



## A white paper from **Active Thermal Management**

*The trusted name in thermal protection...*

By Frank Federman, CEO

### Cooling the Built-in Cabinet – 2019

***This paper replaces two earlier ATM papers on cooling built-in cabinets and credenzas. It incorporates new techniques, additional drawings and text to provide general guidance in ventilating immovable built-in enclosures.***

Whether cabinets in a home or credenzas in a commercial environment, systems integrators and installers will occasionally face the problem of ventilating built-in enclosures. While free-standing cabinets are easily ventilated using fans mounted on back panels, built-in cabinets are more of a challenge. The task is to provide enough ventilation to keep internal temperatures at safe levels while satisfying aesthetic considerations, usually the more difficult (usually much more difficult) task.

We'll discuss several variations of built-in cabinets and suggest effective cooling techniques. First, the basic variations:

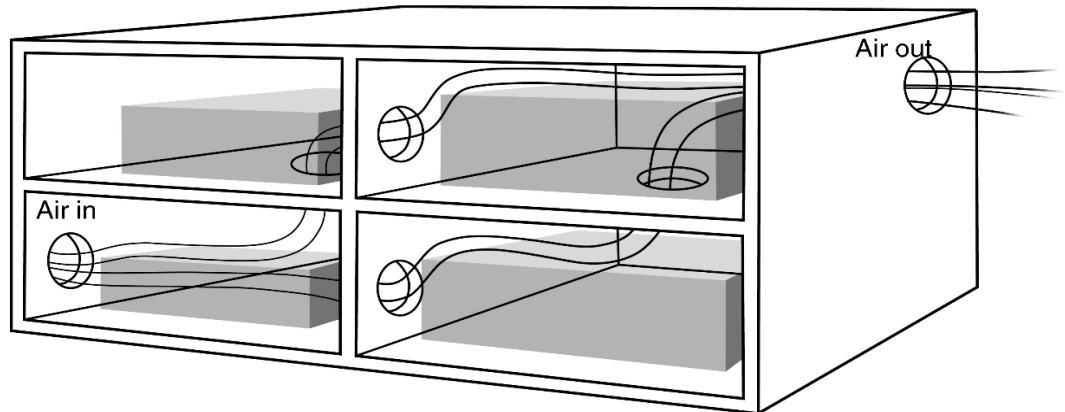
1. Cabinets with two accessible (exposed) sides
2. Cabinets with one exposed side
3. Cabinets with no exposed sides (other than the front).

And there can be “special circumstances”, beyond the scope of this paper --

- If an enclosure is located above a crawl space or basement, please read our white paper on snorkel-type ventilating systems, available on the Downloads page at [activethermal.com](http://activethermal.com).
- If the enclosure to be ventilated “backs up” to a utility space, hallway, or other area in which aesthetics are not of great importance, fans can often be used to move air into and/or out of this area.

*It is not practical in a paper of reasonable length to specify exact hole locations and dimensions to cover all possible cases; our goal is to provide general guidance and suggest techniques that have been proven by decades of experience. ATM's technical support personnel are available to take the details of actual installations and make specific recommendations...*

- Cabinets with two accessible sides, case 1, can be ventilated with side-to-side air flow, as shown in Figure 1.



- Cabinets with one accessible side can be vented as shown in Figures 2 and 3 -

Whether the cabinet has equipment to be cooled in one or two sections, the same general technique can work well.

For cabinets with two sections to be cooled, the fan bringing fresh air in can be located at A, and the exhaust fan at B, while C and D are simply 3" or 4" holes to allow air passage. Alternately, the intake fan can be located at C and the exhaust fan at D, with A and B being passive openings. This keeps the fans (and the very small amount of noise they make) inside the cabinet and allows a wide range of choices of grilles to trim the openings at A and B. *The ATM Cool-vent and Cool-line series work well in this type of installation.*

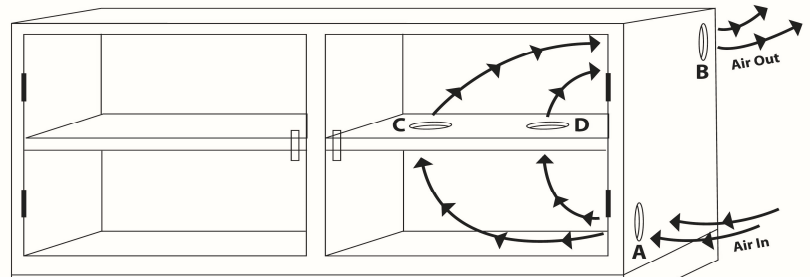


Figure 2

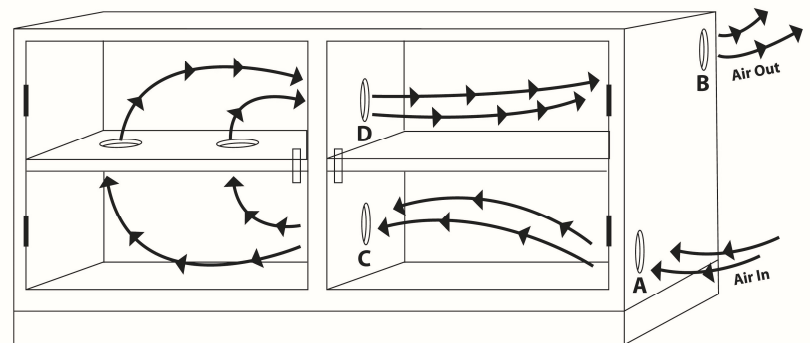


Figure 3

- Cabinets which are fully recessed and have no exposed sides are more of a challenge to ventilate. The type of base a cabinet has will affect how we can most easily cool them. There are two types of cabinet bases; one is the recessed type as seen in kitchen cabinets; the cabinet's floor extends about 2" beyond the base as shown in Figure 4.

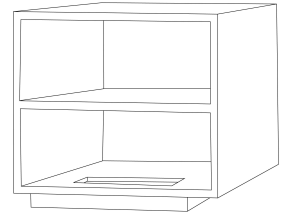


Figure 4

In the other type of cabinet, the floor of the cabinet does not overhang its base; the front surface continues flush to the floor.

Cooling both types of enclosures is made much easier by using an air mover developed by ATM for difficult situations, the System 4. Available with and without grilles, the heart of the system 4 is a small panel to which is mounted two stacks of three 80mm fans each. (Figure 5) The stacking of the fans greatly increases their ability to move air when air flow is restricted by enclosure design.

Of the two types of cabinets, those with recessed bases and two sections are the easier to ventilate. We can cut narrow slots in the cabinet's floor just behind the doors in each section that will be completely hidden when they are closed. Typical slot dimensions are 1" wide by 11" to 15" long. (ATM can supply bezels to trim these slots - see the "Grilles & Bezels" product page at [www.activethermal.com](http://www.activethermal.com) for more information and exact cutout dimensions.)

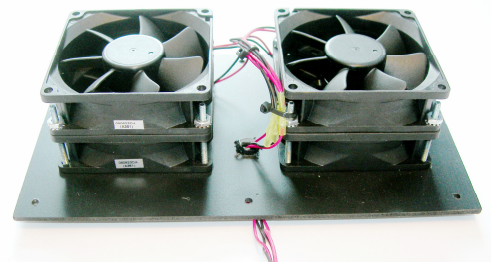


Figure 5

By mounting the System 4 fans in the panel separating the two cabinet sections, as shown in figure 6, we can bring fresh air in on one side of the cabinet, move it up and across and exhaust it on the other side. The power of the system 4 helps it move air despite the air flow restrictions of intake & exhaust slots, any holes made in shelves, etc.

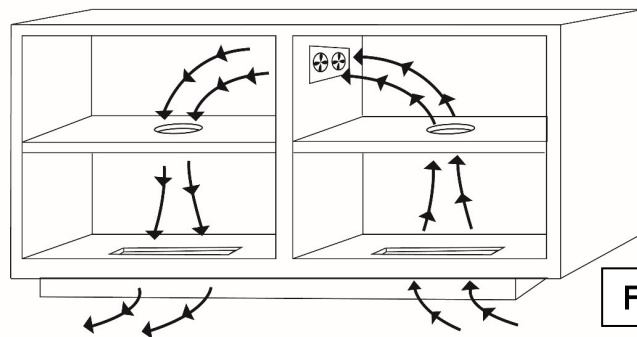


Figure 6

This technique won't work for single-section cabinets; we need the dividing wall to mount the fan panel and separate incoming and outgoing air streams.

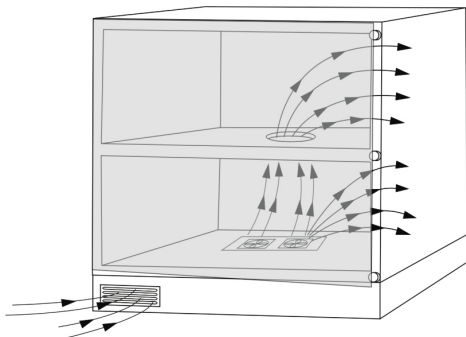


Figure 7

By locating the System 4 fan panel in the cabinet's floor, and installing a grille in the non-recessed toe-kick panel, as shown in Figure 7, we can bring fresh air in and force it out through the gap between the door and the cabinet frame, typically about 1/8". Small self-adhesive bumpers can be used to increase the gap. ***This is not an ideal cooling technique but may be the only option available.***

This arrangement can be used for single-section cabinets regardless of whether the toe-kick is recessed or not.

The most difficult situation may be the double cabinet with a flush base and no dividing panel as shown in Figure 8. A grille on one side lets air in under the cabinet's floor, and a System 4 panel brings it up into the cabinet at point A. The 2 small fans of a System 3 are used at C and D to move air up to & down from the upper level.

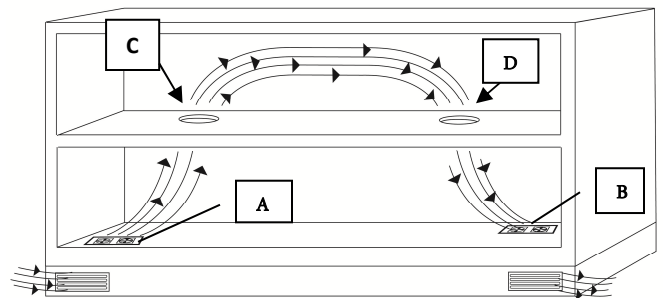


Figure 8

If the heat load is light, a simple hole on the other side of the cabinet at B, just above a second grille, will allow the heated air to escape. If the heat load is greater, a second System 4, blowing down, can be installed at B instead of the passive opening. In installations such as these, we recommend making both openings in the cabinet's floor the appropriate size for mounting a System 4. Should it become necessary at a later time to increase air flow, the installation of a second System 4 at B would be greatly simplified.

These are frequently-seen enclosure types and techniques for ventilating them effectively and quietly. There are many variations that can complicate matters; contact us at (661) 294-7999 or [techinfo@activethermal.com](mailto:techinfo@activethermal.com) to discuss the best way to solve thermal problems not covered here.