CHIPS AND TECHNOLOGIES, INC.

CS8230: AT/386 CHIPSET™ COMPATIBILITY TEST REPORT

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INTRODUCTION

In February of 1987, Chips & Technologies commissioned Ingram Laboratories to test the Chips & Technologies CS8230: AT/386 CHIPSet for functional compatibility with IBM PC/AT compatible software applications and peripherals. The primary objective of the test was to reveal any problems or inconsistencies in the performance of a selected group of third-party microcomputer products operated in conjunction with the Chips & Technologies chip set, relative to the IBM Technical Reference Manual Specifications (PC/AT), and execution on the IBM PC/AT 8MHz Model 339. Of particular interest was the impact of performance enhancement techniques, such as RAM page interleaving and "shadow ROM BIOS" methods which can be implemented by the Chips & Technologies chip set, on the functional compatible operation of IBM PC/AT compatible software and peripherals.

The Chips & Technologies CS8230: AT/386 CHIPSet was installed into a basic IBM PC/AT chassis, and configured with standard IBM PC/AT components. Testing was done to determine if the Chips & Technologies 80386 configured system would be IBM PC/AT compatible. The testing that was done can be classified into two general categories:

1. **SOFTWARE COMPATIBILITY TESTING**: Third-party applications software were run on the Chips & Technologies 80386 system to determine software compatibility with the IBM PC/AT.

2. **HARDWARE COMPATIBILITY TESTING**: Third-party peripherals were configured with the Chips & Technologies 80386 system to determine hardware compatibility with the IBM PC/AT.

METHODOLOGY - GENERAL

Marketing and technical criteria were used as the basis for the selection of third-party applications software, benchmark software, and peripherals. In general, popular applications and benchmark software, representative of a cross selection of categories, along with applications software identified as being particularly demanding in terms of compatibility level, were selected. Peripherals selected included best-selling expansion products as well as timing and BIOS sensitive connectivity products.

The Chips & Technologies CS8230: AT/386 CHIPSet was installed into a basic IBM PC/AT chassis, and configured with standard IBM PC/AT components. Ingram technicians installed software and peripherals to various configurations of the Chips & Technologies 80386 system. Their goal was to observe the performance of these products, as compared to the performance of the products when used with the IBM PC/ATs.

Four system configurations were used: a main stand-alone system configuration, known as Configuration A, two configurations which modified Configuration A with non-interleaved RAM, synchronous clock modes, and non-"shadow ROM" techniques [Configuration A1 and A2], and a network configuration [Configuration B]. Base Configuration A is optimized for speed by RAM interleave and "shadow RAM BIOS" techniques. Configuration A1 is configured without RAM interleaving or "shadow RAM BIOS" techniques. Configuration A2 used a synchronous clock configuration. Normally, an Epson FX-80 printer for output and a Microsoft Serial Mouse as a pointing device were used when required by applications.

CONFIGURATION A [Base]:

- 16 MHz Chips & Technologies 80386 system with 2Mb interleaved RAM
- Shadow RAM enabled
- Phoenix 80386 BIOS
- AT-type keyboard
- 30 Mb FXD
- 1.2Mb high capacity floppy disk drive
- FDD/FXD Disk controller
- IBM 256K EGA display adapter
- Enhanced Color Display
- Real-time clock
- Parallel and Serial Interface Ports
- 8 MHz 80287 math coprocessor
- MS-DOS v3.2
- Asynchronous clock configuration

ALTERNATE BASE CONFIGURATION A1:

- 1 Mb non-interleaved RAM
- Shadow RAM disabled
- Asynchronous clock configuration

ALTERNATE BASE CONFIGURATION A2:

- 1 Mb non-interleaved RAM
- Shadow RAM disabled
- Synchronous clock configuration

CONFIGURATION B [NETWORK]:

SERVER:
Same as base configuration including
- IBM Token-Ring adapter
- Novell Advanced Netware 286
- NETBIOS Option
- Multi-station Access unit

WORKSTATION:
- IBM PC dual 360 FDD System With 256K RAM
- IBM Token-Ring adapter

- IBM MDA display adapter
- Monochrome monitor
- Parallel and serial interface ports
- MS-DOS v3.2

SYSTEM PERIPHERALS:
- Hayes 1200 baud modem
- Microsoft Mouse with Serial Interface
- Epson FX-80 printer
- IBM Proprinter

Some of the peripherals listed above were used for test purposes when required by applications or peripherals.

SOFTWARE COMPATIBILITY TESTING

METHODOLOGY - SOFTWARE COMPATIBILITY TESTING

Thirty-eight software applications were tested on individual Test Configurations A, A1, A2. A special control group of four products were tested on all three configurations. Due to cost and resource constrains, each software application was not tested on all three configurations. All major functions of the application were tested, including disk I/O, screen I/O, keyboard I/O, printer I/O, and serial port I/O. All software applications tested were the current shipping versions as of February 23, 1987, with the exception of archive versions tested because of significant installed base.

TEST RESULTS - SOFTWARE COMPATIBILITY TESTING

Test results were divided into four functional levels:

Level 1:
- Abnormal termination or crash of program.
- Data loss or damaged.
- Loss of function with no acceptable circumvention.

Level 2:
- Loss of function with acceptable circumvention.

Level 3:
- All functions of software performed as expected;
  however, undocumented workaround, patch, or special
  installation required.

Level 4:
- All functions of software performed as documented.

If the products failed in operation when installed in Test Configurations A1 or A2, they were also tested in Base Configuration A in order to isolate possible configuration anomalies.

SOFTWARE TEST RESULTS MATRIX

SOFTWARE PRODUCT/COMPANY:		SYSTEM CONFIGURATION:		
		A	A1	A2
1.	1-2-3 ver. 2.02/LOTUS DEVELOPMENT CORP.	4	4	N/T[1]
2.	AUTOCAD ver. 2.5/AUTODESK	4	4	4
3.	BENCHMARK SERIES[2]/INGRAM	4	N/T	4
4.	BLACKJACK rel. 1983/PC SOFTWARE	N/T	N/T	4
5.	COPYIIPC ver. 2.55/CENTRAL POINT	4	N/T	N/T
6.	CROSSTALK XVI ver. 3.7/MICROSTUF	4	4	N/T
7.	DBASE III+ ver. 1.0/ASHTON TATE	4	4	4
8.	DESQVIEW ver. 1.3/QUARTERDECK	N/T	4	N/T
9.	DOLLARS AND SENSE ver. 2.0/MONOGRAM	N/T	4	N/T
10.	FASTBACK ver. 5.03/FIFTH GENERATION	4	N/T	N/T
11.	FIDO ver. 10A 1/2/T. JENNINGS	4	4	4
12.	FIRST CHOICE v1.0/SOFTWARE PUBLISHING	N/T	4	N/T
13.	FLIGHT SIMULATOR ver. 2.13/MICROSOFT	4	N/T	N/T
14.	FORTRAN ver. 3.30/MICROSOFT	N/T	N/T	4
15.	FRAMEWORK II ver. 1.0/ASHTON-TATE	N/T	4	N/T
16.	GEM COLLECTION ver. 1.2/DIGITAL RESEARCH	N/T	4	N/T
17.	JET ver. 1.3/SUBLOGIC	4	N/T	N/T

SOFTWARE PRODUCT/COMPANY:	SYSTEM CONFIGURATION:		
	A	A1	A2
18. KEYWORKS ver. 2.0/ALPHA	N/T	N/T	4
19. KINGS QUEST II ver. only/SIERRA	N/T	4	N/T
20. PARADOX ver. 1.1/ANSA	N/T	4	N/T
21. PC PAINT PLUS ver. 2.0/MOUSE SYSTEM	N/T	4	N/T
22. PC STORYBOARD ver. 1.1/IBM	N/T	4	N/T
23. PFINISH ver. 1.03/PHOENIX	N/T	N/T	4
24. POLYBOOST ver. 1.1/POLYTRON	N/T	N/T	4
25. PROFESSIONAL WRITE ver. 1.0/SOFTWARE PUBLISHING	4	4	N/T
26. PROKEY ver. 4.0/ROSESOFT	4	4	N/T
27. Q & A ver. 2.0/SYMANTEC	N/T	N/T	4
28. RBASE SYSTEM 5 ver. 1.1/MICRORIM	4	N/T	N/T
29. READY ver. 1.0/LIVING VIDEOTEXT	4	N/T	N/T
30. SIDEKICK ver. 1.56A/BORLAND	N/T	N/T	4
31. SMARTCOM II ver. 2.2/HAYES	N/T	N/T	4
32. SUPERCALC 4 ver. 1.0/COMPUTER ASSOCIATES	N/T	N/T	4
33. SYMPHONY ver. 1.2/LOTUS DEVELOPMENT CORP.	4	N/T	N/T
34. THINKTANK ver. 2.1/LIVING VIDEOTEXT	4	N/T	N/T
35. TOPVIEW ver. 1.01/IBM	N/T	N/T	4
36. TURBO LIGHTNING ver. 1.0/BORLAND	N/T	N/T	4
37. WINDOWS ver. 1.03/MICROSOFT	4	N/T	N/T
38. WORD ver. 3.11/MICROSOFT	4	N/T	N/T

THE TEST RESULTS CLEARLY SHOW THAT OF THE SOFTWARE APPLICATIONS THAT WERE TESTED, THE CHIPS & TECHNOLOGIES 80386 CONFIGURED SYSTEM IS IBM PC/AT COMPATIBLE.

HARDWARE COMPATIBILITY TESTING

METHODOLOGY - HARDWARE COMPATIBILITY TESTING

A total of 14 peripheral products were tested, including display adapters, communication and terminal emulation products, expansion memory and multi-function products, input devices, output devices, mass storage and backup devices, and networks. Each peripheral product was individually installed and tested in a designated base Chips & Technologies 80386 system configuration [Test System Configuration A]. All major functions of the peripheral were tested, as well as other system functions, including specifically disk I/O, screen I/O, keyboard I/O, printer I/O, and serial port I/O. In general, peripheral testing included execution of all manufacturer supplied diagnostics routines, bundled utility software, and at least one representative software application which contained device drivers or functions which exercise the target peripheral. Examples of device drivers include LIM-spec Expanded Memory Drivers and EGA display drivers. In some cases, Ingram proprietary stress and performance programs were utilized. For each terminal emulation product tested, whenever feasible, all tests were executed while the system was connected and on-line with appropriate host systems such as an IBM 3081. Network products were tested in configurations consisting of a server and one workstation. In each network test case, the Chips & Technologies 80386 system was installed as a server connected to dual-floppy IBM PCs as workstations.

Selected peripheral products were tested in alternate configurations. These other configurations are intended to test popular peripheral products in alternate Chips & Technologies 80386 system configurations as well as multiple-peripheral equipped systems in environments typical of end-user installations. Due to cost and resource constrains, each peripheral was not tested on all four test configurations.

The following 14 peripheral products were tested:

Graphics Adapters:

    A. Sigma (Chips & Technologies EGA) EGA Display Adapter

    B. Hercules Graphics Card Plus

    C. Paradise AutoSwitch EGA

Communication and Terminal Emulation Products:

    A. Hayes Smartmodem 2400b modem

Expansion Memory/Multi-Function Products:

    A. Intel AboveBoard AT 2Mb

    B. AST Rampage AT 1.5Mb

Input Devices:

        A. Microsoft Mouse v6.02 Bus Interface

        B. Summagraphics Summasketch Graphics Tablet

        C. IBM Game Port Adapter + Kraft Joystick

Output Devices:

        A. AST Turbolaser

Mass Storage Devices:

        A. Tecmar QIC-60 Tape Backup

Networks

        A. 3COM Etherseries with 3+SHARE software

        B. IBM PC Network with PC Net v1.1

        C. IBM Token Ring Network with PC Net v1.1

TEST RESULTS - HARDWARE COMPATIBILITY TESTING

Test results were divided into three functional levels:

Level 1:
-Abnormal termination or crash of system
-Data loss or damage
-Loss of function with no acceptable circumvention

Level 2:
-Loss of function with acceptable circumvention

Level 3:
-All functions of system and peripheral perform as documented

HARDWARE TEST RESULTS MATRIX

PRODUCT	SYSTEM CONFIG. A	SYSTEM CONFIG. A1	SYSTEM CONFIG. A2	SYSTEM CONFIG. B
1. AST RAMpage AT with 2Mb	3	3	N/T	N/T
2. AST TURBOLASER	3	N/T	N/T	3
3. 3COM Etherseries with 3+SHARE Software	3	3	N/T	N/T
4. Hayes 2400b Internal Modem	3	N/T	N/T	N/T
5. HERCULES GRAPHIC CARD PLUS [RAMFONTS]	3	N/T	N/T	N/T
6. IBM Game Port Adapter + Kraft Joystick	3	N/T	N/T	N/T
7. IBM Token Ring Network with PC Net v1.1	3	3	N/T	N/T
8. IBM PC Network with PC Net v1.1	3	N/T	N/T	N/T
9. Intel AboveBoard AT with 2MB	3	3	3	3
10. Microsoft Mouse v6.02	3	N/T	N/T	N/T
11. PARADISE AUTOSWITCH EGA 350	3	3	N/T	N/T
12. SIGMA EGA(Chips & Technologies EGA) EGA DISPLAY ADAPTER	3	3	N/T	3
13. Summagraphics Summasketch Pad	3	N/T	N/T	N/T
14. Tecmar QIC-60H	3	3	3	3

THE TEST RESULTS CLEARLY SHOW THAT OF THE PERIPHERALS THAT WERE TESTED, THE CHIPS & TECHNOLOGIES 80386 CONFIGURED SYSTEM IS IBM PC/AT COMPATIBLE.

See APPENDIX A for a listing of the type of testing that was done with each peripheral.

CONCLUSION

The Chips & Technologies PC/AT system that was configured using the Chips & Technologies (CS 8230) CHIPSet ran all of the selected third-party applications software without any problems. The Chips & Technologies PC/AT system also passed all the third-party peripheral hardware testing without any problems.

Performance enhancement techniques, such as RAM page interleaving and "shadow ROM BIOS" methods, which can be implemented by the Chips & Technologies CS8230: AT/386 CHIPSet, did not have a negative impact on compatibility of the Chips & Technologies PC/AT system relative to the IBM PC/AT. In fact, there were no observed compatibility differences between the various configurations of RAM interleaving, "shadow ROM BIOS" techniques, and synchronous clock configurations.

Although Ingram Labs did not test each and every IBM PC/AT compatible software application and peripheral currently available in the marketplace (to do so would not have been feasible nor practical), the extensive testing that was done and documented lends a great deal of confidence that the Chips & Technologies CS8230: AT/386 CHIPSet is indeed IBM PC/AT compatible.

FOOTNOTES:

[1] Not Tested. Due to cost and resource constraints, the particular software application or peripheral was not tested for this particular test configuration.

[2] The Ingram Benchmark series is comprised of both industry standard and proprietary benchmark programs. The tests can be categorized into three types: raw CPU and coprocessor power, disk I/O throughput, and simulated application throughput tests. The following tests were used:

1. Peter Norton Computing, Inc.'s Information Program v4.0

2. PC Magazine PC Labs Test Series Release 3

3. Core International, Inc.'s Coretest v2.7

4. PC Tech Journal Benchmark Series

5. Byte Magazine Series

6. Ingram Labs CPU/Memory Access Test v1.20

7. Ingram Labs Application Throughput Tests

HARDWARE PERIPHERAL TESTING CHART

PRODUCT	TYPE OF TESTING DONE
1. AST RAMpage AT with 2Mb	Desqview v1.03 executed in conjunction with PFS Professional Write v1.0, Dbase III + v1.1, and Wordstar v3.3; Lotus 1-2-3 v2.01; XMEM Utilities; Lotus Thruput Testing; SuperPak v6.10 Utilities
2. AST TURBOLASER	Print test with Wordstar v3.3
3. 3COM Etherseries with 3+SHARE Software	PFS Professional File v1.0; Rbase V v1.0; Dbase III + v1.1; PFS Professional Write v1.0
4. Hayes 2400b Internal Modem	Smartcom 2 v2.2
5. HERCULES GRAPHIC CARD PLUS [RAMFONTS]	Diagnostics; Word v3.1 from Microsoft; Lotus 1-2-3 v2.01
6. IBM Game Port Adapter + Kraft Joystick	Karetaka rel. 1984 from Broderbond Software; Kraft Joystick
7. IBM Token Ring Network with PC Net v1.1	PFS Professional File v1.0; Rbase V v1.0; Dbase III + v1.1; PFS Professional Write v1.0
8. IBM PC Network with PC Net v1.1	PFS Professional File v1.0; Rbase V v1.0; Dbase III + v1.1; PFS Professional Write v1.0; Ingram Stress, Performance, & Netbios Tests
9. Intel AboveBoard AT with 2MB	Diagnostics; Lotus 1-2-3 v2.01; XMEM utilities; Lotus Thruput Testing
10. Microsoft Mouse v6.02	Dr. Halo II v2.03; PC Paintbrush from Z-Soft Corp.; Show Partner from Brightbill-Roberts; Mouse Learn
11. PARADISE AUTOSWITCH EGA 350	Colormagic v1.0 from Lifetree; Diagnostics; Lotus 1-2-3 v2.01
12. SIGMA EGA DISPLAY ADAPTER	Colormagic v1.0 from Lifetree; Diagnostics; Lotus 1-2-3 v2.01

PRODUCT	TYPE OF TESTING DONE
13. Summagraphics Summasketch Pad	Gem Paint v1.0 from Digital Research; Freelance Plus v2.0 from Lotus Development Corp.
14. Tecmar QIC-60H	Tecmar Utility software