



VENTILATION GUIDELINES

FOR GAS/ELECTRIC REFRIGERATORS

Norcold, Inc.
P.O. Box 4248
Sidney, OH 45365-4248

Norcold Technical Support
Telephone: 800-444-7210
Fax: 937-497-3183
Web Site: www.norcold.com

Introduction

Norcold refrigerators are certified under the latest edition of ANSI Z21.19 Refrigerator Standard by CSA International for installation in recreational vehicles.



WARNING: DO NOT install this refrigerator in below deck marine applications. Do not install this refrigerator in fixed indoor cabin or other dwelling applications. This refrigerator must use only NORCOLD designed and approved outside air intake and exhaust ventilation for correct and safe operation. Any other ventilation could cause lethal combustion exhaust fumes and/or explosive propane gas fumes to be in the living area and/or below deck.

There are several safety and performance reasons why the correct ventilation is necessary for a gas absorption type refrigerator. These are to make sure that:

- there is enough fresh air intake to support combustion.
- the living area of the vehicle is completely isolated from the combustion system of the refrigerator.
- the flue exhaust gases are not trapped inside the vehicle.
- the heat generated by the refrigerator will readily escape to the outside of the vehicle.
- any leaking propane gas will readily escape to the outside of the vehicle.

These guidelines explain the importance of these reasons for ventilation and how the construction of the refrigerator enclosure in the vehicle affects ventilation.

NOTE: These instructions contain general guidelines for the installation of the lower intake vent, the upper exhaust vent, and the baffles for each configuration. These instructions do not replace the Installation Manual of each refrigerator model. Please refer to the specific Installation Manual of each refrigerator model for the approved vents, for the vent installation instructions, and for any specific construction exceptions.

General Ventilation Requirements

During operation, the refrigerator creates heat in the generator area of the cooling system. The refrigerator also extracts heat from inside the refrigerator and transfers it to the condenser fins and the absorber coils on the back of the refrigerator. This heat is called "rejected heat". For refrigeration to occur, a continuous supply of air must pass over the hot condenser fins and the absorber coils in order to remove this rejected heat. The more rejected heat that the condenser fins and absorber coils gives up to the air, the better the cooling performance of the refrigerator.

Since the refrigerator operates inside of an enclosed space within the vehicle, a good ventilation design must do three (3) things. It must:

- completely isolate the combustion exhaust fumes of the refrigerator from the living space of the vehicle.
- create a natural draft over the condenser fins and absorber coils to remove the rejected heat (and gas combustion products when present).
- isolate the rejected heat away from the sides and top of the refrigerator cabinet.

Creation of a draft and isolation of the refrigerator cabinet are accomplished by the use of a combination of lower and upper vents and baffles.

Isolating the Combustion Exhaust Fumes From the Vehicle Living Area



WARNING: Make sure that the refrigerator cooling system is completely sealed away from the living area of the vehicle. During propane gas operation, the refrigerator cooling system produces exhaust fumes that contain carbon dioxide and carbon monoxide. The breathing of exhaust fumes can cause dizziness, nausea, or in extreme cases, death.

During propane gas operation, the refrigerator burns propane gas to operate the cooling system. The combustion produces exhaust fumes. The breathing of exhaust fumes can cause dizziness, nausea, or in extreme cases, death. isolated from the living area of the vehicle.

The refrigerator contains a foam combustion seal which is between the front mounting flanges of the refrigerator and the interior wall of the vehicle. This combustion seal must remain intact because it prevents the exhaust fumes from moving around the top, bottom, and sides of the refrigerator and entering the living area of the vehicle. The refrigerator enclosure also must be constructed so that it prevents the exhaust fumes from entering the living area of the vehicle. There must be no openings in the refrigerator enclosure that are not completely

Creating Draft

There are two (2) basic requirements to create a draft:

- a sufficient elevation difference between the intake and the exhaust vents.
- a sufficient temperature difference between the warmer interior air and the cooler outside air.

The construction of the vehicle uses three (3) features to meet these basic requirements. These features are:

- a correctly positioned lower intake vent which allows outside air to enter the vehicle below the heated condenser fins and absorber coils.
- a correctly positioned upper exhaust vent which allows the heated air to exit the vehicle above the heated condenser fins and absorber coils.
- baffles which direct the air over the heated condenser fins and absorber coils and isolate the rejected heat away from the top and sides of the refrigerator cabinet.

The air around the heated condenser fins and absorber coils absorbs some of the rejected heat from these components. However, the outside air must be at a lower temperature than the heated condenser fins and absorber coils for these components to give up their rejected heat. The heated air becomes lighter and rises up and out of the vehicle through the upper exhaust vent. The rising air starts a draft which pulls more cooler outside air in through the lower intake vent. This is also called the "chimney effect". The greater the temperature difference between the cooler outside air and the rejected heat, the stronger the draft becomes. The stronger the draft becomes, the more rejected heat is given up from the condenser fins and absorber coils. The more rejected heat that is given up from the condenser fins and absorber coils, the better the cooling performance of the refrigerator. This is true only when the draft carries the heat away from the refrigerator as quickly as it is produced.

The draft is stronger when:

- as much of the air as possible passes over the heated condenser fins and absorber coils. The construction of baffles points the air flow through these components and reduces the amount of air that does not flow through them. (This air is called bypass air. Bypass air cools the heated air and weakens the draft.)
- the cross-sectional area (the size) of the "chimney" is the same size for the entire distance between the lower intake vent and the upper exhaust vent. The construction of baffles eliminates areas in the "chimney" that are wide. Wide areas in the "chimney" cause the air speed of the draft to slow down in these areas and weaken the draft.
- the distance between the lower intake vent and the upper exhaust vent increases.

The strength of a draft also varies directly with the barometric pressure. This means that the draft will weaken as the elevation above sea level increases.

Isolating Rejected Heat from the Refrigerator Cabinet

The walls of the refrigerator cabinet contain insulation which keeps the "heat" outside the refrigerator. But, as the temperature of the air surrounding the refrigerator becomes warmer, the more heat is conducted into the refrigerator cabinet and the cooling performance of the refrigerator can decrease. Therefore, the higher temperatures at the rear of the refrigerator must be isolated from the top and sides of the refrigerator cabinet.

About Vents and Baffles

The Lower Intake Vent

The lower intake vent is a hinged or removable door with louvers. It is installed into an opening in the external wall of the vehicle. The lower intake vent should be directly below the condenser fins and the absorber coils of the refrigerator. However, since this vent is also the service access opening for the refrigerator, move it left or right as necessary, so that the burner area of the refrigerator is readily visible and accessible. On most vehicles, the position of the vent directly below the condenser fins and absorber coils will still allow service access. The bottom of the opening for the lower intake vent must be no higher than the bottom of the refrigerator enclosure. Since propane gas is heavier than air, this allows any leaking propane gas to escape to the outside and not to collect at the floor of the vehicle.

The Upper Exhaust Vent

There are two (2) types of upper exhaust vents that can be used. An upper roof exhaust vent is installed into an opening in the roof of the vehicle. An upper side-wall exhaust vent is installed into an opening in the external wall of the vehicle.

The roof exhaust vent is the preferred upper exhaust vent because it is the farthest away from the lower intake vent and therefore, creates the strongest draft. The roof vent should be centered, in both directions, directly above the condenser fins and absorber coils of the refrigerator. If the design of the vehicle does not allow this, center the roof vent above the condenser fins and absorber coils of the refrigerator, but move it inboard as necessary on the roof of the vehicle.

If the design of the vehicle does not allow the use of a roof vent, use a side-wall exhaust vent. The side-wall exhaust vent should be aligned directly above the condenser fins and absorber coils of the refrigerator. The bottom edge of the vent should preferably be higher than the top of the condenser fins. The refrigerator may not perform as well with this type of exhaust vent, especially in high ambient temperatures (above 100° F.). Some refrigerator models require a fan to supply the correct ventilation with a side-wall upper exhaust vent.

The Baffles

Baffles prevent bypass air and allow maximum unrestricted air flow through the heat rejecting condenser fins and absorber coils of the refrigerator. While the refrigerator certification allows zero (0) inch clearance against the bottom, rear, sides and top of the refrigerator, use the following maximum clearances when installing baffles. These are the maximum allowable clearances between the baffles and the refrigerator to assure a good draft.

| Refrigerator surface | Maximum clearance |
|----------------------|-------------------|
| Bottom | 0 inch max. |
| Each Side | 1/8 inch max. |
| Top | 1/4 inch max. |
| Rear | 1 inch max. |

Install the Vents and the Baffles

NOTE: These instructions are general guidelines for the installation of the lower intake vent, the upper exhaust vent, and the baffles for each configuration. These instructions do not replace the Installation Manual of each refrigerator model. Please refer to the specific Installation Manual of each refrigerator model for the approved vents, for specific vent installation instructions, and for any special construction exceptions.

Install the lower intake vent

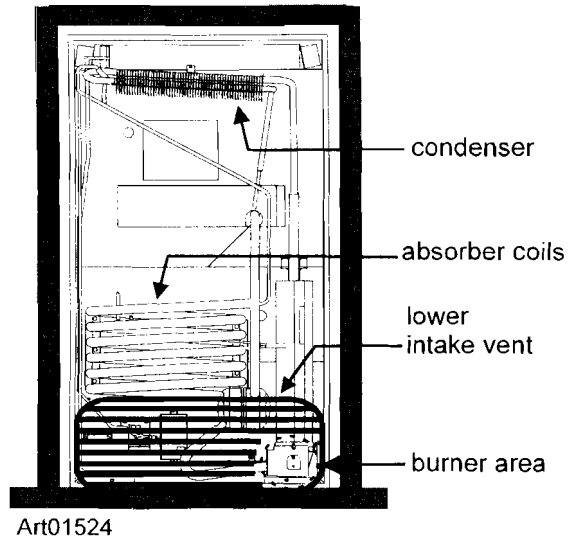
1. Refer to the Installation Manual of each refrigerator model, to find which lower intake vent to use.

NOTE: Table A (Art01522) lists the lower intake vents and rough opening size of each.



WARNING: Make sure that the bottom of the opening for the lower intake vent is no higher than the bottom of the refrigerator enclosure. This allows any leaking propane gas to escape to the outside and not collect at the bottom of the enclosure.

2. Make sure the bottom of the opening for the lower intake vent is at or below the bottom of the refrigerator enclosure.
3. Align the lower intake vent vertically with the condenser fins and the absorber coils (See Art01524).
4. Make sure that the burner area of the refrigerator is readily visible and accessible through the lower intake vent.



Install the upper exhaust vent and the necessary baffles

1. Refer to the Installation Manual of each refrigerator model, to find which upper exhaust vent to use.

NOTE: Table A (Art01522) lists the upper exhaust vents and rough opening size of each.

2. There are three (3) construction options for the upper exhaust vent. Option #1 is the most efficient and Option #3 is the least efficient. Decide which of the following three (3) construction options for the upper exhaust vent to use:

Option #1 - Centered upper roof exhaust vent and baffles

Install a roof exhaust vent that is centered directly above the condenser fins of the refrigerator. The roof exhaust vent must be centered directly above the condenser fins of the refrigerator.

Option #2 - Inboard upper roof exhaust vent and baffles

If the design of the vehicle does not allow the construction of option #1, install a roof exhaust vent that is centered above the condenser fins of the refrigerator, but moved toward the center of the vehicle as necessary to allow it to fit correctly.

Option #3 - Upper side-wall exhaust vent and baffles

If the design of the vehicle does not allow the construction of either option #1 or option #2, install an upper side-wall exhaust vent.

Option #1 - Centered upper roof exhaust vent and baffles

1. Install the roof exhaust vent (See Art01525).

- Make sure the roof exhaust vent is centered above the condenser fins of the refrigerator.
- Make sure the sloped end of the roof exhaust vent is toward the front of the vehicle.

2. Install a top baffle to isolate the rejected heat from the area above the refrigerator. Make sure that this top baffle is:

- the full width of the inside of the enclosure.
- flush with the rear of the refrigerator cabinet.
- less than 1/4 inch from the top of the refrigerator. The baffle may be against the top of the refrigerator.

3. If the distance between the rear of the refrigerator and the inside of the enclosure is more than 1 inch, install two (2) baffles to prevent bypass air around the condenser fins and absorber coils of the refrigerator.

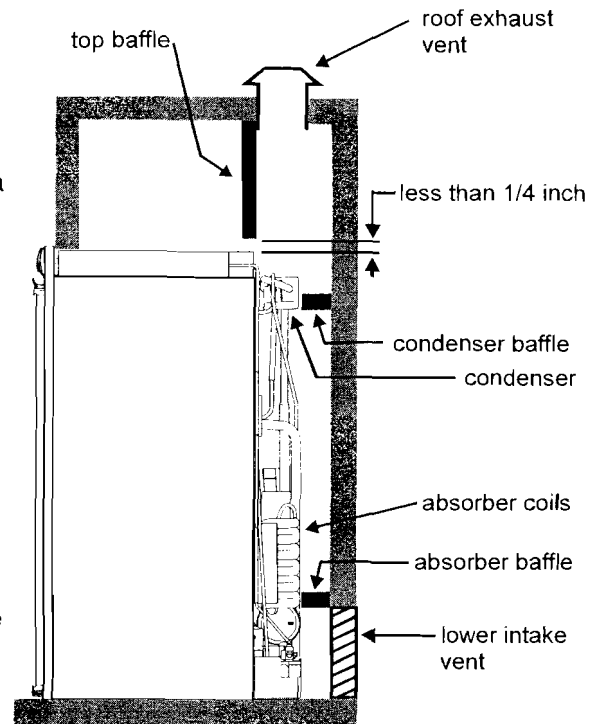
Install a condenser fins baffle that is at the lower edge of the condenser fins of the refrigerator. Install an absorber baffle that is at the top edge of the lower intake vent.

Make sure that both of these baffles are:

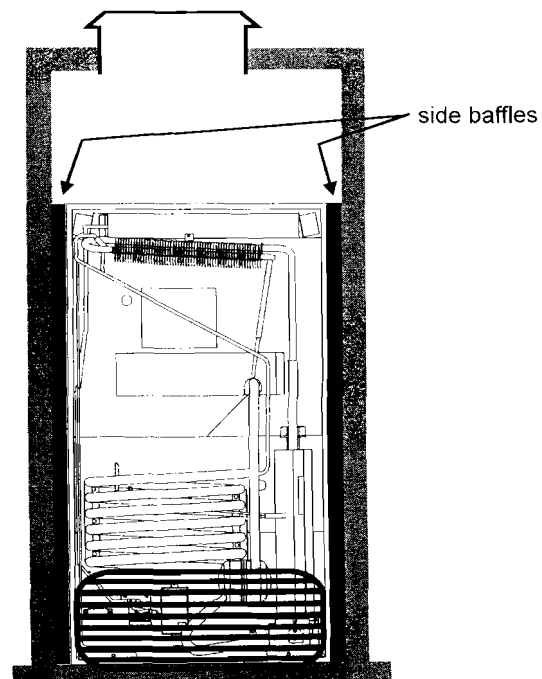
- the full width of the inside of the enclosure.
- less than 1 inch from the rear of the refrigerator. The baffles may be against the rear of the refrigerator.

4. Install side baffles to isolate the rejected heat from the sides of the refrigerator (See Art01527). Make sure that these baffles are:

- flush with the rear of the refrigerator cabinet and the baffle above the refrigerator.
- less than 1/8 inch from the sides of the refrigerator. These baffles may be against the sides of the refrigerator.



Art01525



Art01527

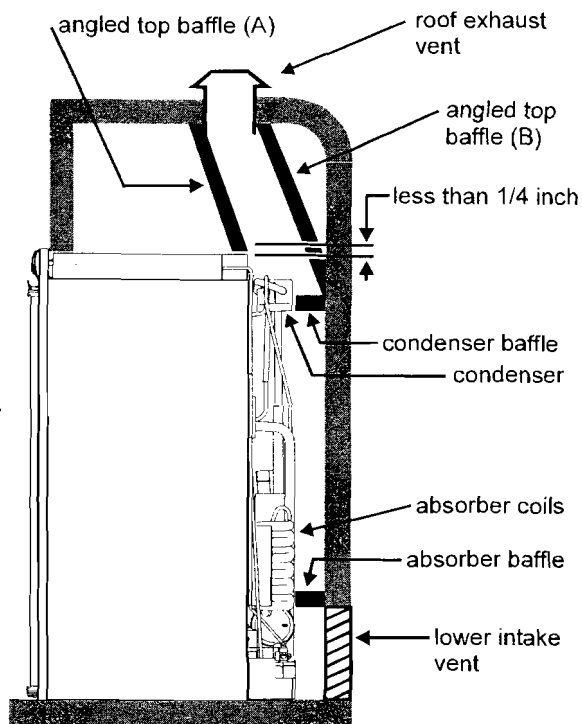
Option #2 - Inboard upper roof exhaust vent and baffles

1. Install the roof exhaust vent (See Art01526).

- Make sure the vent is centered above the condenser fins of the refrigerator.
- Put the roof exhaust vent toward the center of the vehicle as necessary to allow it to fit correctly.

2. Install angled top baffles to isolate the rejected heat from the area above the refrigerator and to change the direction of the draft toward the upper exhaust vent.

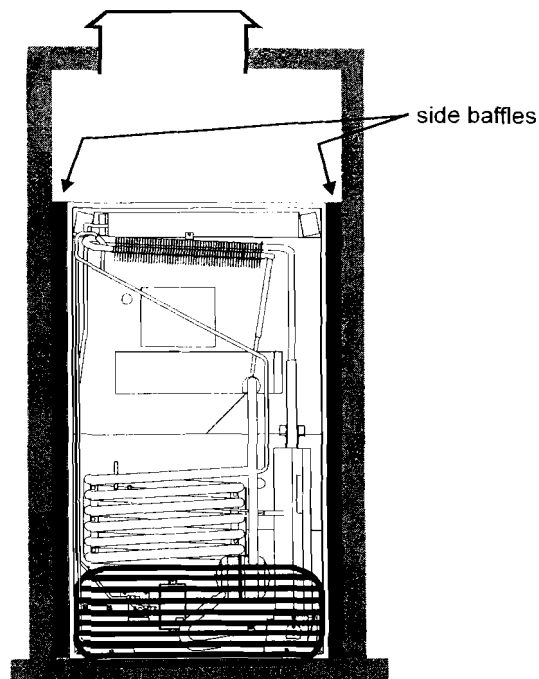
- Install an angled top baffle (A) that is:
 - flush with the rear of the refrigerator.
 - flush with the inboard edge of the opening of the upper exhaust vent.
 - less than 1/4 inch from the top of the refrigerator. The baffle may be against the top of the refrigerator.
- Install another angled top baffle (B) between the roof and the wall of the vehicle that is:
 - flush with the outboard edge of the opening of the upper exhaust vent.
 - as parallel (the same distance from) as possible to angled top baffle (A).
- Make sure that these angled baffles are:
 - the full width of the inside of the enclosure.
 - less than 45° from vertical (straight up and down).



Art01526

3. If the distance between the rear of the refrigerator and the inside of the enclosure is more than 1 inch, install two (2) baffles to prevent bypass air around the condenser fins and absorber coils of the refrigerator:

- Install one baffle that is at the lower edge of the condenser fins of the refrigerator.
- Install another baffle that is at the lower edge of the absorber coils of the refrigerator.
- Make sure that these baffles are:
 - the full width of the inside of the enclosure.
 - less than 1/4 inch from the rear of the refrigerator. The baffles may be against the rear of the refrigerator.



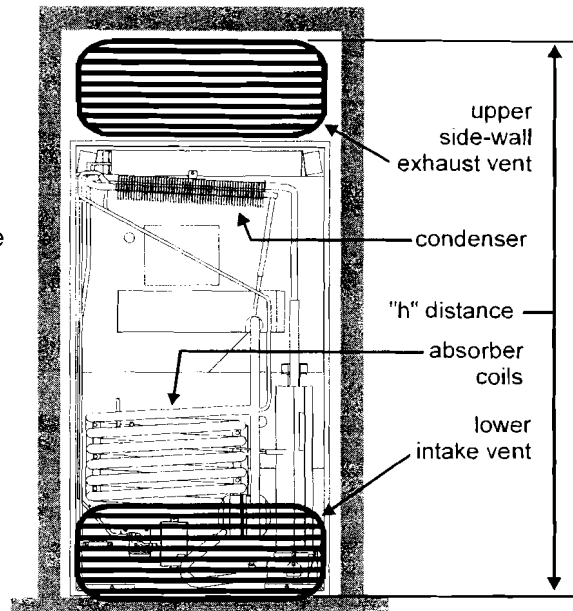
Art01527

4. Install side baffles to isolate the rejected heat from the sides of the refrigerator (See Art01527). Make sure that these baffles are:
 - flush with the rear of the refrigerator cabinet and the angled baffle above the refrigerator.
 - less than 1/8 inch from the sides of the refrigerator. These baffles may be against the sides of the refrigerator.

Option #3 - Upper side-wall exhaust vent and baffles

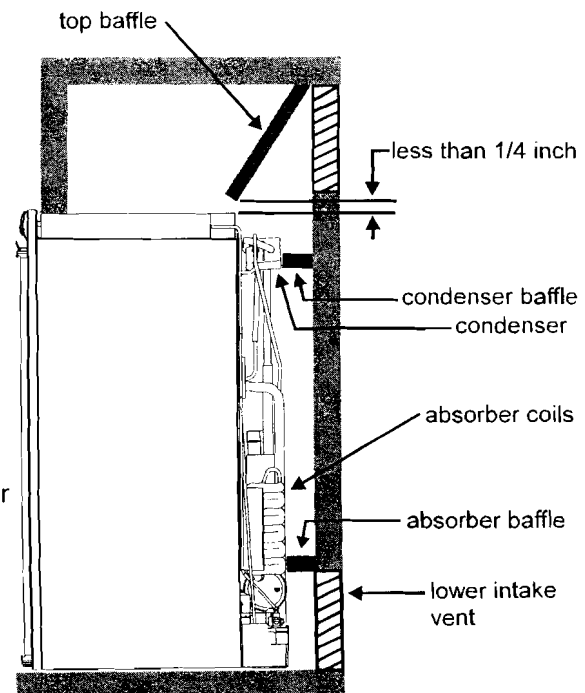
NOTE: An upper side-wall exhaust vent can be used on N600 and N800 models only when these models are equipped with a fan.

1. Install the upper side-wall exhaust vent (See Art01528).
 - Make sure the upper side-wall exhaust vent is centered above the condenser fins of the refrigerator.
 - Make sure that the distance "h" between the bottom of the refrigerator enclosure and the top of the opening for the upper side-wall exhaust vent is equal to or more than the "h" dimension in Table B (Art01523).
2. Install a metal baffle between the top of the refrigerator and the top of the upper side-wall exhaust vent to isolate the rejected heat from the area above the refrigerator (See Art01529). Make sure that this baffle is:
 - the full width of the inside of the enclosure.
 - flush with the rear of the refrigerator.
 - less than 1/4 inch from the top of the refrigerator cabinet. The baffle may be against the top of the refrigerator.

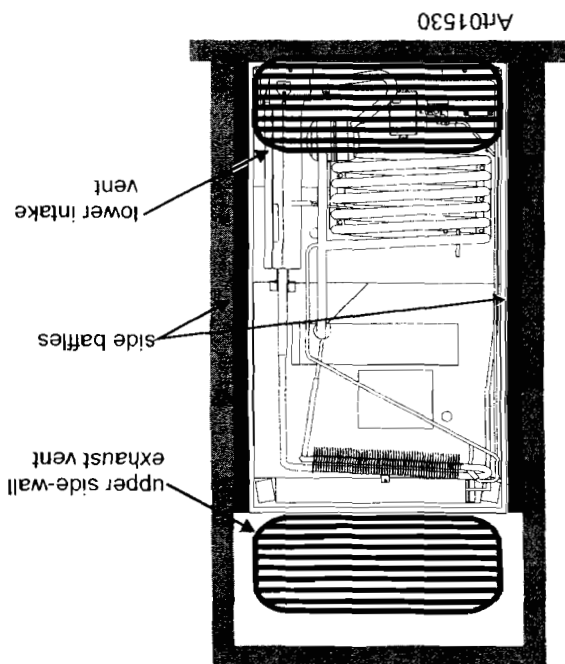


Art01528

3. Install side baffles to isolate the rejected heat from the sides of the refrigerator (See Art01530). Make sure that these baffles are:
 - flush with the rear of the refrigerator and the baffle above the refrigerator.
 - less than 1/8 inch from the sides of the refrigerator cabinet. These baffles may be against the sides of the refrigerator.
4. If the distance between the rear of the refrigerator and the inside of the enclosure is more than 1 inch, install two (2) baffles to prevent bypass air around the condenser fins and absorber coils of the refrigerator:
 - Install one baffle that is at the lower edge of the condenser fins of the refrigerator.
 - Install another baffle that is at the lower edge of the absorber coils of the refrigerator.



Art01529




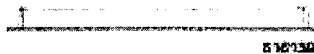
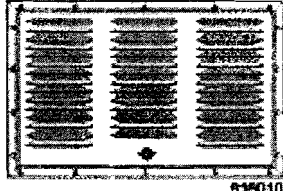
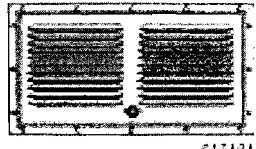
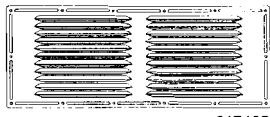
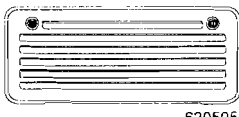
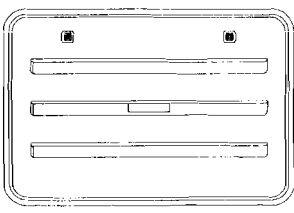
- the full width of the inside of the enclosure.
- less than 1 inch from the rear of the refrigerator. The baffles may be against the rear of the refrigerator.

- Make sure that these baffles are:

Table B - Minimum “h” Distance

| Refrigerator Model Number | "h" (minimum distance bottom of refrigerator enclosure to top of upper side-wall vent opening) |
|----------------------------------|---|
| 322 323 | 30 1/2 in. |
| 3163 models | Does not apply. |
| 1200 models | 63 in. |
| N260 models | 30 1/2 in. |
| N300 models | 37 in. |
| N400 models | 41 3/4 in. |
| N500 models | 47 3/4 in. |
| N600 models | 55 in. |
| N800 models | 62 in. |
| | Art01523 |

Table A - Vents and Rough Opening Sizes

| Vent Description | Vent View | Vent Part Number | Vent Rough Opening Height | Vent Rough Opening Width |
|---|--|------------------|---------------------------|--------------------------|
| Upper Roof Exhaust Vent Cap (plastic - must use w / 616319 base) |  A perspective view of a curved, dome-shaped plastic vent cap. The part number 622293 is visible in the bottom right corner of the image. | 622293 | N/A | N/A |
| Upper Roof Exhaust Vent Base (plastic - must use w / 622293 cap) |  A perspective view of a flat, rectangular plastic vent base with mounting tabs on the sides. The part number 616319 is visible in the bottom right corner of the image. | 616319 | 24 in. - length | 5 1/4 in. |
| Lower Intake Vent (metal - hinged) |  A front view of a rectangular metal intake vent with horizontal slats and a central hinge. The part number 616010 is visible in the bottom right corner of the image. | 616010 | 13 5/8 in. | 21 5/8 in. |
| Lower Intake Vent (metal - hinged) |  A front view of a rectangular metal intake vent with horizontal slats and a central hinge. The part number 617484 is visible in the bottom right corner of the image. | 617484 | 9 3/4 in. | 19 3/8 in. |
| Upper Side-Wall Exhaust Vent (metal) |  A front view of a rectangular metal exhaust vent with horizontal slats. The part number 617485 is visible in the bottom right corner of the image. | 617485 | 7 1/4 in. | 18 in. |
| Universal Upper and Lower Side-Wall Vent (plastic - removable) |  A front view of a rectangular plastic side-wall vent with horizontal slats and mounting tabs. The part number 620505 is visible in the bottom right corner of the image. | 620505 | 6 3/16 in. | 17 13/16 in. |
| Lower Intake Vent (plastic - removable) |  A front view of a rectangular plastic intake vent with horizontal slats and mounting tabs. The part number 621156 is visible in the bottom right corner of the image. | 621156 | 13 3/4 in. | 21 1/2 in. |
| Art01522 | | | | |