HOTLOK®
Rack Airflow Management

HotLok® Blanking Panels

I.C.U.S.
PC & PERIPHERALS
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*State-of-the-art blanking panel providing **99,97 +% of effective sealing** in IT equipment cabinets.*

HotLok® Black

HotLok® 1U #10031

HotLok® 1U with Temperature Strip #10035

HotLok® 2U #10033

HotLok® 2U with Temperature Strip #10038

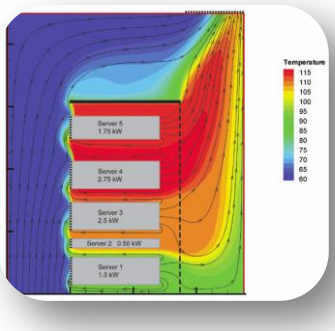
HotLok® White

HotLok® 1U #10014

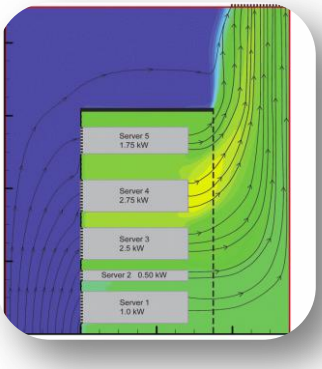
HotLok® 2U #10015

HotLok® blanking panels reduce intake air temperatures to save energy, increase capacity and reduce operating expenses.

Before HotLok®



After HotLok®



Applications

Designed to effectively seal openings in IT equipment cabinets and control airflow for optimized cooling effectiveness. The HotLok® Blanking Panel reduces hotspots and bypass airflow by preventing equipment exhaust air or hot aisle air from migrating to the conditioned air intake stream at the front of the cabinet.

HotLok® Blanking Panels are available in both 1U and 2U configurations with a choice of traditional black, or a more reflective white. Grey HotLok® (RAL7035) Blanking Panels are only available in 1U. The white blanking panels are available to co-ordinate with white racks and enclosures for improved aesthetics.

In addition, they are engineered to offer light reflectivity in the server cabinet reducing the amount of lighting required. At normal data centre lighting levels, the white blanking panel offers 3.5 times the reflectance of a standard black blanking panel. This means more brilliancy in the data centre and better illumination of surrounding surfaces and computer cabinets.

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Features

- ✓ Cantilevered sealing vanes eliminate the gap between adjoining blanking panels or with installed equipment to provide the most effective sealing blanking panel on the market, a seal 29% better than the nearest competitor
- ✓ Tool-free, snap-in installation requires no additional parts or components for installation
- ✓ Ergonomic finger grips built in to allow easy-pull removal in standard EIA-310-E openings
- ✓ Interlocking design allows secure stacking (1U panels stack 10 high and 2U panels stack 20 high) for easy storage and convenient carrying, supporting the best practice of keeping particulates and contaminates like cardboard boxes out of the data center
- ✓ Compliant with Directive 2002/95/EC of the European Parliament and the Council on the Restriction of the Use of Certain Hazardous Substances in the Electrical and Electronic Equipment (RoHS)

Patend Pending Design
U.S. design patent number D577,360 and multiple International design patents. U.S. and International utility patents pending.

Manufactured from **recyclable plastic**.

Fire Resistant - All HotLok® Blanking Panels are rated UL94HB.

Benefits

- ✓ Allows lower temperature air to be delivered to the upper one-third of the cabinet, typically the hottest area and most prone to equipment failure
- ✓ Use in a Hot and Cold Aisle configuration for low or high density cabinets
- ✓ Controls airflow that could lead to saved energy by allowing adjustment of cooling unit set points
- ✓ Use in existing cabinets for optimization and standardization
- ✓ 1U and 2U versions available for EIA-310-E compliant cabinets

DIMENSIONS	
Part Number	Overall Size
10031 - HotLok® 1U black	482,5 x 44,45 mm
10014 - HotLok® 1U white	
10035 - HotLok® 1U black with temperature strip	
10033 - HotLok® 2U black	482,5 x 89 mm
10015 - HotLok® 2U white	
10038 - HotLok® 2U black with temperature strip	

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Independent Study Shows the Importance of Using Blanking Panels

A complete seal is necessary to achieve full benefits

You've probably thought about your data center airflow problems in terms of below-, through-, and above-the-floor issues. But you may not have seriously considered the challenge of air recirculation within your server cabinets. Recirculation within a server cabinet occurs when the hot exhaust air from the rear of the server or from the hot aisle migrates toward the front of the cabinet and mixes with the cold, conditioned stream of air intended for the equipment air-intakes. This condition increases equipment intake-air temperatures, which can contribute to hotspots, the potential for reduced reliability of IT equipment, and the potential for wasted energy (which can lead to increased operating expenses).

Dr. Robert F. Sullivan, senior consultant at Uptime Institute, Inc., has measured the temperature and volume of air being drawn into equipment air-intakes in cabinets not furnished with blanking panels. Dr. Sullivan found that as much as 20 percent of the total volume of air was hot exhaust air recirculated within the server cabinet. Mixing hot equipment exhaust air and conditioned air from the underfloor plenum can create air-intake temperatures that exceed the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)- recommended 77°F maximum. This is especially true with cabinets that are more than 50 percent populated. Equipment located toward the top of the rack is affected more severely.

The best way to cope with this problem is to use blanking plates or filler panels. HotLok™ Blanking Panels are the most effective and easiest to install.

Upsite Technologies, Inc., the designer and manufacturer of HotLok Blanking Panels, recently commissioned Innovative Research, Inc., an independent, third-party organization, to study and compare internal airflow in and around IT equipment cabinets under three conditions: (1) in the absence of blanking panels; (2) using blanking panels with horizontal air gaps between adjacent panels that measured 1/16 inch and 1/8 inch between the panels and servers; and (3) using Upsite Technologies' HotLok Blanking Panels that do not permit air gaps between the blanking panels or between the blanking panels and servers. The study was conducted using two-dimensional, computational fluid dynamics (CFD) modeling. The findings are published in Upsite's white paper Two Dimensional Computation Fluid Dynamics Analysis of Blanking Panel Solutions.

Condition 2 (blanking panels with horizontal air gaps) reduced server air-intake temperatures by 11 to 22 percent over Condition 1 (using no blanking panels in the equipment cabinet). Condition 3 (HotLok Blanking Panels) proved to be 15 to 32 percent more effective in reducing server air-intake temperatures than Condition 1, and showed an improvement of up to 14 percent over Condition 2.

The study showed that HotLok Blanking Panels virtually eliminate internal recirculation between the equipment mounting rails, resulting in uniform inlet air temperatures from the bottom to the top of the cabinet.

The CFD model was confirmed using infrared (IR) thermal photography that shows high internal cabinet temperatures radiate through horizontal gaps between blanking panels without a complete seal. IR thermal photography of the HotLok Blanking Panels demonstrates the highly effective sealing technology.

There are significant benefits to using blanking plates, particularly HotLok Blanking Panels, including:

- ✓ Reduction and stabilization of equipment air-intake temperatures
- ✓ Elimination or reduction of the number and severity of hotspots within equipment cabinets
- ✓ Increased availability, performance, and reliability of IT equipment within the cabinets, especially in the top one-third of the equipment cabinet
- ✓ Elimination of exhaust air recirculation within the cabinet, which allows for the optimization of cooling and the reduction of energy consumption and operating expenses
- ✓ The possibility of deferring capital expenses to add additional cooling capacity or the ability to add more computing power to the data center
- ✓ The potential of greening the data center by reducing its carbon footprint.

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Image 1
In a data center with a conditioned airflow temperature of 72°F, a series of Upsite Technologies' HotLok Blanking Panels are installed. The consistent temperatures shown on the face and gaps between the panels reveal the highly effective sealing technology.

Image 2
In a data center with a conditioned airflow temperature of 72°F, and a series of non-HotLok Blanking Panels installed , the measured temperature of the heat radiating through the horizontal gaps is 91.5°F, which is much higher than the ASHRAE-recommended 77°F.

What differentiates HotLok Blanking Panels from others?

HotLok Blanking Panels offer the following advantages:

- ✓ Engineered to provide one of the most effective seals available on the market
- ✓ Designed for quick, safe, tool-free installation
- ✓ Ergonomically and aesthetically pleasing
- ✓ Easy to use, compact to store and keep in stock for reconfiguring
- ✓ RoHS compliant and UL-certified
- ✓ Competitively priced

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HotLok Financial Impact Case Study

HotLok Blanking Panels Seal IT Equipment Cabinet Openings for Significant Energy Savings and Capacity Improvements

Profile of Chilled Water Liebert 600C Computer Room Air Handler (CRAH) Cooling Units in High-Heat Density Facility:

- ✓ 400 cabinets in a computer room with 10,000 ft₂ (approx 1,000 m₂) of raised floor
- ✓ Each cabinet dissipates 8.5 kW of power, for a total critical load of 3.4 MW
- ✓ Heat density yield of 316 W/ft₂ (approx 3.400 W/m₂)
- ✓ One third of cabinets (14U) contained no IT equipment and required blanking panels
- ✓ Of the one third requiring blanking panels, 40 percent (6U) are filled with 1U Panels and 60 percent (8U) are filled with 2U Panels
- ✓ The cost for Panels is the average selling price

Before the HotLok Blanking Panel installation: At 65°F (18.3°C) / 45% Rh, the 600C units have a 70 kW 100% sensible cooling capacity, therefore there is no latent cooling penalty in this calculation. For these return air conditions, a total of 61 CRAH units are required, 49 units at full cooling capacity and 12 for redundancy.

After the HotLok Blanking Panel installation: At 72°F (22.2°C) / 45% Rh, the 600C units have a 98 kW 100% sensible cooling capacity. For the 4.25 MW of total cooling capacity, a total of 43 CRAH units will be required, 35 units at full cooling capacity and 8 for redundancy.

PLEASE NOTE: There is no difference in the total cooling capacity as that takes place in the mechanical room and the chiller(s) will dissipate the same amount of heat no matter how many CRAH units are operating in the computer room. The chilled water flow rate will not be included for simplicity, although in actuality there may be additional savings associated with reduced chilled water flow rates.

Here's a summary of the operating cost savings available by installing HotLok Blanking Panels:

(1) Increase return-air temperature set point by 7°F (3.9°C)—for this example, 65°F raised to 72°F (18.3°C raised to 22.2°C).
(2) 18 units placed on inactive stand-by.

Annual Operating Cost Savings

18 units with 10 hp fans X 0.757 kW/hp	136 kW
Annual energy consumption savings (8760 hrs / yr)	1.191.360 kWhrs
Annual cost savings at $0.07 (€.12) per kWhr	$83.395 (€142.963)
Maintenance cost savings on 18 units ($3,000 or €3.000 per unit)	$54.000 (€54.000)
Total annual operating cost savings	$137.395 (€196.963)*

*This represents a 29 percent reduction in the annual operating and maintenance costs of the cooling units.

Simple Payback Analysis

Cost and Savings	
# of cabinets	400
open U (1/3 of 42Us)	5.594
# of 1U Panels	2.238
# of 2U Panels	1.678
Total cost of Panels	$21.762 (€27.021)
Annual savings	$137.395 (€196.963)
Monthly savings	$11.450 (€16.414)

*This represents a 29 percent reduction in the annual operating and maintenance costs of the cooling units.

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Simple Payback												
Month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
US $	-10.312	1.137	12.587	24.036	35.486	46.936	58.385	69.835	81.284	92.734	104.183	115.633
EU €	-10.607	5.806	22.220	38.633	55.047	71.461	87.874	104.288	120.701	137.115	153.529	169.942

***ROI Achieved**
With the total annual cost savings at **$137.395** or $11,450 per month (**€196.963** or €16.413 per month), simple payback occurs in the second month of the HotLok Blanking Panel installation.

Conclusion
The results of the Two-Dimensional Computational Fluid Dynamics Modeling Study and the Financial Impact Study underscore the importance of installing HotLok Blanking Panels, an industry-recognized best practice for airflow management. Sealing IT equipment server openings with HotLok Blanking Panels is among the simplest and most effective ways to reduce annual operating costs in the data center, improve PUE, and help you prepare for increasing server density, using your existing cooling infrastructure.

HotLok Blanking Panels provide the lowest total cost of ownership and highest energy money savings of any blanking panel on the market today.

Immediately increase the efficiency of your entire cooling system with a simple solution that delivers quick payback and long term energy cost savings.

HotLok Blanking Panels can provide full ROI in about two months, making them the best investment for your money.

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