QUESTIONS AND ANSWERS

1. What is a sone?

A sone is an internationally recognized measurement of sound output. Sones translate decibel readings into numbers that correspond to the way people sense loudness.

Sones follow a "linear" scale, like inches. Double the sones is double the loudness. In contrast, decibels follow a "logarithmic" scale which is a multiple of numbers. Sone readings offer easy, quick and accurate comparisons for laymen and engineers.

In technical terms, a sone is equal in loudness to a pure 1,000 cycles per second at tone at 40 decibels above the listener's threshold of hearing. In layman's terms, one sone is equivalent to the sound of a quiet refrigerator in a quiet kitchen (source HVI).

Sound Level Situation	Sone Level	How we feel
Traffic noise	8.0	Conversation with
	7.0	added noise
	6.0	
	5.0	
TV/Radio	4.0	Normal conversation
	3.0	
Calm office	2.0	
	1.5	
Night in suburbs	1.0	Comfortable zone
Rustling shrubs	0.5	free from noise

FIG. K

2. What is Static Pressure?

Static pressure is a measure of the resistance against flow as the fan pushes air through a duct. Static pressure is measured in inches of water column or water gauge. It is expressed as 0.1" w.g. or 0.25" w.g. to show that the resistance is equal to a column of water one-tenth or one-quarter of an inch tall. Most bath fans operate at between 0.1" and 0.25" w.g. Sometimes small duct diameter, excessive elbows or tight roof caps can increase this static pressure to 0.5" or 0.7" w.g., which results in virtually no airflow at all. Most bath fans sold in North America are rated and certified at 0.1" w.g. by the Home Ventilating Institute. HVI publishes a directory of certified products, including the Panasonic fans. Call HVI at 1-847-394-0150 extension 117 to request a copy or visit www.hvi.org.

3. How to select the right fan model for a specific room size and duct length?

See sizing on pages 6 and 29.

4. Why are Panasonic Fans so quiet?

Tip Speed.

Fan noise is created as air passes through the grille and enters the blower wheel assembly or fan blade. Much of the noise is a function of the blower wheel blade tip speed – the tip speed is in proportion to the revolutions per minute (RPM) of the wheel or fan blade. A small wheel turning very fast will create more noise than a large wheel turning more slowly for a given airflow. Panasonic fans use a wide blower wheel that moves a large amount of air at reduced RPMs. The Panasonic blower wheel is larger than most competitor models, and turns at lower RPMs, reducing tip speed and noise.

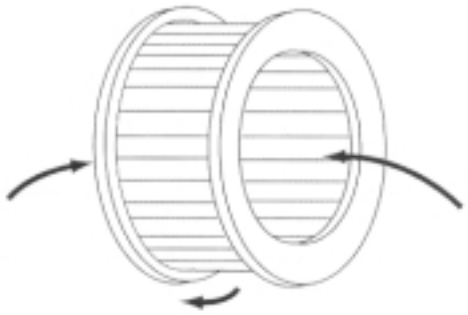

FIG. L: Double Suction Blower Wheel

Double Suction Blower Wheel.

Another reason that the Panasonic fans operate so quietly is that the blower wheel is designed to draw air in from both sides of the wheel (Figure L), making it more efficient. This helps keep the noise down, as there is more area for the air to enter the wheel.

Exhaust Outlet.

The outlet on the discharge side of a Panasonic fan is as wide as the blower wheel, allowing less turbulent air flow as it enters the duct. It is then gradually stepped down to the four inch discharge of the rough-in adapter (on the smaller fans) before it enters the duct. The larger fans have a gradual transition to a six-inch connection.

Note: When you place your hand over the discharge of a Panasonic fan, you may feel that there is less air moving than from a competitor's fan. This is because the discharge of the Panasonic fan is so much larger and the same volume of air is spread over a larger opening.

Quiet Motor.

Motors manufactured by Panasonic and used in all Panasonic fans are four-pole condenser motors, which are an advanced version of a Permanent Split Capacitor (PSC) motor. These are among the most efficient fan motors made. The four pole design helps the fan to rotate smoothly and evenly due to a more stable electrical field that keeps the fan shaft turning more evenly than shaded-pole motors used in midrange fans or C-frame motors used in inexpensive fans.

5. What makes Panasonic Fans so highly energy efficient?

The input wattage readings on the Panasonic fans are among the lowest in the industry. This means that for a given airflow, Panasonic fans will use fewer kilowatt hours and

cost less to operate than other fans. This lower wattage draw is accomplished in a number of ways:

Unique Motor Design.
Panasonic uses a four-pole condenser motor which is composed of a main coil and a sub coil. The coils in a motor are essentially small electromagnets that are turned on and off to create an electrical field to "pull" the fan shaft around, making the fan blower wheel turn. The condenser is connected with the sub coil, which helps with rotation. The condenser acts like a capacitor to store electrical energy and deliver it quickly and in exact amounts to the coil. This improves the electrical efficiency of the motor and reduces power draw.

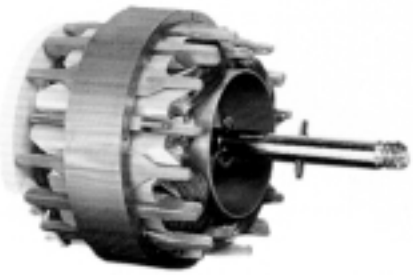

FIG. M

Selective Application.
Panasonic builds its own motors and components and, therefore, has tight control over quality. Panasonic engineers also optimize efficiency by matching the exact motor characteristics with the desired performance of the fans.

Wide Blower Wheel.
Power draw for a motor is a function of the torque needed to turn a load — in this case, the blower wheel. As stated earlier, Panasonic fans use a wide blower wheel to improve the airflow efficiency of the fan. This enables the fan to operate at a lower RPM and reduce energy usage.

6. Why do Panasonic Fans have such a long life?

Panasonic fans are designed to give the consumer trouble-free continuous operation for a minimum of 30,000 hours. In fact, the engineering target for these fans was to provide a fan with at least 100,000 hours of operational life, but they have only been manufactured for about 10 years, so we have not reached 100,000 hours of testing yet. In performance tests at the factory in Japan, fans have been tested after 40, 50, and 60 thousand hours of operation with virtually no wear to its components.

Motor Production.
Panasonic motor production is fully automated, with an automatic defect detecting system. The quality assurance program is exemplary, leading to a defect rate of less than 0.0006%.

ISO 9001 plant.
The production facilities that build Panasonic fans have earned the distinction of being recognized by the International Standards Organization (ISO) under the ISO 9001 Quality Assurance program. Meeting ISO 9001 means that these factories have met the highest quality standards in the world.

Motor Bearings.
Smaller Panasonic fan motors use special, oil-impregnated, sleeve bearings that are designed to sustain 30,000+ hours of operation, without any additional lubrication. The motors in the larger fans use ball bearings.

Motor Design.
Heat is always detrimental to motor life; the cooler the environment, the longer the motor will last. The electrical design of the Panasonic condenser motor allows it to operate at lower temperatures than most other motors, increasing the life of the motor and the bearings.

Fan Housing.
The fan housing is made of heavy-gauge zinc-galvanized steel and painted to protect it from rust.

7. Can insulation material be used over fans installed in the ceiling?

YES. Loose fill or batt insulation can be placed directly over the fan housing in the attic. Panasonic fans and fan/light combination units do not create excessive heat that is a common problem with recessed light fixtures or some competitors' fan/light combinations. Our efficient, cool-running motors and our fluorescent bulbs do not create enough ambient heat to be subject to these limitations.

8. Can a Panasonic fan be used over a bathtub and in showers?

YES. Panasonic fans are listed by Underwriters Laboratories for installation over tubs and showers, provided they are protected by a Ground Fault Circuit Interrupter (GFCI). GFCI is mandated by the National Electrical Code. While not specifically listed by UL as an application, the fan can also be installed in a steam shower enclosure. Keep in mind, however, that any ventilation device located in a damp environment such as a shower enclosure may have a reduced life due to the high humidity and potential for corrosion. Fans installed in a high humidity environment should be operated for longer periods of time to ensure the removal of the moisture and to reduce the potential for condensation in the fan body or ducting.

QUESTIONS AND ANSWERS (Continued)

9. Can a Panasonic fan be installed in a wall as well as in the ceiling?

The Panasonic WhisperWall is the best choice for wall applications.

The smaller ceiling fans up to 110 CFM generally should not be installed in the walls due to mechanical concerns (orientation of the motor, bearing lubrication, built-in damper). If these fans are installed in the wall, the duct needs to be pointed up to allow the damper to operate. However, the bearings may not last as long as specified, due to insufficient oil flow within the sleeve bearings.

The larger 190 and 340 CFM fans can be installed in either wall or ceiling. These fans use ball bearings in the larger motors and are not prone to lubrication concerns when installed in the wall. However, when using a ceiling fan in the wall, the depth of the wall cavity versus the fan height of the housing should be considered.

10. Can a Panasonic fan be used above a kitchen range?

NO. Fans installed above kitchen ranges must be listed for that application by UL and must be designed to handle both grease and high temperatures. Current models of Panasonic fans are not rated by UL for above-range installation, however, Panasonic plans to introduce such models in the future.

Panasonic fans are often specified to provide auxiliary kitchen ventilation rather than range hood ventilation because they are quiet and efficient. For example, a FV-20VQ2 fan installed in the kitchen's ceiling six feet from a cook top that uses an unvented hood is an excellent way to provide kitchen ventilation. The UL definition for kitchen ventilation is the area near a cook top described by a 45 degree line up and out from the cook top. If the fan or grille is within that area, the fan must be rated for this particular application. If it is outside the area, it does not have to have the rating and can use non-metal ducts. Panasonic fans are an excellent choice for this application. An approach that works well in large kitchens is to use a ducted range hood or downdraft exhaust and a Panasonic ventilation fan to exhaust the general odors and moisture in the greater kitchen area.

11. I have heard of water dripping from the grille or mirrors not clearing quick enough. Is the fan not operating correctly?

The problem may be caused by a faulty roof jack that allows wind-driven rain to come into the duct, or condensation from warm humid air in the house striking the cold duct surface. Condensation is a problem that generally occurs when uninsulated metal duct is located in a cold attic. This will vary with the local dew point, but will generally not be a problem where the duct never gets below about 50°. If you get condensation dripping from the grille, it probably means that the metal rough-in adapter on the fan or the duct in the attic or even the roof jack is getting so cold that the warm air rising up the duct from the house is condensing and running back down the duct.

How can you solve this problem? Two things may help. First, try to operate the fan for longer periods to carry out more of the moisture so the air is not so humid after the fan stops running. The moisture will generally not form while the fan is running unless it is very cold or the installation has a very long duct run in a cold attic.

Second, insulate the duct so there is less likelihood for the moisture to condensate. Use insulated flexible duct that is installed properly or pull insulation over the outside of metal duct. In cold climates, it is common to bury the duct under the attic insulation for most of the run across an attic.

If you find that there is a problem of the moisture not clearing from the room, look at the ducting and at the run time of the fan. If the fan cannot overcome the static pressure of the duct (due to poor duct design, installation or damage), you cannot get the air out and, subsequentally, cannot get the moisture out. Often the fan is capable of moving the required amount of air, but it is not run long enough. The fan in a bathroom should be operated for 20-30 minutes after a shower is finished. Better yet it should operate with a programable timer to provide long blocks of ventilation during planned times (i.e. two hours in the morning and two hours in the evening). This would ensure the fan has enough time to remove the moisture from the room after a bath or shower. The same thing applies to kitchen ventilation. You can use a 1,000 CFM fan for one minute or a 100 CFM fan for 10 minutes to move the same amount of air.