

Cooling Flat Panel Displays

By Frank Federman, President

The past few years have seen the development and rapid acceptance of a long-awaited dream of the video enthusiast -- the flat, "hang-on-the-wall" television. Long a science fiction fantasy, it's finally here, with picture sizes comparable to rear-screen projectors. As of this writing, the 42" and 50" sizes are most common (and affordable), 60" units are available, and larger displays are on the way from the manufacturers. Prices continue to plummet as screen sizes increase; the CRT is rapidly going the way of the phonograph record and cassette recorder.

The flat panel's minimal depth has prompted many home theater owners to have plasma displays mounted on or *within* the walls of their home theater, for the "window on the world" look..... (The term "plasma" will be used in this paper, but most remarks will apply equally well to LCD displays)

While "on the wall" mounting does not interfere with a display's ventilation, overheating may become a problem when a flat-screen display is recessed *within* a wall. A display's internal fans don't solve the problem. While they do move heated air out of the panel's chassis, they don't move the heated air out of the enclosure, or frame, that has been built into the wall.

Several points make this an issue for the systems designer and/or installer:

- 1. Flat panel displays generate heat**
- 2. Flat panel displays are damaged by heat**
- 3. Clients often want flat panels mounted in a way that traps heat**
- 4. Flat panel displays are expensive to replace**
- 5. Manufacturers often do not honor warranty claims for panels damaged by heat**

Despite these well-known facts, panels are frequently mounted with no thought given to ventilation....until the panel fails prematurely.

Active Thermal Management (www.activethermal.com) offers several products well-suited for use with plasma or LCD panels. Due to the large number of panel mounting methods likely to be encountered, no one product will be suitable for all installations, but given several products to choose from, most problems can be solved.

As with all enclosures that are to be ventilated, provision must be made to both supply fresh air and remove heated air, based on the fact that “you can’t exhale unless you can inhale.....”. Fans can be used to both force air in and out, or only as intake or exhaust devices, as long as sufficient passive opening(s) are provided to allow a free flow of air from the room, past the back surface of the display, and back into the room or another area.

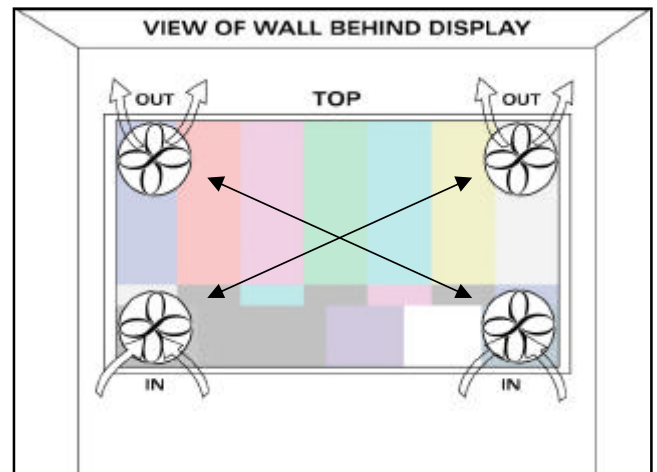
There are several ways to keep those recessed panels cool. The first 3 techniques assume the panel is tightly sealed into the wall; that is, that there are no gaps above, below, or to the side of the flat panel:

The Cool-vent II, an attractive 5 ½" by 15" grille, (face dimensions) is fitted with 4 reversible (and very quiet) fans. Available in 26 species of wood, it can be stained or painted to blend with the wall. Using one below the screen to bring room air in, and a matching passive grille above to exhaust heated air, they form a very quiet, very effective ventilation system. The unit operates automatically at 2 thermostatically-selected speeds.



The drawback to this approach is that many clients (or their interior designers) will automatically veto any ventilating scheme that is visible.

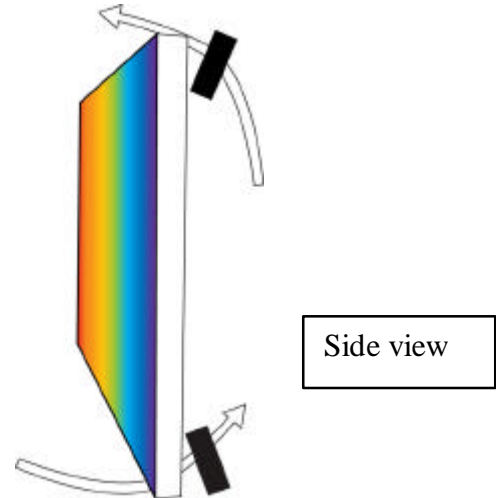
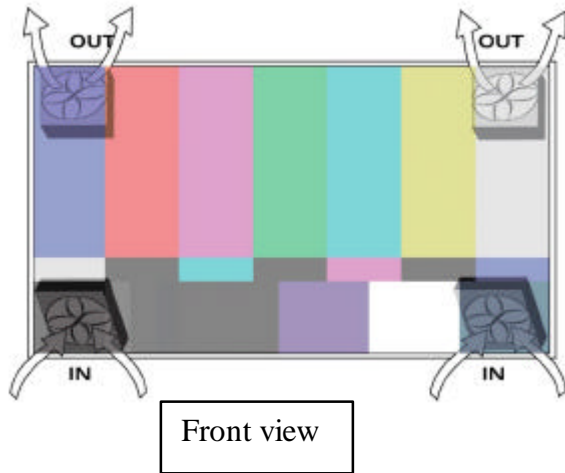
2. Another approach is to put the ventilating equipment on the wall behind the display, bringing air in from, and exhausting heated air to, a room in which appearance may not be an issue. Laundry rooms, hallways, etc., are candidates for this treatment, but the installer cannot expect to be this fortunate very often...!



Two Active Thermal Management System 3's, used for redundancy (see note below), are an inexpensive way to solve this very simple case. One pair of fans is located at the bottom left and top right corners. The fans in the second System 3 are located in the other 2 corners. (See arrows in picture) Both bottom fans pull fresh air in, while the upper fans both exhaust heated air. Should one pair fail (because bad things do sometimes happen, even to good ventilating systems), the airflow from the other System 3 will continue to protect the display.

There's an alternate mounting arrangement for the same System 3 fans, appropriate when venting through the back wall isn't an option, but air gaps of at least 1" above and below

the display can be built into the frame. (See pictures below.) Mounting the two lower fans so that they pull air in and up, and the upper fans so that they push air out, is very effective, but how the four fans are fastened to the enclosure walls will vary from installation to installation.



3. The Cool-cube™ has been used successfully to cool recessed panels by blowing cool air up from basements (with a passive exhaust vent above the display) and by pulling hot air up into attics (with a passive intake vent below the display). Requiring that there be no firestops or insulation in the wall, it's not often the easiest way to vent a display, but when other approaches are impractical, it should be considered.



4. The newest Active Thermal Management product, designed specifically for cooling recessed flat panels, is the Cool-stick™. Consisting of sixteen 50mm fans mounted in a 36" long strip, it's only 5/8" thick and 2 1/4" wide. It can be mounted below, behind, or above the panel in many situations, and will move a 36" wide curtain of air across the rear of the display, carrying off a large amount of heat. Cool-stick is divided into 2 interleaved groups of fans, with each fan group having its own thermal switch and power supply. Adjustable mounting brackets give the installer flexibility.



Note that to operate properly, Cool-stick requires a gap of at least 3/4" below and above the panel. Ideally, there should be no gap at either side, so that airflow is strictly from bottom to top.

A word about redundancy. "Redundancy", meaning "use 2, in case one breaks", isn't just an idea the Sales Department thought up one day; it's of particular importance when cooling flat panel displays. Should a system used to cool a typical cabinet full of home theater equipment fail, the owner will probably notice, before damage occurs, that the amplifiers and cable boxes are hotter than they used to be.

Flat panel displays are different. Fans used to cool them will normally be hidden, and the panels themselves are rarely, if ever, touched. Owners will not normally be aware that the cooling system has stopped operating until the panel has been damaged. Products made by Active Thermal Management, like all products, are subject to eventual failure. Power supplies, thermal switches, etc., may go bad; and overtemperature alarms, often suggested, can also fail – or give false alarms! As cooling equipment is far less expensive than a 60" plasma panel, the most cost-effective solution is to use two cooling systems. The likelihood of both systems failing prematurely is very low.

Active Thermal Management consults with its dealers to solve thermal problems encountered in home theater and other noise-sensitive installations.

We can be reached at (661) 294-7999, M-F, 8:30 - 4:30 PST.