



Small Duct High Velocity Heating, Cooling and Home Comfort Systems

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# RCM Refrigerant Module

## Installation Manual

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**RCM-50 (1.5-2 Tons)**

**RCM-70 (2.5-3 Tons)**

**RCM-100 (3.5-5 Tons)**

Includes:

TX Thermal Expansion Valve

Site Glass

Service/Access Port(s)

Freeze Stat

L-Mounting Brackets

Mounting Tape

Manufactured By  
**Energy Saving**  
PRODUCTS LTD

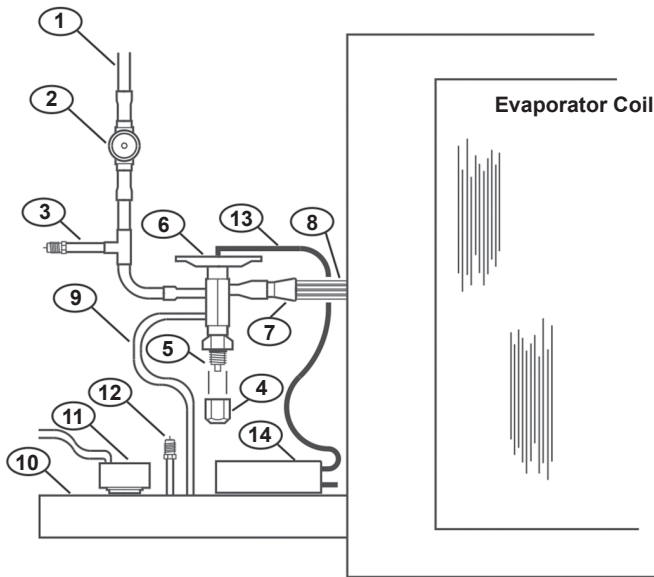


## Refrigerant Modules (RCM)

The cooling coil comes as a module and must be installed in the vertical position on the return air side of the air handler. For return air cut out sizes, refer to Table 3 – Return air cutouts.

Refrigerant modules come with two L mounting brackets, thermal expansion valve, site glass, access port(s), and an external freeze stat. Fig. 01 shows an installed coil assembly and how each piece is connected.

Fig. 01 - Coil Assembly



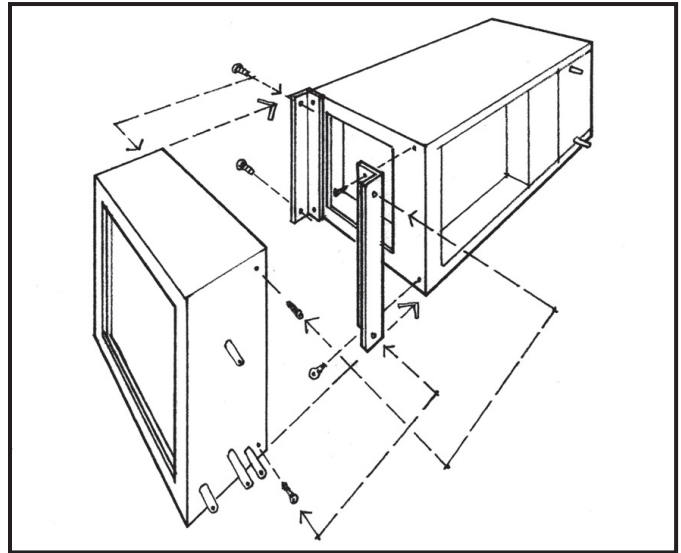
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|--|----------------------------|
| 1) Liquid line                           | 8) Distributor tubes       |
| 2) Site glass                            | 9) External equalizer line |
| 3) High side access port (if applicable) | 10) Suction line           |
| 4) Adjustment stem cap                   | 11) Anti-ice control       |
| 5) Superheat adjustment stem             | 12) Low side access port   |
| 6) Thermal expansion valve (TX)          | 13) TX capillary tube      |
| 7) Refrigerant distributor               | 14) TX sensing bulb        |

R series modules can be used on R-410A condensers; if R-410A refrigerant components are used. All Energy Saving Products R series modules are shipped with R-410A refrigerant components.

## 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)

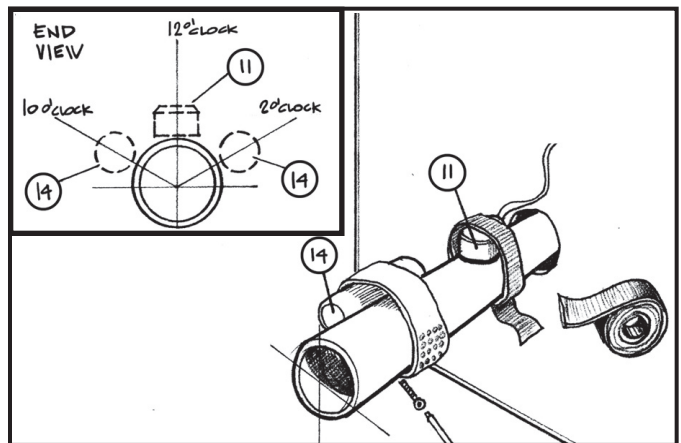
When brazing the TX valve to the copper liquid line, a brazing rod that can bound dissimilar metals should be used. Always wet rag or use heat dissipating paste on the TX body to reduce the chance of overheating the valve.

## 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 – reference 14).

Fig. 03 - TX sensing bulb



## Site Glass and Access Ports

When refrigerant lines are connected to the air handler, a site glass needs to be installed (Fig. 01 – reference 2), as well as access port(s) (Fig. 01 – reference 3 & 12). The site glass should be installed close enough to the coil to be seen while charging the system. The site glass and access ports are required for system startup and for future trouble shooting or service.

## External Equalizer Line

The external equalizer line should be installed on the suction line, immediately after the remote sensing bulb (Fig. 01 – reference 9). 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.

## Freeze Stat

**\*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.

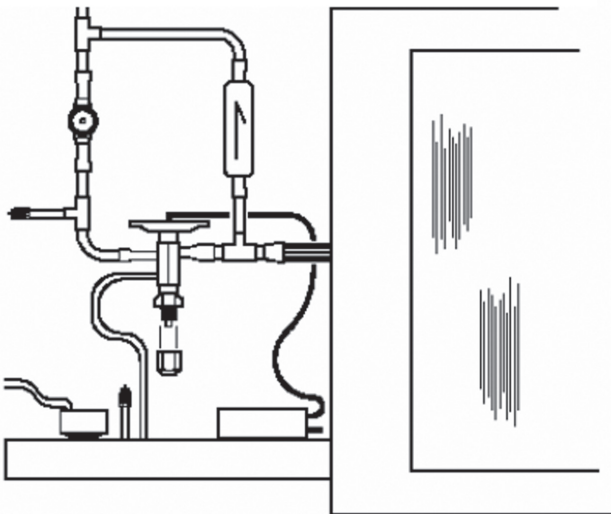
Install the anti-ice control (Freeze-Stat) above the center line of the suction line and connect the wires to the Freeze Stat terminals on the air handler circuit board (Fig. 01 and Fig. 03 – reference 11).

Ensure that the TX bulb and the anti-ice control are fastened securely and are well insulated. Do not use a self-tightening clamp on the anti-ice control, as the control may be damaged by excessive tightening.

## 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



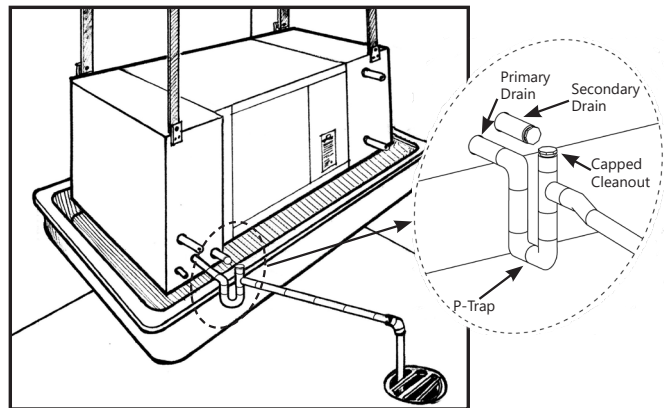
## Drain Connections, P - Trap & Secondary Drain Pan

**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 1/4" per foot in the direction of the drain. RCM 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. 05 - Secondary drain pan



## 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 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. For lines running over 50', a suction line accumulator must be installed. Lines running over 100' are not recommended.

## Pipe Sizing

Tables 01 and 02 contain line sizing information for the liquid and suction lines.

Table 01 – Liquid Line sizes								
	Tons							
Distance	1	1½	2	2½	3	3½	4	5
1'–25'	¼	¼	⅝ <sub>16</sub>	¾	¾	¾	¾	½
26'–50'	⅝ <sub>16</sub>	⅝ <sub>16</sub>	¾	¾	½	½	½	½
51'–75'	¾	¾	¾	½	½	½	½	½
76'–100'	¾	¾	½	½	½	½	½	½

Table 02 – Suction Line sizes								
	Tons							
Distance	1	1½	2	2½	3	3½	4	5
1'–25'	⅝	⅝	¾	¾	¾	⅞	⅞	1
26'–50'	⅝	¾	¾	¾	⅞	⅞	1⅛	1⅛
51'–75'	¾	¾	⅞	⅞	1⅛	1⅛	1⅛	1⅛
76'–100'	¾	⅞	⅞	1⅛	1⅛	1⅛	1⅛	1⅛

The sizes given in the above tables are only for general reference, if the condenser manufacture requires a different size than specified in **Table 01** and **Table 02**, their sizing shall be used whenever a discrepancy occurs.

## 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

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.

## Super Heat

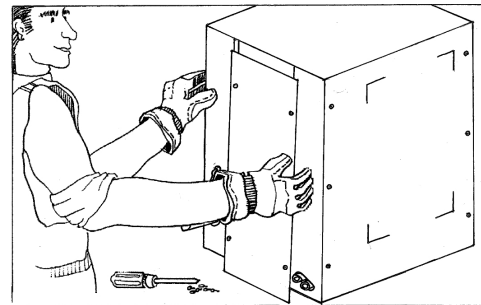
Super heat on Hi-Velocity systems with the RCM series should normally be around 8°F -12°F. The suction line should be set at approximately 42°F.

## Refrigerant Pre-Piped Module (RPM-E)

An alternative to the RCM, our RPM-E Series comes pre-piped with the coil assembly; the coil assembly is shown in Fig. 01. With the RPM, the Liquid and Suction line 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 (Fig. 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.

Install the RPM with the same procedures used per RCM, omitting the coil assembly as it has already been pre-piped.

Fig. 06 - Remove front access panel



## Carry Over Screen

All 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.

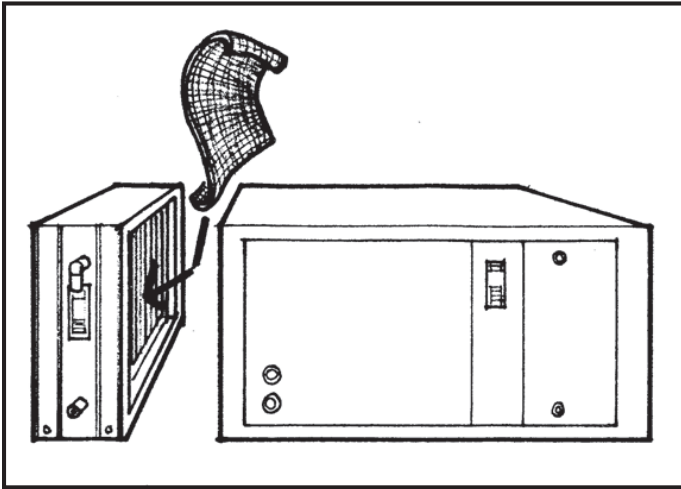
Ensure that the nylon mesh is placed on the exiting air side of the cooling module (Fig. 07).



## Installation Instructions

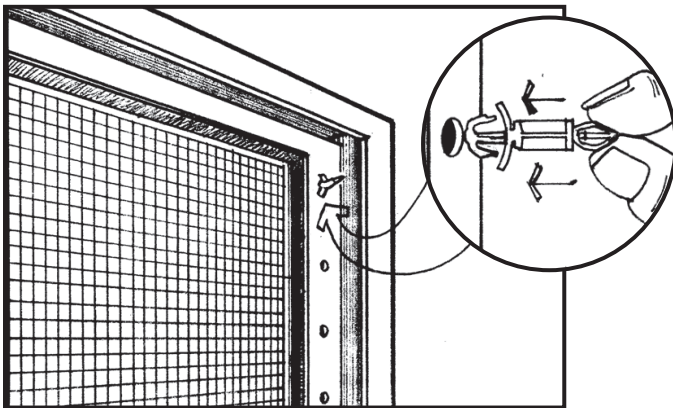
The carry-over screen is placed on air handler side of the cooling module (Fig. 07).

*Fig. 07 - Screen on the air handler side*



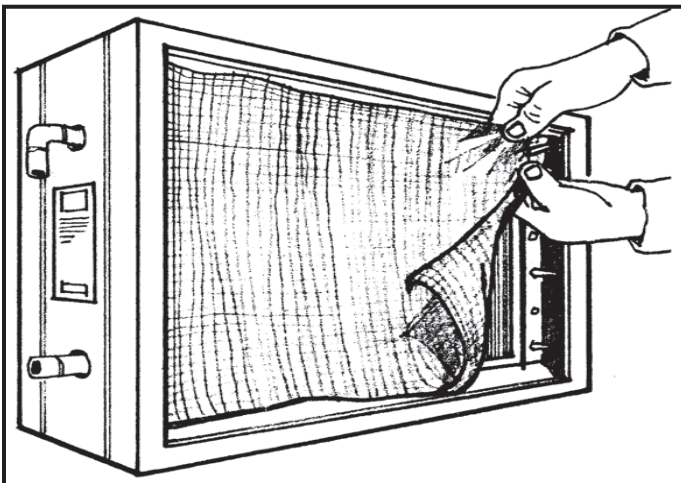
On the air handler side of the cooling module, attach three plastic stand-offs down each side of the cooling coil (Fig. 08).

*Fig. 08 - 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. 09).

*Fig. 09 - Attach screen to coil*



## 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/minus 20% is allowable for sizing return ducts that connect to the Hi-Velocity Systems unit.

It is recommended to install a grill that is 10 - 20% larger than specifications require, this will ensure that there is no air velocity noise at the grill. Where allowed by local codes, a single return air grill may be used. When using flexible duct for return air, use one duct size larger due to the higher friction loss.

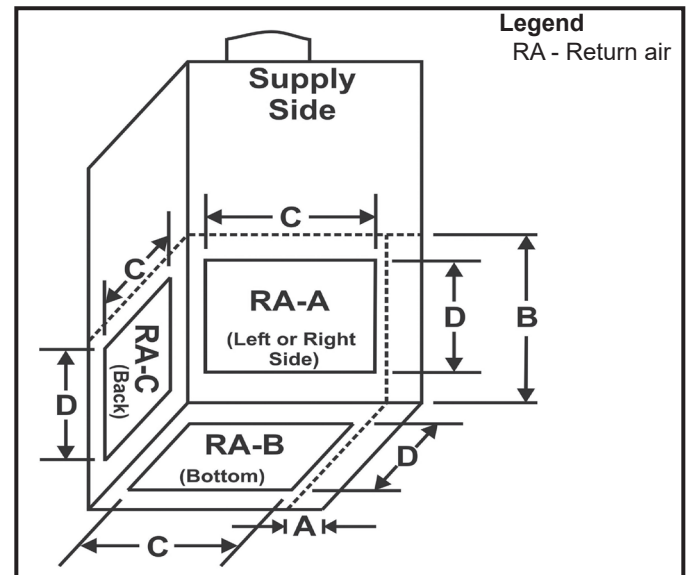
## Return Cutout

Fig. 10 shows the different locations the return air can be installed on Hi-Velocity Systems. Table 03 contains the dimensions needed for the return. All air handlers are shipped with a Return Air Cutout template; the template will guarantee maximum airflow across the coil.

**Table 03 – Return air cutouts**

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

*Fig. 10 - Return air cutout sizing*

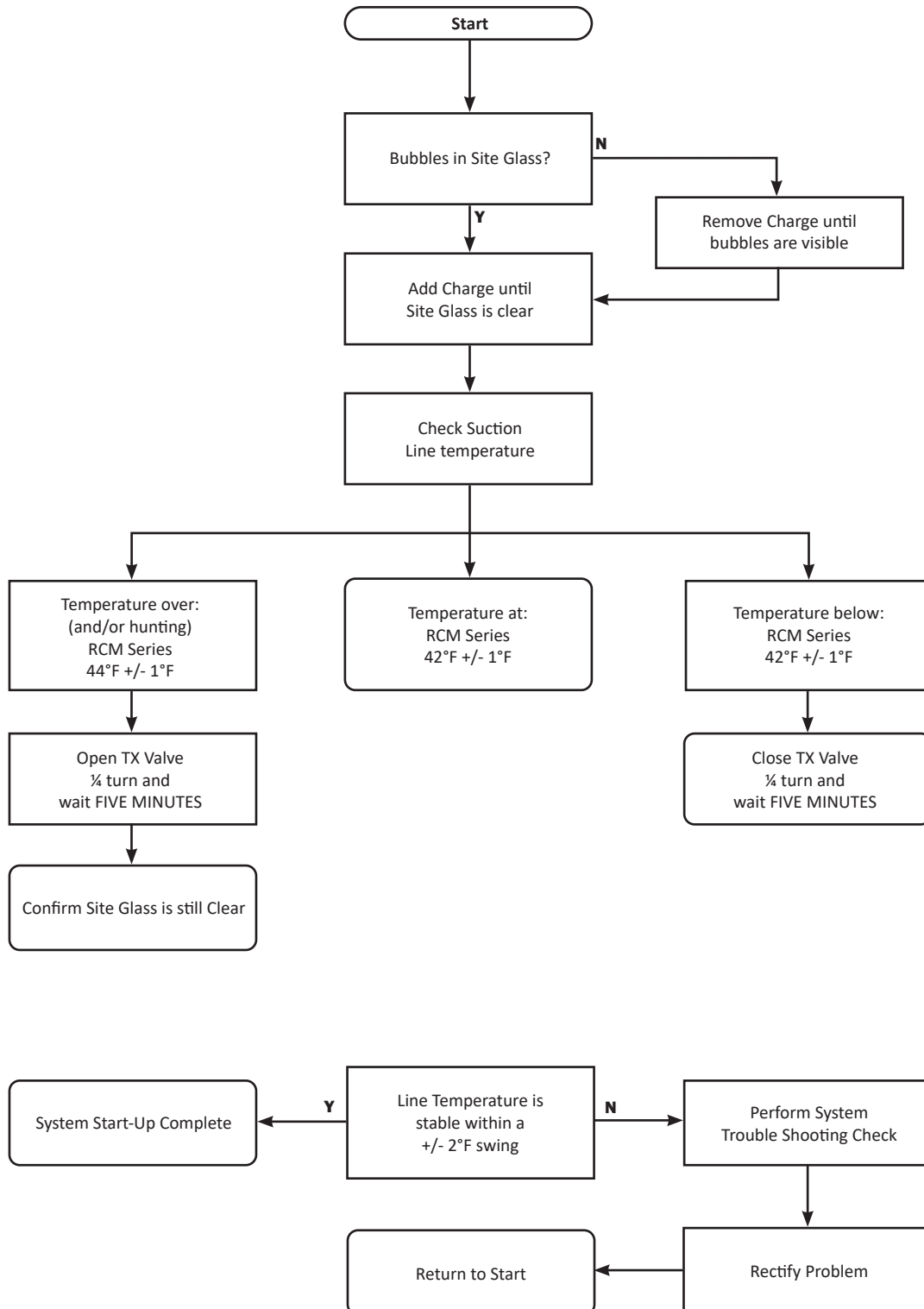


### Note:

- 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.

## Cooling Start-Up

1. Pipe system with Site Glass and Access Port(s) at the evaporator.
2. Leak check and evacuate system.
3. Check system operation with power to the outdoor unit off or use the service disconnect.
4. Connect gauges and open outdoor unit service valves.
5. Turn on power to the outdoor unit and start system.





# 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 <sup>(1)</sup>		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 <sup>(2)</sup>		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
Site Glass		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)

<sup>(1)</sup> Minimum of **four HE outlets per ton** of cooling needed. (2" Duct = Minimum **eight 2" outlets per ton**)

<sup>(2)</sup> 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)
- Site Glass
- Freeze Stat
- Two L-Mounting Brackets
- Carry-over Screen
- Drain Pan



## 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](http://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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