

VEGAS Heat Calculations

J.Ray 10/05/12

This document describes the heating/cooling of the VEGAS shielded rack, based on the estimated heat dissipation of the hardware, and the airflow of the ventilation/blower assembly that came installed in the rack as purchased.

The power dissipation is estimated to be a maximum of 1500W. The blower assembly is specified to provide 400cfm. With the rack doors closed and only the UPS installed, this level of airflow was confirmed using a small handheld airflow meter at the top of the rack.

The calculations are based on those in the “Fans and Blowers” section of the document “Heat Dissipation in Electrical Enclosures” published by Hoffman.

According to this document:

$$\text{CFM} = (3.16 * \text{WATTS}) / \Delta T$$

where,

CFM = Airflow through the rack, in ft³/min

WATTS = Internal heat load, in watts

ΔT = Internal temperature minus ambient temperature, in °F

Assuming the desired temperature rise is 20°F above ambient, for VEGAS it would be:

$$\text{CFM} = (3.16 * 1500) / 20$$

$$\text{CFM} = 237 \text{ cfm}$$

So, if the airflow can remain above 237cfm after the full complement of hardware is installed in the rack, then cooling should not be an issue.

Also, given the low ambient temperature of the air intake to the rack, a +20°F temperature rise only results in an internal temperature of ~85°F. If a less conservative +30°F temperature rise is allowed, the airflow requirement drops to 158cfm.