

Notes on MVME 2700 Airflow Requirements at 5000m

Mick Brooks, 2000-11-03

1 Introduction

Motorola's MVME2700 single board computer is rated to operate at altitudes of up to 5000m. ESO has experienced some instances of the processor halting due to insufficient airflow at sea-level in Garching with 366 MHz versions of the board. What follows is a summary of Motorola's response to questions about this and some information provided by a VME chassis vendor (Hybricon) which included an airflow simulation at 5000m.

ALMA is currently using three different VME chassis:

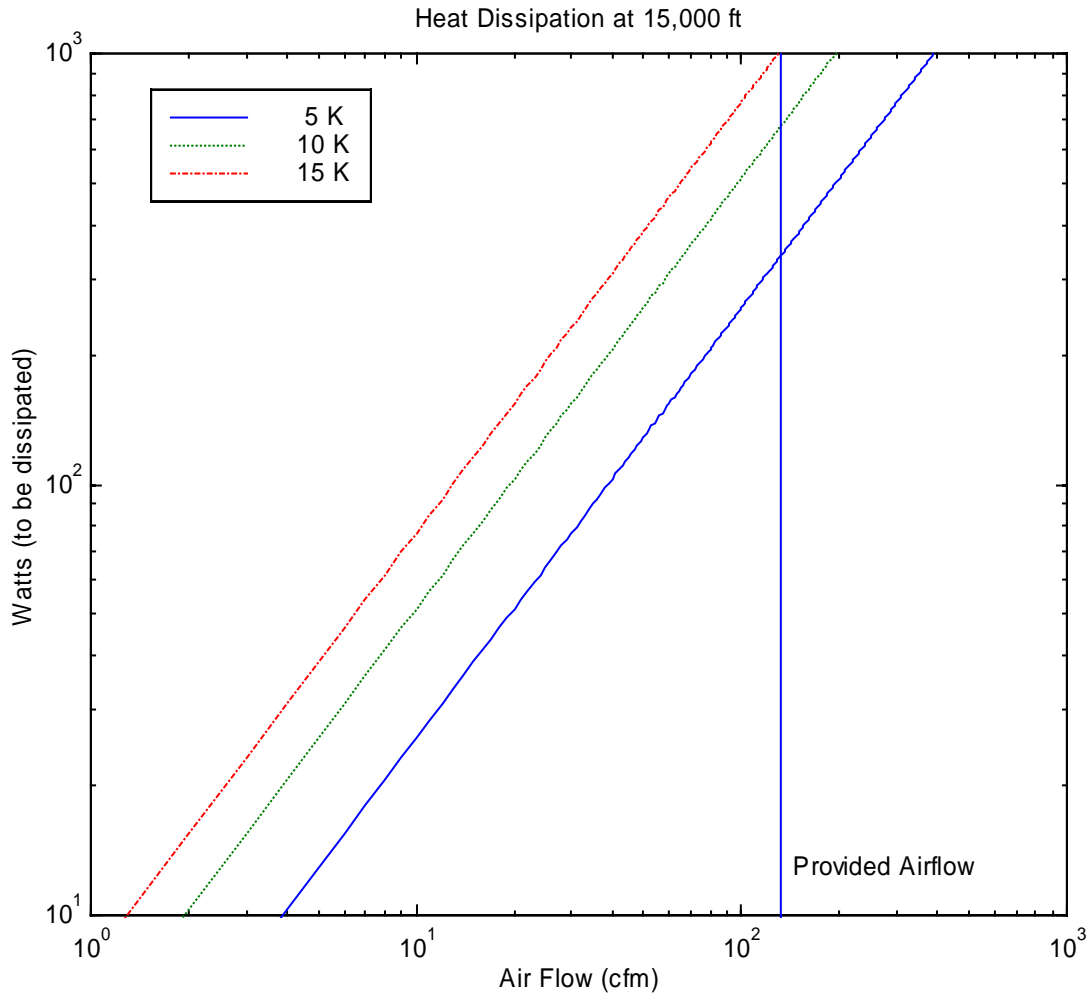
- Wiener Minicrate Series 100
- Elma "type 11" 12-slot
- Elma "type 14" 5-slot with environment monitoring

2 Motorola's Advice

Motorola was asked about the requirement for airflow at 5000m, and the Wiener crate's airflow specification was provided to ascertain whether it was adequate. Following is their answer:

“We ran some analysis on the 366 MVME2700 board operating at 5500m. Assuming that the maximum inlet ambient temperature is still 55 deg C, the minimum airflow that must be provided the the board's slot is 2 m/s (or 400 linear feet per minute). Anything less than this will cause the L2 cache to rise above the manufacturer's recommended operating temperature. MCG would highly recommend that the customer measure the airflow of the slot (see section 4.3 of the MVME2700 thermal report), to ensure that their fans are providing enough airflow. The CFM values below sound high, and may not take into account the system impedance.”

3 Hybricon's Simulation



This graph shows the temperature rise for air flow provided. In the X071 chassis, at 15E3 ft, the air moving devices (AMDs) should provide 132 cfm. This translates to an average of approximately 300 lfm per slot, assuming that you have the 160mm deep version with a mean component height of 0.30". You stated that your system will be minimally loaded; in this case, it will be important that you put air blockers into any unused slots, or you will see very little velocity through the loaded slots, since the air flow will favor the path of least resistance. To summarize:

Ambient Temperature (C)	Watts (to be dissipated)	Temperature Rise (C)	Outlet Temperature (C)
30.0	340.0	5	35
30.0	680.0	10	40
30.0	1020.1	15	45

4 Conclusion

For ALMA's purposes it appears that the crates being purchased have sufficient air-flow to support the operation of 366 MHz MVME2700 SBCs at 5000m. The following recommendations should ensure correct operation:

- Unused VME chassis slots be blocked to force airflow over the active boards
- Airflow through the MVME2700 slot be measured at 5000m to verify that the required 2m/s is being provided
- VME chassis allowing the monitoring of fan speeds and faults should be used in all locations where the equipment is in an unpressurized environment.
- ALMA investigate the purchase of an anemometer suitable for measuring the airflow in VME slots