



Small Duct High Velocity Heating, Cooling and Home Comfort Systems

RPM-E Refrigerant Module

Installation Manual



RPM-E-50 (1.5-2 Tons)

RPM-E-70 (2.5-3 Tons)

RPM-E-100 (3.5-5 Tons)

Includes:

Pre-Piped Integrated Heat Pump Ready

TX Valve with Built-In Check Valve

Integrated Access Port(s)

Integrated Site Glass

Integrated Freeze Stat

Two L-Mounting Brackets

Drain Pan

Manufactured By
Energy Saving
PRODUCTS LTD

Refrigerant Modules (RPM-E)



The RPM-E series cooling module can be used with the Hi-Velocity air handler, 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, access port(s), 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 air handler; 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. RPM-01)

The TXV (Thermal Expansion Valve), sight glass, access port(s) 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.

***IMPORTANT:** The 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. Failure to use the freeze-stat will result in RPM-E related warranty issues being voided.

Configurations

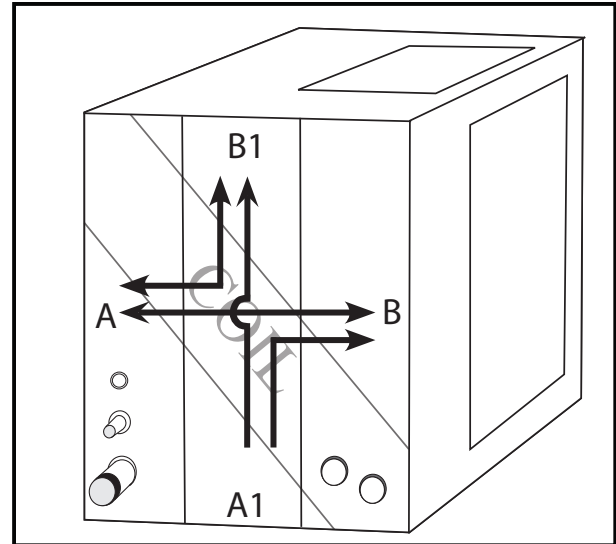
When installing, follow the recommendations shown in Table 01, demonstrated in Fig. 01. For example, a horizontal application could use A to B while highboy applications could use A to B1. Do not use a combination of A to A1 or B to B1, as this would bypass the cooling coil completely. A1 is not to be used for outlet airflow. The knock-outs can be removed with a screw driver and hammer. Use caution when opening the knock-outs, ensuring you do not damage the coil surface.

Table RPM-01 - RPM-E Cooling Module Configurations

Right	Wrong
A to B	B1 to A1
A to B1	B to A1
A1 to B	A to A1
A1 to B1	B to B1
B to A	
B1 to A	

Important: If side A1 is going to be used in your selected configuration, the extended drain pan must be removed.

Fig. RPM-01 - RPM-E Cooling Module Configurations



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)

RPM-E Drain Pan Extension

The RPM-E Drain Pan Extension (DPE) is to be removed for up flow (vertical) return air applications (avoid installing the RPM-E in counter flow applications).

To remove the pre-installed DPE, first remove left side access panel of the RPM-E Module. Remove the 3 - 1/4" screws that hold the DPE in place, remove the DPE and replace 1/4" screws into the coil support (Fig. RPM-02). Replace the left side access panel.

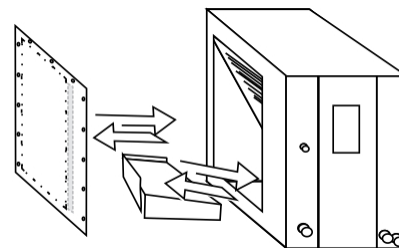


Fig-RPM-02 - Remove DPE

The lower knockout can now be removed, using a screwdriver and hammer (Fig-RPM-03). Use caution when removing knockouts ensuring you do not damage the coil inside the module.

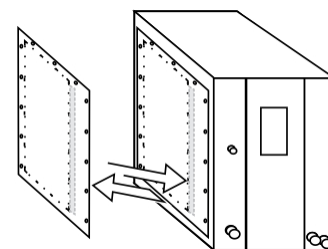
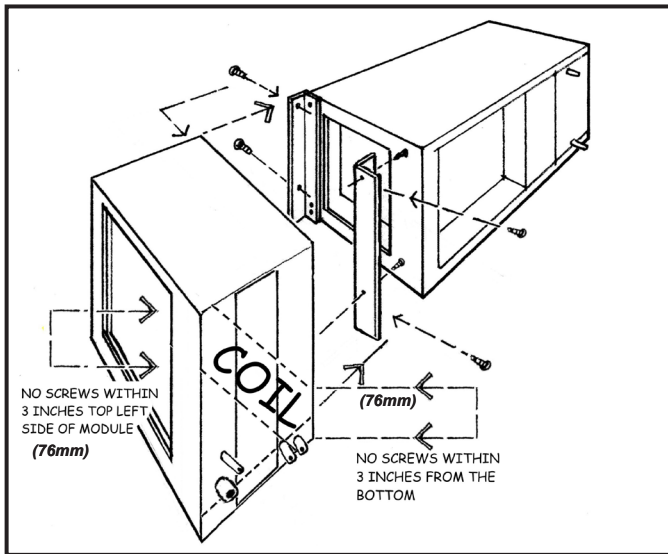


Fig-RPM-03 - Remove Knockout

Mounting the RPM-E

Two L mounting brackets are shipped loose for attaching the RPM-E to the air handler, along with foam tape for an air seal between the units. When mounting the cooling coil to the air handler (Fig. RPM-04), 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 air handler units and cooling modules.

Fig. RPM-04 - Mounting Brackets



Outdoor Unit Installation

Locate the outdoor unit in a suitable location, as close as possible to the air handler. 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.

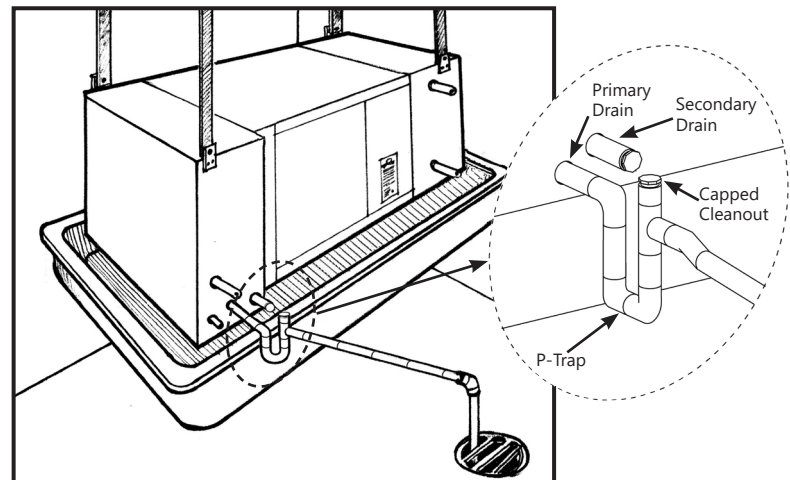
Drain Connections, P - Trap & Secondary Drain Pan

Important: Piping the condensate lines on a return side cooling coil can be dramatically different, be sure to read info below.

The primary condensate drain **must have a minimum 3" P-Trap installed** (Fig. 05). The drain line must run at a slope of $\frac{1}{4}$ " per foot in the direction of the drain. RPM-E modules come with a $\frac{3}{4}$ " male CPVC primary and secondary outlet. It is good practice to install a clean out right above the P-Trap. Using a "tee fitting" and cap in the P-Trap's construction can be used as the clean out and as a way to prime the P-Trap if it ever dries out. A wet P-Trap is important. A dry P-Trap can be detrimental to proper drainage. If code requires a secondary drain line, run the secondary line using the same method as primary. Otherwise, capping off the secondary drain line is acceptable. Do not run the secondary drain line to the secondary drain pan or use it as a vent to atmosphere! An equipment stand/riser or rubber equipment mat may be necessary to elevate the module off of the ground to allow for a P-Trap.

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. RPM-05 - Secondary Drain Pan



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

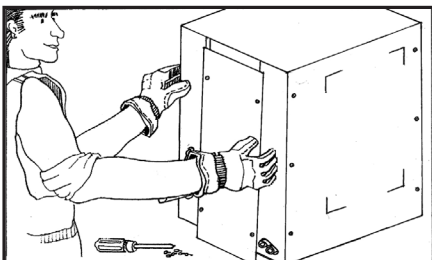
Only refrigerant grade pipe and fittings are to be used with Hi-Velocity Systems. Plumbing fittings may contain wax or other contaminants which are detrimental to the proper operation of the system. Insulate the suction line with 3/8" (9.53mm) insulation such as Armaflex. In high heat areas, 1/2" (12.7mm) 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 air handler. For charging and brazing, remove the front access panel of the RPM-E (Fig. RPM-06). 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. RPM-06 - Remove Front Access Panel



Once the system has been brazed it must be 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 service valves 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.

Charging Cont'd

The RPM-E coil can operate at a level that is different from most other conventional system coils. Typically, superheat levels are low, 2-4°F 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.

Typical Operating Ranges

Saturated Suction Temperature	38 - 40°F (3 - 4°C)	
Suction Line Temperature	42 - 44°F (6 - 7°C)	
Superheat	2 - 4°F (1 - 2°C)	
Suction Line Pressure	R-22	60 - 72 psig
	R-410a	110-124 psig
Liquid Line Pressure	R-22	160-210 psig
	R-410a	250-300 psig

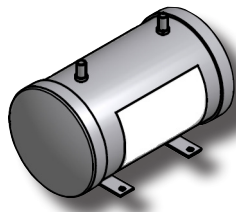
Heat Pumps

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 FREEZE STAT must be used at all times. Failure to use the freeze-stat will result in RPM-E related warranty issues being voided.

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 FZ and FZ 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 air flows 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 in section "Piping the RPM-E".

System set-up and installation should be checked as well. Piping practices should be within the bounds described in section "Piping the RPM-E" 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		RPM-E-50	RPM-E-70	RPM-E-100
Part Number		20090200050	20090200070	20090200100
Matching Air Handler		HE-Z/HE-B/HE-50/51 HV-50/51/52 CU-51 LV-Z/LV-B-750/751 LV-50	HE-Z/HE-B/HE/HV-70/71 LV-Z/LV-B-1050/1051 LV-70	HE-Z/HE-P/HE-B/HE/ HV-100/101 HE-P-240/241 (x2 Coils)
Tons ⁽¹⁾		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)
Refrigerant Type		R-410A	R-410A	R-410A
TX Cooling MBH ⁽²⁾		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 (0.1524mm)	.006 Al (0.1524mm)	.006 Al (0.1524mm)
Hydronic 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" M CPVC (19mm)	3/4" M CPVC (19mm)	3/4" M CPVC (19mm)
TXV with Built in Check Valve & Bypass		Yes	Yes	Yes
Site Glass		Yes	Yes	Yes
Freeze Stat		Yes	Yes	Yes
Access Port(s)		Yes	Yes	Yes
Shipping Weight		45 lbs (20.4 kg)	54 lbs (24.5 kg)	71 lbs (32.2 kg)
Coil Module Dimensions (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)

(1) Minimum of **four HE outlets** per ton of cooling needed. (2) Duct = Minimum **eight outlets** per ton)
(2) Smaller condensers may be matched to the air handler when needed (match TXV to condenser size)

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

WARRANTY

Energy Saving Products Ltd. is proud to offer a limited warranty. This warranty applies strictly to the first purchaser at wholesale level and only to the Air Handler unit and module. It does not include connections, attachments and other products or materials furnished by the installer.

This warranty 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 Air Handler. This warranty does not cover defects caused by failing to adhere to local building codes and following good industry standards. Failure to correctly install the Air Handler, or material related to the unit, may result in improper system performance and/or damages and will void this warranty. This warranty does not cover material installed in or exposed to a corrosive environment. This warranty does not cover products subjected to abnormal use, misuse, improper maintenance, or alteration of the product. Using the Air Handler and/or module as a source of temporary heating/cooling during construction will void this warranty.

A Five (5) Year Limited Warranty is extended on all components in products manufactured exclusively by Energy Saving Products. These components include Motors, WEG Controller, Circuit Boards, Dampers, Zoning Controls, Blowers, Motor & Blower Assemblies, Heating Coils, Chilled Water Coils, and Air Conditioning Coils. Note: If any product is installed in or exposed to a corrosive environment, warranty will be void.

A Three (3) Year Limited Warranty is extended on Electric Strip Heaters.

A One (1) Year Limited Warranty is extended on replacement parts.

Products sold by Energy Saving Products but manufactured by others, will carry the original manufacturer's warranty.

TERMS & CONDITIONS

- **Warranty will not be considered unless a contractor has contacted Energy Saving Products Ltd. Technical Support department for assistance, and received a tech code.**
- Any repair performed under warranty must be approved by Energy Saving Products Ltd. for this warranty to be valid.
- The liability of Energy Saving Products Ltd. is limited to and shall not exceed the cost of pre-approved replacement parts.
- This warranty does not cover shipping costs to and from the factory, labor costs or any other cost associated with the installation of the replacement part.
- Inoperative parts must be returned to Energy Saving Products Ltd. with an ESP RMA Form that includes model, serial number, and a detailed description of the entire problem. Inoperative parts must be returned in testable condition.
- Energy Saving Products Ltd. is not liable for any other damages, personal injury, or any other losses of any nature.

Follow these steps for Service or Repair:

1. Contact the installer of the product or a licensed service company
2. Contact the distributor
3. Contact Energy Saving Products Ltd. Mon-Fri 8 am – 4:30 pm MT 1-888-652-2219

This warranty replaces all other warranties expressed or implied.

www.hi-velocity.com

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!



Small Duct Heating, Cooling and IAQ Systems

Build Smart, Breathe *Easy*

Hi-Velocity HE-Z Air Handlers, **Green** Technology



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