
Harbor Thermal Test

Version 0.2
April 1999

Revision History

Following is a brief history of this document. The date indicates when the text was last modified, causing the revision number to change.

Revision	Date	Description
0.1	March 9, 1999	Preliminary draft for review
0.2	April 12, 1999	Updated access specifications and procedure

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1 Scope

This document covers preliminary testing of selected drives in Harbor SCSI wrappers in a reference drive bay.

2 Required Documents

Product specifications for each drive to be tested must be supplied by each manufacturer. The product specification must identify components to be measured and include maximum temperature specifications for each component.

3 Purpose

To characterize drive thermal performance using Harbor SCSI wrappers in a reference drive dock. This data will be used to optimize the wrapper and to determine acceptability of the design with respect to thermal performance.

4 Test Procedure

Drive thermal performance will be quantified for selected drives from participating manufacturers. Tests will be performed in Harbor SCSI hardware under the conditions described in the following procedure.

4.1 Test Hardware

The hardware under test is as follows:

1. Drives - 5 of each specific type (e.g. 1.0", 10k RPM, 9 GB)
2. Harbor SCSI wrappers – 5 (either 1.0 or 1.6")
3. Drive dock - modified to provide flow to five drives only

4.2 Test Equipment

The following hardware will be used to characterize drive thermal performance:

1. Airflow measurement system – system designed to AMCA guidelines including calibrated pressure transducers
2. Thermocouples – type T (first choice) or type J (second choice) attached at specified manufacturer drive locations
3. Short duct to mate rear of dock with cooling fan
4. Cabling - PC and power supply-to drive cabling
5. PC - computer to be used for exercising drives using a SCSI controller
6. PC - computer used for interfacing to datalogger for data collection
7. Datalogger - suitable for recording thermocouple when connected to a PC
8. Power supply – to power five drives (5/12 VDC)
9. Power supply – DC supply to power fan (no greater than 13 VDC/2 A required)

4.3 Drive Exercise Software

Windows NT will be loaded on the exercise computer and IOMeter will be used to exercise the drives. IOMeter will be configured to attain utilization on the drives which will cause the greatest drive heat dissipation possible. The suggested IOMeter settings are as follows:

- 1) Data transfer length - 512 bytes
- 2) 100% read
- 3) 100% random
- 4) delay of 0
- 5) queue depth of 4
- 6) unformatted/unpartitioned drives

4.4 Thermocouple Attachment

Thermocouples must be mounted on each drive to be tested by the drive manufacturers. The selected locations should be those described in the drive product manual using the attachment method described in this document. If thermocouple attachment instructions are not included in the manual, the following procedure should be used:

1. Select and label either type T or J thermocouples of at least 6 ft length. (Type T is preferred.)
2. For each electronic component to be measured, hot glue thermocouple leads to a nearby component so that the thermocouple bead contacts the top, center of the component to be measured. (Hot glue must NOT be placed around the bead.)
3. While ensuring that the bead contacts the top center of the component, place a small bead of thermally conductive epoxy ($k > 5 \text{ W/m} \cdot ^\circ\text{K}$) around the bead on the top of the component. (Epoxy diameter should be less than 5 mm and no taller than 3 mm.)
4. For HDA temperatures, attach thermocouples using the same constraints at the designated locations.
5. Hot glue the grouped thermocouple leads so that they extend out the front of the drive and can easily be routed around the wrapper.
6. Bundle the thermocouple leads by drive.

4.5 Test Conditions

Airflow will be delivered by a fan attached with a duct to the Harbor dock. Airflow performance of this assembly will be characterized prior to thermal testing on an AMCA airflow measurement system (see Figure 1) with a set of five drives in the Harbor wrappers/dock. Airflow settings (fan input voltages) for the thermal tests will be determined using the airflow measurement system. Thermal testing will be performed at these airflow settings by selecting the appropriate fan input voltages.

4.6 Test Steps

Prior to test start, the test drives will be placed in the wrappers and dock and connected to the exercise PC. Ambient air temperature at the inlet to the drives will be monitored by three thermocouples spaced in front of the left, middle and right drives approximately 3" from the front surface of the wrapper.

For each set of drives the following test steps will be performed:

- 1) Mount drives in Harbor wrappers.
- 2) Populate drives in bay.
- 3) Connect cables to drives.
- 4) Connect thermocouples to data logger.
- 5) Set fan voltage to maximum flow setting.

- 6) Power on drives.
- 7) Start drive exercise software.
- 8) Monitor thermocouple data to determine when stabilization has been attained.
- 9) Take at least five thermocouple readings at one minute intervals following stabilization.
- 10) Record airflow delivery and pressure drop across dock assembly.

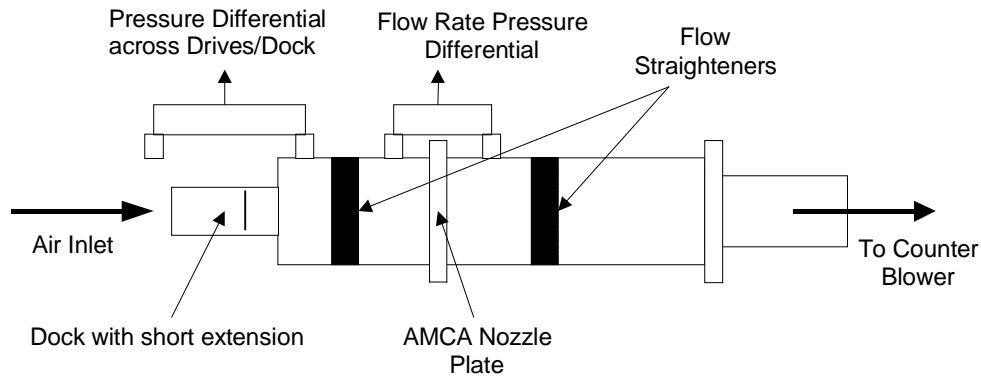


Figure 1 – AMCA Airflow Measurement System

5 Data Analysis

Data for each drive type will be characterized and summarized for use by the Harbor team in determining the adequacy of the design.

The following will also be summarized:

- Component temperatures vs. airflow velocity
- Variability for each set of five drives.
- Summary of approximate airflow velocity to meet component temperatures in the Harbor SCSI hardware to meet drive thermal requirements at 35 °C.