

Chassis Thermal Compliance Test Report

D845EPT2 Intel Motherboard

in the

WTX-2002 Model Chassis

by

L.S.H. Technology Company, LTD.

Testing performed by

Northwest Environmental Test Lab, L.L.C.

Revisions:

Revision Level	Notes
0.1	Draft Copy For Review Only
1.0	Released Version

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1.0 Executive Summary of Results

The L.S.H. Technology Company, LTD. WTX-2002 chassis provides adequate cooling for the Intel D845PT2 desktop motherboard using the 2.4GHz Pentium® 4 processor, one add-in card, one CD-ROM, one floppy drive and one hard drive.

Thermal Test	Test Results
Processor	Pass
Power Supply	Refer to Intel power supply report

Table 1 - Summary of Results

2.0 Introduction

The data compiled in this report is for your reference to facilitate in designing ATX 2.03 compliant chassis that meet the thermal, mechanical, and electrical requirements of Intel motherboards and accompanying processors.

The importance of ATX 2.03 compliant chassis and power supplies lies in the fact that it makes system integration easier and better for everyone. The specification promotes interchangeability, which makes integration/assembly of motherboards (with chassis independent I/O shields) and chassis easier. Overall, this results in lower integration and system costs and also reduced support cost for you. As you can see, ATX 2.03 compliant chassis/power supplies benefit everyone!

3.0 References

- ATX Specification version 2.03
- Intel's chassis independent I/O shield design(s)
- D845PT2 Motherboard Technical Product Specification

4.0 Test Configuration

All peripheral bays and add-in card slots were NOT populated for these tests. A heavily loaded configuration will result in lower performance than noted in this test report. This configuration is considered to be the MINIMUM performance required of a chassis.

Component Description	Quantity	Manufacturer	Model Number	Serial Number
Chassis	1	LSH Technology	WTX-2002	N/A
Desktop Motherboard	1	Intel	D485EPT2	Indeterminate
2.4 GHz Pentium® 4	1	Intel	Pentium 4	Indeterminate
PC133 DDRAM DIMMS 128Mbytes	2	Samsung	PC133R	Indeterminate
Hard Drives	1	Seagate	ST380020A	3G045HT
CD-RW	1	Plextor	PX-W 1610 TA	W1610TA0784962
CD-ROM	0	N/A	N/A	N/A
Floppy Drive	1	Teac	FD235HG	7682422
Add-In Cards AGP Slot (low profile)	1	Aopen	MX200-V	13200603JNC
PCI Slot 1	0	N/A	N/A	N/A
PCI Slot 2 NIC	0	N/A	N/A	N/A
Power Supply (200 watts)	1	Macron	MPT-203	Indeterminate
System fan (s) (size in mm)				
Intake (80)	1	Young Lin Tech. Co. Ltd.	DFS801512M	Indeterminate
Internal	0	N/A	N/A	N/A
Exhaust	0	Globe	B011388 12M	N/A
Power supply – intake (80)	1			Indeterminate
Power supply – exhaust	0	N/A	N/A	N/A
Active Heatsink on CPU (70)	1	Sanyo	109X981270 H046	Indeterminate

5.0 Test Equipment Used

- *Omega Engineering, Inc. PCI-DAS-TC 16 channel Thermocouple and voltage board
- *Alinco DM-340MV DC power supply for test chamber.
- Custom designed ½” Plexiglas temperature chamber that is 35”wide x 36”high x 28”deep.
- *Omega .005” diameter *Teflon coated K-type thermocouples

6.0 Mechanical Test

The component size was evaluated against the product specification for compliance. The passing criterion is defined as not exceeding the component product specification. The ATX 2.0 board gauge was used to determine compliance with keep-out zones defined by the ATX 2.03 specification section 3.4.

7.0 Thermal Tests

The peripherals listed in section 4 were installed in the chassis and K-type thermocouples were attached at the points designated in section 11. The chassis was tested in a controlled temperature chamber held at a constant 35C. The system was run under the *Microsoft Windows 2000 environment where a test program was initialized that exercises the processor up to the 75% Thermal Design Point (TDP). An *Omega data acquisition logger then sampled the thermocouples every thirty seconds for 60 minutes providing a total of 120 data points. The system was exercised until the initial thermal gradient reached a consistent level with a slope-nearing zero. During testing, the ambient temperature was monitored approximately 5cm from the front bezel of the chassis.

8.0 Chassis Description (as Tested)

The L.S.H. Technology Company, LTD. WTX-2002 chassis is a midtower chassis that ships with one 200W power supply and one system intake fan. It has one 5.25" exposed drive bay, one 3.5" external drive bay and two 3.5" internal drive bays. The dimensions of the chassis are 17" L x 13.5" W x 4" H.

The chassis is manufactured by: L.S.H. Technology Company, LTD.

10F-06, No. 14, Lane 609 Chung Hsin Rd., Sec.5
San Chung, Taipei Shien, Taiwan, R.O.C.

9.0 Support Software

The following software was used in this thermal evaluation:

- Max Power v6.0 - an Intel proprietary processor stress utility designed for the Pentium 4 processor
- *OmegaSoft v5.20 data acquisition card drivers
- *NetDAQ macro summary sheet - post processes acquired data and evaluates limits.
- DOS Wizard v2.03 Data Acquisition Control Program

10. Test Setup and Procedure

Thermocouple wires from the test points were carefully routed to avoid modification of the airflow pattern inside the system.

To achieve the 35C maximum specified ambient temperature, the server system was placed inside a Plexi-glass housing. Temperature inside the plexi-glass chamber is controlled by a 2-channel process controller, which regulates a heater inside the enclosure for adding heat and two fans for cooling.

Component temperatures vary greatly depending on what application or exercise program is being run. For these tests the worst-case program was used depending on which component was being evaluated.

An *Omega PCI-DAS-TC 16 channel data acquisition card was used for data collection; readings are monitored until all temperatures have stabilize (usually 1.5 hours). Once data was acquired, it is then post processed using an Excel macro and associated thermal limit file. The thermal margins are determined by extrapolating the data to a 35C ambient, making comparisons against the predefined thermal limits and calculating the RMS value of the last 6 adjusted stable readings collected.

Processor Testing

All tests were performed using a 2.4GHz. Pentium 4 Processor as per plan of record. This represents worst-case processor temperatures for thermal evaluation based on available components at time of testing.

During processor testing, the processor heat spreader had a thermocouple attached to the top surface of the heat spreader, and the temperature was measured while the MaxPower v6.0 program was executing. This software is designed to produce the greatest possible processor heating and is intended only for processor thermal studies. The program simulates a software situation, which is more strenuous than normal real world applications. In reality, desktop applications would involve memory, disk drive, and network accesses, which force the processor to wait. The Pentium 4 heat spreader is not to exceed 69C.

11. Test Results

Summary

Processor:

With Max Power v6.0 running, the case temperature specification of the 2.4 GHz Pentium 4 processor was not exceeded under these worst-case conditions. The temperatures measured were within specifications by a minimum margin of 1.7C on the CPU.

Details

Summary of Test Results:

Test Points	Max Specified Temp Limit (C)	Measurements @ 35C	Margin (C)
Processor Test			
Temperature – Ambient (inlet)	35	35	N/A
Temperature – CPU (case)	69	67.3	1.7
Temperature – CPU Ambient*	43	47.8	4.8
Temperature - Exhaust	N/A	39.1**	N/A

* normalized to 35c, last 100 sample values are averaged of PSU/MEM/Rear I/O and then those values are averaged to obtain the CPU ambient that is posted in the above table.

** Intake power supply fan proximity to CPU vented majority of heat out of chassis through the power supply.

12. Conclusions

The L.S.H. Technology Company, LTD. WTX-2002 chassis (as tested) **provides adequate cooling** for the 2.4GHz Pentium 4 processor.

The margins in this report reflect a combination of multiple worst cases. The data reflects the temperature of the components at the maximum specified temperature of 35C while running software applications designed to highly stress each hardware configuration.

These test cases do not necessarily represent the worst-case peripheral positions. In addition, the system is not maximally loaded with add-in cards and their associated cables that could cause the internal temperatures to increase and reroute airflow.

13. **ATX Mechanical Design Check Sheet:**

See ATX 2.03 specification for details concerning mechanical size restrictions.

Keepout Zones		PASS/IR*
	Zone A .3" clearance compliant?	PASS
	Notes:	
	Zone B clearance compliant?	PASS
	Notes:	
	Zone C clearance compliant?	PASS
	Notes:	
	Zone D clearance compliant?	PASS
	Notes:	
	Zone E clearance compliant?	PASS
	Notes:	
I/O Zones		
	Horizontal Dimension Compliant?	PASS
	Notes:	
	Vertical Dimension Compliant?	PASS
	Notes:	
	.1" keep out Compliant	PASS
	Notes:	
Mounting Holes	Holes A, B, C, F, G, H, and J, R supported?	PASS
	Notes:	
	Standoffs B, D, E and R removable?	N/A
	Notes:	
	423 Direct Attach holes in proper location?	N/A
	Notes:	

* PASS = Compliant

IR = Improvement Required

N/A = Not Applicable

14. Front Panel I/O Cable Length Verification

The cable was found to be of sufficient length to reach the motherboard front panel header.

15. Product Safety Notice

The thermal, mechanical, and electrical testing conducted on this chassis did not evaluate product safety requirements. It is the manufacturer's responsibility to assure the chassis complies with all national and local safety requirements within the country sold. Contact your National Certification Body (NCB) or a third party certifier, like Underwriters Laboratories (UL) <http://www.ul.com>, for further guidance.

16. Suggestions for improvement

No suggestions for improvement at this time.

17. Calibration Information

Watlow Dual 96 Temperature Controller

(thermal test cells)

Measurement and Control Services calibration control number 13501

Calibration Due date: 06MAY02

Omega PCI-DAS-TC Data Acquisition Card

(host thermal test cell computer add in card)

Measurement and Control Services calibration control number 135XX

Calibration Due date: 04JUN02

18. Appendix A - System Set-up

Figure 1: L.S.H. Technology Company, LTD. WTX-2002 (uATX)

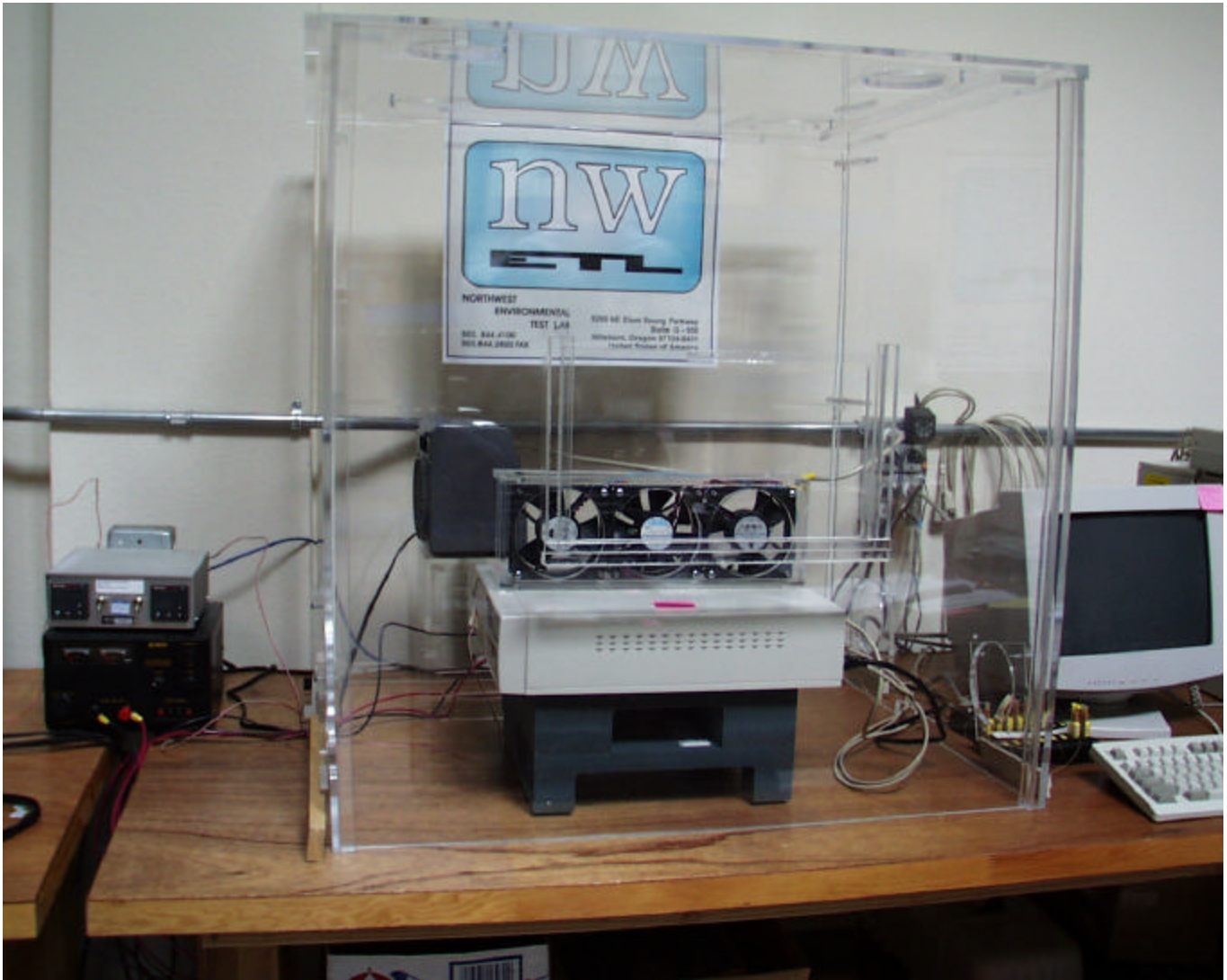


Figure 2: Top cover removed showing component placement

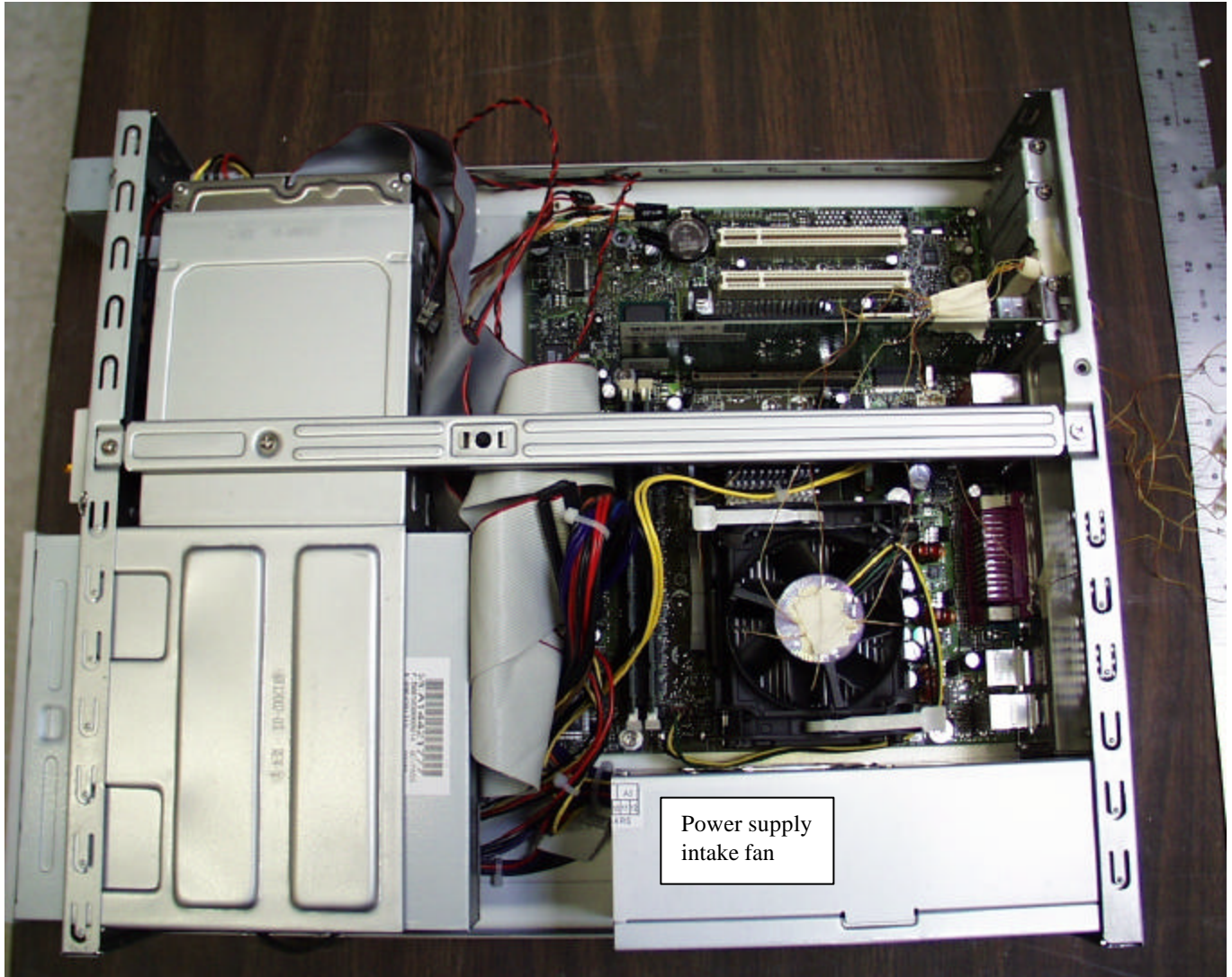


Figure 3: Power Supply label



Figure 4: Front view showing peripherals placement.



Figure 5: Top cover removed showing motherboard mounting holes.

