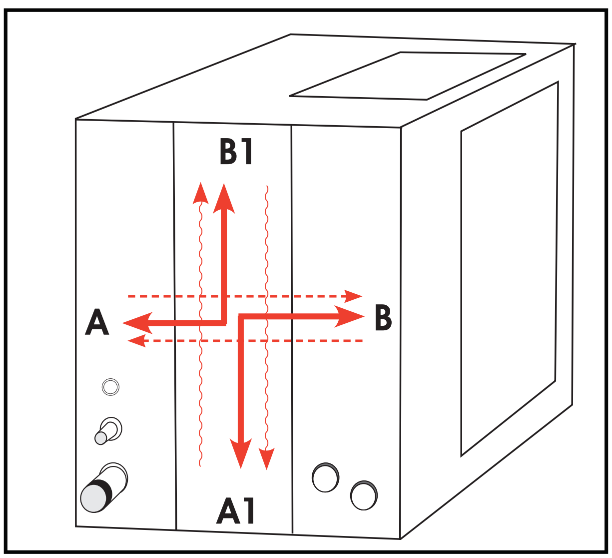
Refrigerant Modules (RPM-E)

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

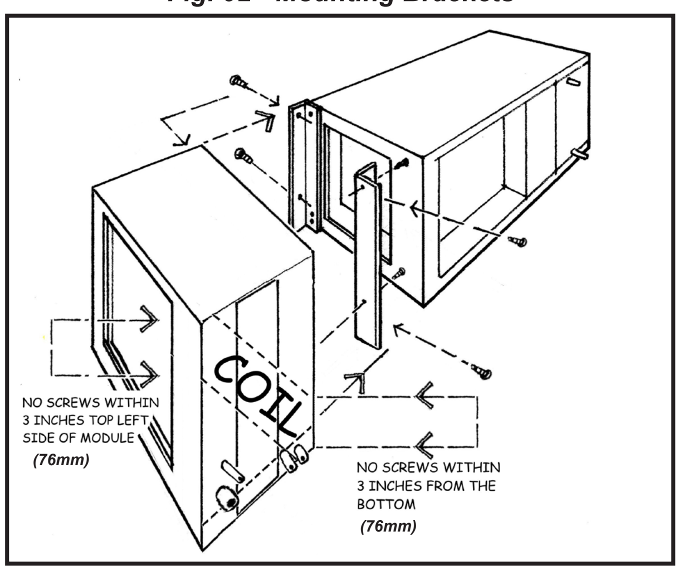
When installing, any combination of A to B or B to A can be used. For example, a horizontal application could use A to B while highboy applications could use A to B1. Do not use a combination of A to A1 or B to B1, as this would bypass the cooling coil completely. The knock-outs can be removed with a 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.

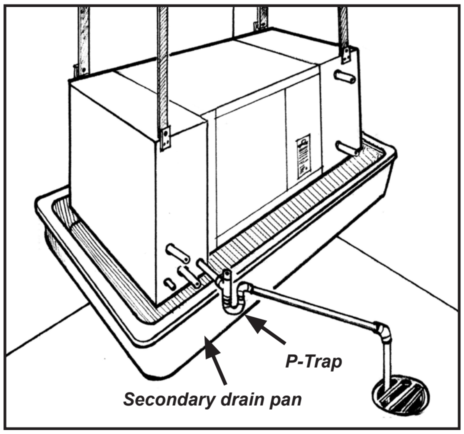
Fig. 02 - Mounting Brackets



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

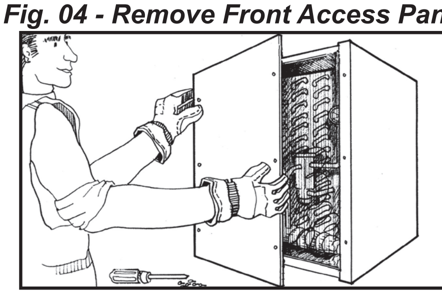
Only refrigerant grade pipe and fittings are to be used with Hi-Velocity Systems. Plumbing fittings may contain wax or other contaminants which are detrimental to the proper operation of the system. Insulate the suction line with 3/8" (9.53mm) insulation such as Armaflex. In high heat areas, 1/2" (12.7mm) 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.

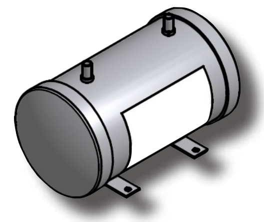
Heat Pumps

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)