

Dehumidification Frequently Asked Questions

Dehumidification Basics

Why do you want to keep indoor Rh between 30-60%?

ASHRAE (American Society of Heating, Refrigeration and Air-Conditioning Engineers) recommends keeping the relative humidity in a home between 30-60% to limit the effects of many unwanted conditions and harmful household particles. In addition, the Journal of Allergy and Clinical Immunology recommends keeping indoor relative humidity below 51% in order to deter dust mites and boost overall comfort of the home.

What areas of the country need whole-house dehumidification?

Clearly, the weather and climate varies in different regions throughout the country. But regardless of locale, customers need a system designed to control humidity separate from cooling. Any region with a summer dew point average above 55° needs dehumidification separate from cooling. This would include cities such as Chicago – St. Louis – Baltimore – Atlanta – Orlando – all have dehumidification needs.

How do you determine if a city has a need for dehumidification?

We start by identifying parts of the country with the average summer dew point is above 55° because it represent areas where the humidity has the opportunity to rise above ideal levels (a 55° represents 50% Rh at 75° F). Then we analyze the amount of time the outdoor temperature is between 55° and 75° F. This calculated time value shows how often there would be a need for dehumidification in a home but there would be no Air Conditioning load. Without air conditioning run time, there is no moisture removal from the home.

What is the Sensible Heat Ratio (SHR) of Air Conditioning and how does it affect dehumidification in homes?

The Sensible Heat Ratio (SHR) is the percentage of cooling in an Air Conditioning evaporator coil that is devoted to sensible vs. latent energy removal. Manufacturers control the SHR of their equipment by the way they design the coils. Trend is to increase equipment SHR in increase the SEER rating of the A/C.

What is the Sensible Heat Ratio (SHR) of the dehumidifier coil?

The evaporator and condenser coils each have two rows . This design is intended to remove maximum moisture, with a special fin design and fin configuration yielding a SHR of .50 vs. a typical air conditioner SHR of .75 or higher.

What is the difference between latent and sensible energy?

The Sensible energy is the energy that can be measured from a thermostat. Latent energy is the amount of moisture that is in the air.

What is the “Design Condition” in Air Conditioning? What is a part-load condition and why does it affect dehumidification in homes?

Air conditioning sizing is based on peak load conditions, a condition that is reached only 2-3% of the year. The other 97% of the year the air conditioner operates at part-load conditions (or is off), limiting the moisture removal in a home. Any time a home has a reduced Sensible Heat Load (evenings, cloudy days, etc) the air conditioner doesn't operate and indoor Rh can rise to uncomfortable levels.

What is causing the decrease in building Sensible Heat Ratio?

Better building practices (for both existing and retro fit homes) are reducing the Sensible heat ratio of a building. The drive to improve energy efficiency (from better windows and insulation) has driven down the need for buildings to have large amounts of sensible cooling

Why does an Air Conditioner use time delays in their fans?

In an effort to increase the SEER rating in Air Conditioning, manufacturers recommend the use of a time delay fan. This allows the A/C compressor to shut off while continuing to run the HVAC blower. This feature can improve the SEER rating by .5 points. But that increased sensible efficiency comes at a cost to the moisture removal. A/C coils can hold a large amount of moisture-¼ to ½ gallon at the end of their cycles. By leaving the fan on, the moisture from the coil becomes re-evaporated back into the living space and can increase indoor Rh by over 10%.

How long does it take a new high efficiency A/C to get full moisture removal?

New high efficiency Air Conditioner coils now require longer time to remove moisture in the home. According to recent research from ASHRAE, a new high efficiency evaporator coil can take 8-10 minutes to get full moisture removal. Older, less efficient A/C coils start removing the maximum moisture within 6 minutes of start-up. This change resulted from equipment manufacturers trying to get a higher SEER rating for their product.

What happens to a home when its Air Conditioner is over sized?

Oversized Air Conditioners tend to run very short cycles because they are able to quickly satisfy the temperature needs of the home. This means that they rarely reach the point at which they can remove any significant moisture in the home.

What happens to a home when the outside conditions are below design conditions (cloudy days, evenings, and spring/fall)?

Just like in the over-sized Air Conditioner condition, in part load conditions tend to run very short cycles. They rarely are able to remove significant moisture in the home.

Aprilaire Model 1750 Dehumidifier Operation

What is a TXV valve and why do we need one?

A Thermostatic Expansion Valve has the capability to adjust the volume of refrigerant flow based on the energy in the air, independent of the condensing pressure. This allows optimal performance of the unit throughout operational range of 40 – 105°F.

Manufacturers of residential portable dehumidifiers generally produce equipment with a fixed restriction device, like a capillary tube. This fixed device defines the limited temperature range in which the unit can operate. Typical residential dehumidifiers will have issues with ice forming on the evaporator coils starting at 65°F or lower due to this fixed performance window.

How many gallons of moisture does the unit remove per day?

1 pint of water is equal to 16 oz. Therefore, the unit removes 90 pints or 11.25 gallons per day.

What is the unit's performance at different RH and temperatures?

The Aprilaire model 1750 whole home dehumidifier has been tested and certified to remove at least 90 pints per day at AHAM conditions (80°F and 60% RH). High-capacity performance is maintained across a wide range of conditions, from hot indoor conditions to cool basements. The TXV valve optimized system performance. Here are some examples:

<i>Inlet Air Temperature</i>	<i>Inlet Air Rh</i>	<i>Pints Per Day</i>
60°F	60% Rh	98 ppd
70°F	60% Rh	100 ppd
80°F	60% Rh	97 ppd
70°F	40% Rh	70 ppd
80°F	40% Rh	75 ppd

How big is the compressor?

The compressor is a ~1 HP, 10300 BTU/hr Tecumseh Rotary. It uses R22 refrigerant. This is a field proven compressor used frequently in demanding mini-splits and PTACs.

What is the cabinet made out of?

The cabinet is made from Galvannealed Cold Rolled Steel, and will be fully painted with powder coat. This is a proven, durable finish used on Aprilaire products for many years.

What is the insulation made out of?

The insulation is 1" EPS (Expanded Polystyrene) with an adhesive backing and aluminum foil face on the side exposed to air flow. This helps keep condensation from forming on the cabinet and also decreases the noise of the unit.

What is the evaporator coil temperature?

The coil temperature will vary based on inlet air conditions, but it typically cools the incoming air about 20°F across the evaporator coil before reheating it in the condenser coil.

What is the rating of the filter?

The filter is MERV 8 and should be cleaned or replaced on a yearly basis. It is constructed from 45 ppi (pores per inch) flame retardant polyester foam with a polybonded, slit and expanded aluminum face and aluminum frame.

What is the leaving air temperature?

The leaving air temperature will depend on the inlet air conditions and the CFM of air going through the unit. It typically will be about 95°F – 100°F and 25% Rh.

What price is the consumer willing to spend?

Aprilaire consumer research showed price points in the range of \$1500 - \$2500 were acceptable for the comfort and wellbeing benefits delivered by the dehumidifier. This will vary by the degree of need, region, and also by the complexity of the installation.

What refrigerant does the system use?

R-22 was chosen for broad availability and acceptance.

What is the warranty on the compressor?

The compressor warranty is the same as the unit, two years. Typically, smaller compressors carry shorter warranties in order to keep costs down. This does not indicate shorter life. Typically if a compressor is going to fail, it will do so in the first months after installation, which falls in the warranty period. Although it is common to have a 10 year warranty in larger HVAC equipment, the length of warranty does not indicate a shorter life for the Aprilaire unit.

What is the temperature drop across the condenser coil?

Typically, the temperature will drop by 20° F, allowing the relative humidity to increase to the dew point and start condensing moisture from the air.

What is the energy usage of the dehumidifier?

Using the following assumptions at “NORMAL” indoor (Model 1750 inlet) air conditions:

Indoor Temperature: 75°F

Indoor RH: 55%

Model 1750 Air Flow: 275 CFM

Typical Model 1750 power consumption at above conditions: 825W

Electricity Rate: \$0.09/kWh **Cost of Operation per Hour: \$0.075** Example: If the unit runs 24 hours per day at these conditions, it will cost approximately \$1.80 per day.

How does the unit know there is a need for dehumidification?

The unit automatically turns on dehumidifier blower for two minutes in a preset timeframe to sample temperature and dew point. You can customize the interval to 30 min, 1, 2 or 3 hours. If the house Rh is above set-point, the dehumidifier will then energize its compressor. This automatic control is built into dehumidifier; requires no wires to living space

Why put a filter dryer in the refrigerant line?

This will protect the TXV and compressor from contaminants and moisture, ensuring consistent efficient and long-term operation of the dehumidifier.

What is the benefit of Energy Star Rating?

Energy Star reflects optimized energy efficiency for the dehumidifier. The rate varies depending on the capacity of the unit. A typical Energy Star rated portable at an removes 1.5 liters of moisture removal per kilowatt hour at AHAM conditions (80°F, 60% Rh), while the Aprilaire units removes 2.25 liters of moisture per kilowatt hour. The Aprilaire dehumidifier performance remains consistent across a broad range of temperature conditions.

What are the benefits of fan cycling?

Built-in Fan Cycling is a great intelligent feature for both dealers and consumers. Fan cycling mixes and evenly distributes air throughout the home, helps eliminate hot/cold spots in the home, and improves performance of air cleaner, dehumidifier, and humidifier.

Aprilaire Model 1750 Dehumidifier Installation and Service

What is the drain pan made out of?

The stainless steel drain pan is designed to resist corrosion and stands up to the extreme conditions from both the evaporator and condenser coil.

Does it need a trap? What kind of trap?

The unit needs a trap due to the negative pressure inside the cabinet. This prevents the unit from sucking water or gasses back into the unit. The trap can be constructed of readily available copper tubing or common PVC fittings. The drain elbow extends out the bottom of the unit and turns 90° towards the side of the unit, which makes it easy to install a hose and trap.

What is the drain fitting size coming out? Can flex tube be used?

The elbow/fitting is ½" O.D. with no barb. Standard condensate hose will work fine in this application.

Can you use extension cords?

Extension cords can certainly be used, but must be 12 or 14 gauge to handle the rated current and should be limited to 25' in length.

How long can the duct work runs be?

The length of duct runs is dependant on the particular HVAC system's operating pressures. Below are some examples: .4 wc = 240 of total equivalent flex duct .5 wc = 150 of total equivalent flex duct A complete table is listed in the "Safety and Installation Instructions Manual" with guidelines and limitations on duct lengths, elbows, etc.

Do you need to increase the tonnage of the cooling system because of the heat produced by the dehumidifier?

No, this should not be necessary. The warm air returning to the ducts is only 275 CFM of 95°F – 100°F dry air. The air coming from the dehumidifier is blended with air in the duct work, before being delivered to the living space. The other important point to remember is that the indoor environment will feel comfortable at warmer temperatures, due to the lower humidity.

Can you reduce the AC tonnage because you will have reduced latent load?

No, we do not recommend this. The air conditioner and dehumidifier will often work at different times, when specific temperature and humidity control needs require it.

Can we bring 100% outside air into the dehumidifier?

No. The Model 1750 will work at this condition, but does not have enough capacity to bring 275 CFM of outside air to a reasonable dew point before entering the space.

Does it have to be an Aprilaire filter?

The filter is a special design for the model 1750 and should be purchased from Research Products. This will ensure proper pressure drops, even air distribution across the evaporator coil, and overall safe operation.

Can you attach it to an existing humidistat?

No, the Model 1750 needs to be controlled using either the automatic control in the unit, or the optional Living Space Control, Model 70 (available Summer 2004). Each control has special built-in features that help the Model 1750 deliver exceptional performance.

Is there a service port on the unit?

The unit will initially have two (2) Schrader Valves, to allow for field charging and evacuation.

What is the minimum distance to the first supply outlet?

The outlet from the dehumidifier must be at least 6' downstream from the A/C coil. If you don't meet this minimum, the recommendation is to have the HVAC fan turned on with the dehumidifier to ensure adequate mixing of the return air to the living space.

Other than dehumidification, what is the benefit of running the dehumidifier in a basement?

Because the air coming from the dehumidifier is slightly warmer than the room temperature, there can be a slight warming effect in the basement. This will further assist in lowering the Rh of the basement, as the same air at higher temperatures has a lower Rh.

What are the Electrical needs of the unit?

It is 110 - 120 VAC, with a current draw of 9 AMPS. The total power is 825 Watts

What does the unit weigh?

92 pounds

Does the unit require any maintenance?

Yes, the filter should be cleaned or replaced annually and the coil checked for contaminants to ensure pressure drops and even air distribution across the coils.