

# Installation Guide


# Homeowner Installation Guide

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

**BUILDING TECHNOLOGIES OFFICE**

**Building America Case Study:  
Technology Solutions for Existing Homes**

## A Homeowner's Guide to Window Air Conditioner Installation for Efficiency and Comfort



**PROJECT INFORMATION**

Building Component: HVAC

Application: Retrofit; single and/or multi-family

Year Tested: 2012

Applicable Climate Zone(s): All

**PERFORMANCE DATA**

Cost of Window A/C unit: \$150-\$600


Cost of materials for improved installation: \$10-\$15

Energy Savings: up to 7% cooling savings, or up to 280 kWh/year

Electricity Bill Savings: up to \$51/year; enough to pay for A/C over its lifetime

**FOR MORE INFORMATION**

Read the full report, Laboratory Performance Testing of Residential Window Air Conditioners, NREL/TP-5500-57617, February 2013. [www.nrel.gov/docs/fy13osti/57617.pdf](http://www.nrel.gov/docs/fy13osti/57617.pdf)



Homeowners in the United States spend one out of every eight dollars of utility costs on cooling their living space. Window air conditioners (A/Cs) are an inexpensive alternative to central systems, and are sold in greater numbers each year than all other residential cooling systems. They are purchased to cool a specific room, and are easy for anyone to install. In contrast to these benefits, window A/Cs come at a cost—they operate less efficiently (using more energy to do the same cooling) than most other residential appliances.

Researchers at the National Renewable Energy Laboratory (NREL) studied window A/Cs on behalf of the U.S. Department of Energy's Building America program, to understand how they perform and how they could be improved.


NREL engineers found that window A/C installation resulted in significantly more air leakage. All summer long, hot outdoor air flows into the home, as shown in the figure at right, making the A/C run longer and use more energy. This outdoor air reduces comfort for occupants through increased heat, and often carries humidity into the home.

The NREL team also found that a portion of the cool air leaving the A/C gets recirculated into the unit because the outlet and inlet are so close together. Thus, that cool air does not help cool off the home and is a secondary waste of energy. Also, the researchers verified the importance of appliance maintenance and cleaning.

**"Air sealing around the window and the air conditioner is critical for best performance"**


—Chuck Booten, Ph.D., Senior Engineer, NREL

Finally, NREL's team identified simple measures to improve both efficiency and comfort of the units. Accessories provided by manufacturers can be replaced with inexpensive hardware store materials to improve a window A/C installation and achieve substantially better efficiency and comfort, lower utility bills and payback in less than one year.




Typical air leakage pathways that increase electricity use and decrease comfort. *Illustration by Marjorie Scholtz, NREL*

**BUILDING TECHNOLOGIES OFFICE: WINDOW AIR CONDITIONER INSTALLATION**



**1**



**2**



**3**



**4**



**5**

**Five Easy Steps to Limit Window A/C Infiltration**

1. Remove accordion panels. Typically a sliding keeper can be removed. Pull the frame out, then remove another keeper from the side of the A/C. Do not remove top and bottom braces. *Note: The top and bottom braces must remain attached to the A/C, as they hold the unit into the window.*
2. Cut and install rigid foam panels to fill the spaces beside the A/C, measure the thickness of the window sash to determine foam thickness; 1-1 1/2 in. thickness will fit most window frame channels. Some foams have a skin to help protect the foam from weather.
3. Foam strips provided by the manufacturer for sealing between sashes are prone to air leaks. Instead, use backer rod (closed cell cylindrical foam) between sashes.
4. No matter what foam is used, it is important to also plug the top of the side channels.
5. Use tape to secure the foam panels and prevent air leaks around joints. Tape the foam panels to the window, window frame, and A/C; tape the top and bottom of the A/C, too. White duct tape is available, as shown in the photo at left.

**Go Further: Address Cool Air Recirculation**

To further enhance performance, install a diverter between the cool air supply (top) and room air return (bottom) of the air conditioner. This maximizes the amount of cool air that goes into the room.



**The Bottom Line**

- Air leakage wastes energy and costs money, but homeowners can reduce this leakage easily
- Recirculation of air near the unit lowers efficiency and can be easily reduced
- Periodic cleaning of intake and exhaust grills on both the indoor and outdoor portion of the unit can help maintain efficient performance
- Remove unit from window or seal it up completely on the inside after cooling season is over, otherwise, air will leak through the unit itself.

For more information, visit: [www.buildingamerica.gov](http://www.buildingamerica.gov)

DOE/GO-102013-3920 • March 2013  
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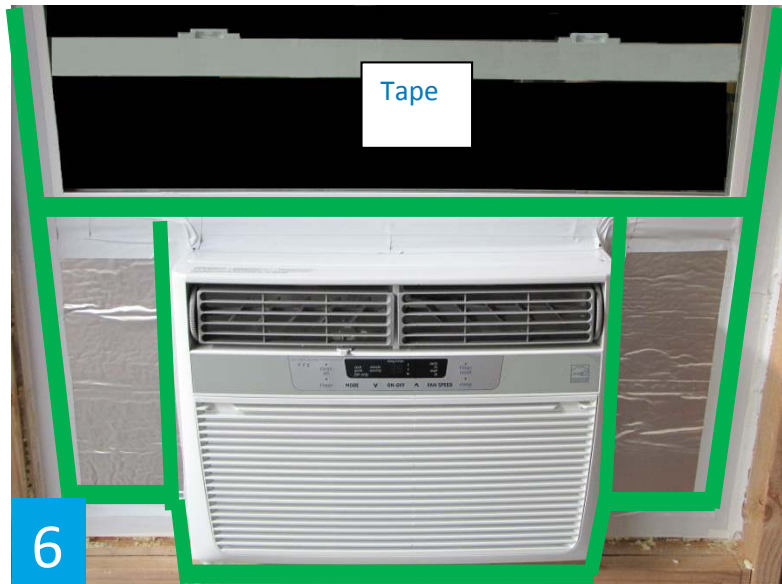
The U.S. Department of Energy's Building America program is engineering the American home for energy performance, durability, quality, affordability, and comfort.

# Recommended Installation



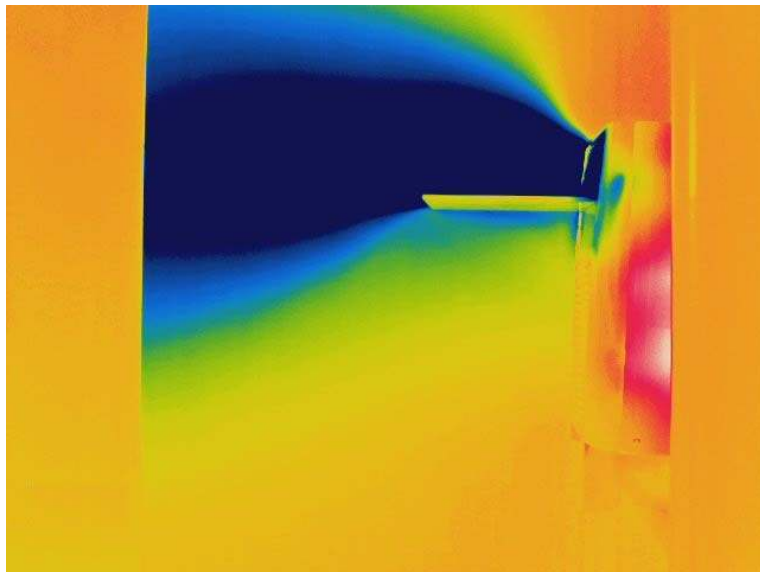
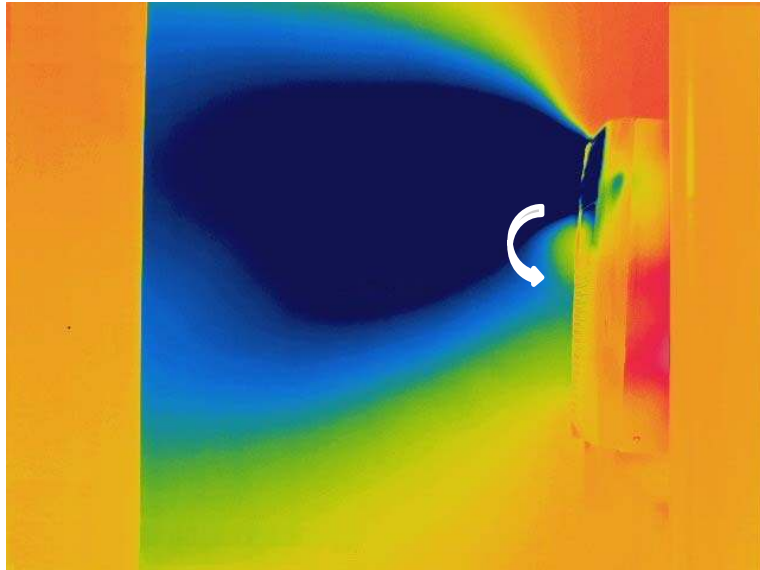
1. Remove unit from the window
2. Remove accordion panels
3. Replace with foam to help insulate and air seal

# Recommended Installation



4. Use backer rod between sashes
5. Seal side channels as well
6. Tape foam, A/C and window frame to complete air sealing

# Fixing the Problem



- Easily eliminate most recirculation
- Many forms possible for diverter
- Easy to manufacture, no changes to current tooling or assembly lines



# Recommended Installation

Standard



Better - Air Sealed



Best – Sealed with Diverter

