



**UNDERSTANDING THERMAL MANAGEMENT:
A Systems Approach To Effective Thermal Management
Solutions For Electronic Equipment Enclosures**





Thermal Management

Maintaining the temperature inside racks and enclosures is critical to the proper functioning and survival of the circuits operating within. Most studies have shown that for every 10°F rise over 85°F, digital equipment life is reduced by approximately 40%. It is essential to ensure the heated air within the enclosure remains at a temperature of no more than 85°F to help protect the sensitive equipment mounted within.

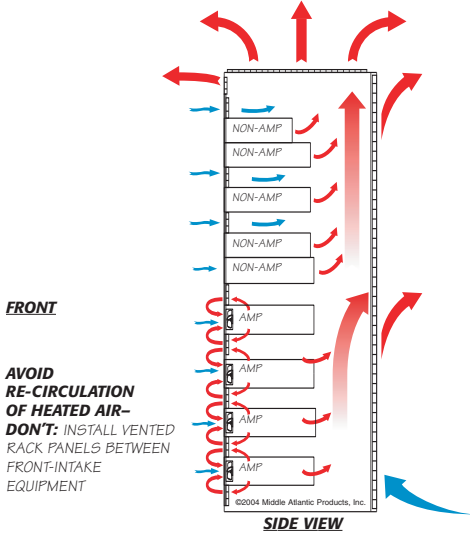
There are two approaches to securing an adequate internal enclosure temperature for the successful operation of the components enclosed: Passive and Active thermal management. Passive makes use of the ability of a properly configured system to ventilate through natural convection. In certain cases, however, the use of fans to force air through an enclosure (Active) is necessary to maintain the desired internal temperature. Please refer to the nomograph located on the back page to determine whether your system will require Passive or Active thermal management.

In addition to the proper configuration of your rack system, room design is critically important to the success of rack and enclosure thermal management. It is essential that not only does the equipment room have the ability to remove the heat generated by the racks, but also that racks are placed strategically within the room to ensure no re-circulation of air occurs.

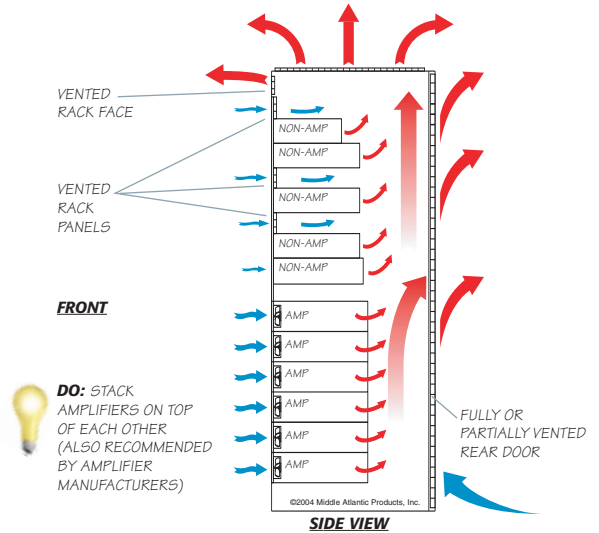
THERMAL TECHNIQUE: PASSIVE THERMAL MANAGEMENT

The Passive approach to thermal management involves capitalizing on natural airflow. Adequate vent openings in the top and bottom portions of an enclosure, as well as an unimpeded airflow, and placing hotter equipment lower in the rack will enhance the natural flow of air, as heat naturally rises. There is a **wrong** and **right** way to approach Passive thermal management:

WRONG! PASSIVE CONVECTION with front-intakes on equipment



PROPER PASSIVE CONVECTION with front-intakes on equipment



Our full range of versatile rack enclosures are optimized for both Active and Passive thermal management. Please see back page for how to configure your Middle Atlantic Products rack for proper thermal management depending on your application.

WRK-SA Series Rack Enclosures are one choice for Passive thermal management:

- 3 Wide design helps promote an unimpeded natural airflow up sides of equipment (chimney effect)
- 3 Engineered ventilation locations on the rack face allow natural removal of heated enclosure air



Additional Enclosure choices for Passive thermal management

- 3 ERK series
- 3 DWR series
- 3 WRK series
- 3 EWR series
- 3 PTRK series
- 3 SR series

If you have any questions about thermal management and which enclosures will satisfy your thermal needs, please call the Middle Atlantic Products customer support team at 800-266-7225.

Use these solutions with a Middle Atlantic Products Rack for optimal Passive thermal management



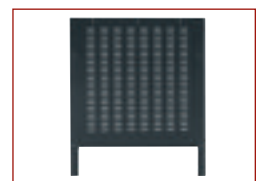
selectively vented rear door kits



extensive selection of aesthetic vent and filter panels allow ambient air to enter the enclosure



extensive selection of vented shelves to facilitate the natural rise of heated air through the enclosure



vented enclosure top options allow heated air to naturally escape the enclosure

HOW TO CALCULATE VENTILATION REQUIRED TO PROVIDE AN INTERIOR RACK TEMPERATURE OF 85°F

This nomograph will show the minimum ventilation (active or passive) required, to provide an interior rack temperature of 85°F.

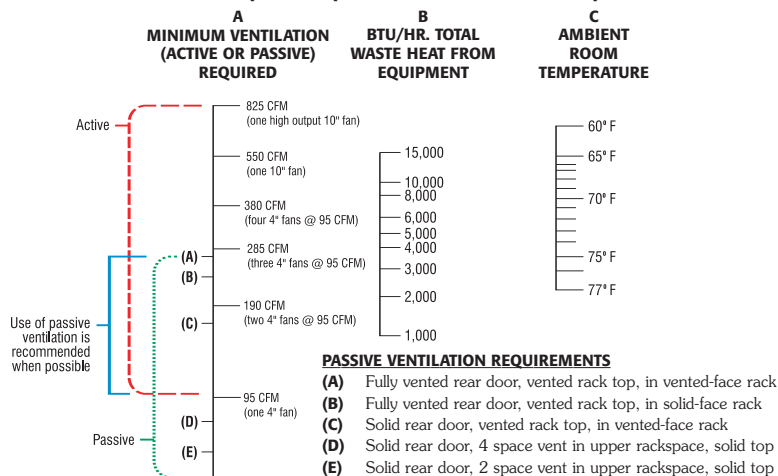
To calculate total waste heat (column B):

1. Obtain total waste heat output by combining the published waste heat BTU/Hr. of all amplifiers in the rack.
2. Add up total measured amperage draw from all other equipment and multiply by 400 (total amperage x 400 = total BTU/Hr. @117v.)
3. Combine BTU/Hr. totals from steps 1 and 2 to obtain total for all equipment. Mark total in column B.

To obtain minimum ventilation requirements:

1. Mark ambient room temperature in column C and connect points in B and C with a straight edge.
2. The minimum cooling required providing an interior rack temperature of 85°F will be shown on column A, where the straight edge intersects the minimum cooling requirements column.

NOMOGRAPH
Calculate ventilation required to provide an interior rack temperature of 85°F.



OPTIONS FOR OPTIMAL THERMAL MANAGEMENT

RACK SERIES	ACTIVE					PASSIVE	
	ENCLOSURE TOP	TOP FAN OPTIONS	SIDE PANELS	SOLID REAR DOOR	VENT BLOCKERS	ENCLOSURE TOP	VENTED REAR DOOR
DRK	*required	*required	*required	*required	*required	MW-VT, MW-LVT	standard
WRK-SA	*required	*required	standard	standard	*required	MW-VT, MW-LVT	*required
WRK	*required	*required	*required	standard	*required	MW-VT, MW-LVT	*required
MRK	*required	*required	*required	standard	not required	MW-VT, MW-LVT	*required
VRK	*required	*required	*required	standard	*required	MW-VT, MW-LVT	standard
VMRK	*required	*required	*required	standard	not required	MW-VT, MW-LVT	*required
ERK	*required	*required	standard	standard	*required	MW-VT, MW-LVT	*required
DWR	standard	*required	standard	n/a	*required	not required	n/a
SR	standard	*required	standard	n/a	*required	standard	n/a

*Required - please see master catalog for part #s – options required to properly configure system for designated thermal management technique.

Copyright©2002-2006 Middle Atlantic Products, Inc ("Middle Atlantic Products"). All rights reserved. All original information, logos, charts, graphics, images, and/or nomographs herein are the sole property of Middle Atlantic Products. Warning: Unauthorized reproduction, copying, display or revision of this Guide, or the information, charts, images and content of the Guide, is prohibited by federal law and is subject to federal prosecution. Middle Atlantic Products gives the viewer of this Guide a limited nonexclusive license to view this publication. All uses of this Guide must be for non-commercial purposes. The Guide may not be copied or distributed without first obtaining the written permission of Middle Atlantic Products.

This Guide is provided to the user for informational purposes only. Middle Atlantic Products makes NO WARRANTIES of any kind with regard to this document, including liability for system failure due to individual thermal management design. The Guide is provided "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. Some jurisdictions do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. Middle Atlantic Products shall not be held liable for any damage, direct or indirect, actual or consequential, that may occur as a result of relying upon, using, following, or circumstances arising out of or in connection with this publication, or information provided, or referenced herein. Middle Atlantic Products, nor its officers, directors, employees, contributors nor agents shall be held responsible for any errors or omissions in this Guide. Information in this publication is subject to update or change without notice at any time. References to other companies, their products or services, are provided without ANY WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED. Nothing contained in this Guide should be construed as granting any right or license to use, reproduce, transmit, perform, publish, license, modify, rewrite, create derivative works from, transfer, store, or sell the content. This publication may be accessed by users internationally and may contain references to products or services that are not available in your country. These references do not imply that Middle Atlantic Products intends to, or will make, such products and/or services available in your country.

For a **complete** guide to thermal management and controlling the temperature inside equipment racks, visit www.middleatlantic.com to download our thermal management white paper, which includes references for all information within this guide and serves as helpful additional reading.



Corporate Headquarters

Corporate Voice 973-839-1011 • Fax 973-839-1976
International Voice +1-973-839-1011 • Fax +1-973-831-4982
middleatlantic.com • info@middleatlantic.com

Middle Atlantic Canada

Voice 613-836-2501 • Fax 613-836-2690
middleatlantic.ca • contactcanada@middleatlantic.com

Factory Distribution

USA: NJ • CA • IL CANADA: ON • BC

