CYRIX PLATFORM VERIFICATION LABORATORY

6x86 Enhanced Test Procedure

Revision 1.2 12/20/96

Motherboard Vendor	
Motherboard Model / Revision	
BIOS Vendor - Date / Revision	

C:\DATAOEM\PVL\Pvladv.fm5

1. Introduction

Motherboards from around the world are subject to rigorous product qualification testing in Cyrix's Platform Verification Laboratory (PVL). Prior to testing, each motherboard is inspected for physical integrity. Motherboards are then tested by removing a motherboard from a known good system and replacing it with the motherboard under test. A series of hardware and software tests are performed on the system. If all the tests pass, the motherboard is included on the Cyrix list of recommended motherboards.

Software testing includes the use of several Cyrix utility programs, the installation of several operating systems and benchmark testing. Several demanding and popular software programs are executed to ensure the compatibly and reliability of each motherboard. During hardware testing, ISA and PCI versions of video, disk controller and network cards are tested for proper operation. Plug and play features are also examined. This document outlines the test procedure for verifying motherboard support for the Cyrix 6x86. It is intended for motherboard vendors who choose to perform their own verification testing at their facility.

Using this document, motherboard vendors can perform their own testing at their facility. Cyrix may, at its own discretion, make available a Cyrix Design Consultant to assist with testing. In the event a motherboard fails and the vendor cannot determine the solution to the problem, the board can be sent to Cyrix for analysis.[1]

The last page in this document contains a summary of the tests and their results. If the motherboard vendor would like to obtain a recommendation certificate, the vendor should contact Cyrix for further information. A list of recommended 6x86 motherboards is currently maintained on the Cyrix Web site (www.cyrix.com).

1. This offer is defined solely by Cyrix and may be withdrawn at any time

BASIC TASKS TO BE COMPLETED BEFORE TESTING

Material Required

Obtain the following items for the motherboard test procedure.

1. Motherboard under test
2. 3.3 volt CPU with correct heatsink/fan*
3. 3.52 volt CPU with correct heatsink/fan*
4. Correct voltage regulator (part of motherboard)
5. Hard drive, floppy drive, monitor
6. 32 MBytes of DRAM
7. 8 or 16 MBytes additional DRAM for testing non-standard memory size
8. SVGA PCI 2-MByte video card (suggest Diamond Stealth)
9. SVGA ISA 2-MByte video card (suggest Diamond Stealth)
10. SCSI card and SCSI hard drive
11. ISA network card
12. PCI network card
13. IDE CD ROM
14. Sound Blaster 16 (plug and play) compatible sound card and speakers
15. Cyrix Software (M1.EXE, CX_TEST.EXE)
16. Operating System Software used in Test 12
17. Applications and Game Software used in Test 13
18. Benchmark Software in Test 14
19. Diagnostic Software in Test 15
20. An unmarked copy of this document

*Note: All testing should be with either a 3.3 or 3.52 volt CPU. The CPU should be checked for proper operation with the alternative voltage by running Winstone 96 under Windows 95. This is detailed in test 18.

PRELIMINARY CHECK LIST

Before applying power to the motherboard perform the following tasks:

1. Visually inspect the motherboard for possible defects.
2. Ensure that the CPU has correct heatsink/fan installed (see below).
3. Check if thermal grease has been applied between CPU and the heatsink/fan. Thermal grease is not required for heatsink/fan with Softface thermal interface.
4. Ensure the voltage regulator has sufficient current rating (see below).
5. Ensure the clock frequency and CPU jumpers are correct (record settings on next page).
6. Ensure all other set-up jumpers are correct (recorded settings on next page).
7. Ensure all cables are seated and polarized correctly.
8. Check to ensure memory is seated correctly.

Voltage Regulator Inspection

The voltage regulator is one of the higher heat producers on a 6x86 motherboard and requires an adequate heatsink. The regulator should be designed to provide enough current for CPU upgrades. Except for the 6x86-P90$^+$ motherboards, Cyrix recommends using a voltage regulator with at least a 7.5 A rating (Table 1-1). The motherboard must be tested with various Cyrix CPUs that operate at different voltages (see Test 19).

CPU, CPU Heatsink/Fan Inspection

The motherboard should be tested with the highest frequency CPU that the motherboard support. The CPU should have a recommended (or equivalent) heatsink/fan assembly attached as listed in Table 1-1. Record heatsink/fan and voltage regulator data on the line that corresponds to the type of CPU that will be used during testing.

Table 1-1. Recommended Heatsink/Fan

CPU TYPE	HEATSINK/FANS		VOLTAGE REGULATOR		
	RECOMMENDED SOLUTIONS	VENDOR SELECTED MANUFACTURER AND PART NUMBER	MINIMUM CURRENT RATING* (A)	CURRENT RATING OF SELECTED PART (A)	VENDOR SELECTED MANUFACTURER AND PART NUMBER
6x86-P90$^+$	(1) Thermalloy 20750B (2) Wakefield 919167 (3) AAVID 023565		5.0		
6x86-P120$^+$			7.0		
6x86-P133$^+$			7.0		
6x86-P150$^+$			7.0		
6x86-P166$^+$			7.5		
6x86-P200$^+$			7.5		

*Note: Cyrix recommends that a voltage regulator with a 7.5 A rating be used in all cases to allow for future CPU upgrades.

MOTHERBOARD TRACKING INFORMATION

Usually a name tag is used to track the motherboard. Before sending a motherboard to Cyrix use the motherboard identification to fill out the board setup information listed in Table 2-2. Fill in the table located on the front cover of this procedure.

Table 2-2. Motherboard Information

STEP	ITEM	DATA
1.	Motherboard Manufacturer and Model	
2.	Printed Circuit Board Revision	
3.	Serial Number	
4.	Chip Set Manufacturer and Model Number Information	
5.	BIOS Vendor	
6.	BIOS Date and Sticker Information	
7.	3.3 volt CPU Lotcode	
8.	3.52 volt CPU Lotcode	
9.	DRAM Memory Size and Type	
10.	Select and Record Motherboard Jumper Settings:	
	BUS Clock	
	CPU Clock Frequency	
	BUS/CPU Clock Ratio	
	CPU Voltage Selection	
	Power Supply Selection	
	L2 Cache Memory Vendor(s)	
	L2 Cache Memory Size	
	Additional setting(s)	
11.	Arrival Date	
12.	Return Date	

TEST 1 — POWER UP TESTS

Check power supply cables, hard drive cables, floppy disk cables and monitor cables to ensure proper connections. Turn on monitor and power supply. Record data as shown in Table 2-3. Do not modify the BIOS setup.

Table 2-3. Boot Up Data

STEP	ITEM	PASS/ FAIL	DATA
1	Boot up screen appears on monitor		
2	POST testing completes		
3	Record BIOS name, date and revision as it appears on screen		
4	Record CPU type as it appears on screen		
5	C Prompt appears on screen		
6	Bootup using floppy in drive A		
7	XCOPY data to Drive A from C Drive		
8	XCOPY data from Drive A to C Drive		
9	Run Windows 95, Winstone.		

Comments:

TEST 2 — BOOT-UP CPU SPEED AND CPU TYPE

The Cyrix software utility "M1.EXE" is used to test the CPU type and speed displayed at boot-up. The test is repeated for each motherboard speed by changing the jumper settings. One CPU can be used to run all tests.

1. Record the name and P-rating of the CPU under test in column B.

2. Jumper the motherboard speed to value shown in column D. (Start with highest CPU speed.)

3. Boot up.
   Record CPU type from boot-up screen in column C.
   Record CPU speed in column E.

4. Run M1.EXE test program.
   Record the CPU speed from M1 program screen in column F.

5. If column A = column C and
   if column D = column E = column F
   then motherboard passes test.

6. Repeat steps 2 through 5 until lowest the CPU test speed that board can accept is performed.

Table 2-4. Boot Up CPU Description and Frequency Display

(A)	(B)	(C)	(D)	(E)	(F)	(G)
EXPECTED CPU PART NAME	CPU PHYSICAL PART NAME	BOOT-UP CPU PART NAME	JUMPER SPEED (MHz)	BOOT-UP REPORTED CPU SPEED (MHz)	M1.EXE REPORTED CPU SPEED (MHz)	PASS/FAIL
6x86-P200+			75/150			
6x86-P166 +			66/133			
6x86-P150+			60/120			
6x86-P133+			55/110			
6x86-P120+			50/100			
6x86-P90+			40/80			

Comments:

TEST 3 — BIOS CONFIGURATION REGISTER CONTENTS

Record a 1 or 0 in each unshaded cell in Table 2-5 according to data displayed by the M1.EXE test program. The information is listed on the M1.EXE screen pages 2 through 7.

Table 2-5. BIOS Configuration Register Setup

REGISTER	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	PASS /FAIL
CCR0							NC1		
CCR1	SM3			NO_LOCK		SMAC	USE_SMI		
CCR2	USE_SUSP			WPR1	SUSP_HALT	LOCK_NW	SADS		
CCR3	MAPEN3	MAPEN2	MAPEN1	MAPEN0		LINBRST	NMI_EN	SMI_LOCK	
CCR4	CPUID_EN			DTE-EN		IORT2	IORT1	IORT0	
CCR5			ARREN	LBR1				WT_ALLOC	

The results of this test should be compared to the suggested settings contained in the 6x86 BIOS Writers Guide. Deviations may occur when certain features are selected. Record all deviations in the space below.

Comments:

TEST 4 — ADDITIONAL BIOS CONTENTS

Use M1.EXE to determine the contents of the registers listed in Table 2-6. The information is listed on the M1.EXE screen page 1.

Table 2-6. Other BIOS Register Settings

REGISTER	ON/OFF
BTB	
Far Hits	
Return Stack	
Data forward/ Data bypass	

Comments:

TEST 5 — RCR AND ARR REGISTERS DATA RECORDING

Use the M1.EXE program to read the RCR registers and determine the state of the ARR registers. Record either a 0 or 1 in each row of Table 2-7 below, except for the last three rows. Use the M1.EXE program to read the ARR registers and determine the starting address and size for the eight address regions. Record the region starting addresses and size on the last three lines.

Use the next three tables to record settings for 32, 40 and 48 MBytes of Memory.

Table 2-7. ARR CONTROL SETTINGS, 32 MBYTES OF MEMORY

REGISTER BIT	REGION 0 (ARR0)	REGION 1 (ARR1)	REGION 2 (ARR2)	REGION 3 (ARR3)	REGION 4 (ARR4)	REGION 5 (ARR5)	REGION 6 (ARR6)	REGION 7 (ARR7)
RCD/RCE								
WW0								
WL								
WG								
WT								
NLB								
Reserved								
Reserved								
Region Starting Address								
Size (KBytes)								
Check if Register Not Used								

Comments:

Table 2-8. ARR CONTROL SETTINGS, 40 MBYTES OF MEMORY

REGISTER BIT	REGION 0 (ARR0)	REGION 1 (ARR1)	REGION 2 (ARR2)	REGION 3 (ARR3)	REGION 4 (ARR4)	REGION 5 (ARR5)	REGION 6 (ARR6)	REGION 7 (ARR7)
RCD/RCE								
WW0								
WL								
WG								
WT								
NLB								
Reserved								
Reserved								
Region Starting Address								
Size (KBytes)								
Check if Register Not Used								

Comments:

Table 2-9. ARR CONTROL SETTINGS, 48 MBYTES OF MEMORY

REGISTER BIT	REGION 0 (ARR0)	REGION 1 (ARR1)	REGION 2 (ARR2)	REGION 3 (ARR3)	REGION 4 (ARR4)	REGION 5 (ARR5)	REGION 6 (ARR6)	REGION 7 (ARR7)
RCD/RCE								
WW0								
WL								
WG								
WT								
NLB								
Reserved								
Reserved								
Region Starting Address								
Size (KBytes)								
Check if Register Not Used								

Comments:

TEST 6 — INSTALLED DRAM SIZE AND ARR7 SIZE FIELD

Standard-Size Memory Test. The amount of DRAM memory should correspond to the SIZE field in ARR7 recorded in Table 2-7 for standard size DRAM (4, 8, 16, 32, 64 MBytes). Enter the amount of DRAM memory and the contents of the ARR7 SIZE field in Table 2-8

Non-Standard Size-Memory Test. Place a non-standard amount of DRAM in motherboard. Suggest adding 8 or 16 MBytes to 32 MBytes already installed. The total amount of DRAM should be equal to ARR7 minus non-cacheable region(s) defined by other ARR registers. Record the ARR register(s) SIZE field(s). The ARR7 SIZE field minus the sum of additional ARR register non-casheable region SIZEs should equal the amount of installed DRAM to pass test.

Table 2-10. DRAM SIZE SETUP

TEST	AMOUNT OF DRAM	ARR7 SIZE	ADDITIONAL ARR REGISTER	PASS /FAIL
Standard Size Memory				
Non-Standard Size Memory				

Comments:

TEST 7 — FPU, REGISTER STATUS AND WRITE-BACK TESTS

Run the CX_TEST.EXE program three times using the command lines listed in Table 2-9. Indicate if the tests pass or fail.

Table 2-11. Operations Hardware Test

TEST NAME	COMMAND LINE	PASS/ FAIL	COMMENTS
FPU Error Test	CX_TEST.EXE f		
Register Status Test	CX_TEST.EXE s		
Write-Back Tests	CX_TEST.EXE w		

TEST 8 — RESET TESTS

Perform two reset tests. First press the <CONTROL> <ALT> <DELETE> keys. The system should reset. Perform the second test by pressing the front panel RESET button if connected. If this button is not connected, jumper the RESET pin to ground. Again the CPU should reset.

Table 2-12. Reset Test

TEST NAME	PASS/ FAIL	COMMENTS
<CTRL-ALT-DEL>		
Front Panel Reset		

TEST 9 — MEMORY CONFIGURATION TEST

This test uses the CSREG.EXE program to obtain memory configuration information. The 6x86 CPUs and the Pentium CPUs are compared. Use the default BIOS setting.

1. Jumper the motherboard for the highest frequency.
2. Insert a Cyrix 6x86.
3. Run CSREG.EXE program using the command line CSREG [chipset_number]. To obtain the command line switch (i.e., chipset_number) run the CSREG program without the command line switch (just type CSREG <ENTER>). Record the information in Table 2-11.
4. Repeat the same test with a Pentium CPU. To pass this test, the Cyrix 6x86 and the Pentium must match values.
5. Jumper the motherboard for the next lower clock frequency.
6. Repeat steps 1 through 5 and repeat the test. The exact format varies depending on which type of chipset is being tested. Record information in Table 2-7.

Table 2-13. Memory Configuration for Stability and Performance

BUS/CPU FREQUENCY	CPU TYPE	SRAM CACHE READ	SRAM CACHE WRITE	DRAM READ	DRAM WRITE	L2 BIOS SETTING	PASS/ FAIL	COMMENTS
40/80	6x86-P90+							
	Pentium							
50/100	6x86-P120+							
	Pentium							
55/110	6x86-P133+							
	Pentium							
60/120	6x86-P150+							
	Pentium							
66/133	6x86-P166 +							
	Pentium							
75/150	6x86-P200 +							
	Pentium							

TEST 10 — HARDWARE TEST EXPANSION BOARDS AND PERIPHERALS

Turn the power off when inserting or removing boards. Perform each test and record results in Table 2-12. Include IRQ, DMA and I/O settings in comments.

Table 2-14. Expansion Boards and Peripherals Tests

TEST NAME	TEST INSTRUCTIONS	PERIPHERAL VENDOR AND PART NO.	COMMENTS	PASS/ FAIL
EDO DRAM	Change DRAM to EDO memory. Use POST test.			
SVGA PCI Video Card	Using a graphics program such as Corel or Designer, zoom all the way in and out. Draw with different line widths and fonts.			
SVGA ISA Video Card	Using a graphics program such as Corel or Designer, zoom all the way in and out. Draw with different line widths and fonts.			
PCI IDE Card	Unplug hard disk and floppy cables from motherboard and plug into expansion PCI IDE card. It may be necessary to disable on-board IDE using BIOS setup.			
ISA IDE Card	Unplug hard disk and floppy cables from motherboard and plug into expansion ISA card. It may be necessary to disable on-board IDE using BIOS setup.			
PCI SCSI Card	Plug a SCSI hard drive into a PCI SCSI expansion board, and verify that the SCSI hard drive can be accessed. It may be necessary to disable the on-board secondary IDE using BIOS setup.			
ISA SCSI Card	Plug a SCSI hard drive into a ISA SCSI expansion board, and verify that the SCSI hard drive can be accessed. It may be necessary to disable the on-board secondary IDE using BIOS setup.			

Table 2-14. Expansion Boards and Peripherals Tests (Continued)

TEST NAME	TEST INSTRUCTIONS	PERIPHERAL VENDOR AND PART NO.	COMMENTS	PASS/ FAIL
PCI Network Card	Verify that a network can be accessed in either DOS, Windows 3.x or Windows95.			
ISA Network Card	Verify that a network can be accessed in either DOS, Windows 3.x or Windows95.			
CD ROM Card	Verify multimedia functionality using a Sound Blaster 16 or equivalent sound card and a CD ROM. Connect to the sound card or IDE port on motherboard. Verify using a multimedia game program.			
Sound Card	Verify multimedia functionality using a Sound Blaster 16 or equivalent sound card and a CD ROM connect to either the sound card or IDE port. Verify using a multimedia game program.			

TEST 11 — POWER MANAGEMENT FEATURES HARDWARE TESTS

Enable power management using BIOS setup program. Set doze timer to the lowest possible value for convenient testing (20 seconds is typical). Using the program M1.EXE, determine if the Green Features can be activated.

Table 2-15. Power Management Testing

TEST NAME	PASS/ FAIL	COMMENTS
IDLE (Standby)		
SUSPEND		

TEST 12 — OPERATING SYSTEMS SOFTWARE TESTING

Install each program using installation disks or CDs. Run test program. The last two tests may be run from a hard disk with pre-installed test programs and operating systems.

Table 2-16. Operating System Tests

SOFTWARE	INSTALL PASS/FAIL	TEST PROGRAM	TEST PROGRAM PASS/FALL	COMMENTS
Windows NT		HCT		
Windows 95		SCT		
OS/2 Warp		Typical OS/2 program		
OS/2 2.11	(optional)	Typical OS/2 program		
SCO UNIX	(optional)	Typical UNIX program		

TEST 13 — APPLICATIONS AND GAMES SOFTWARE TESTING

Run with ISA or PCI sound card and ISA or PCI SVGA video card. Connect this system to another computer using Novell Client. If each program runs without errors, the system passes the test. Record the results in Table 2-15.

Table 2-17. Applications and Games Testing

SOFTWARE	INSTRUCTIONS	PASS/FAIL	COMMENTS
Novell Client (Rev 4.01 or newer) Networking Program	Use network computer and test each configuration for one hour. Set system-under-test as client. Copy a groups of 5 MByte files back and forth to server. Repeat test using system-under-test as server.		
AutoCAD DOS (Rev 13 or newer) Drawing Program	Modify complex sample drawing supplied by AutoCAD		
DOOM II Game Program	Spend 5 minutes playing the game.		
Dark Forces Game Program	Spend 2 minutes playing the game.		
Tie Fighter Game Program	Spend 2 minutes playing the game.		
Magic Carpet Program	Spend 2 minutes playing the game.		

TEST 14 — BENCHMARK TESTS SOFTWARE TESTING

Run tests with the sound card and high speed PCI SVGA video card installed. Install the programs listed in Table 2-16. Run Winstone with a permanent swap file and 32-bit disk/file access. Check if the major features of each program performs correctly.

Table 2-18. Benchmark Testing

BENCHMARK	OVERALL SCORE	PASS /FAIL	COMMENTS
BAPCo Sysmark95			
Winstone95 under Windows 3.11			
Winstone96 under Windows95			
Winstone97 under Windows95			
Winstone32 under Windows95			

TEST 15 — DIAGNOSTIC TESTS SOFTWARE TESTING

Run test with sound card and PCI SVGA video card installed. Install the programs listed in Table 2-17. Check that the major features of each program perform correctly.

Table 2-19. Diagnostic Programs

DIAGNOSTIC SOFTWARE	SOFTWARE VERSION	PASS/ FAIL	COMMENTS
QAPLUS			
Dr. PC			
FASMATH Diagnostic			
IEEE Diagnostic			

Additional Comments:

TEST 16 — DOS BENCHMARK PERFORMANCE TESTING

Run tests with the sound card and high speed PCI SVGA video card installed. Run the tests listed in Table 2-18. Indicate if the Benchmark program runs to completion.

Table 2-20. Benchmark Performance - DOS

BENCHMARK	SCORE	COMPLETES TEST (PASS/FAIL)	COMMENTS
Landmark 2.0 CPU			
Landmark 2.0 FPU			
Norton 8.0 CPU			
Powermeter 1.8 MIPS			
PC Bench DOS Mark			
PC Bench CPU Mark 16			
PC Bench Disk Score			
PC Bench Video Score			

Additional Comments:

TEST 17 — WINDOWS 3.11 BENCHMARK PERFORMANCE TESTING

Setup:

1. Install the high performance 2-MByte PCI SVGA video card. (suggest Diamond Stealth) and Windows 3.11 driver.
2. Install a high speed hard drive (suggest Quantum fireball or equivalent).
3. Set Windows 3.11 configuration to 32-bit file access, 32-bit disk access, swap file to 20 MBytes.
4. Record the overall scores in Table 2-19. Benchmark must complete to pass test.

Table 2-21. Benchmark Performance - Windows 3.11

BENCHMARK	SCORE	COMPLETES TEST (PASS/FAIL)	COMMENTS
Ziff Davis Winstone 95 overall			
Ziff Davis Winstone 95 Business Graphics			
Ziff Davis Winstone 95 Database			
Ziff Davis Winstone 95 Spreadsheet			
Ziff Davis Winstone 95 Word Processing			
Ziff Davis Winbench 95 Graphics Winmark			
Ziff Davis Winbench 95 Disk Winmark			

TEST 18 — WINDOWS 95 BENCHMARK PERFORMANCE TESTING

Setup:

1. Install a high performance 2 MByte video card and Windows 95 driver.
2. Install a high speed drive (suggest Quantum Fireball or equivalent).
3. Verify Windows 95 configuration for 32-bit file access, 32-bit disk access.
4. Record the overall scores in Table 2-20. Benchmark must complete to pass test.

Table 2-22. Benchmark Performance - Windows 95

BENCHMARK	OVERALL SCORE	COMPLETES TEST (PASS/FAIL)	COMMENTS
Ziff Davis Winstone 96 overall			
Ziff Davis Winstone 96 Business Graphics			
Ziff Davis Winstone 96 Database			
Ziff Davis Winstone 96 Spreadsheet			
Ziff Davis Winstone 96 Word Processing			
Ziff Davis Winbench 96 Graphics Winmark			
Ziff Davis Winbench 96 Disk Winmark			
Ziff Davis Winbench 96 CPU Mark 16			
Ziff Davis Winbench 96 CPU Mark 32			
Ziff Davis Winstone 97 overall			
Ziff Davis Winstone 97 Business Graphics			
Ziff Davis Winstone 977 Database			
Ziff Davis Winstone 97 Spreadsheet			
Ziff Davis Winstone 97 Word Processing			
Ziff Davis Winstone32 overall			
Ziff Davis Winstone 32 Business Graphics			
Ziff Davis Winstone 32 Database			
Ziff Davis Winstone 32 Spreadsheet			
Ziff Davis Winstone 32 Word Processing			

Additional Comments:

TEST 19 — CPU VOLTAGE TEST

If testing to this point has been done with a 3.3 volt CPU, replace the 3.3 CPU with a 3.52 volt CPU. Change the motherboard jumper settings to 3.52 volts.

If testing to this point has been done with a 3.52 volt CPU, replace the 3.52 CPU with a 3.3 volt CPU. Change the motherboard jumper settings to 3.3 volts.

If required, install Windows 95 and Winstone 96.

Table 2-23. CPU Voltage Test

TEST NAME	PASS/FAIL	COMMENTS
Boot up screen appears on monitor.		
Windows 95 screen appears.		
Winstone 96 completes.	Score:	

TEST 20 — VOLTAGE REGULATOR THERMAL TEST

1. Install motherboard in system case.
2. Connect thermometer probe to voltage regulator case using thermal grease.
3. Allow landmark 2.0 to run for 30 minutes at the highest CPU frequency and the lowest CPU voltage (this combination produces the largest voltage drop across the regulator). Note: Typically, the highest CPU frequency 66/133MHz and the lowest CPU voltage is 3.3 V
4. Obtain and record voltage regulator manufacture and part number in Table 2-24.
5. Obtain and record voltage regulator maximum current rating in Table 2-24.
6. Measure and record voltage regulator temperature T_C (Table 2-24).
7. Measure and record voltage drop across the regulator (V_{IN} to V_{OUT}) using digital voltmeter.

Table 2-24. Voltage Regulator Thermal Test

VOLTAGE REGULATOR PART NUMBER	VOLTAGE REGULATOR CURRENT RATING (A)	T_C (°C)	V_{IN} - V_{OUT} (V)

8. Calculate and record (Table 1-25) maximum power dissipation (P) where P = voltage drop across the regulator times maximum CPU current (typically 6.6 A).
9. Obtain and record (Table 1-25) maximum Junction Temperature (T_{JMAX}) and Junction to Case Thermal Resistance (θ_{JC}) of thermal regulator.
10. Calculate and record (Table 1-25) maximum case temperature (T_{CMAX}). where $T_{CMAX} = T_{JMAX} - (\theta_{JC} * P)$
11. Test passes if case temperature (T_C) is less than maximum case temperature (T_{CMAX}).

Table 1-25. Voltage Regulator Calculations

P (W)	T_{JMAX} (°C)	θ_{JC} (°C/W)	T_{CMAX} (°C)	PASS/FAIL

TEST 21 — CPU THERMAL TEST

1. Install motherboard in system case.
2. Connect thermometer probe to center of CPU case using thermal grease.
3. Allow landmark 2.0 to run for 30 minutes at the highest CPU frequency
4. Measure and CPU temperature T_C (Table 2-26).
5. Test passes if T_C is less 70°C
6. Record manufacture and model number of CPU Heatsink used.

Table 2-26. CPU Thermal Test

Tc (°C) MEASURED	Tc(°C) MAXIMUM SPECIFIED	PASS/FAIL	CPU HEATSINK

TEST 22 — OPERATING SYSTEM STRESS TEST

Run the following tests for each of the operating systems listed below.

Table 2-27. Operating System Stress Test

TEST NAME	DURATION/ NUMBER OF RUNS	PASS/FAIL	COMMENTS
Windows NT 4.0 using HCT	24 hours		
Windows 3.11 using Winstone 95	24 hours		
OS/2 Warp using HCT OS/2 Script	24 hours		
UNIX (SCO) using HCT UNIX Script	24 hours		
Novell Client/Server Stress Test	24 hours		
Windows 95 using Winstone 32	10 single runs		
Windows 95 using Winstone 96	10 single runs or 8 hours		

TEST 23 — TIMING ANALYSIS

1. Setup timing analysis tool to measure AC parameters listed Table 2-29. (If available, use labview test: c:/labview/ac_tests/spec_pf.seq)

2. Record temperature and selected clock frequency in Table 2-29. Measure and record clock frequency in Table 2-29.

3. Perform and record the AC measurement parameters listed in Table 2-29 or attach printout to this sheet.

4. Test passes if the measurement conforms to the corresponding specification listed in the 6x86 Processor Data Book. If appropriate, use the current addendum to 6x86 Processor Data Book.

Table 1-28. TEMPERATURE AND CLOCK FREQUENCY

TEMPERATURE	CLOCK FREQUENCY	
	SELECTED	MEAS

Table 2-29. Timing Analysis

	PARA-METER	OUTPUT VALID DELAYS				INPUT SETUP TIMES		INPUT HOLD TIMES		PASS/ FAIL
		MIN		MAX		MIN		MAX		
		SPEC	MEAS	SPEC	MEAS	SPEC	MEAS	SPEC	MEAS	
T7b	ADS#									
T7b	M/IO#									
T7a	D/C#									
T7a	W/R#									
T7a	CACHE#									
T7a	LOCK#									
T7a	A3									
T7a	BE0#									
T11	D0 (Write)									
T22a	D0 (Read)									
T31b	D0 (Read)									
T20	BRDY#									
T29	BRDY#									
T25	KEN#									
T34	KEN#									

Summary Sheet

Model Number _____ **Serial Number**_____

Date_____**Tested by**_____

Company _____

Table 1-30. Test Summary

TEST NUMBER	TEST NAME	PASS/ FAIL	COMMENTS
1	Power Up Tests		
2	Boot-up CPU Speed and CPU Type		
3	BIOS Configuration Register Contents		
4	Additional BIOS Contents		
5	RCR And ARR Registers Data Recording		
6	Installed DRAM Size And ARR7 Size Field		
7	FPU, Register Status And Write-back Tests		
8	Reset Tests		
9	Memory Configuration Test		
10	Hardware Test Expansion Boards And Peripherals		
11	Green Features Hardware Tests		
12	Operating Systems Software Testing		
13	Applications And Games Software Testing		
14	Benchmark Tests Software Testing		
15	Diagnostic Tests Software Testing		
16	DOS Benchmark Performance Testing		
17	Windows 3.11Benchmark Performance Testing		
18	Windows 95 Benchmark Performance Testing		
19	CPU Voltage Test		
20	Voltage Regulator Thermal Test		
21	CPU Thermal Test		
22	Operating System Stress Test		
23	Timing Analysis		

Design Consultants

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