

Understanding Sound for HVAC Equipment



Turn to the Experts.™



Enhancing Customer Satisfaction

TURN TO THE EXPERTS FOR SOUND ADVICE.

When consumers Turn to the Experts at Carrier, they expect the very best in HVAC innovation, technology, quality and customer service. And, more and more, when people think of high quality products, they look at sound as a key differentiating factor in the decisions they make.

To maintain our competitive edge, we continuously look for ways to minimize sound with every new product we develop and with every product line upgrade we make. We feel that by taking sound out of the product, we are giving our distributors and dealers an advantage they can use when selling Carrier products.



To make the most of Carrier's sound advantage, it is important that every distributor and dealer understands the basics of how sounds are generated, measured and compared. With this understanding, you'll be able to better communicate the differences in sound ratings and how homeowners can expect Carrier products to make a difference.

The Indianapolis engineering facility includes a reverberant sound room with rotating vane to test sound ratings of HVAC equipment.

THE ROLE OF SOUND IN CUSTOMER SATISFACTION

Sound plays a major role in people's lives everyday. From waking to the electronic beep of a bedside alarm clock to sliding back into a quiet resting place at the end of a long day, people are inundated with sounds at home, work and play that are both pleasing to the ear and annoying. In an effort to take noise out of their lives, homeowners today are placing more and more emphasis on minimizing unwanted sounds in their home environments. And, for the typical homeowner, HVAC equipment falls into the category of products that are better appreciated when they are *quiet*.

WHY ARE STANDARDIZED SOUND RATINGS SO IMPORTANT?

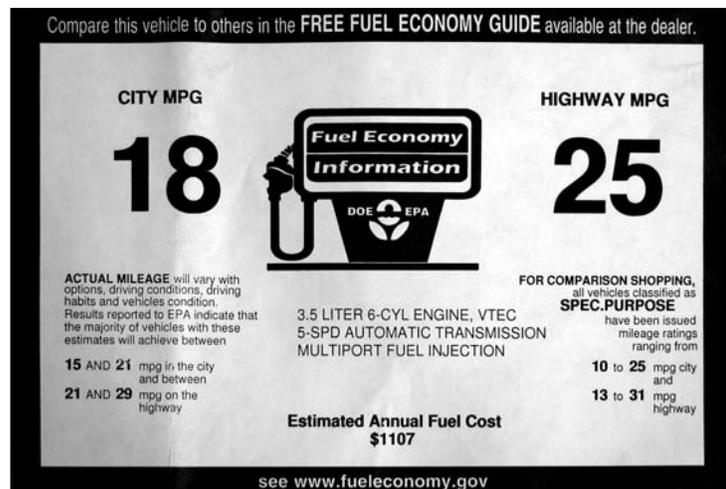
The complex qualities of sounds and how they are perceived by the human ear make some louder, some quieter, some more annoying and others more soothing. These variances can make accurately measuring and comparing sounds fairly difficult. When trying to compare the sound levels of products that you can't, in all practicality, line up side-by-side and listen to, it's extremely important to have a standardized, consistent rating system. And, that's why understanding sound ratings for HVAC systems and knowing how to interpret them for your customers can be such a critical component to selling systems and retaining satisfied customers.

ARI SOUND RATINGS AND MILES PER GALLON

The ARI Sound Ratings provided by Carrier and many other HVAC manufacturers is a voluntary, standardized rating system that allows customers to accurately compare sound levels between products. It's kind of like comparing miles per gallon (mpg) ratings on a new car.

Most consumers are familiar enough with mpg ratings to know that their driving habits, terrain, city or highway driving, type of gas used, and other variables will affect their actual mileage. At the same time, they accept the miles per gallon concept as a good way to compare the type of mileage they can expect from different makes and models of cars.

Homeowners shopping for HVAC equipment should understand that the ARI sound ratings provided by Carrier offer an excellent comparison to competitors who also list ARI sound ratings for their products. At the same time, they should also be aware that environmental conditions, installation location and other variables will affect the amount of noise their system will make.



WHAT IS SOUND AND WHY DO WE MEASURE IT?

Any pressure variance detected by the human ear can be defined as sound. Some are pleasing to the ear, some are irritating, and all ears will hear sounds and interpret them a little differently. Measuring sounds allows us to accurately describe differing sounds and provides a basis for the following:

- Consumer comparison between models and brands
- Troubleshooting HVAC equipment
- Scientific analysis of annoying sounds
- Benchmarking for product quality improvements

UNITS OF SOUND MEASUREMENT

Hertz (Hz) - Hertz is the unit used to measure sound frequency (number of pressure vibrations per second). The frequency of a sound is directly related to its distinctive tone - for example, the low rumble of thunder is a low frequency sound, while the shrill sound of a siren is a high frequency sound.

Decibel (dB) - Decibels measure the amplitude of a sound's pressure fluctuations. Decibels are typically associated with the loudness of sound. Also, it's important to know that decibel measurements can be fine-tuned for greater accuracy using "weighting networks" that process the sounds much like a human ear, and filtering out specific sound frequencies for consistency.

All HVAC manufacturers who conform to ARI standards (ARI Standard 270-95) list their sound measurements in "A" weighted decibels, or dBA.

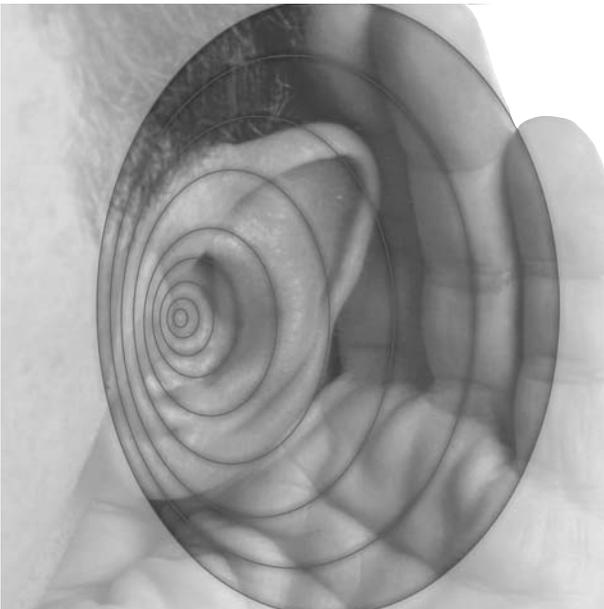
The above statement is important to remember because there is no simple way to compare dB sound measurements to dBA sound measurements. For a fair comparison for homeowners, the sound ratings MUST be listed in the same unit of measurement.

EFFECTS OF SOUND ON THE HUMAN EAR

The typical, healthy human ear can sense sounds between the frequencies of 20Hz to 20kHz, or in a measurement more familiar to most, from 0 decibel (dB) to the threshold of pain, about 130 dB or more. The smallest change in sound the ear can sense is about 3dB. Because of the way sound is interpreted by the ear, an increase of 6dB, or twice the amount the ear can detect, would need to increase to about 10dB to sound twice as loud.

To make this subject even more complicated, the way the sound is perceived by the ear can be affected by several factors:

- Not all ears are sensitive to all frequencies
- Sounds at lower frequencies will need to be made at higher decibels to have the same relative loudness
- Impulse sounds, or sounds that are made in short spurts (such as a hammer striking a nail), may not sound as loud as sounds made at slightly lower dB but occur for a longer duration.



HOW SOUNDS ARE MEASURED

To ensure the greatest accuracy and consistency for comparison, HVAC manufacturers measure sound using equipment that responds to sounds in approximately the same way as a human ear. The sound data is collected in a highly controlled environment -- typically in a certified, reverberant sound room with a rotating vane, equipment that averages sound according to ARI standards, and a handheld sound meter. Because the environment is so controlled, any field measurements you might take in dBA units will almost certainly not match the listed equipment ratings. Variables that will affect any field measurements you take might include:

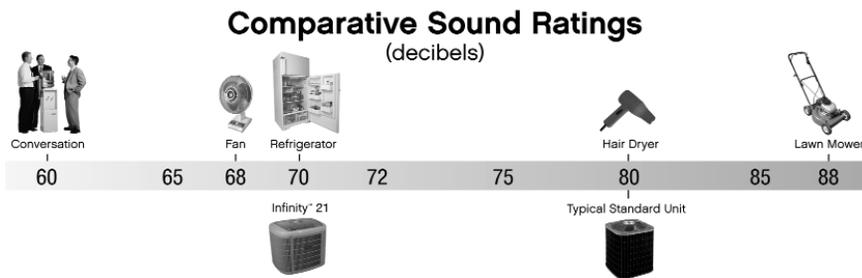
- Temperature
- Wind
- Humidity
- Any other exterior noise



Sound lab reverberant sound room.

SOUND FROM MULTIPLE UNITS

In situations where you are gauging the sound of more than one piece of equipment, you cannot simply add the dBA ratings of each to get a combined sound rating for both. Because decibel units are based on a logarithmic relationship, "adding" two ratings involves several calculations. This is important to know, as some of our marketing literature exploits the relative loudness of some competing products by showing how many Carrier units operating simultaneously it would take to equal the sound of one competitive product model.



HOW DOES ALL THIS RELATE TO RESIDENTIAL HVAC SYSTEMS?

Because manufacturers *voluntarily* provide sound information on their products, it's not always easy to guarantee your customers will be able to make a fair and accurate comparison of which product is quietest. However, because Carrier does conform to ARI Standards, you can be confident that your comparisons are accurate if:

- The competing brand also conforms to ARI standards
- Competitor ratings are listed as dBA
- If competitor ratings are not listed as dBA, try to obtain a dBA rating by contacting a distributor or dealer of that product
- If competitor ratings are not listed with “pure tone penalty”, try to obtain a rating with “pure tone penalty” by contacting a distributor or dealer of that product

Then, when they choose Carrier, go the extra mile by:

- Helping them select the quietest product that fits their application needs and budget
- If practical, work with them to determine the best installation location to minimize the effects of equipment noise during operation
- Follow up with a maintenance plan to keep the system operating trouble free and as quietly as possible

By maintaining an open line of communication with the homeowner, and using the information in this document to provide honest, well-informed answers to questions they may have regarding sound, you'll improve your chances of making and retaining happy, satisfied customers.



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Stock Symbol UTX.



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