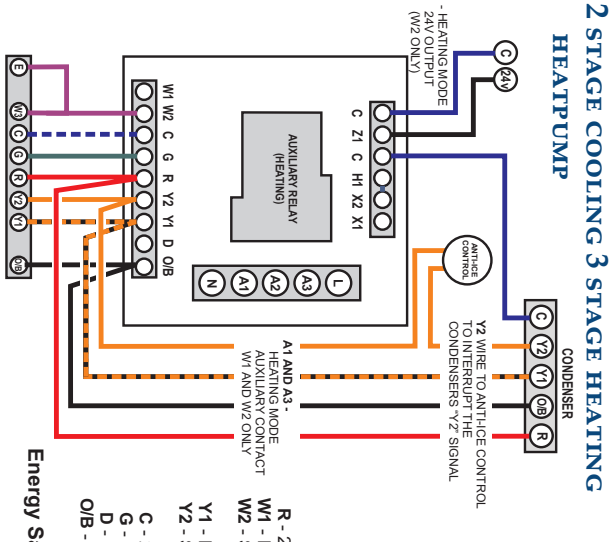
1 Stage Cooling 2 Stage Heating

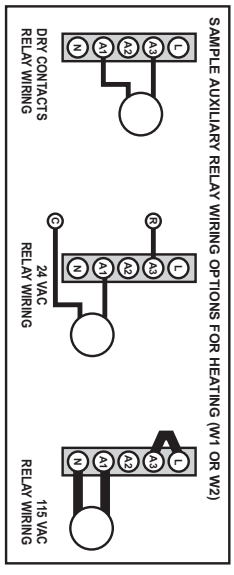


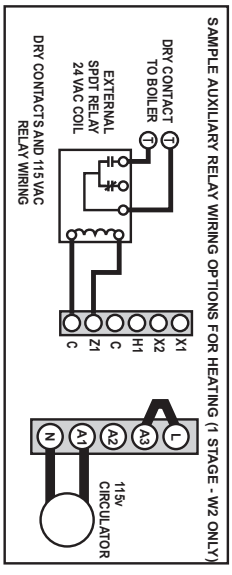
1 Stage Cooling 2 Stage Heating Heatpump

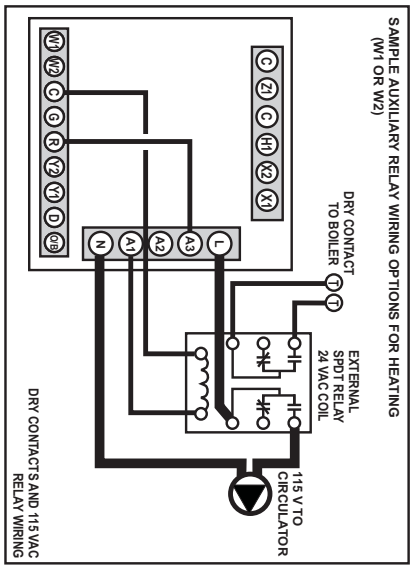


2 Stage Cooling 3 Stage Heating Heatpump









FOR SINGLE STAGE OPERATION USE W2 & Y2 TERMINALS

R - 24VAC OUTPUT
W1 - FIRST STAGE HEAT
W2 - SECOND STAGE HEAT (OR SINGLE STAGE)
Y1 - FIRST STAGE COOLING
Y2 - SECOND STAGE COOLING (OR SINGLE STAGE)
C - 24 VAC COMMON
G - THERMOSTAT FAN SWITCH
D - DEHUMIDIFICATION
O/B - HEATPUMP REVERSING VALVE

N - NEUTRAL
L - LINE VOLTAGE
A1 - AUXILIARY NORMALLY OPEN
A2 - AUXILIARY NORMALLY CLOSED
A3 - AUXILIARY COMMON

X1 - FREEZE STAT
X2 - FREEZE STAT
H1 - CONDENSING UNIT 24V OUTPUT (Y)
C - 24 VAC COMMON
Z1 - HEATING MODE 24V OUTPUT
C - 24 VAC COMMON

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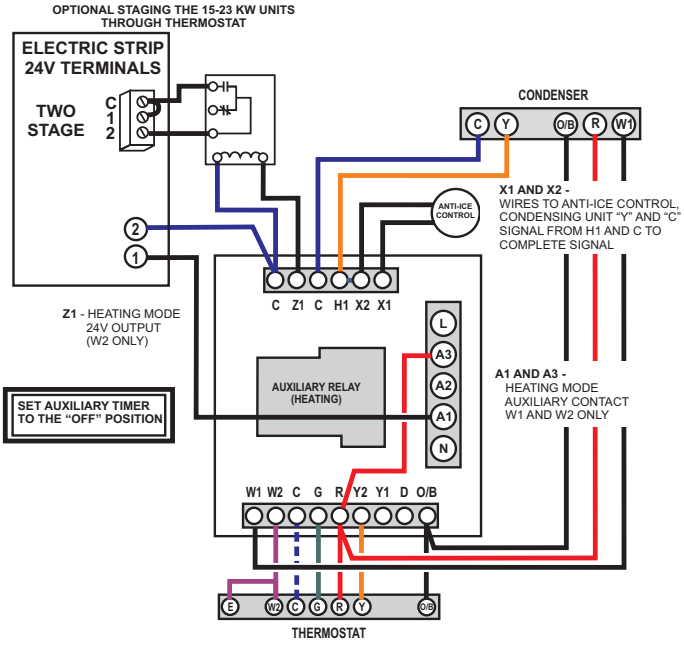
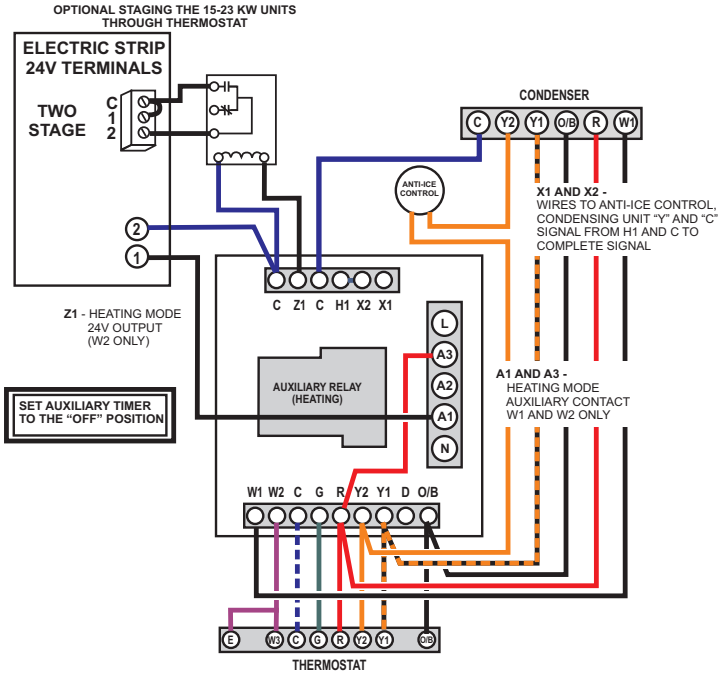
ESP315.07

Heat Pump c/w Condenser Defrost Cycle
Electric BackUp

1 stage cooling 2 stage heating (electric)
heat pump c/w condenser defrost cycle

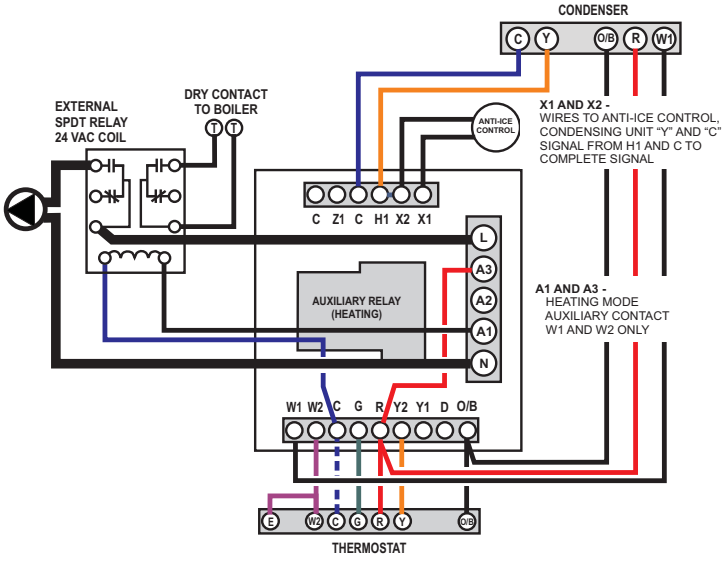


2 stage cooling 3 stage heating (electric)
heat pump c/w condenser defrost cycle

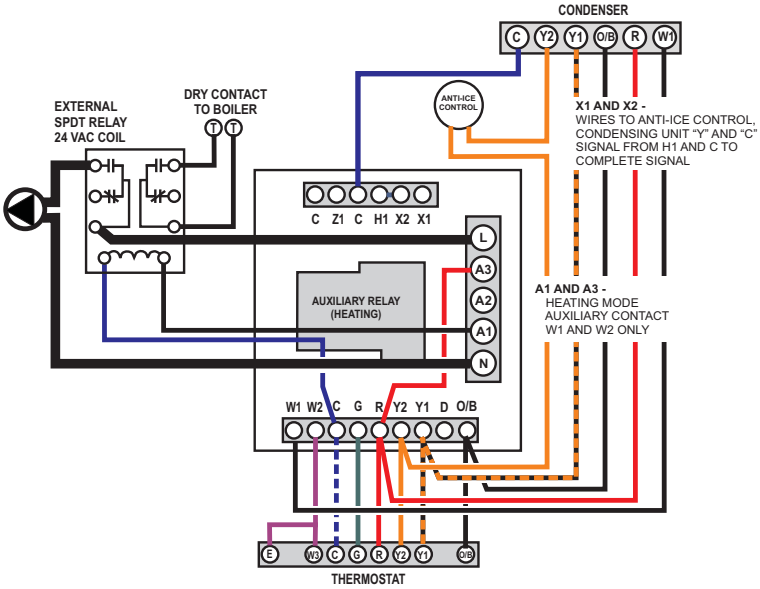


Heat Pump c/w Condenser defrost cycle
Boiler Back-Up

1 stage cooling 2 stage heating
heat pump c/w condenser defrost cycle

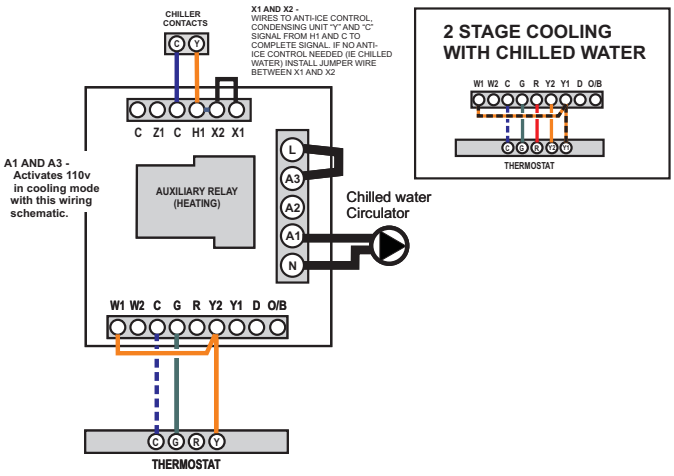


2 stage cooling 3 stage heating
heat pump c/w condenser defrost cycle

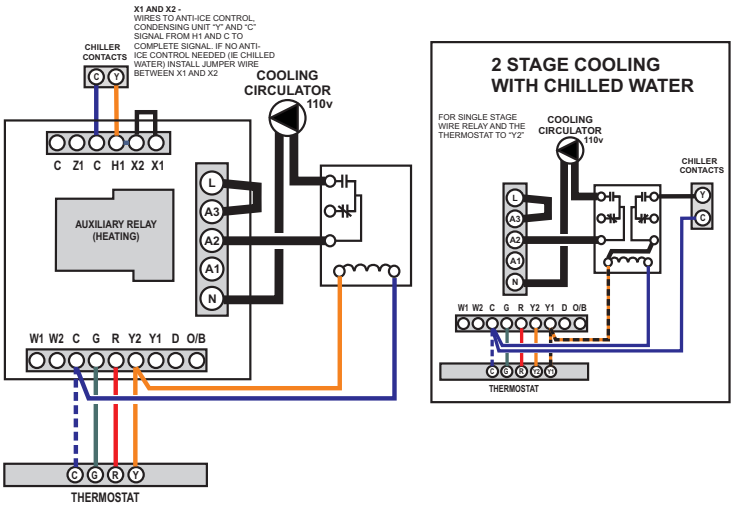


Chilled Water Wiring

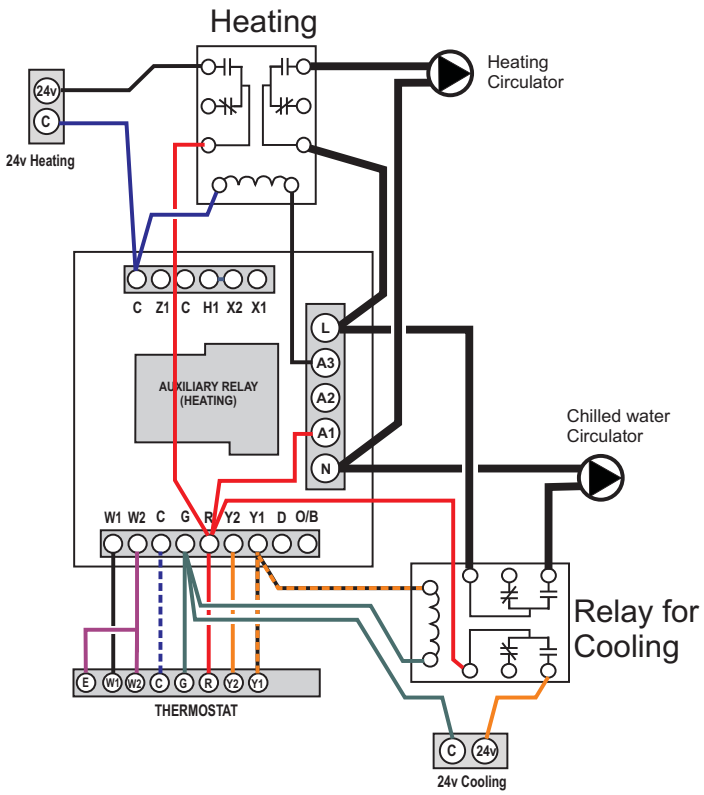
1 stage cooling (only) c/w chilled water circulator



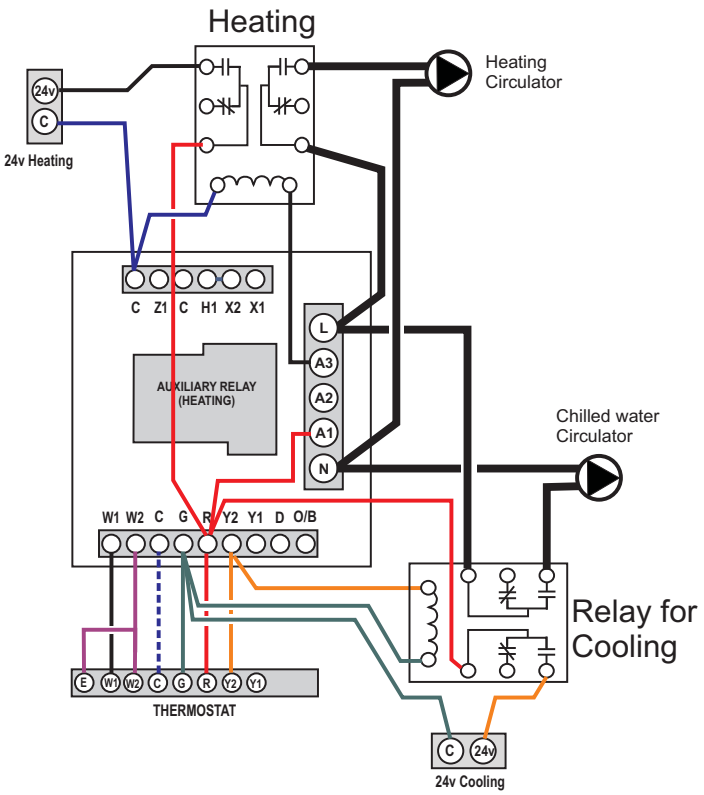
1 stage cooling c/w chilled water circulator w/o using "W" terminals



2 stage chilled water cooling c/w chilled water circulator and 24v zone valve output 2 stage heating c/w hot water circulator and 24v valve output

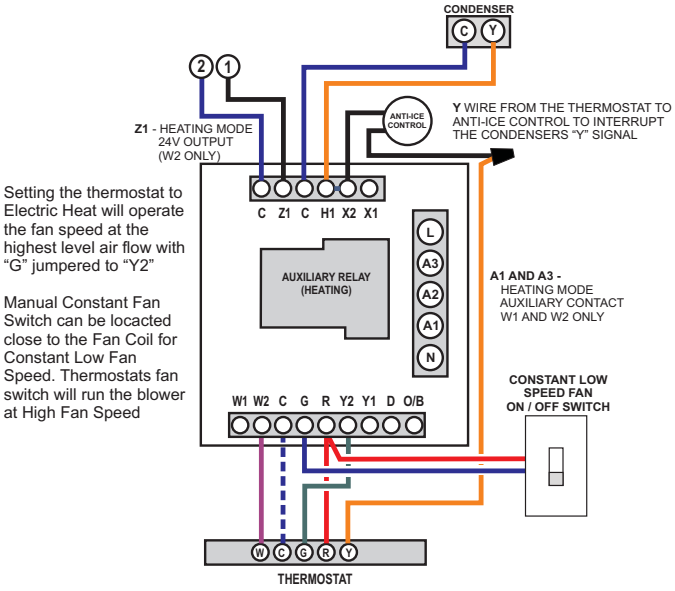


1 stage chilled water cooling c/w chilled water circulator and 24v zone valve output 2 stage heating c/w hot water circulator and 24v valve output



c/w High Fan Speed from Thermostat Fan Switch

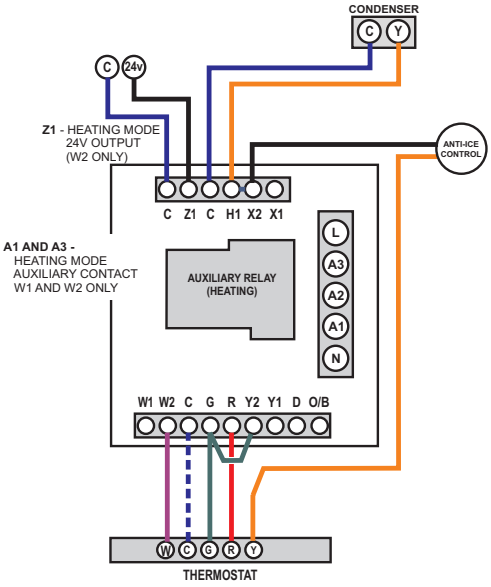
1 stage cooling
1 stage heating (electric) high fan speed
from thermostat fan switch



Setting the thermostat to Electric Heat will operate the fan speed at the highest level air flow with "G" jumpered to "Y2"

Manual Constant Fan Switch can be locacted close to the Fan Coil for Constant Low Fan Speed. Thermostats fan switch will run the blower at High Fan Speed

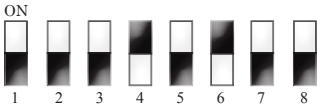
1 stage cooling
1 stage heating high fan speed
from thermostat fan switch

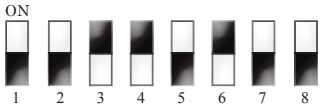


EPC Circuit Board Pin Settings and Air Flow Data (Standard)

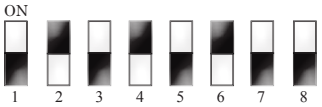
BLACK INDICATES DIP SWITCH POSITION. A heat loss/gain must be done prior to selecting a Hi-Velocity-HE unit. Once a heat loss/gain is known based upon tonnage and vents required, select the appropriate HE unit and the correct pin settings. If further adjustments are required for the CFM please refer to the extended Pin Setting section.

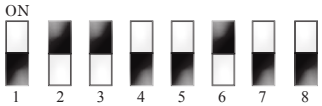
Model: HE-50

Model: HE-50	# Outlets	12	16	20	24
Cooling: 1.5 Ton	Mode	Airflow in CFM			
Heating: 32 MBH	Hi Cooling (Y2)	375	410	415	420
ESH: 5-10 kW	Lo Cooling (Y1)	225	245	250	255
	Dehumid (D)	300	300	260	280
	Hi Heating (W2)	340	355	340	360
Pin Setting 0001-0100	Lo Heating (W1)	275	280	260	270
	Constant (G)	185	215	250	265

Model: HE-50	# Outlets	16	20	24
Cooling: 2.0 Ton	Mode	Airflow in CFM		
Heating: 40 MBH	Hi Cooling (Y2)	490	505	520
ESH: 5-15 kW	Lo Cooling (Y1)	295	305	315
	Dehumid (D)	410	415	420
	Hi Heating (W2)	460	470	480
Pin Setting 0011-0100	Lo Heating (W1)	355	340	300
	Constant (G)	260	255	295

Model: HE-70

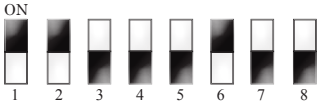
Model: HE-70	# Outlets	20	24	28	32
Cooling: 2.5 Ton	Mode	Airflow in CFM			
Heating: 51 MBH	Hi Cooling (Y2)	620	650	660	670
ESH: 5-18 kW	Lo Cooling (Y1)	375	390	400	405
	Dehumid (D)	510	525	530	520
	Hi Heating (W2)	570	600	610	605
Pin Setting 0101-0100	Lo Heating (W1)	445	460	460	440
	Constant (G)	310	350	370	370

Model: HE-70	# Outlets	24	28	32
Cooling: 3.0 Ton	Mode	Airflow in CFM		
Heating: 58 MBH	Hi Cooling (Y2)	755	770	770
ESH: 5-18 kW	Lo Cooling (Y1)	455	465	465
	Dehumid (D)	600	610	605
	Hi Heating (W2)	680	695	690
Pin Setting 0110-0100	Lo Heating (W1)	540	545	540
	Constant (G)	370	385	380

Model: HE-100

Model: HE-100	# Outlets	28	32	36
Cooling: 3.5 Ton	Mode	Airflow in CFM		
Heating: 72 MBH	Hi Cooling (Y2)	885	895	920
ESH: 5-18 kW	Lo Cooling (Y1)	535	540	555
	Dehumid (D)	700	700	710
	Hi Heating (W2)	795	815	830
Pin Setting 1000-0100	Lo Heating (W1)	625	625	625
	Constant (G)	520	440	465

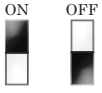
Model: HE-100	# Outlets	32	36	40
Cooling: 4 Ton	Mode	Airflow in CFM		
Heating: 80 MBH	Hi Cooling (Y2)	1000	1030	1030
ESH: 5-20 kW	Lo Cooling (Y1)	600	620	620
	Dehumid (D)	800	820	800
	Hi Heating (W2)	905	930	915
Pin Setting 1010-0100	Lo Heating (W1)	720	735	710
	Constant (G)	495	505	490

Model: HE-100	# Outlets	36	40	44	48
Cooling: 5.0 Ton	Mode	Airflow in CFM			
Heating: 94 MBH	Hi Cooling (Y2)	1255	1250	1260	1260
ESH: 5-23 kW	Lo Cooling (Y1)	755	750	760	760
	Dehumid (D)	1010	1005	1005	1000
	Hi Heating (W2)	1120	1120	1120	1115
Pin Setting 1100-0100	Lo Heating (W1)	920	900	900	890
	Constant (G)	670	635	635	625

Minimum of **eight** 2" (51mm) outlets per ton of cooling (HE Duct = Minimum **four** outlets per ton)

ESH = Electrical Strip Heaters, minimum of 7 outlets per 5kW is required

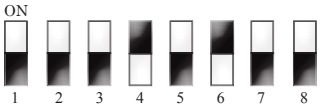
Black indicates dip switch position:

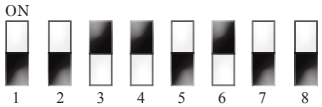


EPC Circuit Board Pin Settings and Air Flow Data (Metric)

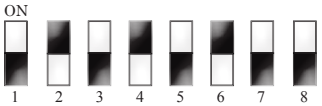
BLACK INDICATES DIP SWITCH POSITION. A heat loss/gain must be done prior to selecting a Hi-Velocity-HE unit. Once a heat loss/gain is known based upon tonnage and vents required, select the appropriate HE unit and the correct pin settings. If further adjustments are required for the L/s please refer to the extended Pin Setting section.

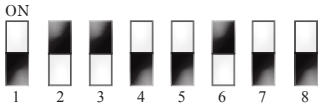
Model: HE-50

Model: HE-50	# Outlets	12	16	20	24
Cooling: 5.3 kW	Mode	Airflow in L/s			
Heating: 9.4 kW	Hi Cooling (Y2)	177	193	196	198
ESH: 5-10 kW	Lo Cooling (Y1)	106	116	118	120
	Dehumid (D)	142	142	123	132
	Hi Heating (W2)	160	168	160	170
Pin Setting 0001-0100	Lo Heating (W1)	130	132	123	127
	Constant (G)	87	101	118	125

Model: HE-50	# Outlets	16	20	24
Cooling: 7.0 kW	Mode	Airflow in L/s		
Heating: 11.7 kW	Hi Cooling (Y2)	231	238	245
ESH: 5-15 kW	Lo Cooling (Y1)	139	144	149
	Dehumid (D)	193	196	198
	Hi Heating (W2)	217	222	227
Pin Setting 0011-0100	Lo Heating (W1)	168	160	142
	Constant (G)	123	120	139

Model: HE-70

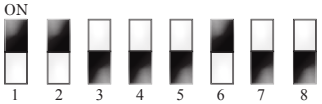
Model: HE-70	# Outlets	20	24	28	32
Cooling: 8.8 kW	Mode	Airflow in L/s			
Heating: 15 kW	Hi Cooling (Y2)	293	307	311	316
ESH: 5-18 kW	Lo Cooling (Y1)	177	184	189	191
	Dehumid (D)	241	248	250	245
	Hi Heating (W2)	269	283	288	286
Pin Setting 0101-0100	Lo Heating (W1)	210	217	217	208
	Constant (G)	146	165	175	175

Model: HE-70	# Outlets	24	28	32
Cooling: 10.6 kW	Mode	Airflow in L/s		
Heating: 17 kW	Hi Cooling (Y2)	356	363	363
ESH: 5-18 kW	Lo Cooling (Y1)	215	219	219
	Dehumid (D)	283	288	286
	Hi Heating (W2)	321	328	326
Pin Setting 0110-0100	Lo Heating (W1)	255	257	255
	Constant (G)	175	182	179

Model: HE-100

Model: HE-100	# Outlets	28	32	36
Cooling: 12.3 kW	Mode	Airflow in L/s		
Heating: 21.1 kW	Hi Cooling (Y2)	418	422	434
ESH: 5-18 kW	Lo Cooling (Y1)	252	255	262
	Dehumid (D)	330	330	335
	Hi Heating (W2)	375	385	392
Pin Setting 1000-0100	Lo Heating (W1)	295	295	295
	Constant (G)	245	208	219

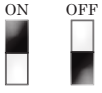
Model: HE-100	# Outlets	32	36	40
Cooling: 14.1 kW	Mode	Airflow in L/s		
Heating: 23.5 kW	Hi Cooling (Y2)	472	486	486
ESH: 5-20 kW	Lo Cooling (Y1)	283	293	293
	Dehumid (D)	378	387	378
	Hi Heating (W2)	427	439	432
Pin Setting 1010-0100	Lo Heating (W1)	340	347	335
	Constant (G)	234	238	231

Model: HE-100	# Outlets	36	40	44	48
Cooling: 17.6 kW	Mode	Airflow in L/s			
Heating: 27.5 kW	Hi Cooling (Y2)	592	590	595	595
ESH: 5-23 kW	Lo Cooling (Y1)	356	354	359	359
	Dehumid (D)	477	474	474	472
	Hi Heating (W2)	529	529	529	526
Pin Setting 1100-0100	Lo Heating (W1)	434	425	425	420
	Constant (G)	316	300	300	295

Minimum of **eight** 2" (51mm) outlets per ton of cooling (HE Duct = Minimum **four** outlets per ton)

ESH = Electrical Strip Heaters, minimum of 7 outlets per 5kW is required

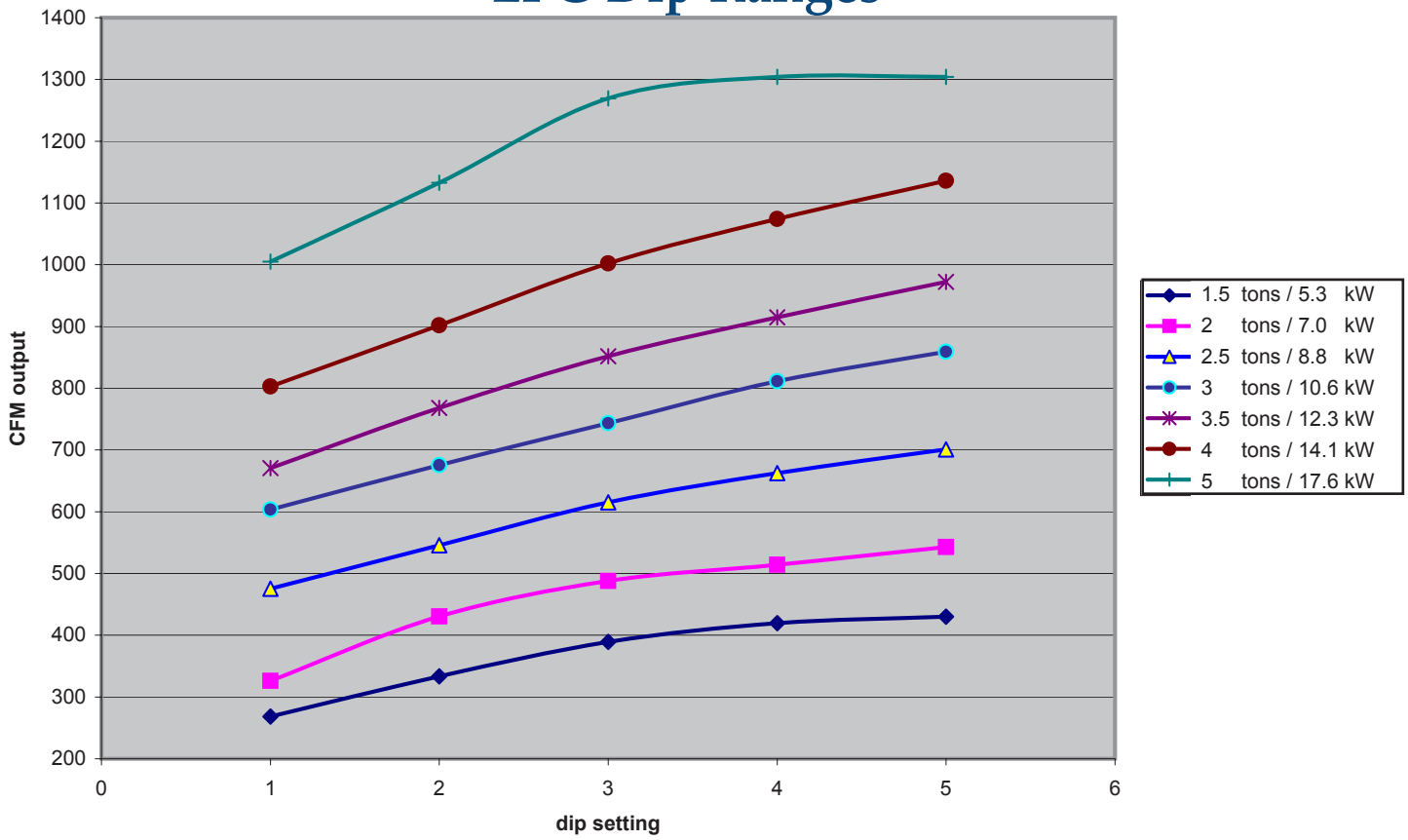
Black indicates dip switch position:



EPC Dip Ranges & Extended Air Flow Adjustments

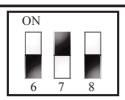
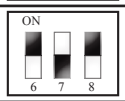
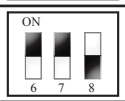
The extended pin settings show how to increase or decrease the required CFM on the Hi-Velocity-HE fan coil for fine tuning. The chart illustrates the CFM difference achieved changing pins 6, 7, and 8. Only these three pins are modified to increase or decrease the CFM based upon the selected tonnage of pins 1 through 4.

EPC Dip Ranges



Extended Air Flow Adjustments

The extended pin setting applies to all HE fancoils and can be used to lower or raise CFM output. Only PIN's 6,7,8 are changed in order to modify the CFM output

Pin Setting		Result
1.		Decrease 
2.		
3.		Ideal (default)
4.		 Increase
5.		

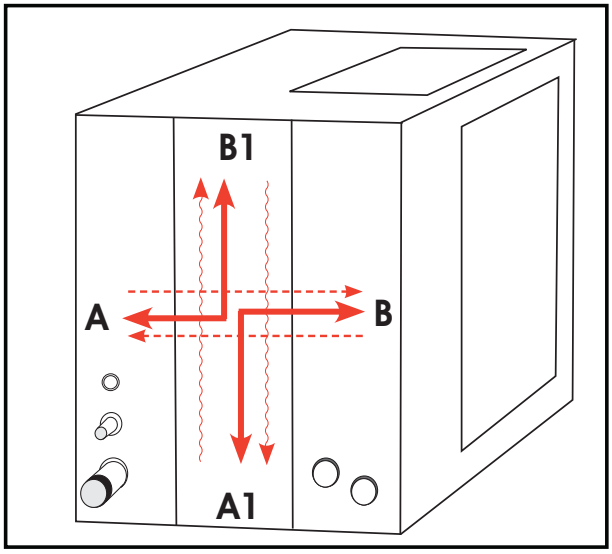
Black indicates DIP switch position

Refrigerant Modules (RPM-E)

The RPM-E series cooling module can be used with the Hi-Velocity Fancoil, installed in many different positions. It is pre-piped with an adjustable, heat pump ready, thermal expansion valve and comes with a bleed port, sight glass, suction and liquid line access ports, freeze-stat, and two L brackets for mounting.

The RPM-E comes as a complete module and must be installed in the vertical position on the return air side of the fancoil; the unit cannot be turned on its side and is a draw through unit only. The module offers multi-position airflow configurations for horizontal, highboy, or counter-flow configurations. ***(Fig. 01)***

Fig. 01 - RPM-E Cooling Module



The TXV (Thermal Expansion Valve), sight glass, access ports, and freeze-stat are already installed and are accessible through an easy to remove access hatch. The liquid and suction lines have male solder connections at a standard width making connections to the condenser lines quick and easy.

Configurations

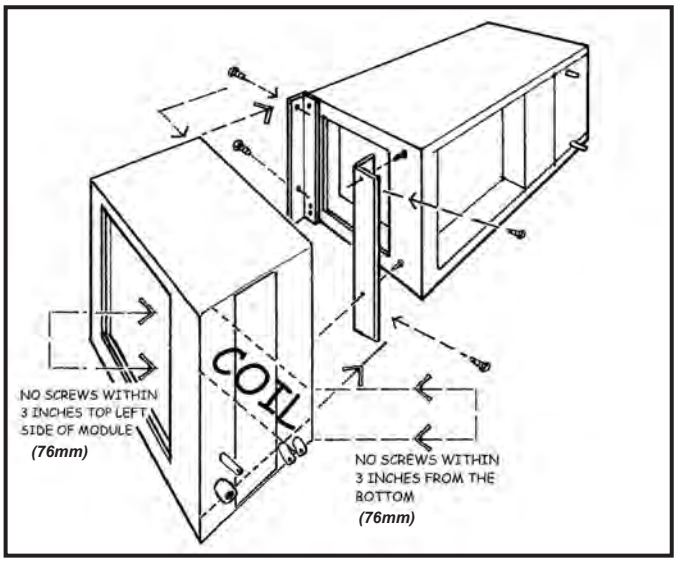
When installing, any combination of A to B or B to A can be used. For example, a horizontal application could use A to B while highboy applications could use A to B1. Do not use a combination of A to A1 or B to B1, as this would bypass the cooling coil completely. The knock-outs can be removed with a screw driver and hammer. Ensure caution is used when opening the knock-outs, as any extreme protrusion into the module may damage the coil surface.

Rough Opening Sizes	A or B	A1 or B1
RPM-E 50	11 3/4"L X 13 1/4"H (298mm X 337mm)	11 3/4"L X 9"W (298mm X 229mm)
RPM-E-70	16 3/4"L X 13 1/4"H (425mm X 337mm)	16 3/4"L X 9"W (425mm X 229mm)
RPM-E-100	22 3/4"L X 13 1/4"H (578mm X 337mm)	22 3/4"L X 9"W (578mm X 229mm)

Mounting the RPM-E

Two L mounting brackets are shipped loose for attaching the RPM-E to the fancoil, along with two sided foam tape for an air seal between the units. When mounting the cooling coil to the fancoil ***(Fig. 02)***, ensure that no screws puncture the drain pan or coil. It is advised that no screws be placed within 3 inches (76mm) from the bottom of the coil. This will prevent the drain pan from being accidentally pierced. It is also advised that care be taken when placing screws in the top left side of the cooling coil (when looking at the access hatch), as this is where the top most extent of the cooling coil is located. See Specification Pages for the dimensions of the fan coil units and cooling modules.

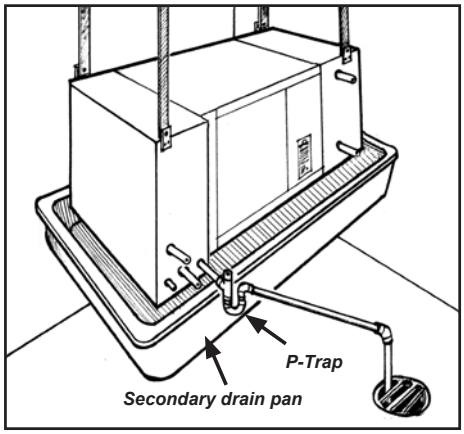
Fig. 02 - Mounting Brackets



Secondary Drain Pan

Some building codes call for the use of a secondary drain pan underneath the entire unit ***(Fig. 03)***. Any installation that has the potential of property damage due to condensate must have a secondary drain pan installed. If the unit is installed in a high heat and/or high humidity location, extra insulation around the unit casing may be required. This will prevent excessive condensate from forming on the outer surface of the casing.

Fig. 03 - Secondary drain pan



Drain Connections

All RPM-E modules come with a ¾" (19mm) primary and secondary outlet. The condensate drain must have a vented p-trap installed ***(Fig. 03)***, and run at a slope of ¼" (6.7mm) per foot in the direction of the drain. When installing the P-trap, one must be installed on both the primary and secondary outlets. The P-traps must have a minimum depth of two inches (51mm). Due to the high negative pressure of the blower system, the RPM-E will hold some amount of water during operation. Once this level has been achieved, condensate will flow from the coil regularly. When the unit shuts down, or lowers speed, the force is released, allowing the held condensate to empty from the drain pan. During this time, condensate may flow from both the primary AND secondary drains.

Outdoor Unit Installation

Locate the outdoor unit in a suitable location, as close as possible to the fan coil. Maintain the clearances recommended by the manufacturers of the outdoor unit, to ensure proper airflow. The outdoor unit must be installed level, in a properly supported location. A liquid line filter/drier is recommended to be installed.

Wiring - Outdoor Unit

Make all connections to the outdoor unit with rain tight conduit and fittings. Most building codes require a rain tight disconnect switch at the outdoor unit as well (always check local codes). Run the proper size copper wires to the unit, and connect as per the manufacturer's recommendations.

Ensure that the outdoor unit is setup for a TX system. If not, a hard start kit may be required.

Pipe Sizing

When sizing refrigerant piping, follow the outdoor unit manufacturer's recommendations.

Piping the RPM-E

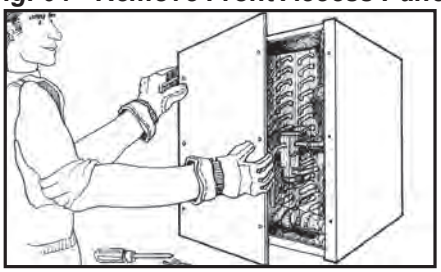
Only refrigerant grade pipe and fittings are to be used with Hi-Velocity Systems. Plumbing fittings may contain wax or other contaminants which are detrimental to the proper operation of the system. Insulate the suction line with 3/8" (9.53mm) insulation such as Armaflex. In high heat areas, 1/2" (12.7mm) insulation may be needed. If the lines are run in an area where temperatures could exceed 120°F (49°C) or runs longer than 50' (15.24m), then the liquid line may need to be insulated as well. Support the pipe every 5 feet (1.52m), or whatever local code states.

Run the pipes in the most direct route possible, taking into account structural integrity and building details. If the evaporator is located above the condenser, slope any horizontal runs toward the condenser. If the condenser is located above the evaporator, a P-trap must be installed at the bottom of the vertical riser. For long vertical risers, additional P-traps must be installed for every twenty feet (6m). For lines running over 50' (15m), a suction line accumulator must be installed. Lines running over 100' (30m) are not recommended. All lines should be piped so as not to restrict access to the front panels, filter section, or electrical enclosure.

Brazing & Pressure Testing

The RPM-E comes pre-piped with the coil assembly. With the RPM-E, the Liquid and Suction lines are the only brazing that need to be done at the fan coil. For charging and brazing, remove the front access panel of the RPM-E (***Fig. 04***). With the access panel removed, the coil assembly will be accessible. Wet rag the liquid and suction line (or use a heat dissipating paste) to ensure no overheating occurs to the pre-piped coil assembly. Excess heat may damage the RPM-E components.

Fig. 04 - Remove Front Access Panel



Once the system has been brazed it must been pressure tested. Pressure testing must be done with nitrogen and not refrigerant. Typically, pressures are tested to the maximum operating pressure that the system will see. Allow the system to hold the nitrogen charge for at least 15 minutes to ensure there are no leaks. Check with local codes for proper testing procedures.

Evacuating

After the piping is installed and all components have been brazed together, a vacuum pump must be used to evacuate the system from both the low and high side to 1500 microns (200 pa). Add pressure to the system to bring the pressure above zero psig. After allowing the refrigerant to absorb moisture, repeat the above procedure. Evacuate the system to 500 microns (67 pa) on the second evacuation, and ensure that the system holds at the vacuum pressure. If not, check for leaks and evacuate again. At this point open service valves on pre-charged condensing units, and add refrigerant to the system if necessary.

The use of an electronic leak detector is recommended, as it is more sensitive to small leaks under the low pressures.

Charging

Once the system has been determined clean and ready for charging, refrigerant can be added. The access ports on the condenser must be open at this point. Never leave the system unattended when charging. With the system running, slowly add refrigerant. The typical operating point of an RPM-E coil is that of a saturated suction temperature of 38-40°F (3-4°C) and a suction line temperature of 42-44°F (6-7°C). In order to prevent overcharging during this stage, refrigerant should be added in steps. This will allow time for the system to settle and prevent 'overshooting' the ideal charge. Condenser pressures and temperatures remain similar to those in a conventional forced air system. It is recommended that the coil be charged on a high load day at the compressor's highest speed.

Most system start ups require only an adjustment to the refrigerant level of the system. Should further refinement be required, the TXV may be adjusted. A clockwise turn of the superheat valve (the direction in which the cap is screwed on) will result in a closing of the valve while a counterclockwise turn (the direction in which the cap was unscrewed) will result in opening of the valve. Always note system conditions before adjusting the valve and allow 5 minutes for the system to settle before making any further adjustments. Never adjust the TXV more than one quarter turn at a time.

The RPM-E coil can operate at a level that is different from most other conventional system coils. Typically, superheat level are low, two to four degrees of superheat. Adjustment of the valve also differs somewhat. Rather than having a large effect on the range of superheat, adjustment of the valve has a larger effect on the system pressures; superheat maintaining a fairly constant point. Opening the valve will increase suction pressures and decrease liquid pressures, while closing the valve will decrease suction pressures and raise liquid pressures.

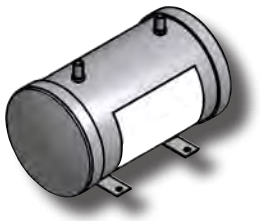
Heat Pumps

Traditionally, SDHV systems have been charged to special guidelines when used in conjunction with heat pumps. This charging procedure involved charging the units to normal cooling capacities and reviewing the operation in heating mode. If head pressures were found to be impinging on the high head pressure limits, a small amount of refrigerant was removed to prevent the unit from shutting down. The cause of high head pressures in heating mode is due to the disparity in sizes of the indoor and outdoor coils, along with the lower airflow rates of SDHV systems.

With the introduction of newer, larger heat pumps, this issue is more likely to be experienced. While some heat pump units may still be charged in the traditional method, the amount of refrigerant that is required to be removed for heating mode may leave the system drastically undercharged for cooling mode. For this reason it is highly recommended that a Bi-Flow Receiver be used with heat pump applications.

Bi-Flow Receiver

The Bi-Flow Receiver is designed for use with heat pump systems, up to 5 tons, and with any typical refrigerants. The receiver allows refrigerant a location to migrate to during the heating cycle, minimizing head pressures. During cooling mode, the receiver is empty, allowing the full refrigerant charge to be utilized for cooling.



The receiver is a horizontal tank with a pair of dip tubes extending to the bottom of the tank. These two tubes allow for liquid refrigerant to be drawn from the tank regardless of the direction of flow. For this reason, the receiver must be mounted so that the inlet/outlets of the tank come out of the top of the unit. Mounting brackets are located at the base of the unit for secure mounting. The receiver is to be located on the liquid line of the system, anywhere between the indoor and outdoor coils. As the unit is of a bi-flow design, it does not matter which end faces towards the indoor coil.

The inlet/outlet ports are constructed of steel and require the use of a 35-45% Silver Solder and Flux for brazing. The use of standard copper to copper solders may result in difficulty brazing and the potential for a failure at the weld. Ensure that the tank is protected from overheating while brazing and that any remaining flux is cleaned from the unit. If installing outdoors, ensure that the receiver is insulated and protected from the elements.

Freeze Stat

The RPM-E series cooling coil comes equipped with an anti-freeze control mounted on the suction line. This freeze control serves the purpose of preventing severe icing of the coil in the event of an undercharge or low load on the coil. This piece of equipment must be used at all times. Lack of use of the freeze-stat will result in RPM-E related warranty issues being voided. During start-up, it is acceptable to jumper across the Freeze-Stat. This will prevent the freeze-stat from shutting the system off while charging a new system that may be low on refrigerant. Once charged and running, this jumper must be removed and the Freeze-Stat connected to the X1 and X2 terminals on the Printed Circuit Board. Should wiring needs arise in which the outdoor unit is controlled through another means of wiring, the Freeze-Stat should be connected in series on the supply side of the control wiring.

Troubleshooting the TXV

When issues arise that bring the function of the TXV into question, factors must be looked into before replacement. Inspect the TXV for signs of damage. This may be from a pinched equalizer line to a burnt valve. These issues will have an adverse affect on the operation of the valve. Should the equalizer line be pinched, the valve will no longer be able to supply the proper amount of refrigerant to the coil. A burnt valve may have an effect on the refrigerant charge of the TXV bulb or the seal of the valve. This may again cause an improper amount of refrigerant to be metered by the valve or cause the valve head to become seized.

The TXV bulb location and mounting should also be inspected. The bulb should be securely mounted on the top half of the suction line. If the bulb is loose or on the lower half of the line, the bulb will not properly sense the refrigerant temperature and will not meter the proper amount of refrigerant. Ensure that the bulb is also properly insulated, as a lack of insulation will expose the bulb to conditions well outside those of the coil. This will cause an overfeed of refrigerant to the system.

Should the installation of the valve be proper, and no damage is evident, inspect the operation of the valve. If the TXV bulb is removed and held in ones hand, the valve should react accordingly. This sudden increase in heat will open the valve. This will cause a rise in suction pressure and a drop in liquid pressure. Should nothing happen, the valve is likely seized and will need to be replaced.

Short Cycling

Short cycling is the unnecessary running of the indoor and outdoor unit, on and off. This often takes the form of very short and frequent on cycles. There are many factors that may contribute to short cycling of the refrigerant system. These issues can generally be broken down between airflow related issues, refrigerant issues, and installation issues.

Low airflow rates are one of the most common causes of short cycling. As the airflow rate is lowered across the cooling coil, the coil pressure drops along with it. This lowers the temperature of the coil and may cause the freeze-stat to trip. As the system settles, the freeze-stat closes and the cycle begins again, as the unit does not run long enough for the space to become adequately conditioned. Ensure that the proper amount of airflow is provided to the coil. Check for proper dip-settings and return air practices.

Improperly charged systems run the risk of short cycling as well. An undercharged system will react much the same as a system with low airflow. If the charge is low enough, it may trip out on low pressure. If a system is overcharged, it may trip out on high head pressure. Ensure that the system charge is within the bounds described above.

System set-up and installation should be checked as well. Piping practices should be within the bounds described above and within the realms of the outdoor unit manufacturer. Extreme and often unnecessary adjustment of the TXV can create conditions similar to an undercharged coil. A poorly placed T-stat, such as underneath a vent, can cause short cycling. This happens due to the T-stat being satisfied very shortly after the unit has begun to operate.

Specifications

Specifications		RPM-E-50	RPM-E-70	RPM-E-100
Matching Fan Coil		HE - 50 / 51 / 52	HE - 70 / 71	HE - 100 / 101
Part Number		20090200050	20090200070	20090200100
Refrigerant Type		R-410A	R-410A	R-410A
TX Cooling MBH[1]		18-24 (5.3-7.0 kW)	30-36 (8.8-10.6 kW)	42-60 (12.3-17.6 kW)
Latent Cooling MBH		6.8-8.9 (2.0-2.6 kW)	11.7-13.7 (3.4-4.0 kW)	16.0-22.2 (4.7-6.5 kW)
Fin Material		Aluminum	Aluminum	Aluminum
Tubing Material		Copper	Copper	Copper
Type of Fins		.006 Al	.006 Al	.006 Al
Connection Sizes	Liquid Line (Lq)	3/8" (9.5mm)	3/8" (9.5mm)	3/8" (9.5mm)
	Suction Line (S)	7/8" (22.3mm)	7/8" (22.3mm)	7/8" (22.3mm)
	Drain Connection	3/4" (19mm)	3/4" (19mm)	3/4" (19mm)
TXV with Built in Check Valve & Bypass		Yes	Yes	Yes
Site Glass		Yes	Yes	Yes
Access Ports		Yes	Yes	Yes
Freeze Stat		Yes	Yes	Yes
Shipping Weight (lbs)		48 (22kg)	59 (27kg)	74 (34kg)
Module Size (L x W x H)		19 1/4" x 14 5/8" x 18 1/2" (489mm x 371mm x 470mm)	24 1/4" x 14 5/8" x 18 1/2" (616mm x 371mm x 470mm)	32" x 14 5/8" x 18 1/2" (813mm x 371mm x 470mm)
Tons[2]		1.5 - 2.0 (5.3 - 7.0 Kw)	2.5 - 3.0 (8.8 - 10.6 Kw)	3.5 - 5.0 (12.3 - 17.6 Kw)

MBH = Thousand British Thermal Units per Hour TX = Thermal Expansion TXV = Thermal Expansion Valve

1) Smaller condensers may be matched to the fan coil when needed (match TXV to condenser size)

2) Minimum of 8 full 2" (51mm) outlets per ton of cooling needed (4 outlets for HE)

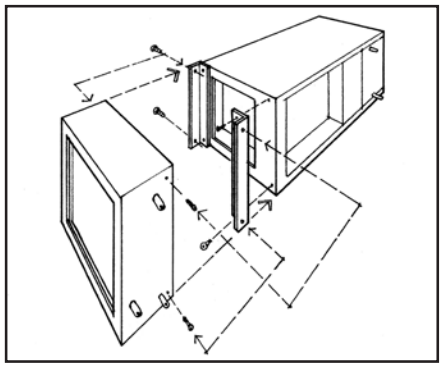
Chilled Water Coil (WCM/WM)

The WCM/WM coil is a High Capacity Hydronic Water Coil available as an add-on module to the Hi-Velocity System. Mainly used in the chilled water applications for cooling, this coil can also be used for heating with water temperatures up to 130°F (54°C).

Installation

The coil comes as a module and must be installed in the vertical position on the return air side of the fan coil. The WCM/WM come supplied with two L mounting brackets for connection to the fan coil ***(Fig. 01)***. When mounting the cooling coil, ensure that no screws puncture the drain pan or coil.

Fig. 01 - Mounting the WCM/WM



Piping the WCM/WM

The WCM comes complete with 2 built-in 3/4" (19mm) drain lines, primary and secondary. Ensure the primary drain line is vented and P-trapped.

The use of a mixture of gylcol will reduce capacities; refer to gylcol manufacture reduction charts.

When the potential for gravity flow of the hot water exists, check valves may be needed on both the supply and return lines. All lines should be piped so as not to restrict access to the front panels, filter section, or electrical enclosure. Size your supply and return lines according to ***Table 01***.

Table 1 - WCM/WM pipe sizing

Zone BTUH	Pipe Size up to 40 feet	Pipe Size 40 – 100 feet
0 - 35,000 (0 - 10.3 kW)	3/4" (19mm)	3/4" (19mm)
35,001 - 70,000 (10.4 - 20.5 kW)	3/4" (19mm)	1" (25mm)
70,001 - 140,000 (20.6 - 41 kW)	1" (25mm)	1 1/4" (32mm)

Specifications

		WCM - 50	WCM - 70/1050	WM - 100/1050	WM - 1750
Matching Fan Coil		**HE/HV-50/51/52 LV-50**	**HE/HV-70/71 LV-70 LV-E-1050**	**HE/HV-100/101 LV-120/140 LV-E-1050**	**LV-E-1750**
Part Number		10010201050	10010201070	10010201100	20090101750
Fin Material		Aluminum	Aluminum	Aluminum	Aluminum
Tubing Material		Copper	Copper	Copper	Copper
Type of Fins		.006 Al (0.1524mm)	.006 Al (0.1524mm)	.006 Al (0.1524mm)	.006 Al (0.1524mm)
Flow Rate (GPM)		5 (0.32 L/s)	7 (0.44 L/s)	10 (0.63 L/s)	10 (0.63 L/s)
Hydronic Connection Sizes	Supply Line	3/4" (19mm)	3/4" (19mm)	3/4" (19mm)	1 1/8" (29mm)
	Return Line	3/4" (19mm)	3/4" (19mm)	3/4" (19mm)	1 1/8" (29mm)
	Drain Connection	3/4" (19mm)	3/4" (19mm)	3/4" (19mm)	3/4" (19mm)
Pressure Drop FT. H_2O		3 (9.0 kPa)	6.5 (19.4 kPa)	6.8 (20.3 kPa)	4.9 (14.65 kPa)
Shipping Weight		30 lbs (14 kg)	35 lbs (16 kg)	40 lbs (18 kg)	45 lbs (20 kg)
Module Size (L x W x H)		14 3/8" x 10 1/8" x 18 1/2" (365mm x 257mm x 470mm)	19 3/8" x 10 1/8" x 18 1/8" (492mm x 257mm x 460mm)	25 3/8" x 7" x 18 3/8" (645mm x 178mm x 467mm)	26 1/4" x 8" x 22 5/8" (656mm x 203mm x 575mm)
BTUH	80°/67° @ 42°F E.W.T. (27°/19 @ 5.5°C E.W.T.)	18,000-24,000 (5.3-7.0 kW)	30,000-36,000 (8.8-10.6 kW)	42,000-60,000 (12.3-17.6 kW)	42,000-70,000 (12.3-20.5 kW)

Hot Water Coil Add-On

Installation

Designed for the Hi-Velocity System, the HWC is a High Capacity Hydronic Heating water coil that comes installed in the "H" Series fan coils and can be field installed in the "BU" Series fan coils. To install, simply remove the front blower panels, and slide the coil into place on the supply air side of the blower. ***(Fig. 01)***

The water coil is designed with ¾" copper connections with 6 internal rows of 3/8" copper tubing, for high heat transfer ratings even when using low water temperature sources. The coil is factory tested at 500 psi for leaks, and is designed to have a low water pressure drop through the coil reducing pump head loss.

Fig. 01 - Hot Water Coil easily slides into the fan coil

The Fan Coil can be installed in upflow, counterflow or horizontal positions, using the lowest water connection into the coil as the supply line and the highest water connection as the return line, to reduce possible air trapping within the coil. Typical hot water heating sources used are dual purpose hot water tanks (natural gas or oil), boilers (gas, oil, electric or wood fired), and even solar heating systems. Geo-thermal systems, water-to-water heat pumps or reverse cycle chillers would use the WM or WCM coils, as they have a drain pan incorporated within the coil casing, for condensate water formed from the cooling cycle.

When used with dual purpose hot water tanks, be sure to size the tank for both the domestic hot water usage as well as the heating requirements.

Table 01 – WCM/WM pipe sizing

Zone BTUH Heat loss	Pipe Size up to 40 feet	Pipe Size 40 – 100 feet
0 - 35,000 (0 - 10.3 kW)	5/8" (16mm)	3/4" (19mm)
35,001 - 70,000 (10.4 - 20.5 kW)	3/4" (19mm)	1" (25mm)
70,001 - 140,000 (20.6 - 41.0 kW)	1" (25mm)	1 1/4" (32mm)

Piping The Hot Water Coil

Size your supply and return lines according to ***Table 01***. ***Figs. 02 and 03*** illustrated typical pipe runs from a dual purpose hot water tank to a fan coil. These drawings are only for reference as all piping has to be run according to local codes.

Fig. 02 - Hot water tank: With side take-offs

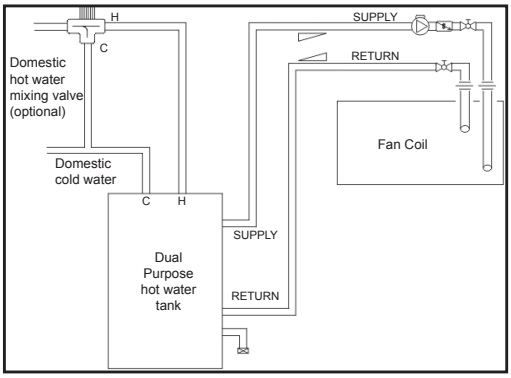
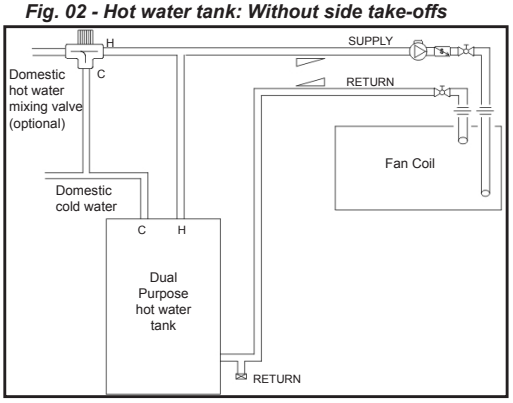


Fig. 02 - Hot water tank: Without side take-offs



Incorporated within the circuit board there is a timer that when turned on will duty cycle the circulation pump for 5 minutes every 24 hours to ensure there is no stagnate water within the water coil. Spring check valves are required to be installed on the supply and return to prevent gravity flow from the hot water source on a call for cooling or constant fan.

Specifications

Specifications		HWC-50 Coil	HWC-70 Coil	HWC-100 Coil	HWC-1750 Coil
Matching Fan Coil		**HE/HV-50/51 LV-50**	**HE/HV-70/71 LV-70 LV-E-1050**	**HE/HV-100/101 LV-120/140**	**LV-E-1750**
Coil Type		6 Row/10 FPI	6 Row/10 FPI	6 Row/10 FPI	6 Row/12 FPI
Part Number		20100100050	20100100070	20100100100	20090101750
Fin Material		Aluminum	Aluminum	Aluminum	Aluminum
Tubing Material		Copper	Copper	Copper	Copper
Type of Fins		.006 Al (0.1524mm)	.006 Al (0.1524mm)	.006 Al (0.1524mm)	.006 Al (0.1524mm)
Hydronic Connection Sizes	Supply	3/4" (19mm)	3/4" (19mm)	3/4" (19mm)	1 1/8" (29mm)
	Return	3/4" (19mm)	3/4" (19mm)	3/4" (19mm)	1 1/8" (29mm)
Flow Rate (GPM)		5 (0.32 L/s)	7 (0.44 L/s)	10 (0.63 L/s)	10 (0.63 L/s)
Pressure Drop FT. H_2O		3 (9.0 kPa)	6.5 (19.4 kPa)	6.8 (20.3 kPa)	4.9 (14.65 kPa)
Coil Dimensions		13 1/2" x 5 1/2" x 16" (343mm x 140mm x 406mm)	19" x 5 1/2" x 16" (483mm x 140mm x 406mm)	25" x 5 1/2" x 16" (635mm x 140mm x 406mm)	26 1/4" x 8" x 22 5/8" (667mm x 200mm x 575mm)
Shipping Weight		17 lbs (8kg)	21 lbs (10kg)	28 lbs (13kg)	45 lbs (13kg)
Max. BTUH 180°F E.W.T. (kW @ 82°C)		54,500 (16.0 kW)	81,800 (24.0 kW)	122,900 (36.0 kW)	137,000 (40.0 kW)

Electrical Strip Heater

The Electrical Strip Heater (ESH) is an electric resistance heater that slides into the fan coil on the leaving air side (supply side) of the blower. This heater can be used for primary heating or supplemental heat (auxiliary heating) for heat pumps. The ESH has “0” clearance to combustibles, and requires minimum clearances on the access side for maintenance and servicing (see Fan Coil Placement: Module FCP). Allow 18” minimum of straight plenum duct from the supply of the air handler before any branch outlets, tees or elbows.

There is a minimum air flow requirement for the electric strip heater:

The HE-50 and the HE-70 require a minimum of six 2”x10’ AFD outlets per 5 kW.

The HE-100 requires a minimum of seven 2”x10’ AFD outlets per 5 kW.

*One HE x 10’ AFD is equivalent to two - 2” x 10’ AFDs

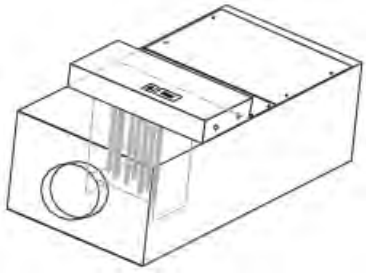
Installation

Remove the shipping covers and inspect the heater carefully. Check the ESH for any shipping damage, check the heating elements for any loose connections and check all porcelain insulators for any breaks. Report any damage to the manufacturer. DO NOT INSTALL DAMAGED HEATER.

The ESH is labeled with a directional airflow sticker; when placing the ESH, the sticker shall be in the direction of the air flow.

Install the ESH in the supply air side of the fan coil. Remove the coil access door and simply slide the coil into place. The heating elements ***(Fig. 01)*** must always be installed horizontally. Seal the void between the fan coil and the ESH with the foam tape supplied with the unit or with a suitable sealant. Mount the ESH onto the fan coil cabinet with 4 self tapping screws from inside the ESH wiring access door. Seal any additional openings with a suitable sealing compound.

Fig. 01 - Do not install elements Vertically



Elements are to be installed Horizontally, not Vertically

Wiring the Electrical Strip Heater

The air handler and the ESH must have independent power supplies. **Disconnect all power sources before opening the control box and working within.** Wires shall be sized according to local electrical codes and ordinances. All wires must be brought in through knock-outs. See Table 01 for feeder quantity of feeder ampacity.

Table 01

Kw	Volts/ Phase	# of feeders	Circuit Breakers
5	240/1	1 X 20.8	1 X 30A
10	240/1	1 X 41.6	1 X 60A’
15	240/1	1 X 20.8 1 X 41.6	1 X 30A 1 X 60A
18	240/1	1 X 31.2 1 X 41.6	1 X 40A 1 X 60A
20	240/1	2 X 41.6	2 X 60A
23	240/1	2 X 47.0	2 X 60A

PLEASE NOTE: THE ESH MUST BE WIRED TO A DEDICATED BREAKER, SEPARATE FROM THE FAN COIL.

The ESH elements are rated for 240V 60 Hz. Higher voltages are not recommended. When lower voltages are supplied, de-rate the capacity of the ESH accordingly. 230V = 92%, 220V= 84%, 208V = 75%. Use only wires suitable for 167° F (75°C).

The ESH 5 and 10 kW units have one single 240V breaker; the 15 kW to 23 kW units come complete with two supply circuit breakers. These two circuits can be joined together using a Jumper Bar (Square D® – QOU14100JBAF, not supplied) designed to use one pair of larger gauge wire instead of two smaller gauge wires. Install as per manufacturers guide lines, and according to code. A disconnect switch close to the heater will be required.

Control circuit wiring between the heater terminals #1 and #2 on the ESH use Class 2 - 18 gauge wire to the zone valve terminals in the fan control box.

Operation

The low voltage signals that energize the ESH come from the air handler's zone valve terminals (Z1 and C). These are to be connected to #1 and #2 of the ESH. Note: This connection is polarity sensitive. The Z1 is energized with 24v with a call for heat from a W2 call on the air handler's terminal board. W2 will also energize the heating fan speed on the air handler. For air handler to ESH low voltage wiring, see page __ of this manual. High voltage wiring of the ESH can be viewed on the inside of the ESH front panel.

On a demand for heat the TH-24 electronic sequencer will energize the heating elements in sequence. When the thermostat is satisfied, all the elements and blower will be de-energized.

Within the ESH, there are automatic reset thermal cut-out disc type safety devices at a fixed temperature that open the control circuit when a set point is reached. When the overheating conditions have disappeared, it automatically resets and returns the heater to normal operating conditions.

Zoning

The standard off the shelf ESH has a minimum of outlets per kW that is required to be running for air flow. Energy Saving Products Ltd. also offers a special electric strip module for zoning capabilities. Please contact the factory for additional information.

Maintenance

ESH heaters have been designed to operate long term without issue. Those responsible for equipment and maintenance should be aware of the following suggestions:

Periodic visual inspection: This precautionary step will help to keep your unit operating properly. Inspect the unit periodically and be on the lookout for any first signs of problems: Accumulation of dust on the heating elements, signs of overheating on the heater frame, traces of water or rust on the control box.

Electrical inspection: Two weeks after start up, all electric connections to contactors should be re-checked and tightened. Before each heating season, the following steps are recommended:

- Check all fuses
- Check resistance to ground for each circuit
- Check resistance phase to phase for each circuit
- Check the tightness of connections at all contactors and heating elements
- Check all contactors
- Check electrical connections to heating elements, magnetic contactors, and main power plugs.

It is recommended that this inspection be performed monthly for the first four months of operation. Following that, two inspections per heating season is sufficient.

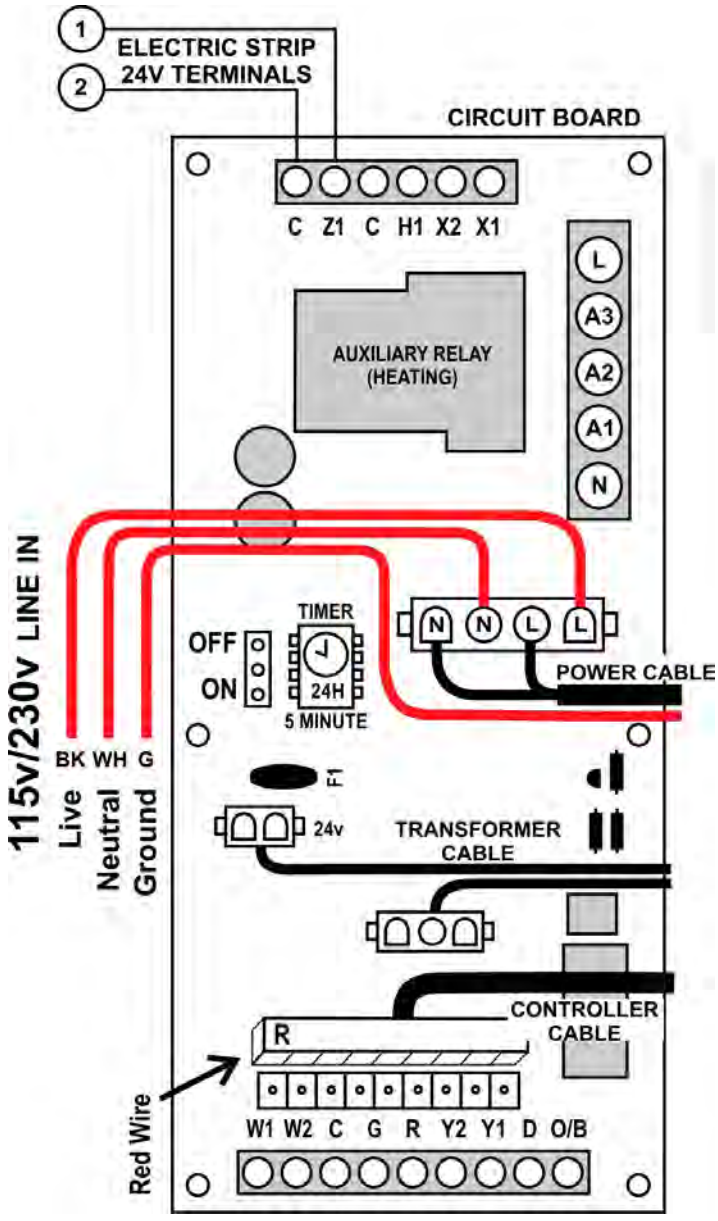
Off Season Maintenance

Should a heater be shut off for a long period, we recommend that you carefully check the resistance to ground for each circuit. It is important not to power a heater when too low a resistance to ground has been measured. It is also recommended to pay attention to any other heater operating in normal conditions. All control components should be maintained and checked according to respective manufacturer's instructions. Any defective components should be replaced only with identical origin parts.

Specifications

		ESH - 650	ESH - 750	ESH - 1100
Matching Fan Coil		HE - 50 / 51	HE - 70 / 71	HE - 100 / 101
Part Numbers		5kw - 10025650005	5kw - 10025750005	10kw - 10025110010
		10kw - 10025650010	10kw - 10025750010	15kw - 10025110015
		15kw - 10025650015	15kw - 10025750015	18kw - 10025110018
			18kw - 10025750018	20kw - 10025110020
				23kw - 10025110023
Volts		240	240	240
Phase		1	1	1
Shipping Weight		21 lbs (9.5kg)	27 lbs (12kg)	28 lbs (13kg)
Module Size	Length	20" (508mm)	24" (610mm)	31"(788mm)
	Width	13" (330mm)	13" (330mm)	13" (330mm)
	Height	18" (457mm)	18" (457mm)	18" (457mm)

Electrical Strip Heater (ESH) Wiring Diagram



N - NEUTRAL
L - LINE VOLTAGE
A1 - AUXILIARY NORMALLY OPEN
A2 - AUXILIARY NORMALLY CLOSED
A3 - AUXILIARY COMMON

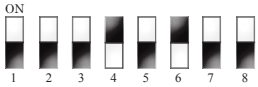
X1 - FREEZE STAT TERMINAL
X2 - FREEZE STAT TERMINAL
H1 - CONDENSING UNIT 24V OUTPUT
C - CONDENSING UNIT 24 VAC COMMON
Z1 - HEATING MODE 24V OUTPUT
C - HEATING MODE 24V VAC COMMON

CAUTION
DISCONNECT THE ELECTRIC POWER BEFORE SERVICING

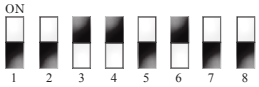
ATTENTION
DECCONNECTER DU CIRCUIT D'ALIMENTATION ELECTRIQUE AVANT L'ENTRE-TIEN

MINIMUM FACTORY DIP SETTINGS
BLACK IS DIP SWITCH SETTING

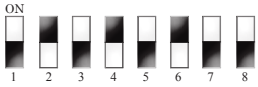
HE-50 5-10 kW
(1 1/2 Ton Dip Setting)



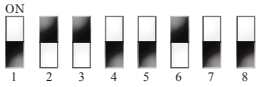
HE-50 5-15 kW
(2 Ton Dip Setting)



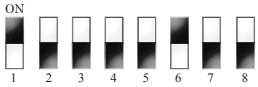
HE-70 5-15 kW
(2 1/2 Ton Dip Setting)



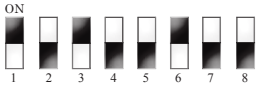
HE-70 5-18 kW
(3 Ton Dip Setting)



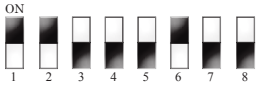
HE-100 10-18 kW
(3 1/2 Ton Dip Setting)



HE-100 10-20 kW
(4 Ton Dip Setting)



HE-100 10-23 kW
(5 Ton Dip Setting)



NOTES:

1) USE THERMOSTAT FAN SWITCH TO DISABLE/ENABLE CONTINUOUS FAN.

2) 'C' TERMINAL ON THERMOSTAT (COMMON) IS NOT NEEDED FOR SOME THERMOSTATS. CONSULT THERMOSTAT INSTRUCTIONS FOR DETAILS.

3) A3 (AUXILIARY RELAY COMMON) CAN BE USED WITH A1 AND/OR A2 AS DRY CONTACTS, ARMED 24v FROM THE 'R' TERMINAL, OR ARMED FROM THE 'L' TERMINAL.

4) AUXILIARY RELAY TIMER ACTIVATES CIRCUIT FOR 5 MINUTES EVERY 24 HOURS STARTING WHEN POWER IS APPLIED TO THE UNIT. RED LIGHT IS ON WHEN AUXILIARY RELAY IS ACTIVATED.

5) SEE INSTALLATION MANUAL FOR MORE DETAILED WIRING DIAGRAMS AND DIP SWITCH SETTINGS.

6) FAILURE TO READ AND FOLLOW ALL INSTRUCTIONS CAREFULLY BEFORE INSTALLATION COULD CAUSE PERSONAL INJURY AND/OR PROPERTY DAMAGE.

HEAT PUMP NOTES:
DEPENDING ON THE REVERSING VALVE, SOME HEAT PUMP UNITS REQUIRE 'B' INSTEAD OF 'O' CONNECTION ON BOTH THE THERMOSTAT AND THE OUTDOOR UNIT. CONSULT YOUR HEAT PUMP MANUAL TO SEE IF THIS IS REQUIRED.

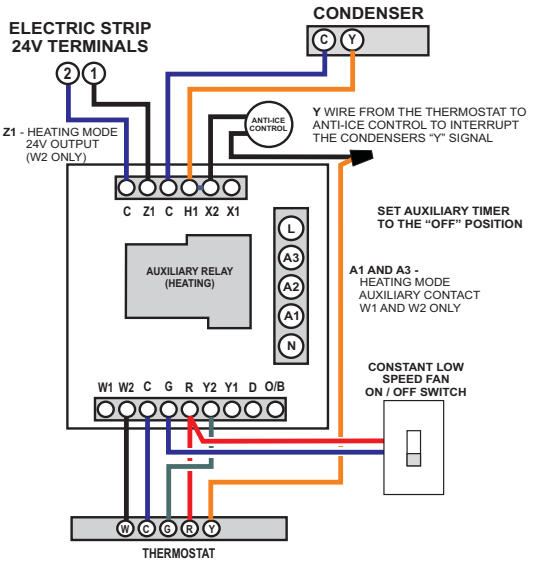
TIMER CIRCUIT CAN BE DISABLED WHEN USING A HEAT PUMP AND ELECTRIC BACKUP HEAT.

OPTIONAL WIRING FOR ELECTRICAL STRIP HEATER (ESH)

1 Stage Heating (Electric Strip)
1 Stage Cooling
1 Constant Low Speed

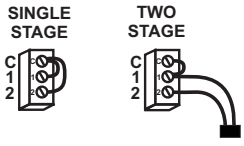
OPTIONAL WIRING FOR HIGHEST FAN SPEED FOR HEATING AND COOING

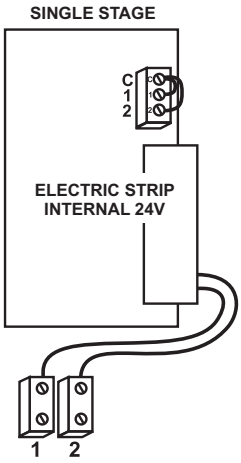
For highest blower speed on the fan coil for heating and cooling, set the thermostat to electric mode instead of gas. Wire the G terminal from the thermostat to the Y2 of the fan coil. When there is a call for heat or cool the fan will run at its highest dip setting air flow. For constant low fan speed control wire a switch (light switch or a toggle switch) at the fan coil between R and G. When the thermostat is not calling for heating or cooling and the fan switch is in the ON position the fan will operate at half the fan speed for constant fan circulation.
Note: This wiring is not required for heat pump set ups, as Y2 is activated for both heating and cooling.



OPTIONAL STAGING THE 15-23 KW UNITS THROUGH OUT DOOR THERMOSTAT

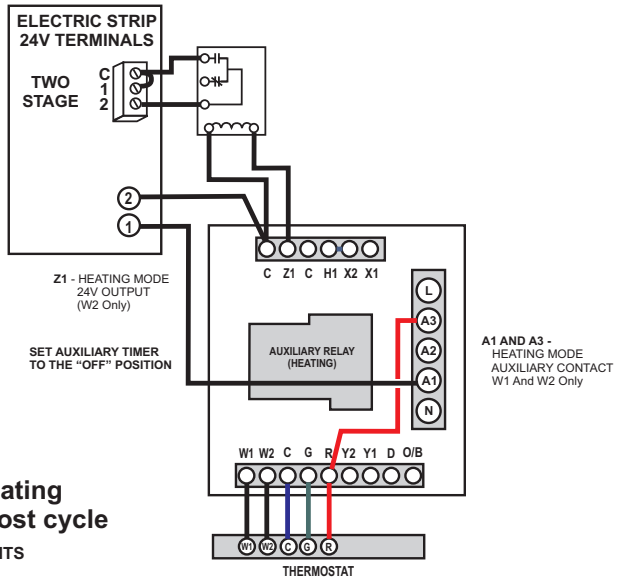
For optional energy savings install a outdoor thermostat to limit the use of the second stage of the ESH. For example - 2 staging the electric strip interrupt "C" and "1" or "C" and "2" with a outdoor stat as shown below. This allows single stage of the two banks of the electric strip to activate, the second stage will be allowed to activate by the outdoor stat.





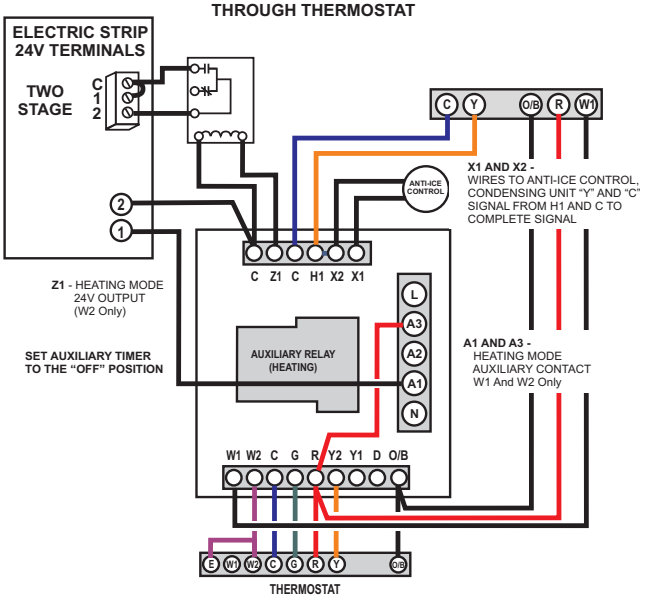
2 Stage Heating

OPTIONAL STAGING THE 15-23 KW UNITS THROUGH THERMOSTAT



1 Stage Cooling 2 Stage Heating
Heat pump c/w condenser defrost cycle

OPTIONAL STAGING THE 15-23 KW UNITS THROUGH THERMOSTAT

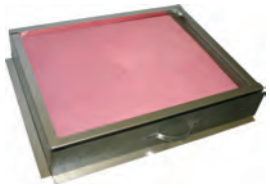


Options & Add-Ons

Filter Rack (Optional)

Available from Energy Saving Products is a 3" (76mm) Filter Rack. Filters are 1 inch (25mm) thick, 3 medium filters approximately 14% efficient. Any after market filter may be used with both the Hi-Velocity Return Air Base and Filter Rack.

Fig. 04 - Filter Rack and Filter



Hi-Velocity Air Purification System

Designed specifically for use with the Hi-Velocity Systems™ product line, the Hi-Velocity Air Purification System gives consumers unsurpassed indoor air quality.

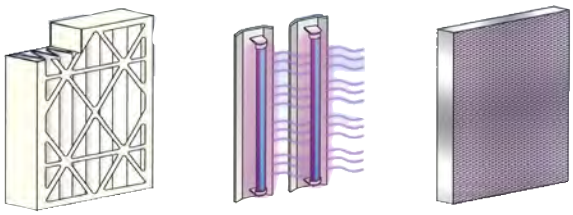
Three powerful technologies in one Air Purification System:

- Electrostatic MERV-11 Filter Removes Allergens Electrostatically
- Photo-Catalytic Oxidation destroys toxic chemicals and eliminates household odors
- Ultraviolet Light Kills Disease Germs on Contact

Our one-size-fits-all design allows for easy applications on any Hi-Velocity System. See our website **(www.hi-velocity.com)** for Brochure and Installation Module. The Hi-Velocity Air Purification System comes with a built-in Remote Mounted Service Panel to automatically keep track of service intervals. Indicator lights will tell you when to change the filter and ultraviolet lamps 30 days in advance:

MER 11 Filter: Change every **6 months** - service light turns from green to yellow after five months and to red after six months.

Ultraviolet Lamps: Change every **12 months** - service light turns from green to yellow after eleven months and to red after twelve months.



PWM Zoning Controller

The add-on Pulse Width Modulating Input (PWM Controller) provides total motor control making multiple zoning easy without the need of by-pass air flow. The pressure sensing PWM Controller will adjust the motor performance to maintain constant pressure in the supply plenum. Cooling, Heating, and Constant fan mode will compensate for damper operation and changing airflow demands, all while maintaining peak energy efficiency with the variable frequency drive technology.

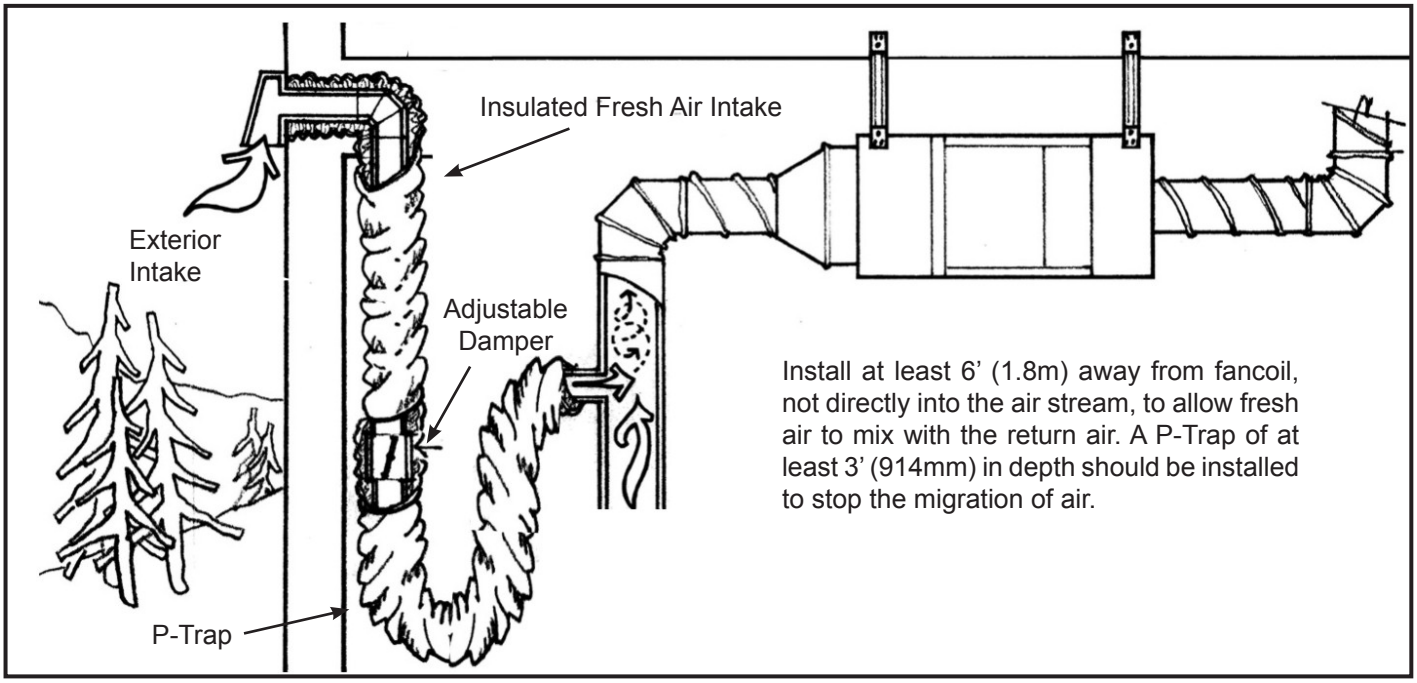
The PWM controller is pressure reactive and will change the energy input to maintain constant CFM flow of open outlets from 150 - 1250 CFM (71 - 590 L/s). The PWM controller has three independent settings for Cooling, Heating and Recirc. Fan, allowing for fine tuning with variable commands. The PWM unit is compatible with most forced air zoning packages and has been successfully integrated with Inverter Drive Heat Pump Condensing Units, providing leading edge technology for unsurpassed comfort and energy efficiency. See our website **(www.hi-velocity.com)** for Brochure and Design/Installation Modules.

Turbo Meter™ from Davis Instruments

The Turbo Meter provides uncommon accuracy, sensitivity, and pocket-sized convenience. It is based on the principle that a freely turning turbine will rotate at a speed directly proportional to the wind speed. To insure maximum sensitivity and accuracy, the turbine is suspended on sapphire jewel bearings, and its rotation is sensed by an infrared light beam which adds no friction. The resulting signal is processed electronically by an LSI (Large Scale Integrated) circuit for improved reliability and reduced size. A special three digit display is used for extra resolution and provides excellent viewing contrast in bright sunlight. A handy switch selects between four different scales —knots, feet per minute, meters per second, and miles per hour — for unmatched versatility. Unit is compact size (2.6 x 4.7", 7x 12cm) and light weight (3oz., 85g). Measures wind speed from 0 - 99.9 mph. Available from Energy Saving Products, or directly from Davis Instruments.

Third Party Options

Fig. 01 – Fresh Air Make up



Fresh Air Make-Up

For areas that require fresh air make-up, a small intake may have to be installed. It is recommended to install an insulated flex duct, with a damper, into the return air plenum. The damper can then be adjusted to supply the exact amount of fresh air needed to meet local building codes ***(Fig. 01)***. This should be balanced to the exhaust air levels of the structure. Either filter the combined air stream through a common filter or use separate filters for both air streams.

Install the fresh air duct to the side of the return air and not directly into the air stream. As shown in ***Fig. 01***, the fresh air duct should be installed more than 6' (1.5m) away from the fan coil and before a 90º bend.

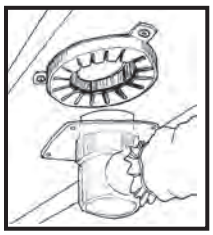
If too large of a duct is installed, the excess fresh air will increase system operating costs and decrease system performance.

An approximate fresh air duct sizing is: 3" (76mm) for the HE-50, 4" (102mm) for the HE-70, and 5" (127mm) for the HE-100.

Fire Stopping

Some areas require a Fire Stopping device to stop the spread of a fire and/or prevent the duct system from supplying oxygen to the fire. The Hi-Velocity System can be used in conjunction with several types of Fire Stopping devices such as pipe collars, wrap strips and mechanical shut-offs.

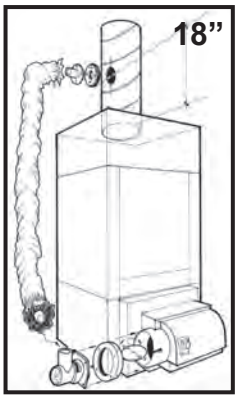
Fig. 02 – Fire Stopping Devices



With our Rough-In Boots, Metacaulk pipe collars work very well; **Fig. 02** gives an illustration of a pipe collar used with the Rough-In Boot. Many options are available to the designer. If assistance is needed in product choice, call our representatives at Energy Saving Products for free technical advice.

Humidity Control

Fig. 03 – Humidifier



When a bypass type humidifier is used, the humidifier can be mounted on the return air duct, and then a 2" (51mm) take-off from the hot air side is run back ***(Fig. 03)***. DO NOT use any size larger than 2" (51mm), and be sure to install a summer shut-off, or it will create problems with the airflow.

HRV/ERV

An HRV (Heat Recovery Ventilator) is typically a flat-plate air-to-air heat exchanger that transfers temperature between the two air streams. An ERV (Energy Recovery Ventilator) will exchange water vapour as well as temperature. It is usually a "heat wheel" and some amount of air will leak between the two airstreams. It is generally more costly than an HRV but it has the advantage of reducing the latent capacity and not just the sensible capacity.

There are several ways to integrate these products into the Hi-Velocity System. The easiest is to draw the exhaust from the return duct and then to add the fresh air immediately downstream.

However, the best method is to have a separate return for the exhaust air. This will minimize any short circuiting of air between the fresh air and the exhaust, optimizing the location of the exhaust returns, which are best located in bathrooms.

Hi-Velocity Systems™ Installation Check List

Ensure that all electrical connections are tight, and that any packing or shipping restraints are removed from both the fan coil, and the outdoor unit. With the power to the condensing unit off, check the thermostat for normal operation, and again check that there is proper airflow from all the vents. Ensure that no branch ducts were damaged or bent sharply. Do not run the fan coil without a filter in place.

Observe the system pressures during the initial start-up and charging of the system. Check the voltage and amp draw of both the fan coil, and the outdoor unit. The voltages must be within 10% of the rating plate data. If more than 10% is noted, contact your local electrical company. Check that the amp draws of both units are within the information printed on the unit rating plates. Set the system charge and adjust the TXV setting according to the RPM-E Installation Module.

Flexible Duct

___ Ensure Rough-In Boots located in unconditioned spaces are properly sealed and vapour barriered.

___ Ensure no Flex runs are shorter than 10' (3.05m) or longer than 25' (7.62m).

___ Ensure no Flex duct is crushed or torn.

___ Ensure proper bend radius in flex duct.

___ Ensure all Flex connections are secured and sealed at the plenum and Rough In Boot.

___ Ensure vent plate is properly connected to the rough in boot, using a vent extender kit if necessary.

___ Ensure flex connections are not kinked at plenum.

___ Ensure all outlet dampers are fully open, and unobstructed.

___ Ensure all vent caps have been cut out.

Supply Plenum

___ Ensure no flex duct is used for supply plenum.

___ Ensure ***a minimum*** 18" (457mm) of straight plenum off fan coil (no elbows, tees, outlets, etc.)

___ Ensure plenum and all connections are sealed (elbows, tee's, end caps, etc.)

___ Ensure proper system balancing is maintained if Tee's have been used in Plenum.

___ Ensure all duct and components in unconditioned space are insulated with a vapour barrier.

Fan Coil

___ Ensure motor, blower, and coil(s) are free of dirt, drywall dust, etc.

___ Ensure return air opening has been cut in fan coil.

___ Ensure minimum clearances are met for maintenance accessibility.

Cooling Coil (If Applicable)

___ Ensure condensate line is vented with a P-trap. (WCM/WM Coils)

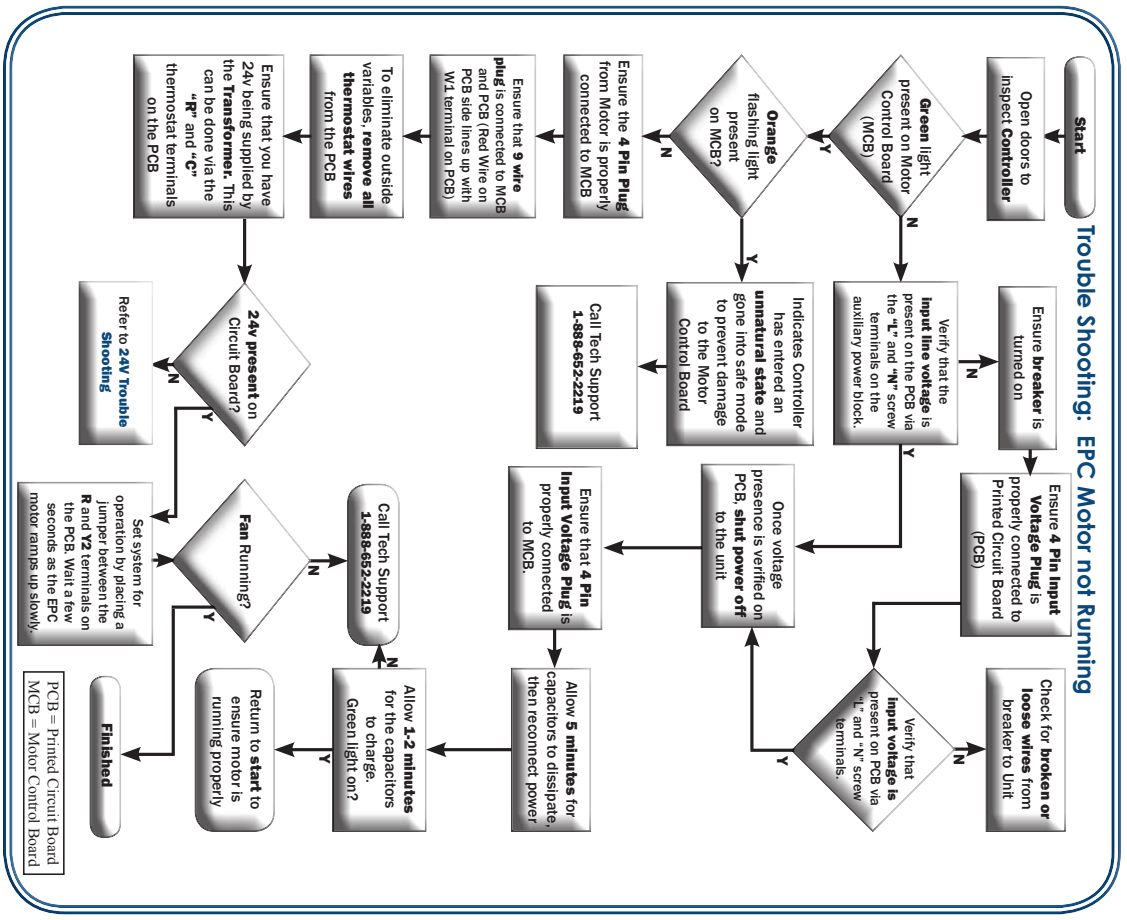
___ Ensure proper slope has been maintained in condensate line for drainage.

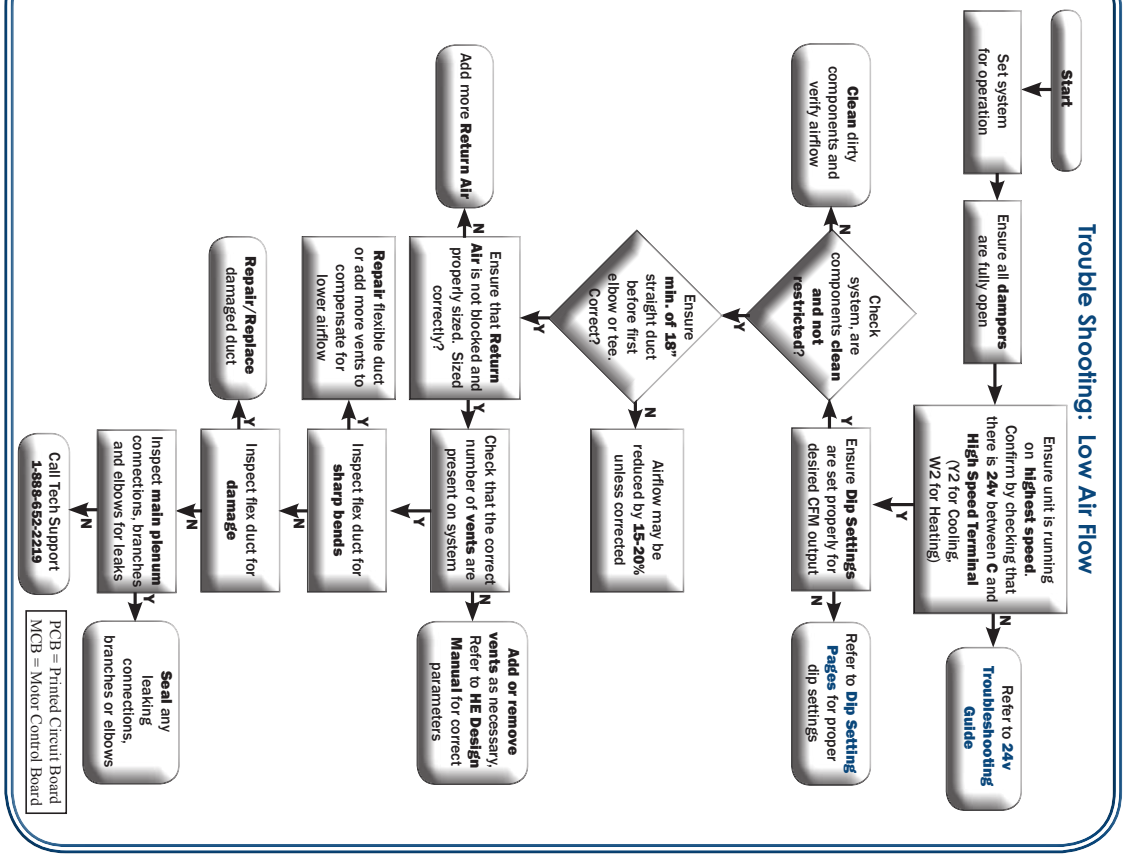
Return Air

___ ***Ensure correct size return is used*** and securely connected.

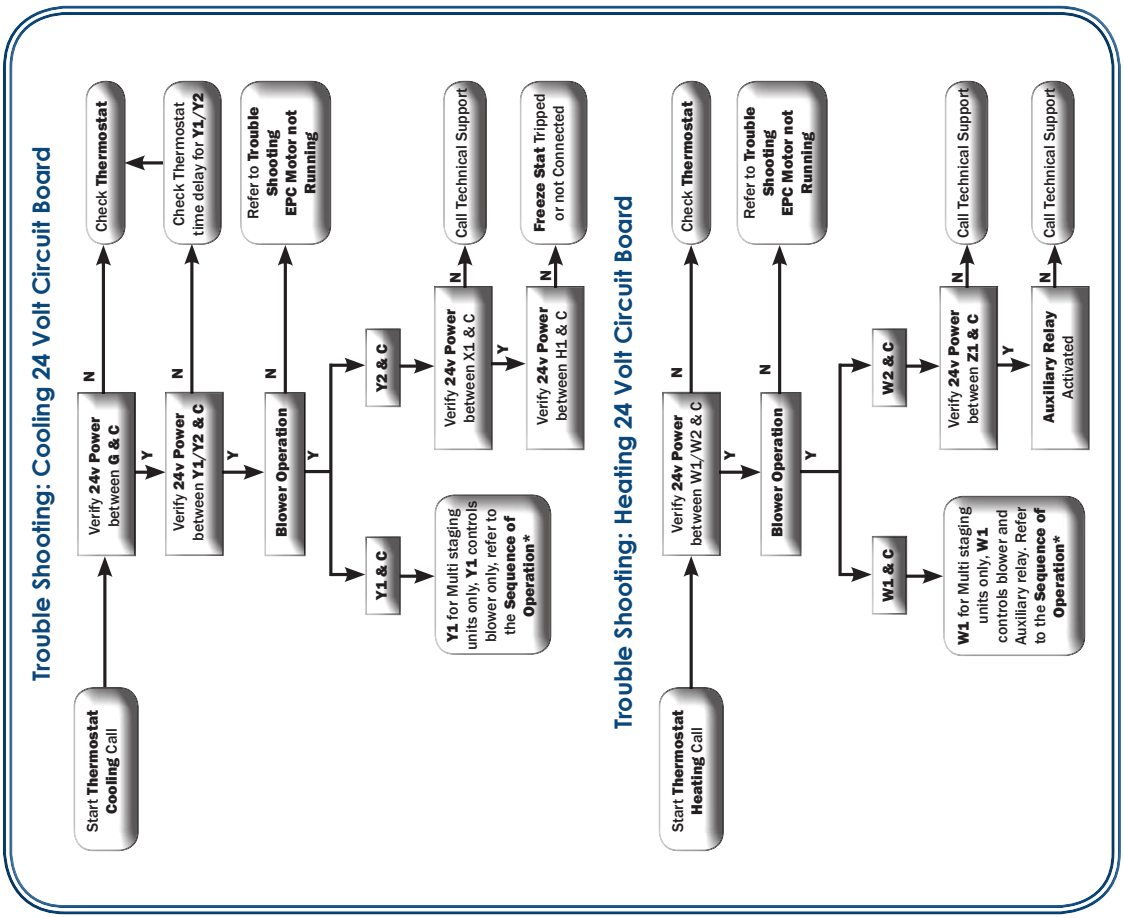
___ Ensure filter is installed before fan coil or cooling module if applicable.

In the event of difficulty during the start-up procedure, please refer to the *trouble shooting flow charts* to assist you in determining the problem.

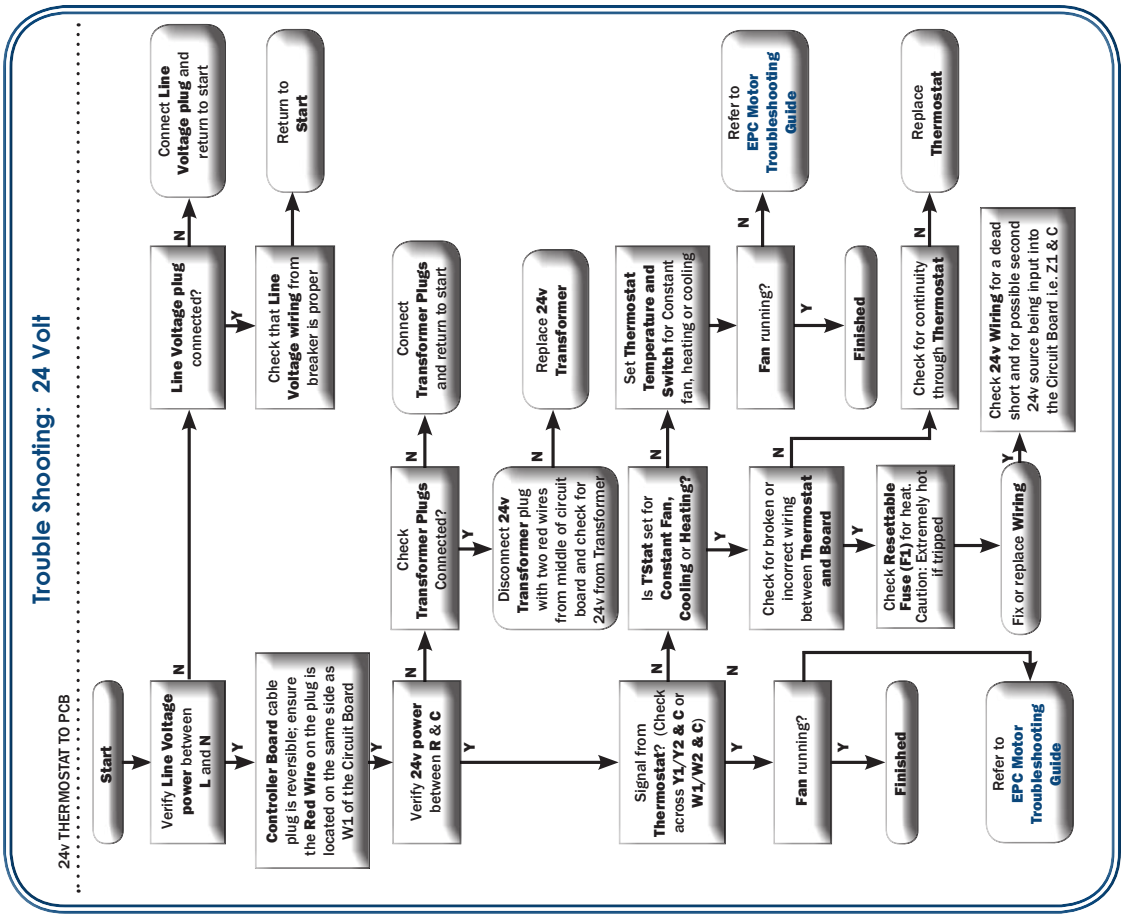




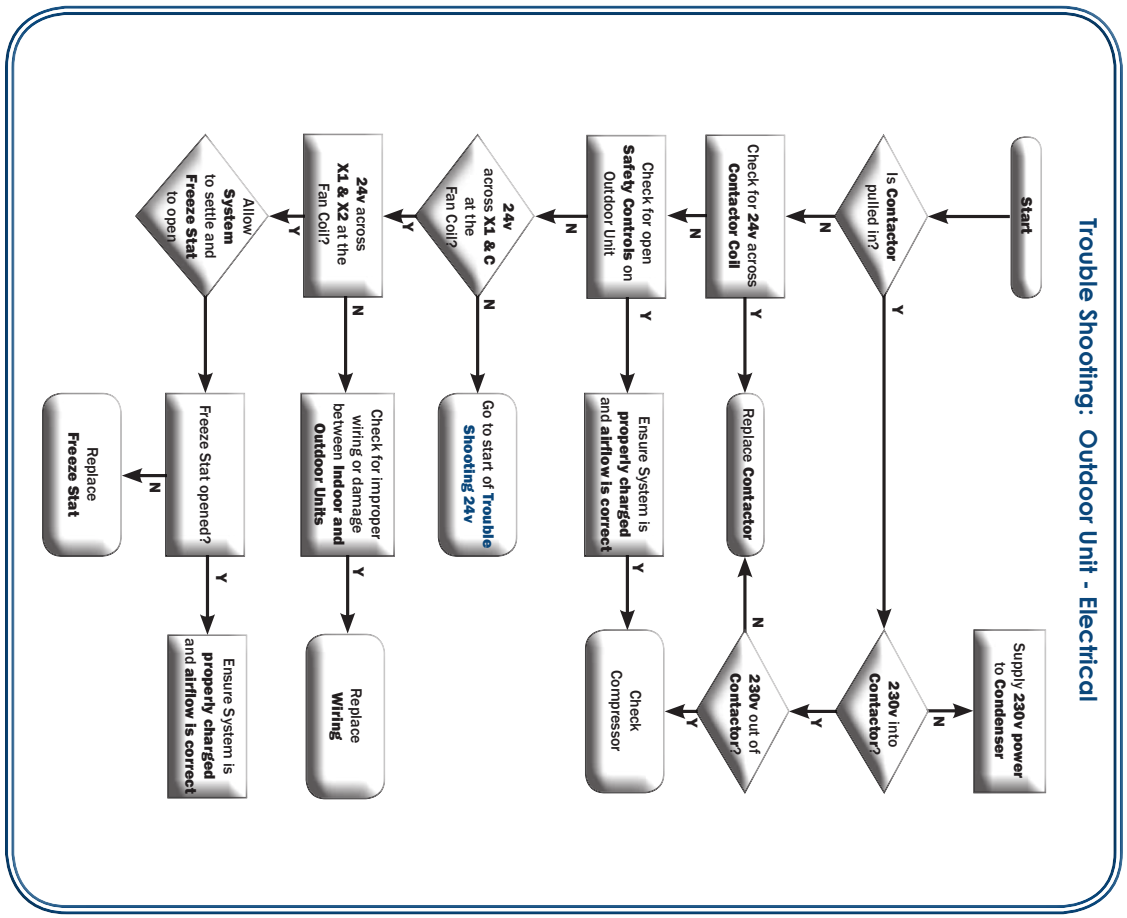
Module CTS Check List & Trouble Shooting (2/4) - EPC Motor/Low Air Flow

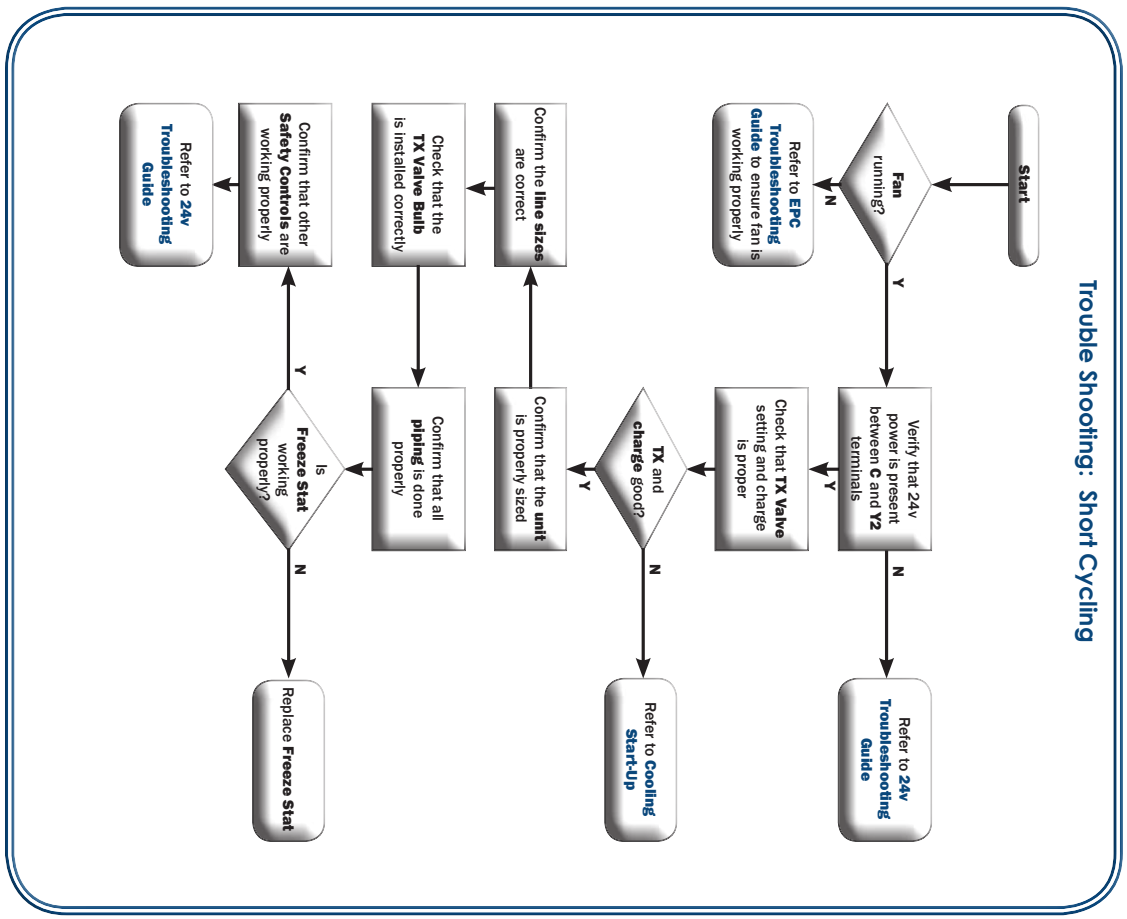


*Sequence of Operation Page is located on **Pg 24** of the HE Installation Manual, and online at www.hi-velocity.com (**Module WIR - Wiring and Dip Settings**)



Module CTS Check List & Trouble Shooting (3/4) - 24 Volt Heating/ 24 Volt Circuit Board





Module CTS Check List & Trouble Shooting (4/4) - Outdoor Unit - Electrical/Short Cycling

Matching Coils

Refrigerant Coils
RPM-E-50, 70, 100

Chilled Water Coils
WCM-50, 70, WM-100

Hot Water Coils
HV-50, 70. 100 - 6 Row

Electrical Coils
ESH-650 (5-15 kW)
ESH-750 (5-18 kW)
ESH-1100 (5-23 kW)

HE Series Specifications (Standard & Metric)

HE-50/51 — HE - 70/71 — HE - 100/101

Hot Water Heating

	2 Ton Airflow (7.0 kW)	3 Ton Airflow (10.6 kW)	5 Ton Airflow (17.5 kW)
Coil Type	6 Row/10 FPI	6 Row/10 FPI	6 Row/10 FPI
Max. BTUH @ 190°F E.W.T. (kW @ 88°C)	59,400 (17.4 kW)	89,200 (26.1 kW)	134,000 (39.3 kW)
Max. BTUH @ 180°F E.W.T. (kW @ 82°C)	54,500 (16.0 kW)	81,800 (24.0 kW)	122,900 (36.0 kW)
Max. BTUH @ 170°F E.W.T. (kW @ 77°C)	49,600 (14.5 kW)	74,400 (21.8 kW)	111,800 (32.8 kW)
Max. BTUH @ 160°F E.W.T. (kW @ 71°C)	44,600 (13.1 kW)	67,100 (19.7 kW)	100,700 (29.5 kW)
Max. BTUH @ 150°F E.W.T. (kW @ 66°C)	39,700 (11.6 kW)	59,700 (17.5 kW)	89,700 (26.3 kW)
Max. BTUH @ 140°F E.W.T. (kW @ 60°C)	34,700 (10.2 kW)	51,800 (15.2 kW)	78,400 (23.0 kW)
Max. BTUH @ 130°F E.W.T. (kW @ 54°C)	29,700 (8.7 kW)	44,700 (13.1 kW)	67,100 (19.7 kW)
Max. BTUH @ 120°F E.W.T. (kW @ 49°C)	24,800 (7.3 kW)	37,400 (11.0 kW)	56,200 (16.5 kW)
Max. BTUH @ 110°F E.W.T. (kW @ 43°C)	20,100 (5.9 kW)	30,300 (8.9 kW)	45,500 (13.3 kW)
GPM Flow ratings (L/s)	5 (0.32 L/s)	7 (0.44 L/s)	10 (0.63 L/s)
Pressure Drop in FT. (m) H_2O	3 (9.15 KPa)	6.5 (19.8 KPa)	6.8 (20.7 KPa)
CFM @ 68°F E.A.T. (L/s @ 20°C E.A.T.)	470 (221 L/s)	700 (300 L/s)	1120 (528 L/s)

Chilled Water Cooling

	2 Ton Airflow (7.0 kW)		3 Ton Airflow (10.6kW)		5 Ton Airflow (17.5 kW)	
Coil Type	6 Row/10 FPI		6 Row/10 FPI		6 Row/10 FPI	
(WCM Modules in Cooling Mode)	Total	Sensible	Total	Sensible	Total	Sensible
Max. BTUH @ 48°F E.W.T. (kW @ 8.9°C)	19,300 (5.7 kW)	13,700 (4.0 kW)	27,000 (7.9 kW)	19,200 (5.6 kW)	42,100 (12.3 kW)	30,300 (8.9 kW)
Max. BTUH @ 46°F E.W.T. (kW @ 7.8°C)	20,900 (6.1 kW)	14,200 (4.2 kW)	29,400 (8.6 kW)	20,000 (5.9 kW)	45,800 (13.4 kW)	32,100 (9.4 kW)
Max. BTUH @ 44°F E.W.T. (kW @ 6.7°C)	22,600 (6.6 kW)	14,900 (4.4 kW)	31,800 (9.3 kW)	21,000 (6.2 kW)	49,500 (14.5 kW)	33,700 (9.9 kW)
Max. BTUH @ 42°F E.W.T. (kW @ 5.6°C)	24,200 (7.1 kW)	15,700 (4.6 kW)	34,000 (10.0 kW)	21,800 (6.4 kW)	53,200 (15.6 kW)	35,100 (10.3 kW)
Max. BTUH @ 40°F E.W.T. (kW @ 4.4°C)	25,800 (7.6 kW)	16,300 (4.8 kW)	36,400 (10.7 kW)	23,000 (6.7 kW)	56,800 (16.6 kW)	36,400 (10.7 kW)
(WCM Modules in Heating Mode)	Total		Total		Total	
Max. BTUH @ 150°F E.W.T. (kW @ 66°C)	39,700 (11.6 kW)		59,700 (17.5 kW)		89,700 (26.3 kW)	
Max. BTUH @ 140°F E.W.T. (kW @ 60°C)	34,700 (10.2 kW)		51,800 (15.2 kW)		78,400 (23.0 kW)	
Max. BTUH @ 130°F E.W.T. (kW @ 54°C)	29,700 (8.7 kW)		44,700 (13.1 kW)		67,100 (19.7 kW)	
Max. BTUH @ 120°F E.W.T. (kW @ 49°C)	24,800 (7.3 kW)		37,400 (11.0 kW)		56,200 (16.5 kW)	
Max. BTUH @ 110°F E.W.T. (kW @ 43°C)	20,100 (5.9 kW)		30,300 (8.9 kW)		45,500 (13.3 kW)	
GPM Flow ratings (L/s)	5 (0.32 L/s)		7 (0.44 L/s)		10 (0.63 L/s)	
Pressure Drop in Ft. (m) H_2O	3 (9.15 KPa)		6.5 (19.8 KPa)		6.8 (20.7 KPa)	

Refrigerant Cooling

RPM Modules BTUH Refrigerant TX Cooling	1.5 - 2.0 Tons (3.5-6.4 kWh)	2.5 - 3.0 Tons (8.8-10.5 kWh)	3.5 - 5.0 Tons (12.3-17.5 kWh)

Electrical Heating

Kilowatt Range (240v)	5 - 15 kW	5 - 18 kW	5 - 23 kW

Fan Coil

Voltage	115/230/1/50/60 F.L.A. 8 amp		
Max Rated C.F.M. (L/s)	520 (245 L/s)	770 (363 L/s)	1260 (595 L/s)
Horse Power/Watts	3/4 - 310	3/4 - 530	3/4 - 720
R.P.M.	Variable	Variable	Variable
Integral Surge and Fuse System	Yes	Yes	Yes
Supply Air Size	8" round (203mm)	8" round (203mm)	10" round (254mm)
Supply Maximum Length[1]	70' (21.3m)	80' (24.4m)	100' (30.5m)
Return Size Needed	12" (120 in^2) (305mm/774cm^2)	12" (120 in^2) (305mm/774cm^2)	14" (168 in^2) (356mm/1084cm^2)
Minimum Outlets[2]	12 (2") 6 (HE)	20 (2") 10 (HE)	28 (2") 14 (HE)
Maximum Outlets	24 (2") 12 (HE)	32 (2") 16 (HE)	52 (2") 26 (HE)
Shipping Weight	80 lbs (36.3 Kg)	95 lbs (43.1 Kg)	115 lbs (52.2 Kg)
Fan Coil Size — Length	32" (813mm)	32" (813mm)	32" (813mm)
Fan Coil Size — Width	14" (356mm)	19" (483mm)	25" (635mm)
Fan Coil Size — Height	18" (457mm)	18" (457mm)	18" (457mm)

[1] Maximum length is from the unit to the supply end run cap. More than one run per unit is allowable.
[2] Minimum of **eight 2" outlets** per ton of cooling needed. (HE Duct = Minimum **four outlets** per ton)

Quick Sizing Guide

Item	Length	Width	Height
Fan Coils	**A**	**B**	**C**
HE-50 H/BU	32 5/16" (821mm)	14 1/2" (368mm)	18 1/4" (464mm)
HE-52 H/BU	30 1/2" (775mm)	18 1/2" (470mm)	14 1/4" (362mm)
HE-70 H/BU	32 5/16" (821mm)	19 1/2" (495mm)	18 1/4" (464mm)
HE-100 H/BU	32 5/16" (821mm)	25 1/2" (648mm)	18 1/4" (464mm)

Refrigerant Modules	G	E	F	J	K
RPM-E-50	19 1/4" (489mm)	14 5/8" (371mm)	18 1/2" (470mm)	3/8" (9.5mm)	7/8" (22mm)
RPM-E-70	24 1/4" (616mm)	14 5/8" (371mm)	18 1/2" (470mm)	3/8" (9.5mm)	1 3/8" (35mm)
RPM-E-100	32" (813mm)	14 5/8" (371mm)	18 1/2" (470mm)	3/8" (9.5mm)	1 3/8" (35mm)

Hot Water Coils (6 Row)	B	D	C	H	I
HWC-50	13 1/2" (343mm)	5 1/2"(140mm)	16" (406mm)	3/4" (19mm)	3/4" (19mm)
HWC-70	19" (483mm)	5 1/2" (140mm)	16" (406mm)	3/4" (19mm)	3/4" (19mm)
HWC-100	25" (635mm)	5 1/2" (140mm)	16" (406mm)	3/4" (19mm)	3/4" (19mm)

*Heating Coil Add-on does not come as a module, it slides into the Hi-Velocity fan coil

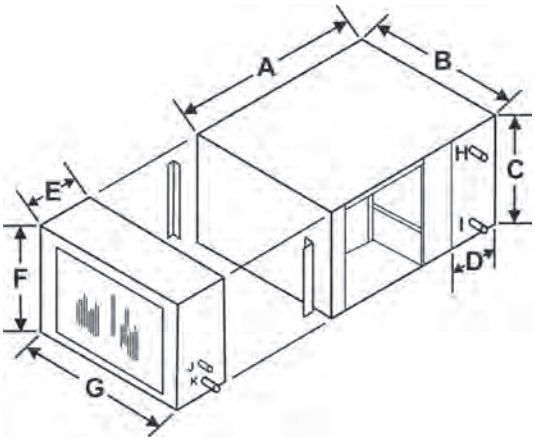
Water Cooling Modules	G	E	F	J	K
WCM-50	14 3/8" (365mm)	10 1/8" (257mm)	18 1/2" (470mm)	3/4" (19mm)	3/4" (19mm)
WCM-70	19 3/8" (492mm)	10 1/8" (257mm)	18 1/2" (470mm)	3/4" (19mm)	3/4" (19mm)
WM-100	25 3/8" (645mm)	7" (178mm)	18 3/8" (467mm)	3/4" (19mm)	3/4" (19mm)

Electrical Strip Heater	D	C	B
HV-650	13 3/4" (349mm)	5 5/8" (143mm)	15 1/2" (394mm)
HV-750	18 3/4" (476mm)	5 5/8" (143mm)	15 1/2" (394mm)
HV-1100	24 3/4" (629mm)	5 5/8" (143mm)	15 1/2" (394mm)

Dimensions for the ESH do not include the electrical access panel, add 4" to ESH for Total Length

Hi-Velocity Air Pur. Syst.	G	F	E
HE PS c/w Merv 11 Filt.	29" (737mm)	21" (533mm)	11" (279mm)

Filter Rack	G	F	E
FR-50 Filter Rack	20" (508mm)	17" (356mm)	4" (102mm)
FR-70 Filter Rack	21" (533mm)	22" (559mm)	4" (102mm)
FR-100 Filter Rack	18" (457mm)	24" (610mm)	4" (102mm)
FR-140 Filter Rack	24" (610mm)	26" (660mm)	4" (102mm)



Standard 1" Filters	G	F	E
FR/RA-50 Filter	18" (457mm)	14" (356mm)	1" (25mm)
FR/RA-70 Filter	18" (457mm)	18" (457mm)	1" (25mm)
FR/R-100 Filter	18" (457mm)	24" (610mm)	1" (25mm)
FR/RA-140 Filter	24" (610mm)	26" (660mm)	1" (25mm)

Return Air Base c/w Filter	A	B	C	D	E
RA-50	24" (610mm)	18 1/2"(470mm)	14 1/2"(368mm)	1 1/8"(28.6mm)	21 3/4" (552mm)
RA-70	24" (610mm)	18 1/2"(470mm)	19 1/2"(495mm)	1 1/8"(28.6mm)	21 3/4" (552mm)
RA-100	24" (610mm)	18 1/2"(470mm)	25 1/2"(648mm)	1 1/8"(28.6mm)	21 3/4" (552mm)

Service and Performance Form

Date _____

Date Installed _____

Job Information

Job Name _____ **Job Number** _____

Job Location _____ **Distributor/Supplier** _____

Installing Contractor _____ Contact Name _____

Contact Name _____ Phone Number _____

Address _____ Fax Number _____

City, State _____ **Elevation** _____

Zip Code _____ **Design Temp. (Heating/Cooling)** _____

Phone Number _____

Fax Number _____

Issue ☐ Heating ☐ Cooling ☐ Airflow

System Information

Fancoil Model _____ **Voltage** _____ **Amperage** _____ **Watts** _____

Fancoil Serial _____

Dip Switch Setting _____ **Static Press.** 18" from Supply _____ **E.A.T.** (DB/WB) _____

PWM ☐ Yes ☐ No **Static Press.** Blower Compartment _____ **L.A.T.** (DB/WB) _____

Static Plate Installed ☐ Yes ☐ No **E.A.T.** R/A Grill _____ **L.A.T.** First Outlet _____

Filter ☐ Clean ☐ Dirty **Airflow** _____ **L.A.T.** Last Outlet _____

Ductwork Information

Fancoil Location ☐ Attic ☐ Crawlspace ☐ Conditioned Space **Supply Duct Size** _____

Plenum Location ☐ Attic ☐ Crawlspace ☐ Conditioned Space **Return Duct Size** _____

Return Air Location ☐ Attic ☐ Crawlspace ☐ Conditioned Space **Fresh Air Duct Size** _____

Plenum Length _____ **Insulated** ☐ Yes ☐ No **R-Value** _____ **Distance to First Elbow/Tee** _____

Extra Insulation Over Ductwork ☐ Yes ☐ No **R-Value** _____

Total # Of 2" Vents (HE Vents = Two 2" Vents) _____ **Number Of 10' AFD's** _____

Total # Of 15' AFD's _____ **Number Of Other AFD's** _____ **Average Length Of Others** _____

Heating Information (Electric Strip, Hot Water)

Model _____ **E.W.T** _____ **% Glycol** _____ **Coil Size** ☐ 4 Row ☐ 6 Row

Serial _____ **L.W.T** _____ **Circ. Pump** _____ **Lines** (Size/Length) _____

Cooling Information (Chilled Water)

Model _____ **E.W.T** _____ **% Glycol** _____ **Lines** (Size/Length) _____

Serial _____ **L.W.T** _____ **Circ. Pump** _____

Refrigerant Information (AC, Heat Pump)

Model _____ **Suction Press.** _____ **Siteglass** ☐ Bubbles ☐ Clear

Serial _____ **Liquid Press.** _____ **Moisture** ☐ Wet ☐ Dry

Outdoor Make _____ **Suction Temp.** _____ **Outdoor E.A.T.** _____

Outdoor Model _____ **Liquid Temp.** _____ **Outdoor L.A.T.** _____

Location Of TXV Bulb _____ **Insulated** ☐ Yes ☐ No **Outdoor Amps** _____

Location Of Anti-Ice Control _____ **Insulated** ☐ Yes ☐ No **Filter-Drier** _____

Location Of Equalizer Line _____ **Insulated** ☐ Yes ☐ No **Line-set** (Length/Height) _____

Expansion Valve Size _____ **Expansion Valve Model** _____

P-Trap ☐ Yes ☐ No **Hard Start Kit** ☐ Yes ☐ No **Hot Gas BP** ☐ Yes ☐ No **Delay Timer** ☐ Yes ☐ No

If More Than One Fancoil Is Present On This Job, Please Indicate Which One: _____

Notes: _____

Service and Performance Form

Airflow Information

Date _____

Date Installed _____

#	Location	FPM	LPS	CFM
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

#	Location	FPM	LPS	CFM
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

TOTAL CFM _____

Conversion Factors

2" Knots to CFM:	x 2.2	**2" Knots to L/s:**	x 1.4
HE Knots to CFM:	x 4.2	**HE Knots to L/s**	x 1.98
2" FPM to CFM:	x 0.022	**2" m/s to L/s**	x 2.02
HE FPM to CFM:	x 0.042	**HE m/s to L/s**	x 3.85

If More Than One Fancoil Is Present On This Job, Please Indicate Which One: _____

Notes: _____

Energy Saving Products Ltd., established in 1983, manufactures the Hi-Velocity Systems™ product line for residential, commercial and multi-family markets. Our facilities house Administration, Sales, Design, Manufacturing, as well as Research & Development complete with an in-house test lab. Energy Saving Products prides itself on Customer Service and provides design services and contractor support.

For all of your Heating, Cooling and Indoor Air Quality needs, the Hi-Velocity System is the right choice for you!

Hi-Velocity Systems™

Small Duct Heating, Cooling and IAQ Systems

Build Smart, Breathe *Easy*

Hi-Velocity HE Fan Coils, Green Technology

Energy Saving Products Ltd

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