



Small Duct High Velocity Heating, Cooling and Home Comfort Systems

RBM-I Refrigerant Base Module

Installation Manual

For use with HVS-24, HVS-36 & HVS-60 Variable Speed Heat Pumps



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

Includes:
Freeze Stat
Drain Pan
Service/ Access Port(s)
T-Mounting Brackets
Mounting Tape
Hole Plugs (2)

Manufactured By
Energy Saving
PRODUCTS LTD

Refrigerant Base Modules (RBM-I)

The RBM-I Series cooling coil comes as a module and can be installed in the vertical or horizontal position on the return air side of the air handler. The RBM-I comes with T-mounting brackets, access port(s), an external freeze stat*, and additional components for air sealing.

RBM-I modules can be used on any R-410A condenser if R-410A refrigerant components are used. All Energy Saving Products R-Series modules come standard with R-410A refrigerant components.

This module is for use with HVS-24, HVS-36 and HVS-60 Inverter Heat Pump Condensing Units. It does not come with thermal expansion valve, as there are internal EXVs inside the Heat Pump. When installing the RBM-I Modules, DO NOT INSTALL WITH TXVs.

The module will come with access port(s) that will need to be installed to read refrigerant pressures/temperatures at the Evaporator (RBM-I). Fig. 01 shows approximate installation locations for these components.

RBM-I Modules were designed to be used with the HVS-24, HVS-36 and HVS-60 Heat Pumps but can be used on any R-410A condensing unit, as long as a TXV is installed as well. All Energy Saving Products cooling modules come standard with R-410A refrigerant components.

***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 RBM-I related warranty issues being voided.

NOTE: Do not remove protective bubble wrap from Freeze Stat

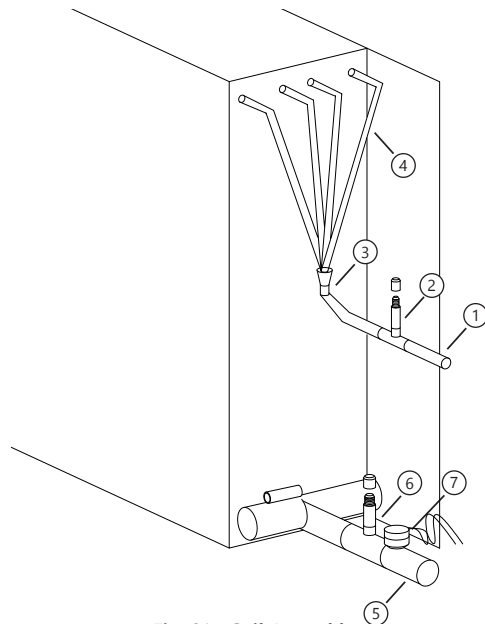


Fig. 01 - Coil Assembly

1) Liquid line	5) Suction line
2) High side access port (if applicable)	6) Low side access port
3) Refrigerant distributor	7) Freeze Stat (Anti-ice Control)
4) Distributor tubes	

Coil Configuration

The RBM-I module can be installed as a stand (return air base) for the air handler or as a side mounted coil. When the desired air inlet side has been determined, the module can be adapted. The module comes ready as left to up/right orientation (Fig. 02) but can easily be changed to a right to up/left orientation. (Fig. 03) See page 3 for steps to adapt the coil to up/left.

The RBM-I Module can be installed in four different configurations:

A - Entering air in through the left, leaving through the top.

B - Entering air in through the left, leaving through the right.

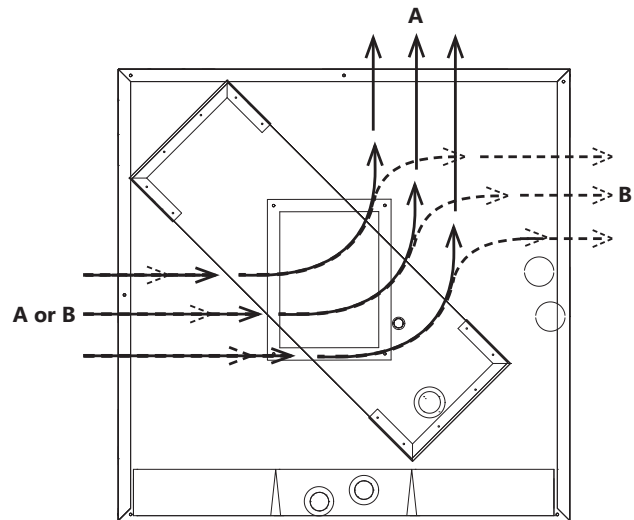


Fig. 02 - Up/Right Orientation

OR (WITH ADAPTATION)

C - Entering air in through the right, leaving through the top.

D - Entering air in through the right, leaving through the left.

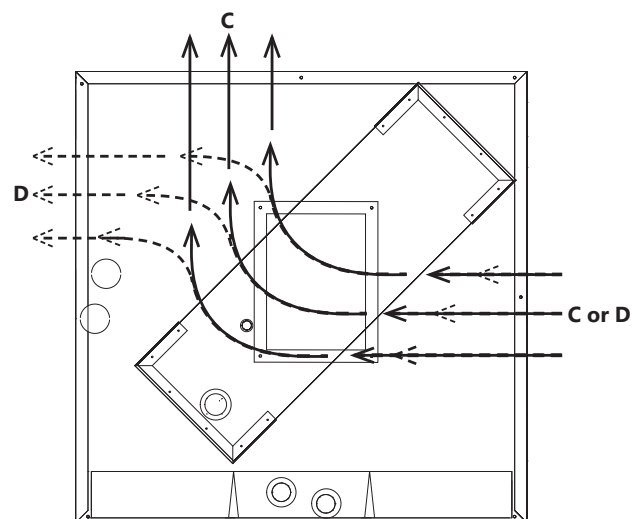


Fig. 03 - Up/Left Orientation

RBM-I Change Configuration

To change from up/right (standard) configuration to up/left configuration, follow the steps below.

- 1) Remove front door from module. (Fig. 04)

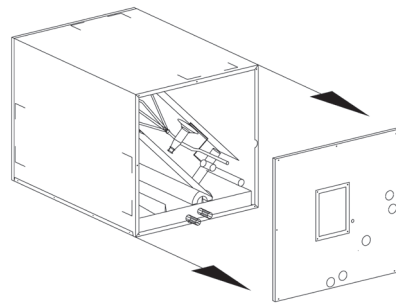


Fig. 04

- 2) Remove drain pan by sliding it out from the bottom of the coil casing, ensuring that the foam air dam is also removed. (Figs. 05a, 05b)

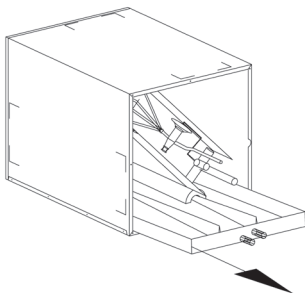


Fig. 05a

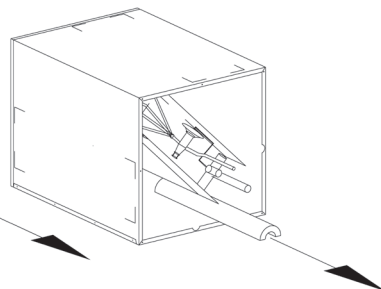


Fig. 05b

- 3) Rotate entire unit 90 deg. clockwise. (Fig. 06)

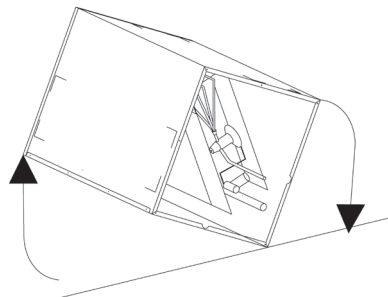


Fig. 06

- 4) Position the blue horse hair filter in front of the drain line inlets, to filter condensate and prevent any air from bypassing under the coil through the gap in the drain pan's air dam. (Figs. 07a, 07b)

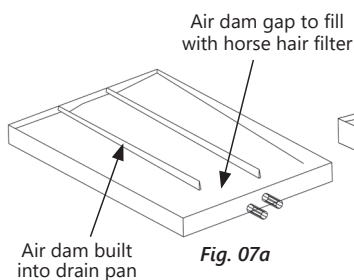


Fig. 07a

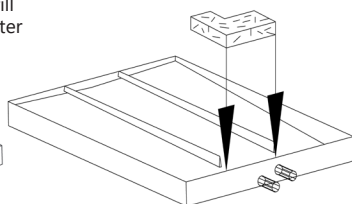


Fig. 07b

- 5) Replace the drain pan in (new) bottom location. (Fig. 08)

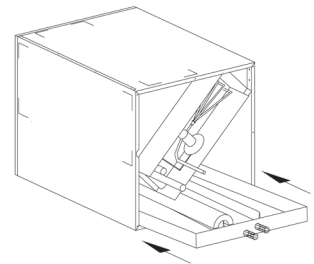


Fig. 08

- 6) Ensure the foam air dam is re-installed under the corner of the coil to prevent air from bypassing under the coil. (Fig. 09)

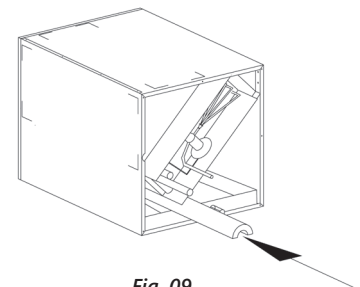


Fig. 09

- 7) Remove round knock-outs on the door to fit drain lines. Plug previously used drain holes with provided plugs. (Fig. 10)

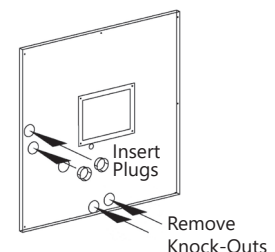


Fig. 10

- 8) Replace front door on module. (Fig. 11)

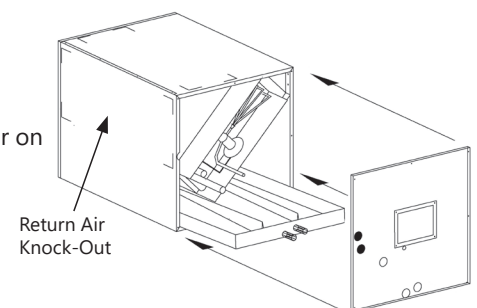


Fig. 11

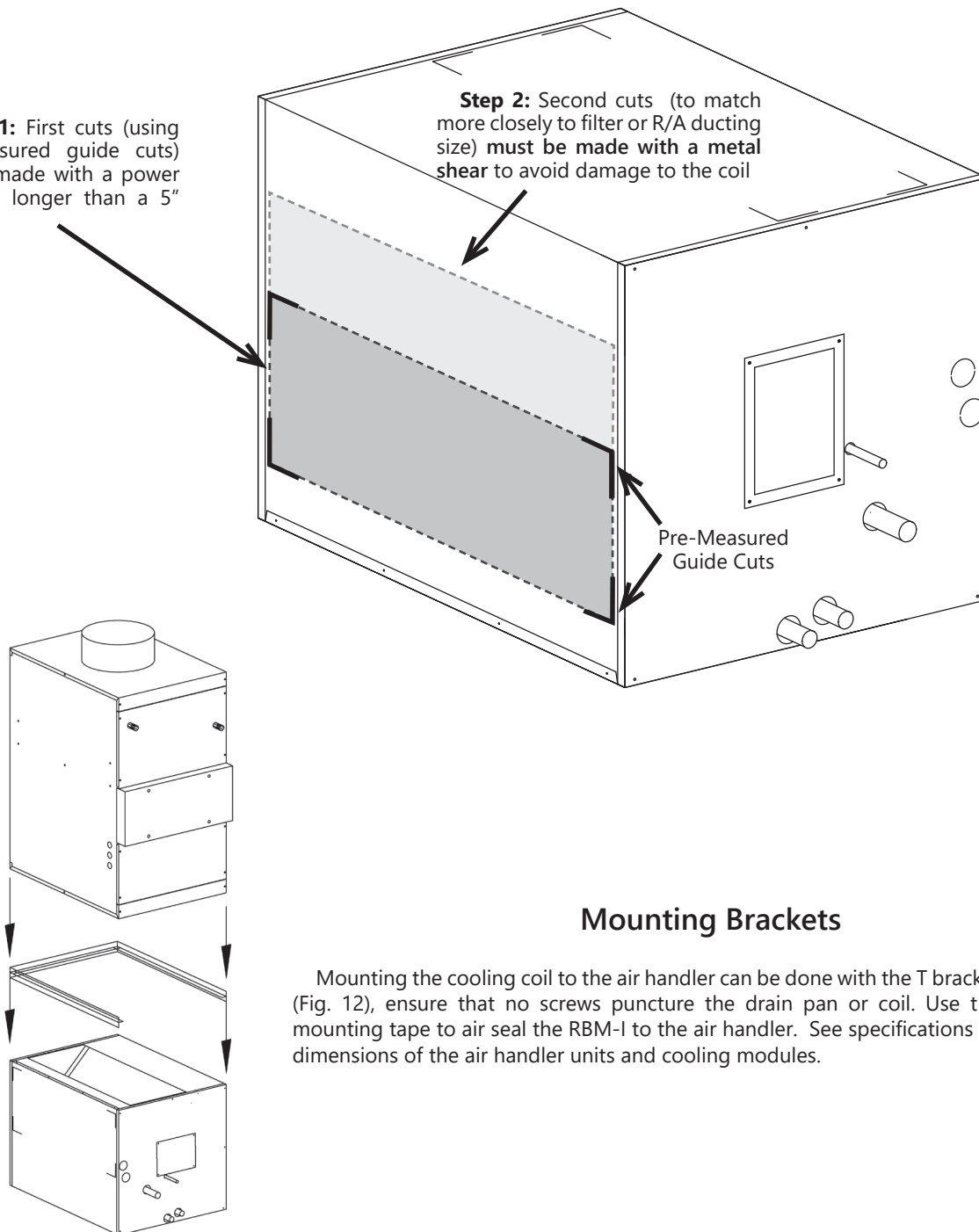
Return Air Cutouts

Once the RBM-I coil configuration and placement of the return air ducting has been decided, the return air knockout(s) can be cut. The pre-measured guide cuts supplied with the RBM-I coil should always be used to make the first cut. For this first cut, do not use a saw blade longer than 5" (125mm) or damage to the coil can occur.

TO AVOID DAMAGE: After the first initial cut using the return air knockout(s) a metal shear must be used to make the return air cutout opening match more closely to the filter or return air ducting size to maximize flow capacity. Use this cut method for both coil inlet and outlet.

Step 1: First cuts (using pre-measured guide cuts) can be made with a power tool (no longer than a 5" blade)

Step 2: Second cuts (to match more closely to filter or R/A ducting size) must be made with a metal shear to avoid damage to the coil



Mounting Brackets

Mounting the cooling coil to the air handler can be done with the T brackets supplied (Fig. 12), ensure that no screws puncture the drain pan or coil. Use the provided mounting tape to air seal the RBM-I to the air handler. See specifications page for the dimensions of the air handler units and cooling modules.

Fig. 12

Access Ports

When refrigerant lines are connected to the RBM-I coil, access port(s) must be connected as well. (Fig. 01 - reference 2 & 6) With the use of a tee and reducer this process is simplified. The access ports are required for system startup and for future trouble shooting or service. When reading refrigerant pressures/temperatures, always read them at the evaporator access port.

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. 15). The drain line must run at a slope of 1/4" per foot in the direction of the drain. RBM-I modules come with a 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.

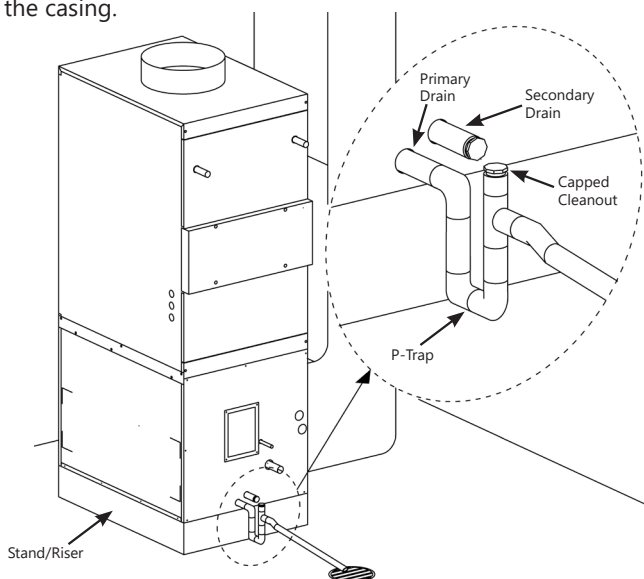


Fig. 15 - Example of Recommended Condensate Piping

Piping the RBM-I

Only refrigerant grade pipe and fittings are to be used with the RBM-I Module. Plumbing fittings may contain wax or other contaminants which are detrimental to the proper operation of the system. Insulate the suction line with a minimum of 3/8" insulation. For inverter heat pump applications, insulating both suction and liquid lines is mandatory. In high heat areas, a minimum of 1/2" insulation may be needed. 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. Minimum refrigerant pipe length is 16ft (6m). If going less than 16 ft, coil the additional copper pipe up in horizontal loops to ensure proper oil return. 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. Lines running over 213' (65m) are not recommended.

Freeze Stat

The RBM Series cooling module 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. **NOTE: Do not remove protective bubble wrap from Freeze-Stat.**



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).

Pipe Sizing

Refer to the charts below and Module HVS - Variable Speed Heat Pump Manual for pipe sizing.

Minimum pipe sizes, maximum length and maximum lift

Model	Liquid Line	Suction Line	Maximum Length	Maximum Lift
HVS-24	3/8" (9.5 mm)	5/8" (15.9 mm)	164.5' (50 m)	82' (25 m)
HVS-36	3/8" (9.5 mm)	5/8" (15.9 mm)	213.25' (65 m)	98.4' (30 m)
HVS-60	3/8" (9.5 mm)	3/4" (19 mm)	213.25' (65 m)	98.4' (30 m)

The HVS Variable Speed Heat Pump comes with a factory charge. Additional charge will only be needed on line sets longer than 25 ft. (See table below)

Minimum pipe sizes, factory charge and additional refrigerant required

Model	Liquid Line	Suction Line	Factory Charge (kg)	Add extra refrigerant for line sets over 25 ft (7.5 m)
HVS-24	3/8" (9.5 mm)	5/8" (15.9 mm)	5.18 lbs (2.35 kg)	1 oz/ 3 ft
HVS-36	3/8" (9.5 mm)	5/8" (15.9 mm)	6.75 lbs (3.06 kg)	1 oz/ 3 ft
HVS-60	3/8" (9.5 mm)	3/4" (19 mm)	10.15 lbs (4.6 kg)	1 oz/ 3 ft

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 HVS Variable Speed Heat Pump manual to ensure proper airflow. The outdoor unit must be installed level, in a properly supported location. If proper refrigerant piping techniques are used, a liquid line bi-directional filter/drier is not needed. More information can be found in module HVS - Variable Speed Heat Pump Manual.

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.

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 properly evacuate the system from both of the access ports to 1500 microns, to ensure system is free of contaminants. Add refrigerant 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.

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 time. By referring to page 5 in the HVS Heat Pump Manual, if additional refrigerant is needed, weigh in the recommended amount. Truly, the only way to tell if the system is properly charged is by pulling out all refrigerant, then weighing it back in based on the factory charge listed on the rating plate, plus any additional refrigerant needed based on page 5 of Module HVS - Variable Speed Heat Pump Manual.

The RBM-I coil can operate at a level that is different from most other conventional system coils. This coil is supplied refrigerant by a variable speed condenser/compressor, so refrigerant pressures and temperature can vary as well. Temperature and pressure reading aren't as important for a refrigeration technician to know in a variable speed heat pump condensing unit.

Important: Failure to follow the proper evacuating and charging procedures may void warranty.

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

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 air handler. 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.

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.

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 RBM-I or Hi-Velocity Systems unit.

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

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.

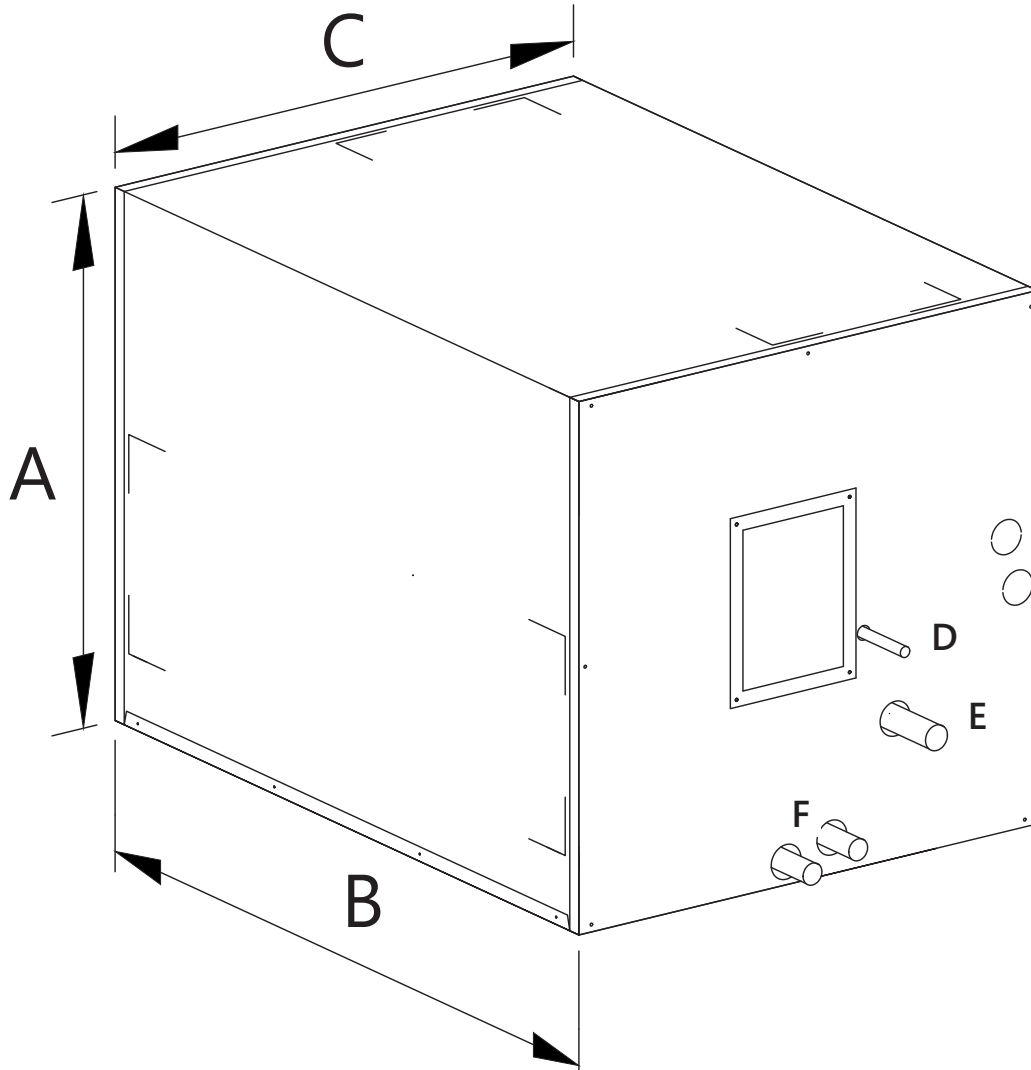
Specifications		RBM-I-50	RBM-I-70	RBM-I-100
Part Number		41090303050	41090303070	41090303100
Matching Air Handler		HE-Z/HE-B/HE/HV-50/51 CU-51 LV-Z/LV-B-750/751 LV-50	HE-Z/HE-B/HE/HV-70/71 LV-Z/LV-B-1050/1051 LV-70	HE-Z/HE-P/HE-B/HE/ HV-100/101 HE-P-240/241 (x2 Coils)
Matching Inverter Heat Pump		HVS-24	HVS-24, HVS-36	HVS-24, HVS-36, HVS-60
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)
Connection Sizes	Liquid Line (Lq)	1/2" (13mm)	1/2" (13mm)	1/2" (13mm)
	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)
Freeze Stat		Yes	Yes	Yes
Access Port(s)		Yes	Yes	Yes
Shipping Weight		35 lbs (15.9 kg)	45 lbs (20.4 kg)	55 lbs (24.9 kg)
Module Size (L x W x H)		14 1/2" x 18 1/4" x 18 1/4" (368mm x 464mm x 464mm)	19 1/2" x 18 1/4" x 18 1/4" (495mm x 464mm x 464mm)	25 1/2" x 18 1/4" x 18 1/4" (648mm x 464mm x 464mm)

(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

RBM Series Sizing

Item	Length	Width	Height	Liquid Line	Suction Line	Drain Conn.
Refrigerant Modules	B	C	A	D	E	F
RBM-I-50	14 1/2" (368mm)	18 1/4" (464mm)	18 1/4" (464mm)	1/2" o.d.	7/8" o.d.	3/4" M CPVC
RBM-I-70	19 1/2" (495mm)	18 1/4" (464mm)	18 1/4" (464mm)	1/2" o.d.	7/8" o.d.	3/4" M CPVC
RBM-I-100	25 1/2" (648mm)	18 1/4" (464mm)	18 1/4" (464mm)	1/2" o.d.	7/8" o.d.	3/4" M CPVC



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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