

LED Signs: Sealed and Delivered!

How Adaptive Handles the Heat ... Better

Comprising nearly 450,000 individual LEDs (light emitting diodes), a digital billboard is an amazing example of how a traditional communications medium has been transformed by the recent revolution in electronics design. In addition to these thousands of LEDs, a display of this size also contains miles of wires, hundreds of connections, and a sizeable number of other components, all of which must work together perfectly in order to consistently create a large-scale, high-quality image.

The added challenge in designing a long-lasting outdoor LED display lies with the fact that these units are exposed to incredible extremes of heat, cold, wind, rain, fog, dust, and any other kind of environmental forces that might come up. Combine those exterior stresses with the interior demands generated by hundreds of heat-generating electronic components. How can these displays adequately balance these influences, yet still offer reliable performance?

Handling the Heat — With Help

In many cases, manufacturers handle heat buildup by simply adding air conditioners and vents to their outdoor displays. This certainly serves the intended purpose of keeping the circuitry cool, but at what cost?

For one, the effort of starting and running an air conditioner actually creates additional power demands and heat, requiring even more energy to cool the unit. Considering the skyrocketing cost of electricity and the need for greater efficiency, the last thing the owner of an EMC wants are additional utility charges cutting into his ROI!

A further drawback of supplementary cooling systems is weight. A 14' X 48' billboard can weigh as much as 8,500 lbs.; adding an air conditioner will increase that weight by another 1,000 lbs., or nearly 12%, which in turn could translate into higher structural and transportation costs.



Since 2005, this RoadStar™ display has delivered traffic and profits to State Line Service while successfully surviving the unforgiving heat of the Mojave Desert, thanks to its cool-running case and efficient circuitry.

Some display manufacturers use venting to manage temperature. Typically installed in the back of the case, each vent hole usually requires a filter to keep out dust, dirt, and other airborne particles. Even with regular filter changes, however, a hole is a hole, and over time, the smallest particulates will eventually build up and affect the billboard's performance and lifespan. Additional mechanical air handling units merely accelerate the process of contamination.

Adaptive's Sealed Solution

Adaptive, on the other hand, takes an entirely different approach to the heating/ cooling/contaminant dilemma. Adaptive's outdoor LED displays have been engineered to keep their cool through convection: no openings, no air conditioners. The difference is in a totally sealed design, the result of years of analysis and experimentation coupled with laboratory testing and real-world experience.

- An Adaptive sign is constructed of several separate modules grouped closely together like bulkhead compartments on a ship. This **modular enclosure construction** prevents heat from circulating throughout the unit or rising and collecting at the top of the sign, overheating the components situated there. Each module is individually monitored and cooled with a small fan. Since these modules hold a relatively smaller amount of heat, they maintain a more uniform temperature distribution across the entire sign, allowing heat transfer out of the sign through natural convection, thus eliminating the need for an extra cooling unit.

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- **The Protector™ case — only from Adaptive.**

Constructed from .060" thick mill-finished aluminum, our case allows internal heat to dissipate to the outside while mitigating the effects of the sun's heat. Aluminum is lightweight, readily available, and corrosion-resistant, as well as offering good thermal properties. In addition, this is the same material specified by transportation departments for over-the-highway applications.

- **Unobstructed LEDs** that allow full light output and greatly improving viewing angles. We have found that "protective" plastic shields trap too much heat.

- **Conformal-coated components** that can freely exchange any heat generated to inside the enclosure, unlike potted and insulated components which trap heat inside.

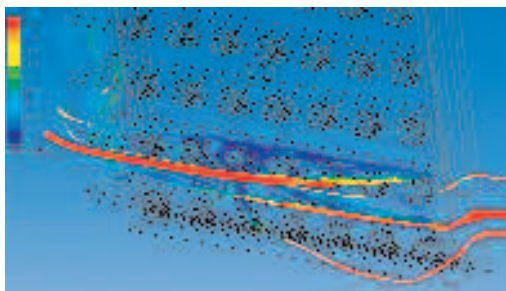
- **Gold-plated connectors** used for high-speed data lines offer greater efficiency, generate less heat, and insure long-term reliability.

- **Exclusive thermal/power management design of the PC board**, which wicks heat away from critical components and dissipates it readily and evenly throughout the rest of the unit.

Proven in the Lab and in the Field

As part of a thorough development process, Adaptive engineers conducted extensive thermal analysis (analytical as well as laboratory testing) on their outdoor LED product lines.

In one test, the unit was subjected to conditions simulating, according to the report, "1% of the hours



Adaptive engineers used Computational Fluid Dynamics (CFD) software to predict the levels and behaviors of temperatures in the sign. This tool was also used to determine optimal placement of components on the circuit boards.

in the most extreme month at the most severe locations that experience very high temperatures accompanied by high levels of solar radiation," or more precisely, 50°C/122°F. Although heat in the case rose to nearly 70°C/158°F within an hour, tests showed that our units were able to withstand these extreme temperatures over a long period of time without thanks to the the high temperature limit of the high-quality components we use.

In order to further safeguard our units (and your investment), Adaptive also equips them with temperature sensors that will automatically dim, and, if need be, shut down the sign in the event of extraordinarily high-heat situations.

Thanks to this kind of heavy-duty lab testing, Adaptive's outdoor products have performed successfully in some of the hottest regions of the United States – including the Mojave desert – further proving this design to be fully capable of handling the even the most demanding temperature extremes.

The Adaptive Advantage

From full-color, state-of-the-art MEDIAMaster digital billboards to tried-and-true StreetSmart digital displays, Adaptive Micro Systems' outdoor products are engineered in and out for a perfect balance of durable design, brilliant images, and minimal maintenance.

Perhaps no other EMC manufacturer has focused more energy on delivering a display that uses less. We've actively sought out the most modern, efficient electronics that show low power losses while generating a minimal amount of wasted heat. These cool-running components make it possible to maintain proper temperature through natural convection, making a sealed case a logical reality. And the aluminum "skin" of this sealed case not only allows heat out, but also guards its contents from the effects of rain, snow, sleet, dust, and whatever else nature—and man—can dish out.

The result: a product that not only pays its way by avoiding the extra costs of separate air handling units, but one that also eliminates the additional expenses of changing filters and replacing contaminated or corroded components.

It is, simply stated, an "airtight" case for choosing Adaptive.

ADAPTIVE
Adaptive Micro Systems LLC

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