Home & Appliance

External Audience Protocol (EAP)

Room Air Conditioners

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Room Air Conditioner Test Procedure

Each test sample is run-in for a minimum of 18 hours on the high cool setting (up to a maximum of 24 hours). After the run-in period, window units are installed in a “window”; portable units are positioned in front of the window within a test room. The test room has a moveable wall and can be configured as either small, medium, or large as determined by the capacity of the air conditioner. The ceiling height remains at approximately 8 feet for all room sizes. The small room measures 12 x 13 feet (156 sq. ft.); the medium room measures 12 x 17 feet (204 sq. ft.); and the large room measures 12 x 21 feet (252 sq. ft.) The test room is constructed of aluminum framing with plastic panels and is enclosed within an environmental chamber.

A controller maintains the temperature and relative humidity (RH) of the space surrounding the test room (annular space). This establishes the load that the room air-conditioner works against. A second environmental chamber, sharing a common heavily insulated wall and a “window” is maintained at typical outdoor summer conditions for most tests. This chamber is referred to as the outdoor chamber.

The following is an overview of each test procedure used to evaluate air conditioners:

**Comfort Performance**

This test primarily measures how well an air conditioner can reach a set temperature and takes into account the time it takes to reach that temperature. The thermostat on the air conditioner is set to maintain an average temperature in the test room of about 75° for window mounted units and about 80° for portable units. To simulate summer conditions, the outdoor chamber is maintained at 95° and 70% RH, while the annular space surrounding the test room provides the
heat and humidity load for the air conditioner and is set for 90° and 57.5% RH. The size of the room is determined by the capacity of the air conditioner. For window-mounted units small air conditioners between 5,000 to 6,500 BTU/Hr. are used to cool the “small” room; medium ACs of 7,000 to 8,500 BTU/Hr. to cool the “medium” room; large ACs of 9,000 to 14,000 BTU/Hr. cool the “large” room. For portable units small/medium air conditioners between 5,000 to 8,500 BTU/Hr. are tested in the “small” room and units of 9,000 BTU/Hr. or larger are tested in the “medium” room. For portable models, the BTU used for testing purposes is the listed DOE BTU. Inside the test room, the average temperature from several strings of sensors mounted from the ceiling to the floor are recorded. The test is repeated a minimum of three times and test results are averaged. The air conditioner is run at regular cool and high fan speed. The comfort performance rating is primarily based on how long it takes to achieve a ten-degree drop in average room temperature and how close the unit cycles to the set point of 75°.

Adverse Conditions

This test measures how well an air conditioner can perform during typical “brown-out” and “black-out” conditions. The air conditioner test sample is initially run on low cool at a line voltage of 100 V. The annular space is set at 90° and 40% RH, while the “outdoor” chamber is controlled to 120° and 40% RH.

After 40 minutes of operation at “brown-out” conditions, the computer data acquisition system automatically cuts power off to the air conditioner to simulate a “black-out.” After exactly three minutes, power is restored, and the computer graphically records the number of “false starts” — attempts to resume normal compressor operation — during the next 20 minutes. An excellent rating is given to those units that restart immediately and do not shut off on their own during the test. A lower rating is given to units that require additional tests at higher fan speeds and/or higher voltages to keep running. A unit continues undergoing an adverse conditions test until a “rating” is assigned.

Noise

This test evaluates how loud an air conditioner is indoors while operating at low and high cool settings. A decibel meter is used to measure sound pressure level (RMS; A scale weighting) and “loudness” in sones.

The meter is positioned at the four foot height for all readings and measurements are taken within the test room. The meter is placed off-center to avoid directional effects. For window and portable units, the microphone is placed seven (7) feet from the wall where the unit is mounted and approximately five (5) feet from the left side wall.

Readings of sound pressure levels at both high-and low-cool settings are recorded along with that of background noise. Sones are used as the basis for the final noise rating at that fan speed.
**Directional Control**

This test measures how well an air conditioner can control (direct) the flow of cold air. A grid of 30 temperature sensors is suspended 4 feet from the window wall in the test room and centered left-to-right with respect to the air conditioner’s discharge outlet. Each sensor is spaced six inches apart horizontally and eight inches apart vertically in two rows of fifteen sensors on the grid.

With annular space conditions maintained high enough (~90° F) so that we can detect temperature differences along the grid, the air conditioner is set to maximum cool and high fan speed. The louvers are adjusted to direct air to the left for one test, then to the right for another test. A data acquisition system records the temperature distribution along the grid. Our ratings assess how accurately the unit can direct cool air in the direction chosen.

This test is not conducted for portable units since they can be moved to various locations within the room.

**Ease of Use and Convenience**

Key criteria is scored based on established standards eliminating tester judgments and allowing for repeatable, consistent scoring. Criteria such as the unit’s weight, control panel display, air filter access as well as directional performance are evaluated. Units that are user-friendly and easy-to-assemble/install earn the highest points.

Portable models are also scored based on their window fit range and method of connecting hoses to the window panel.

**EER**

As part of the overall rating of window-mounted models, the Energy Efficiency Ratio is scored. The EER is obtained primarily from the yellow tag affixed to models and model specification labels directly adhered to the unit. If needed, models can be sent to an outside lab to verify the listed EER.