Hi-Velocity Systems™

Small Duct High Velocity Heating, Cooling and Home Comfort Systems

RCM Refrigerant Module

Installation Manual

For use with **RCM Coil with R-410A** Refrigerant

For RCM-A2L Refrigerant Coils you MUST refer to the RCM-A2L Installation Manual



RCM-50 (1.5-2 Tons)
RCM-70 (2.5-3 Tons)
RCM-100 (3.5-5 Tons)

Includes:

TX Thermal Expansion Valve (R-410A)
Service/Access Port(s)
Freeze Stat
Drain Pan
L-Mounting Brackets
Carry-Over Screen
Mounting Tape

Manufactured By

Energy Saving PRODUCTS LTD

Refrigerant Modules (RCM)

The cooling coil comes as a module and must be installed in the vertical position on the return air side of the air handler (horizontal airflow). For return air cut out sizes, refer to Table 3 – Return Air Cutouts. RCM modules come with TX Valve, two L mounting brackets, access port(s), carry-over screen, external freeze stat*, and additional components for air sealing.

The included TXV and access port(s) will need to be field installed to read refrigerant pressures/temperatures at the evaporator coil (RCM). Fig. 01 shows approximate installation locations for these components.

RCM (R-410A) coil modules can be used on any R-410A outdoor unit (condenser/heat pump) if proper R-410A refrigerant components are used.

***IMPORTANT: The Freeze Stat (anti-ice 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 properly install the freeze stat will result in RCM related warranty issues being voided.**

NOTE: Do not remove protective bubble wrap from Freeze Stat



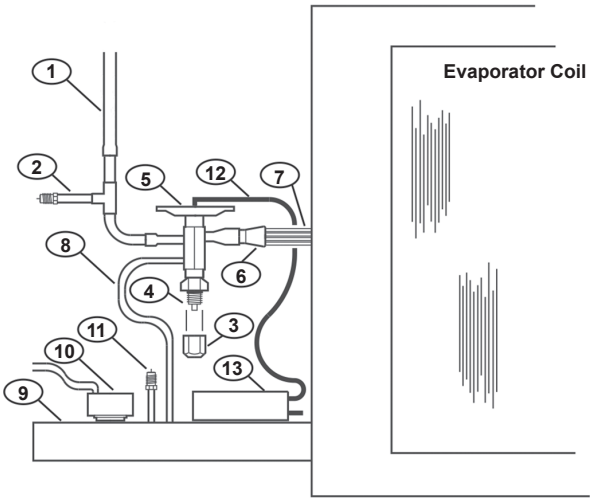


Fig. 01 - Coil Assembly

1) Liquid line	8) External equalizer line
2) High side access port (if applicable)	9) Suction line
3) Adjustment stem cap	10) Freeze Stat (Anti-ice control)
4) Superheat adjustment stem	11) Low side access port
5) Thermal expansion valve (TX)	12) TX capillary tube
6) Refrigerant distributor	13) TX sensing bulb
7) Distributor tubes	

Mounting Brackets

Mounting the cooling coil to the air handler can be done with the L brackets supplied (Fig. 02), ensure that no screws puncture the drain pan or coil. Appendix B has the dimensions of the air handler units and cooling modules.

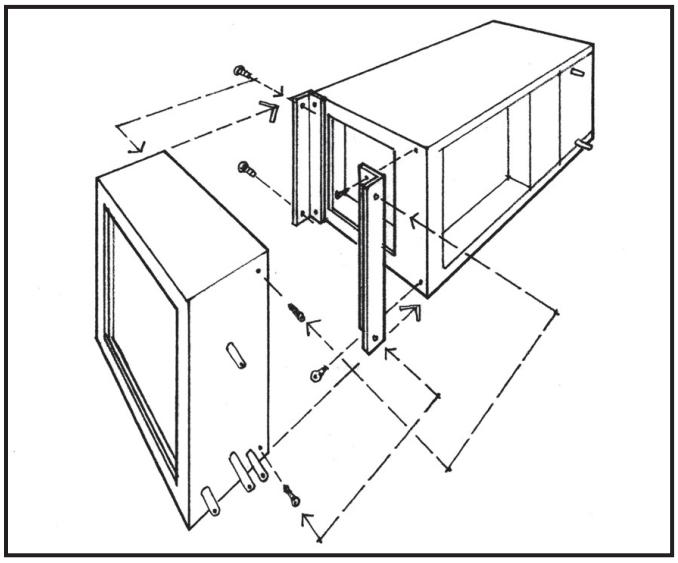


Fig. 02 - Mounting Brackets

Thermal Expansion Valve (TX)

When brazing the TX valve to the copper liquid line, a brazing rod that can bound dissimilar metals should be used. Always wet rag or use heat dissipating paste on the TX body to reduce the chance of overheating the valve.

Thermal Expansion Sensing Bulb

The remote sensing bulb for the thermal expansion valve should be located on a clean, horizontal section of the suction line. It should be mounted on the top half of the pipe in the 2 o'clock or 10 o'clock position (Fig. 01 and Fig. 03).

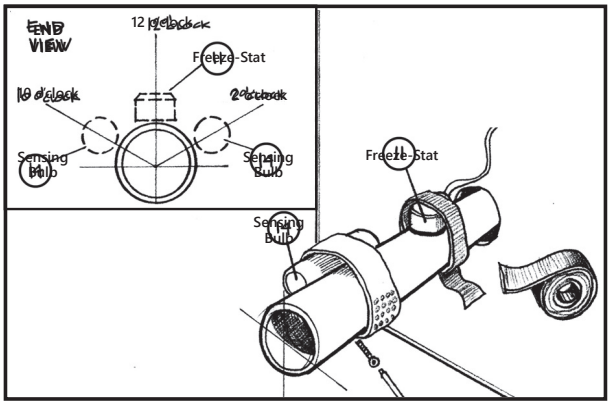


Fig. 3 - TX Sensing Bulb

Access Ports

When refrigerant lines are connected to the RCM coil, access port(s) must be connected as well (Fig. 01 - reference 2 & 11). With the use of a tee and reducer this process is simplified. The access port(s) are required for system startup and for future trouble shooting or service. When reading refrigerant pressures/temperatures, always read them at the evaporator access ports.

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External Equalizer Line

The external equalizer line should be installed on the suction line, immediately after the remote sensing bulb (Fig. 01 – reference 13). When the pressure drop through the evaporator is of any consequence:

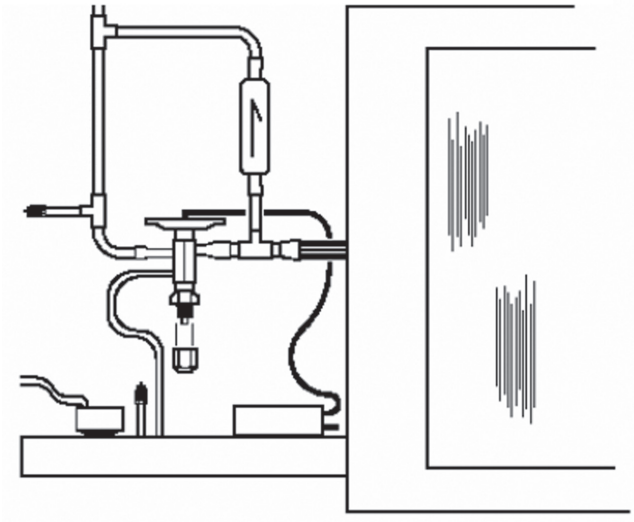
- 3°F in the air conditioning range
- 2°F in the commercial temperature range
- 1°F in the low temperature range

It will hold the thermo expansion valve in a relatively "restricted" position and reduce the system capacity, unless a thermo expansion valve with an external equalizer is used.

Refrigerant Bypass

All RCM coils come with check valve ready TX valves. Third party TX valves may require a bypass check valve.

Fig. 04 - Bypass check valve



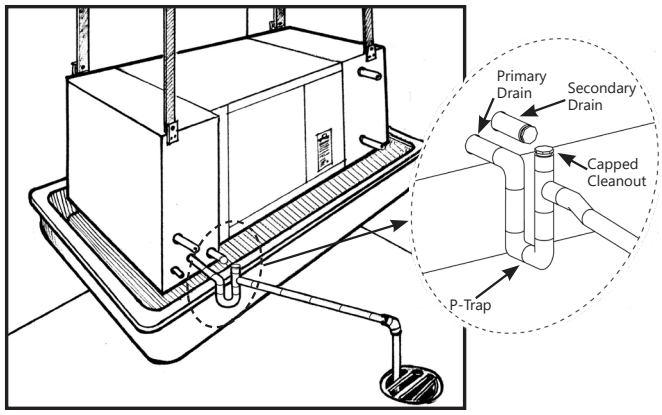
Drain Connections, P-Trap & Secondary Drain Pan

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 ¼" per foot in the direction of the drain. RCM modules come with a ¾" 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. 05 - Secondary drain pan



Freeze Stat

The RBM-I comes with a Freeze Stat (anti-ice control). This freeze stat 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.

Install the Freeze-Stat above the center line of the suction line and connect the wires to the Freeze Stat terminals on the air handler circuit board.

Ensure that the Freeze Stat is fastened securely and are well insulated. Do not use a self-tightening clamp on the Freeze Stat control, as the control may be damaged by excessive tightening.

Important: The Freeze Stat (anti-ice control) must be used at all times. Failure to do so may void warranty.

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 input side of the control wiring. See freeze stat install location on page 2 (Fig. 01 reference 10).

NOTE: Do not remove protective bubble wrap from Freeze Stat



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Carry-Over Screen

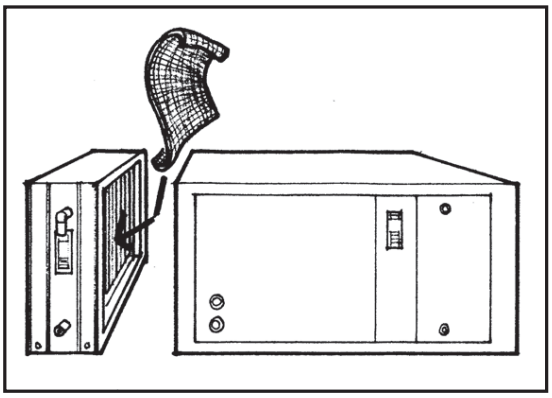
RCM refrigerant cooling modules come supplied with a nylon mesh carry-over screen and six stand-off plugs. The Hi-Velocity units have a very high humidity removal rate, it is possible for the airflow across the coil to grab moisture off the fins and carry it into the unit. With the carry-over screen in place it reduces the chance of moisture being carried into the unit.

Ensure that the nylon mesh is placed on the exiting air side of the cooling module (Fig. 4)

Screen Installation

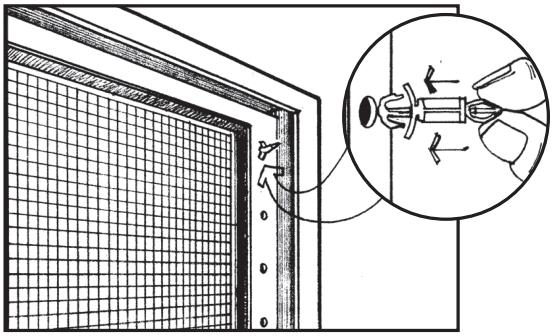
The carry-over screen is placed on air handler side of the cooling module (Fig. 04).

Fig. 04 - Screen on the air handler side



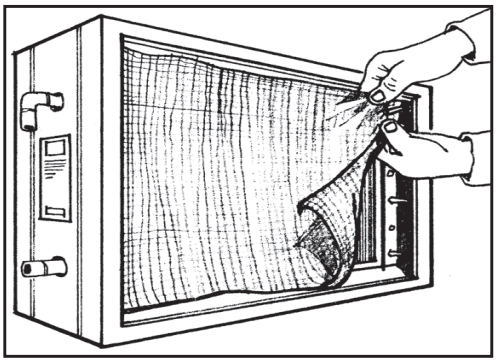
On the air handler side of the cooling module, attach three plastic stand-offs down each side of the cooling coil (Fig. 05).

Fig. 05 - Attach stand-off plugs



Place the nylon wire mesh over the stand-offs, ensuring the screen touches the drain pan. Then snap the screen over the plastic stand-offs (Fig. 06).

Fig. 06 - Attach screen to coil



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Return Air

When sizing the return air ducts, keep in mind that if they are too small they can create noise, but if they are too large, the air handler cannot build up proper pressure. Table 03 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.

Note: It is recommended to use a grill that is 10-20% larger than R/A duct size.

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 centrallized return air grill may be used. When using flexible duct for return air, use one duct size larger due to the higher friction loss. Return air MUST be filtered before entering the cooling module.

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 will create noise, increase motor power consumption, reduce airflow and increase the possibility of condensate carry-over.

Important: When connecting a round Return Air duct to the RCM coil, a round to rectangular transition is required.

Table 03 has recommended return air sizes for round and rectangular ducts. A variance of **+20%** is allowable for sizing return ducts that connect to the RCM or Hi-Velocity Systems unit.

Table 03 – Return Air Duct Sizes

Unit	Rigid Ø	Flex Ø	Min Sq. Inches (Sq. cm)
50/51/52	12" (305mm)	14" (356mm)	120 (774cm)
70/71	12" (305mm)	14" (356mm)	120 (774cm)
100/101	14" (356mm)	16" (406mm)	168 (1084cm)

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

Where allowed by local codes, a single return air grill may be used. Note: Return air grill must have equal minimum of free air area to return air.

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

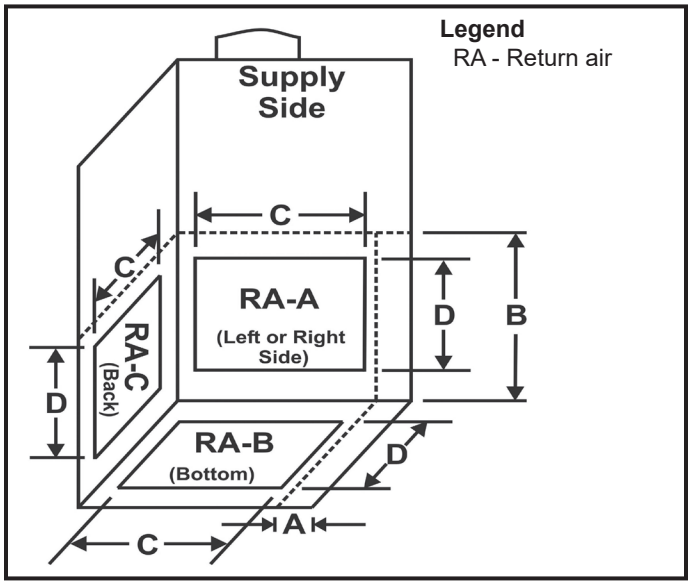
Return Cutout

Fig. 07 shows the different locations the return air can be installed on Hi-Velocity air handlers. Table 04 contains the dimensions needed for the return. All air handlers are equipped with return air knockout cuts and can be used as a proper return air size.

Table 04 - Return Air Cutouts

Unit	A	B	C	D
50/51	3"	17"	10"	14"
70/71	3"	17"	15"	15"
100/101	3"	17"	22"	15"

Fig. 07 - Return air cutout sizing



Notes:

- DO NOT cut past the center plate or electrical box (Dim A & B).
- 100 and 140 Units CANNOT use return air "C" (RA-C).
- This drawing is NOT to scale.

Important: Return air must be filtered before entering the cooling module.

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Piping the RCM

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" insulation such as Armaflex. In high heat areas, 1/2" insulation may be needed. If the lines are run in an area where temperatures could exceed 120°F or runs longer than 50', then the liquid line may need to be insulated as well. Support the pipe every 5 feet, or whatever local code states.

Run the pipes in the most direct route possible, taking into account structural integrity, building details and local building codes. If the evaporator coil is located above the outdoor unit (condenser/heat pump), slope any horizontal runs toward the outdoor unit. If the outdoor unit is located above the evaporator coil, 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. For lines running over 50', a suction line accumulator must be installed. Lines running over 100' are not recommended.

Pipe Sizing

Refer to the Outdoor Unit manufacturer's installation manual to select correct lineset diameters and total length constraints. Always adhere to the ODU manufacturer's piping specifications to ensure optimal oil return and system efficients.

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.

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

Evacuating

The system must be brazed under a nitrogen purge to prevent oxidation of the pipe during the brazing process. 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. 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 on the second evacuation, and ensure that the system holds at the vacuum pressure. If not, check for leaks and evacuate again. If the vacuum holds, add refrigerant to raise the pressure to 2 psig. At this point open service valves on pre-charged condensing units, or add refrigerant to the system.

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 to the system. 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 to the system until the site glass is clear of all bubbles. If the site glass is clear of bubbles and the super heat is off, the TX valve will need to be adjusted (See Super Heat for temperature settings). When adjusting the TX valve, never turn it more than a quarter turn at a time. Always allow 5 minutes for the system to settle down before making another TX adjustment. When adjusting the TX valve, a clockwise turn will close the valve, allowing less refrigerant through. With less refrigerant flowing through the coil, less cooling will be done, which will bring up the suction line temperature.

See "Cooling Start-Up and Charging Guide" on page 7.

Superheat

Super heat on Hi-Velocity systems with the RCM series should normally be around 8ºF -12ºF. The suction line should be set at approximately 42ºF.

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Cooling Start-Up and Charging Guide

1. Pipe in the system using the provided components as described in the "TX" & "Access Ports" sections (Pg. 2). (Refrigeration gauges must be connected to these ports when taking pressure reading.)
IMPORTANT: Install a freeze stat on suction line as described in the "Freeze stat" section (Pg. 3).

2. Leak check and evacuate system as described in the "Evacuating" section of manual (Pg.6).

3. Check indoor unit operation with power to the outdoor unit off (can use service disconnect switch). It is critical to ensure you have adequate airflow. (For the HE-Z Series, the Y fan speed must be between 55 to 66Hz as displayed on VFD.)

4. (For A2L (R-32/R454B) Refrigerant Coils only) Check refrigerant detection system is installed correctly and confirm the verification procedure.

5. Connect refrigeration gauges to evaporator access ports and open outdoor unit service valves. If required, weigh in the condensers recommended refrigerant charge, taking into consideration:

- Condensers charging chart for varying outdoor temperatures
- Indoor wet bulb temperature

6. Turn on power to the outdoor unit and start system operation.

7. Depending on your evaporator's model number, adjust the system's refrigerant charge as needed to obtain the suggested superheat range in the chart below. (If SH is too high, add refrigerant, if SH is too low, remove refrigerant.) Also, ensure the system is not excessively hunting (+/- 10 PSIG). A secondary airflow adjustment maybe needed after the charge adjustment.

8. If you cannot reach recommended superheat range/pressure range with charge adjustment, TX valve adjustment maybe required. **Important:** Never adjust the TX valve more than 1/4 turn at a time(2).

- Opening TXV (Counter-Clockwise) - Increases suction temp. / Lowers superheat
- Closing TXV (Clockwise) – Decreases suction temp. / Raises superheat

9. If you still cannot reach recommended superheat ranges and/or excessive fluctuations/hunting persists, more unconventional problems have occurred. Please call **tech support 1-888-652-2219**(1).

Suggested Superheat Ranges

RBM	6-10°F
RCM	8-12°F

Typical Operating Ranges (at ideal outdoor charging temperatures)

Saturated Suction Temperature	34-40°F
Suction Line Temperature	38-44°F
Suction Line Pressure	R-454B/R-32/R-410a: 110-130 PSIG
Liquid Line Pressure	R-454B/R-32/R-410a: 250-300 PSIG

Notes:

1. Before calling tech support please be sure to have the following info ready:
   a) Airflow or fan speed (Hz on the VFD) b) Liquid line pressure c) Suction line pressure d) Suction line temperature e) Return air static pressure f) Supply air static pressure
2. Document all TX valve stem adjustments (number of ¼ turns, open/closed) for supporting info when contacting tech support.
3. It is recommended that the coil be charged on a high load day at the compressor's highest speed.
4. When adjusting charge or TX valve positioning, wait 5 minutes between adjustments for system to settle.
5. If the system is not charged on a high load day the suggested temperatures may vary. Use your own discretion.
6. 55 Hz (fan speed) displayed on the VFD drive may not be enough airflow for some systems.

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RCM Specifications

Refrigerant Cooling Module



Specifications		RCM-30	RCM-50	RCM-70	RCM-100
Part Number		4090200030	10090200050	10090200070	40090200100
Matching Air Handler		CU-31 JH-15/30	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]		1.0 Ton (3.5 kWh)	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	R-410A
TX Cooling MBH[2]		6-12 (1.8-3.5 kW)	18-24 (5.3-7.0 kW)	30-36 (8.8-10.6 kW)	42-60 (12.3-17.6 kW)
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	Liquid Line (Lq)	3/8″ (9.5mm)	1/2″ (13mm)	1/2″ (13mm)	1/2″ (13mm)
	Suction Line (S)	5/8″ (15.9mm)	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)	3/4″ M CPVC (19mm)
TXV with Built in Check Valve & Bypass		Yes	Yes	Yes	Yes
Freeze Stat		Yes	Yes	Yes	Yes
Access Port(s)		Yes	Yes	Yes	Yes
Shipping Weight		17 lbs (7.7 kg)	27 lbs (12.2 kg)	34 lbs (15.4 kg)	45 lbs (20.4 kg)
Coil Module Dimensions (L x W x H)		14 3/8″ x 12 1/4″ x 12 3/8″ (365mm x 311mm x 314mm)	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 1/2″ (492mm x 257mm x 470mm)	25 3/8″ x 10 1/8″ x 18 1/2″ (645mm x 257mm x 470mm)

[1] Minimum of **four HE outlets per ton** of cooling needed. (2" Duct = Minimum **eight 2" 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

RCM Refrigerant Module comes with:

- Heat Pump Ready Thermal Expansion Valve with Built-In Check Valve
- Integrated Access Port(s)
- Freeze Stat
- Two L-Mounting Brackets
- Carry-over Screen
- Drain Pan

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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:

Motors, Blowers, Motor & Blower Assemblies, WEG Controllers, Circuit Boards, Dampers, Zoning Controls, Heating Coils, Chilled Water Coils, Electric Strip Heaters, Air Conditioning Coils, HEPS Air Purification Systems and Inverter Drive Heat Pumps

A One (1) Year Limited Warranty is extended on:

Replacement parts not listed above

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

Note: If any product is installed in or exposed to a corrosive environment, warranty will be void.

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.

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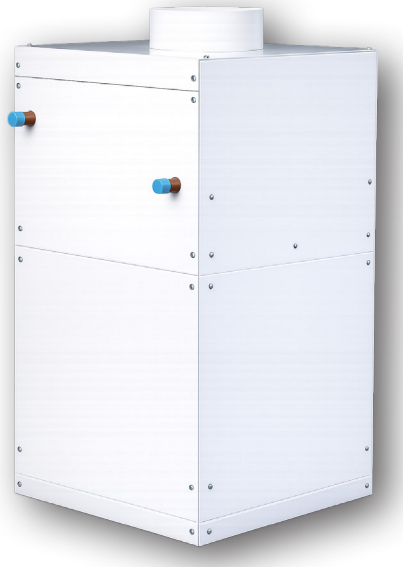
For all of your Heating, Cooling and Indoor Air Quality needs, the Hi-Velocity System is the right choice for you!

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Small Duct Heating, Cooling and IAQ Systems

Build Smart, Breathe *Easy*

Hi-Velocity HE-Z Air Handlers, Green Technology



Energy Saving Products Ltd

Phone: 780-453-2093
Fax: 780-453-1932
Toll Free: 1-888-652-2219

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