Technical Product Summary

Classic E-Series
Expandable Desktop

Version 1.0
March, 1993

Order Number xxxxxx-001

Intel Corporation makes no warranty for the use of its products and assumes no responsibility for any errors which may appear in this document nor does it make a commitment to update the information contained herein.

Intel Corporation retains the right to make changes to these specifications at any time, without notice.

Contact your local sales office to obtain the latest specifications before placing your order.

The following are trademarks of Intel Corporation and may only be used to identify Intel products:

376™	i750®	MAPNET™
Above™	i860™	Matched™
ActionMedia®	i960®	MCS®
BITBUS™	Intel287™	Media Mail™
Code Builder™	Intel386™	NetPort™
DeskWare™	Intel387™	NetSentry™
Digital Studio™	Intel486™	OpenNET™
DVI®	Intel487™	OverDrive™
EtherExpress™	Intel®	Paragon™
ETOX™	intel inside.™	Pentium™
ExCA™	Intellec®	ProSolver™
Exchange and Go™	iPSC®	READY-LAN™
FaxBACK™	iRMX®	Reference Point®
FlashFile™	iSBC®	RMX/80™
Grand Challenge™	iSBX™	RxServer™
i®	iWARP™	SatisFAXtion®
ICE™	LANDesk™	SnapIn 386™
iLBX™	LANPrint®	Storage Broker™
Inboard™	LANProtect™	SuperTuned™
i287™	LANSelect®	The Computer Inside.™
i386™	LANShell®	TokenExpress™
i387™	LANSight™	Visual Edge™
i486™	LANSpace®	WYPIWYF®
i487™	LANSpool®	IntelTechDirect™

MDS is an ordering code only and is not used as a product name or trademark. MDS is a registered trademark of Mohawk Data Sciences Corporation.

CHMOS and HMOS are patented processes of Intel Corp.

Intel Corporation and Intel's FASTPATH are not affiliated with Kinetics, a division of Excelan, Inc. or its FASTPATH trademark or products.

TRADEMARK ACKNOWLEDGMENTS

AutoCAD is a trademark of Autodesk Inc.
BAPCo and Sysmark92 are trademarks of the Business Applications Performance Corporation.
Centronics is a trademark of Centronics Data Computer Corp.
IBM, MDA, MCGA, EGA, VGA, Personal System/2, PS/2, PC/XT and PC/AT are trademarks of International Business Machines.
Microsoft, MS-DOS, OS/2, Xenix and Windows are trademarks of Microsoft Corporation.
Novell is the trademark of Novell, Inc.
PolySwitch is a registered trademark of Raychem Corporation.
SCO is a trademark of Santa Cruz Operations, Inc.
SPEC, SPECratio, SPECint92 and SPECfp92 are trademarks of the Standard Performance Evaluation Corporation.
TEAC is a trademark of TEAC Corp. of Japan.
UNIX is a trademark of AT&T Bell Laboratories.
Western Digital is a trademark of Western Digital Corp.

All other trademarks are the property of their respective owners.

Classic E-Series
Preliminary Technical Product Summary
March 29, 1993

Table of Contents

Introduction

The Intel486™ Classic E-Series opens the door to solid high performance, expandability, and upgradeability for users requiring slots and watts for their add-in devices. For OEMs and VARs adding a lot of value to the base platform, the Classic E-Series is a logical successor to systems with Intel 386 CPUs.

Standard configurations of the E-Series come with either an i486 SX/25 or an i486 DX/33 microprocessor, but the platform also provides a 238-pin socket for upgrading CPU performance with any i486 OverDrive™ Processor or future OverDrive components based on Pentium™ microprocessor technology.

The Classic E-Series makes the integrator's job easy by providing seven ISA bus slots and five peripheral expansion bays. The seven ISA slots support six full-length ISA cards and one half-length ISA card. In addition, one of the slots accepts a VESA Local Bus slave add-in card. The Classic-E's 200 watt power supply and a secondary fan provide ample power and cooling for a full load of peripherals and devices. The E-Series may be purchased as either a board or system product. The platform ships with one 4 MB SIMM installed, and supports up to 64 MB of system memory using the motherboard's four 36-bit SIMM sockets.

All standard I/O features are integrated on the motherboard. Included are the floppy drive and IDE hard disk controllers and connectors, two DB9 RS-232 serial port connectors, a bi-directional parallel port, an integrated speaker and an AT style keyboard connector.

The Classic E-Series is available as both a board and system product. The motherboard complies with the Baby-AT form factor, allowing OEMs to purchase their own off-the-shelf chassis, if desired.

BABY AT FORM FACTOR

The motherboard is designed to the Baby AT standard, as shown in Figure 1. The standard specifies board size, board mounting locations and connector locations for the keyboard. For a list of several chassis suppliers that support the Baby AT standard, refer to Appendix G.

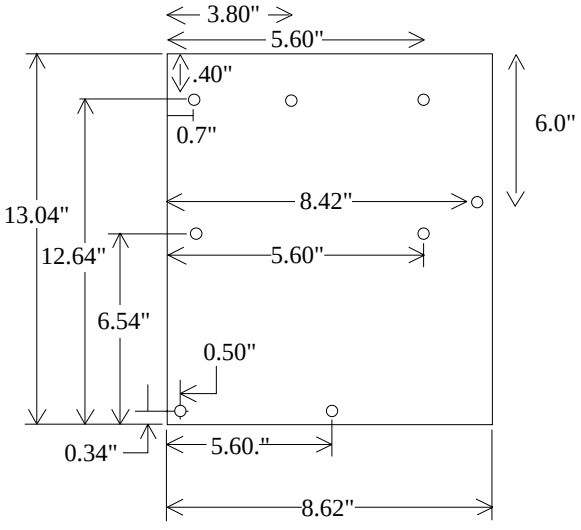
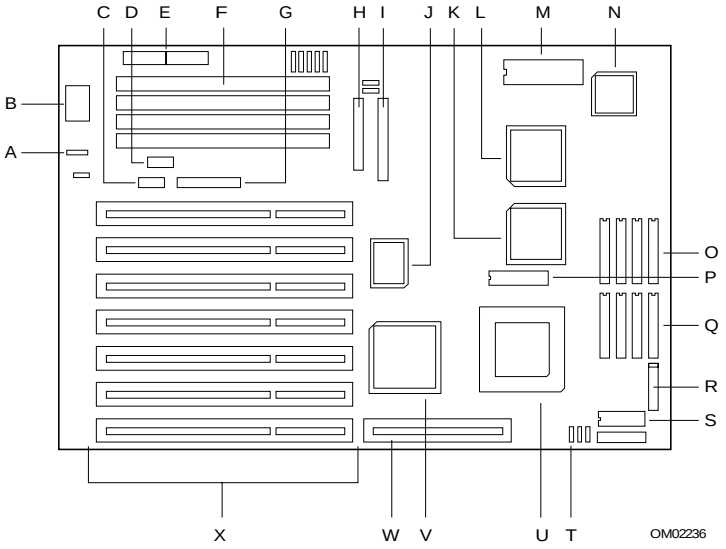


Figure 1. Baby AT Board Dimensions

Board Level Features



A – Offboard battery connector
B – AT-style keyboard connector
C – Serial port 2 connector
D – Serial port 1 connector
E – Power supply connectors
F – System memory SIMM sockets (4)
G – Parallel port connector
H – Diskette Drive connector
I – IDE hard disk drive connector
J – OPTi 82C206 integrated peripheral controller
K – OPTi 82C495 ISA system controller
L – OPTi 82C392 data buffer controller
M – Flash EPROM containing the BIOS
N – Keyboard controller
O – Secondary cache memory data bank 0
P – Secondary cache tag bit RAM
Q – Secondary cache memory data bank 1
R – Front panel connectors
S – Secondary cache dirty bit RAM
T – Front fan connector
U – OverDrive-compatible 238-pin socket
V – Main CPU site
W – Add-in VESA local bus slot
X – Add-in board slots

CPU

Intel486™ Classic E-Series is offered with two base CPU options: an i486™ SX CPU running at 25 MHz or an i486 DX CPU running at 33 MHz. This provides a price/performance range to fit a variety of customer application needs.

The Classic-E supports all i486 CPU functionality. Common features of the two CPUs include backward compatibility with the 8086, 80286, and i386™ CPUs, burst mode bus cycles, and an on-chip 8 KB cache. The cache is 4-way set associative, uses a write-through policy, and can be disabled via software. The i486 DX contains an on-chip numeric coprocessor to increase the speed of floating point operations. This coprocessor is backward code compatible with i387 DX and i387 SX math coprocessors and complies with ANSI/IEEE standard 754-1985. The i486 SX CPU does not include the numeric coprocessor.

PERFORMANCE UPGRADES

Upgrades to higher performance are easy using the Performance Enhancement Socket incorporated into the Classic E-Series platform. The socket accepts Intel OverDrive processors for significantly faster CPU performance and number-crunching capabilities. To improve floating-point performance alone, an i487 SX component can be added to systems based on the i486 SX CPU. A detailed description of the upgrade process is included in Appendix A.

OPTIONAL SECOND LEVEL CACHE

The Classic E-Series supports an optional secondary cache using industry-standard SRAM. DIP sockets on the motherboard allow cache sizes of 64 KB, 128 KB, or 256 KB. The OPTi 486SXWB chipset includes a direct-mapped, write-back cache controller. Installation details and a list of SRAM vendors are included in Appendix A.

SYSTEM MEMORY

The Classic E-Series memory subsystem consists of four logical banks, each containing one 36-bit SIMM socket. Standard configurations ship with one 4 MB (1 Mb x 36) SIMM installed in Bank 0. The user may expand system memory to a maximum of 64 MB by adding SIMMs sequentially to Bank 0 (U5), followed by Bank 1 (U12), Bank 2 (U16), and Bank 3 (U20). Each bank supports 80 ns fast page mode SIMMs. Faster DRAM can be installed, but there will be no improvement in system performance. For a complete list of possible memory configurations, refer to Appendix A.

NATIONAL PC87311 (SUPERI/O)

The serial ports, parallel port, floppy and IDE hard drive interface are incorporated into a single component, the National PC87311AVF. This component provides:

- Two NS16450 UARTs (No 16-bit FIFO support)
- IBM and Centronics compatible bi-directional parallel port
- Industry standard floppy controller (2.88 MB floppy support)
- IDE hard disk decode and chip select

OPTI CHIPSET

The OPTi 486SXWB is a three-chip solution for i486 DX and i486 SX ISA-based systems.

82C495 SYSTEM CONTROLLER

- CPU reset control
- CPU internal cache control
- CPU burst mode control
- CPU interface control
- Integrated write-back cache controller with tag comparator
- Page-mode DRAM controller
- Burst line fill control logic

82C206 INTEGRATED PERIPHERAL CONTROLLER

- DMA control
- Interrupt controller
- Real Time Clock
- Timers
- CMOS RAM

82C392 DATA BUFFER CONTROLLER

- Data bus conversion
- Parity generation/detection
- AT-BUS direction control
- Clock source for 82C206 and keyboard controller
- Chip select for keyboard controller and RTC
- Speaker control
- NMI logic
- Floating-point coprocessor interface
- Keyboard reset and gate A20 emulation logic

KEYBOARD CONTROLLER

An Intel 8242 surface-mount microcontroller (at location U4) contains the Phoenix Technologies PS/2 compatible keyboard controller. An AT-style keyboard connector is located on the back panel. The microcontroller supports Power-On/Reset (POR), and keyboard password protection. The POR password can be set via the SETUP program. In addition, the keyboard controller provides these "hot key" sequences:

- CTRL-ALT-DEL: System software reset. This sequence performs a software reset of the system by jumping to the beginning of the BIOS code and running POST, excluding memory tests.

- CTRL-ALT-1 and CTRL-ALT-2: Turbo mode selection. CTRL-ALT-1 sets the system for de-turbo mode (emulation of an 8 MHz 80286 CPU using wait states) and CTRL-ALT-2 sets the system for turbo mode (normal operation). Changing the Turbo mode may be prohibited by an operating system or application software.

- CTRL-ALT-+ and CTRL-ALT--: Keyclick.

REAL TIME CLOCK, BATTERY-BACKED CMOS RAM, AND BATTERY

The real-time clock (RTC) and battery-backed CMOS RAM are contained within the OPTi 82C206. This provides a clock accurate to 12 minutes/year, 14 bytes of CMOS RAM for time keeping, and 50 bytes of general non-volatile RAM for storage of setup information. All CMOS RAM is reserved for BIOS use. A jumper on the baseboard or a setup option can be used to set system CMOS to its default values. For jumper configurations, see Appendix B.

Power is provided by a 4.5V Ray-O-Vac alkaline battery attached to the inside of the chassis. The expected life of the battery is 3 years. A replacement battery providing 3.6V, 4.5V or 6.0V can be installed using the connector at J17.

PHOENIX TECHNOLOGIES SYSTEM BIOS

The E-Series uses a Phoenix Technologies BIOS to provide ISA compatibility. A 1 Mbit FLASH EEPROM device (Intel 28F001B at location U1) incorporates the BIOS and facilitates easy BIOS upgrades. Upgrading the BIOS is as simple as running a utility from the floppy drive. Upgrades will be available for download on iPAN, the electronic bulletin board service of IntelTechDirect™. Classic-E supports video and system BIOS shadowing, allowing for the execution of any BIOS routine out of fast 32-bit onboard DRAM memory instead of the slower 8-bit FLASH device.

BIOS IDENTIFIER/REVISION LEVEL

The E-series BIOS sign-on during POST is 1.00 01 AB0. As BIOS updates occur, the BIOS revision number will increment by one (i.e.; 1.00 01 AB0 moves to 1.00 02 AB0).

FLASH IMPLEMENTATION

The Intel 28F001B 1 Mbit FLASH component is organized as 128 Kbit X 8 (128 KB). The Flash device is divided into five areas, as described in Table 2.

System Address		*FLASH Memory Area*
F0000H	FFFFFH	64 KB Main BIOS
EE000H	EFFFFH	8 KB Boot Block (Not FLASH erasable)
ED000H	EDFFFH	User available
EC000H	ECFFFH	4 KB Parameter Block (BIOS Only)
E8000H	EBFFFH	CMOS Setup
E0000H	E7FFFH	User available

Table 2. Flash Memory Organization

The FLASH device resides in system memory in two 64 KB segments starting at E0000H, and is distributed in two different organizations, depending on the mode of operation.[1] In *Normal Mode* address line A16 is inverted, switching the E000H and F000H segments so that the BIOS is organized as shown in the system address column above. *Recovery mode* removes the inversion on address line A16, swapping the E000H and F000H segments so that the 8 KB boot block resides at FE000H where the i486 expects the bootstrap loader to exist. This mode is only necessary in the unlikely event that a BIOS upgrade procedure is interrupted, causing the BIOS area to be left in an unusable state. For information on recovering the BIOS in the event of a catastrophic failure, refer to Appendix D.

UPGRADE UTILITY

The disk-based FLASH upgrade utility (FMUP.EXE; downloadable from iPAN) has three options for BIOS upgrades:

- The FLASH BIOS can be updated from a file on a disk;
- The current BIOS code can be copied from the FLASH EEPROM to a disk file as a backup in the event that an upgrade cannot be successfully completed; and
- The BIOS in the FLASH device can be compared with a disk file to ensure the system has the correct BIOS version.

SETUP UTILITY

Classic E-Series incorporates many commonly used system setup features into the FLASH EEPROM. The setup utility is accessible only during the Power-On Self Test by pressing the <F1> key. A screen prompt for this key press can be enabled or disabled. The ROM-based setup allows the system configuration to be modified without opening the system for most basic changes. Setup options are detailed in Appendix C.

[1]For a complete system memory map, consult Appendix E**.**

System Level Features

CHASSIS

The Classic E-Series easily provides the expandability required for most traditional PC applications – five peripheral bays, seven ISA slots, an ample 200 Watt power supply and an additional fan, located at the front left side of the chassis, to help keep the system cool. The user can access all five peripheral bays from the front of the chassis. System security is provided by a mechanical keyboard lock and a BIOS password feature. Classic-E also meets stringent environmental requirements.

PERIPHERAL BAYS

Five expansion bays are available for peripherals and other add-in devices. These include three 5¼" half-height bays and two 3½" one-inch bays. All of the drive bays are accessible from the front panel.

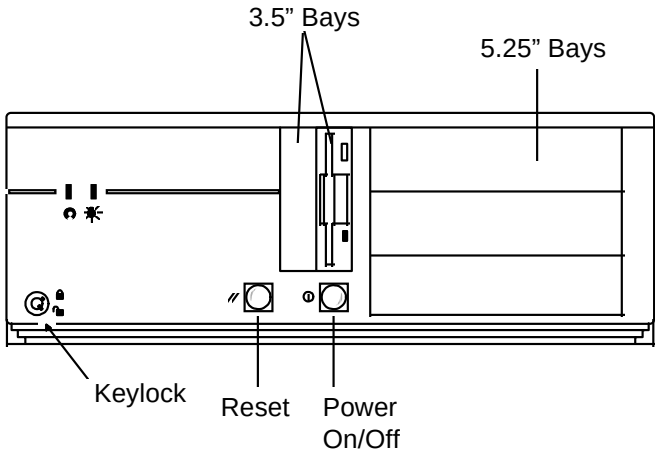


Figure 2: E-Series Front Panel

FAN

The Classic E-Series has two fans to keep the system cool. One fan within the power supply provides 28 cfm of air movement. The second fan, located behind the card guide, provides 26 cfm across the add-in cards and the CPU. The second fan receives 12 Vdc directly from the baseboard at stake pin location J29.

EXPANSION SLOTS

The Classic E-Series has seven 16-bit ISA card slots, as shown in Figure 3. Six slots (J21, J22, J23, J24, J26 & J28) support full-length ISA cards, while a seventh slot (J20) supports a half-length ISA card. Tandem slots J27 & J28 support an ISA card, but also accept a target VESA Local Bus card.

VESA LOCAL BUS SLOT

The VESA Local Bus slot supports any target (slave) VL card that meets the VESA Local Bus specification. The slot is a direct connection to the CPU local bus, allowing the installed VL card to operate at the processor speed instead of the slower speed of the ISA bus. I/O add-in peripheral cards designed to support the VL bus benefit from the direct connection to the processor bus. Specifically, graphics cards, disk controllers and LAN controllers benefit significantly from the faster bus and 32-bit data path.

FRONT PANEL

The Classic E-Series front panel consists of a power switch, a hardware reset switch, a power-on LED, a hard disk access LED and a keyboard lock. All five peripheral bays also are accessed from the front panel, as shown in Figure 2.

BACK PANEL

The back panel consists of access panels for the expansion slots (one location is unused), two DB9 RS-232 serial ports, a bi-directional parallel port, an AT-style keyboard connector, a 115/230 voltage switch, a power supply input, an auxiliary power output and the power supply fan.

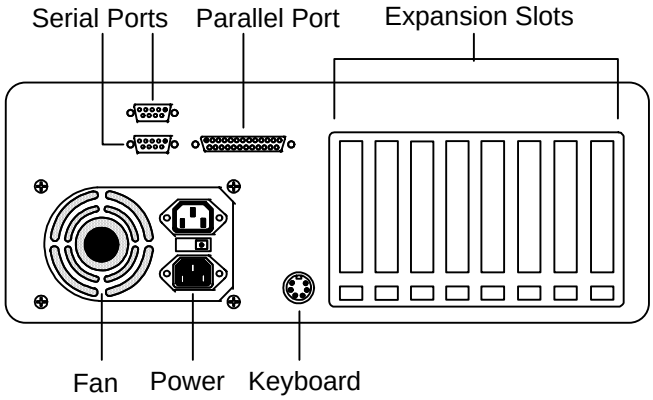


Figure 3. Classic E-Series Back Panel.

POWER SUPPLY

The Classic E-Series integrates a 200 watt switchable power supply for all onboard resources, add-in cards, and peripherals. The Astec Corp. model SA201-3440 supports operating settings at 100-120 VAC (5 Amps AC) or 200-240 VAC (3 Amps AC). The input voltage is selected using a switch on the back of the system.

AC POWER INPUT SPECIFICATIONS

Input frequency 50/60 Hz	
AC Voltage	*Current*
90-135	5.0 A
180-265	3.0 A

Table 3. Power Supply Input Specifications.

DC OUTPUT SPECIFICATIONS

DC Voltage	*Max. Continuous Current*	*Peak Current 15 Seconds*	*Minimum Current Load*
+5V	22.0A	-	3.0A
-5V	0.5A	-	0A
+12V	8.0A	9.0 A	0A
-12V	0.5A	-	0A

Table 4. Power Supply DC Output Specifications.

Table 5 lists the wattage used by system resources. This information is preliminary and is provided only as a guide for calculating approximate total system power usage with additional resources added.

Resource	Typical Current	Maximum Current
E-Series baseboard, i486 DX-33 CPU, 4MB, 256 K cache	3255.26 mA	4139.33 mA

Table 5. Current Use by System Resources (Calculated)

Resource	Measured Current
+5 V	2.19 A
+12 V	0.24 A
-12 V	0.06 A
-5 V	0.01 A

Table 6. Current Use by System Resources (Measured)

Measurements in Table 6 were obtained using a Classic E-Series motherboard with 4 MB of memory, an i486 DX-33 CPU, no secondary cache, a TEAC 3½" floppy drive and the ASTEC 200w supply.

FLOPPY DRIVE

Classic E-Series integrates a 3½" Teac Floppy drive Model FD-235HF into the right 3½" bay. This is the same proven floppy disk drive that has been used on many previous Intel systems.

SPEAKER

The standard system ships with an external speaker installed. The user may enable/disable the device using the Setup utility or program the speaker via port 61H. The speaker provides error beep code information during POST if the system cannot use the video interface. The E-Series product guide (Order # 469281-001) contains detailed beep and error code information.

SECURITY

SYSTEM KEYLOCK

When engaged, the system keylock prevents keyboard input. Each system is provided with a set of two identical keys.

BIOS PASSWORD

A BIOS password feature provides security during the boot process. A password can be entered using the Setup utility and must be re-entered prior to disk boot each time the system is reset. The password can be changed by entering <old password>/<new password>/<new password><enter>. If the password is forgotten, it can be cleared by turning off the system and setting jumper J7 to 1-2. After the system has finished the Power-On Self Test, turn the system off and reset the jumper to 2-3. This allows the user to again access the password feature, but with the forgotten password cleared.

CHASSIS COLOR

The chassis color is beige. The bottom and back of the chassis are not painted.

Performance Benchmarks

BAPCO SUITE

The BAPCo tests were developed in 1992 by a consortium of more than 14 companies (Business Applications Performance Corporation). The SYSmark92 suite is a set of application scripts, data files MS-DOS batch files and executable programs designed to measure overall system performance by realistically using all the computer subsystems. This collection of program scripts is based solely on actual user patterns for a large variety of DOS and Windows applications. The BAPCo scripts are written for use under MS-DOS 5.0 and Windows 3.0. The six areas in the BAPCo suite:

Word Processing	*Database*	*Spreadsheet*	*Desktop Graphics*	*Desktop Publishing*	*S/W Development*
Word 2.0 for Windows	dBase IV v1.5	Lotus 1-2-3 v 3.1+	Harvard Graphics v3.0	PageMaker 4.0 for Windows	Microsoft C v6.0
WordPerfect v5.1	Paradox v3.5	Excel 3.0 for Windows			Borland C++ v2.0
		QuattroPro v3.0			

While the SYSmark92 result is based on popular applications, there are very few Windows or 32-bit applications. The BAPCo test suite is available to anyone, yet it is somewhat difficult to use (over 21 3½" diskettes) and takes up to 10 hours to test a single system configuration. Future enhancements include a test suite based on 32-bit windowing applications with graphical floating point and CPU intensive programs. A standalone 16-bit and 32-bit Networking Benchmark Test also is planned.

System	*Word Proc.*	*Spreadsheet*	*Database*	*Graphics*	*DTP*	*S/W Devel.*	***SysMARK 92***
DX/33 w/256 KB	110.23	111.80	113.15	94.68	119.95	105.17	**108.91**
SX/25 w/256 KB	94.49	98.64	95.16	81.53	98.42	94.08	**91.73**
DX/33, no cache	90.21	97.29	88.80	89.82	103.17	93.63	**92.99**
SX/25, no cache	71.32	74.83	70.42	73.32	83.81	81.19	**74.03**

Note: Specific configuration information (AUTOEXEC.BAT and CONFIG.SYS files) for the results are available on request.

PC LABORATORIES SUITE, VERSION 7.01

Developed by PC Magazine ZD Labs in late 1992, the version 7.0 suite is considered to be one of the most widely used utilities to measure system performance. PC Magazine consulted CPU component vendors to analyze DOS, Windows and OS/2 16-bit applications to determine the frequency of the instructions executed by the i486 CPU. The ZD Labs utilized new software tools to bring the level of source code and compilers up to date when compared to version 6.0. In March 1993, ZD Labs released the revised version 7.01 and WinBench 3.11 test suites. Specific alterations include memory test script computation formulas, DosMark computation formulas and developments in compilier techniques.

Processor Tests in Release 7.01 have been recompiled to test both real mode and protected mode instructions, focusing on the instruction mix test scripts. The synthetic application scripts are broken into a small instruction mix (1 KB) and a medium instruction mix (48 KB). The small instruction mix will easily fit into the CPU's 8 KB internal cache, while the medium instruction mix utilizes the internal cache and any second level cache. There is no 32-bit instruction mix in this release, but ZD Labs feels confident it will complete a profile of 32-bit application compilation and synthetic 32-bit instruction mix test scripts in a future benchmark (sometime after Windows NT is released).

The **Memory Test** includes five scripts to determine raw memory transfer speed, but only the extended and conventional memory tests are factored when comparing to other computer systems. An average of all extended and conventional memory tests determines the performance result. The extended memory test performs sequential read/write operations in 8-bit, 16-bit and 32-bit blocks in protected mode into every memory location. The conventional memory test performs sequential read/write operations in 8-bit and 16-bit blocks in real mode to every memory location below 640 KB (A0000H).

The **Video Tests** in Release 7.01 are identical to Release 6.0.

PC Labs Suite ver 7.01	*i486DX2/66 w/o cache*	*i486DX2/66 w/ 256 kB*	*i486DX/33 w/o cache*	*i486DX/33 w/ 64 kB*	*i486DX/33 w/ 128 KB*	*i486DX/33 w/ 256 KB*
Processor Harmonic	8474.01	14713.56	6753.85	8932.40	8929.59	8932.40
Video Harmonic	9886.67	10646.26	9862.48	10343.22	10558.58	10597.60
Memory Harmonic	6206.84	5933.79	5077.32	4640.17	4722.29	4727.18
Disk Harmonic	36.96	33.40	36.03	34.50	33.80	32.71
DOSmark Rating	**33.57**	**35.35**	**29.98**	**31.13**	**30.87**	**30.31**

PC Labs Suite ver 7.01	*i486SX/25 w/o cache*	*i486SX/25 w/ 64 kB*	*i486SX/25 w/ 128 kB*	*i486SX/25 w/ 256 KB*
Processor Harmonic	5169.66	6905.39	6763.67	6919.58
Video Harmonic	7679.91	8098.52	8289.68	8467.88
Memory Harmonic	3908.08	3572.65	3565.83	3674.27
Disk Harmonic	34.53	33.96	31.76	30.55
DOSmark Rating	25.65	27.34	26.26	26.06

Each system tested with 8MB system memory, 1MB video DRAM and the WD 2340 hard drive. Tests were conducted by Intel Corp.

PC LABORATORIES SUITE, WINBENCH VERSION 3.11

The **Disk WinMark** is based on testing techniques adapted from PC Magazine's DOS disk test to reflect operation within the Windows 3.1 environment. Each system contained 2 MB of SmartDrive cache. This test determines how effectively the disk processes data files of varying sizes up to 32 MB. This will force disk cache misses. The test simulates large database accesses, large graphic files, and reading/writing small files typically used in word processors and electronic mail. Multi-user, multi-tasking and networking disk access patterns also are simulated.

WINBENCH Version 3.11	*i486DX2/66 w/o cache*	*i486DX2/66 w/ 256 kB*	*i486DX/33 w/o cache*	*i486DX/33 w/ 256 kB*	*i486SX/25 w/o cache*	*i486SX/25 w/ 256 kB*
640 x 480 x 16 Graphics WINmark	13.274	15.806	10.166	11.096	8.011	8.987
640 x 480 x 256 Graphics WINmark	13.015	15.407	10.208	11.000	7.958	8.939
800 x 600 x 256 Graphics WINmark	13.027	15.144	10.239	11.307	8.108	9.147
1024 x 768 x 256 Graphics WINmark	13.046	15.243	10.151	11.331	8.047	9.080
1280 x 1024 x 16 Graphics WINmark	13.442	15.401	10.156	11.243	8.130	9.121

Each system tested with 8MB system memory, 2MB video VRAM on an ATi Ultra Pro VL, and the WD 2340 hard drive. Tests conducted by Intel Corp.

DHRYSTONE SUITE

Dhrystone versions 1.1 and 2.1 are measurements of processor speed when executing a 'typical' program. The typical program was designed by taking a mix of C instructions and measuring statistics on a large number of real applications. The typical program was written using these statistics. In 1988, after an evaluation of the Dhrystone in achieving its original goals, version 2.1 was released. Although expected to be close, Dhrystone numbers for version 2.1 are lower than those in version 1.1. Version 2.1 is intended to provided a more realistic benchmark by defeating some compiler optimizations that were becoming common, but not representative of those applied to real programs. The benchmark allows the use of internal registers (r) or no registers (nr) when executing and is dependent on the 32-bit compiler used. Dhrystone tests only fixed-point calculations and is weighted towards the CPU/Cache/Memory subsystem and serves as a compiler optimization intensive benchmark which tests virtually no I/O transfers across the EISA/ISA bus. The benchmark is a small program which easily fits into a 64 KB cache. While the Dhrystone suite is a good indication of performance for a single processor system, it is a somewhat poor indication of overall throughput. The VAX MIPS number is a derivative of the Dhrystone version 1.1 benchmark, obtained by dividing by 1757 (the Dhrystone result on a VAX 11/780).

SCO ODT 2.0 Intel C v5.1.1 beta	*Dhry1.1nr4*	*Dhry1.1r4*	*Dhry2.1nr4*	*Dhry2.1r4*

DX/33 / 256 kB	56,179	56,179	39,370.1	39,215.7
SX/25 / 256 kB	42,194	42,194	30,395.1	30,395.1

Each system tested with 16 MB (80ns) system memory, Adpatec 1542B SCSI controller and Maxtor 535S MB Hard Drive.

MIPS COMPUTATION

The VAX MIPS (million of instructions per second) is a measure used in conjunction with the Dhrystone benchmark. Different packages contain MIPS rating benchmarks which can give very contrary results. The MIPS rating depends on the CPU frequency, instruction mix executed, system response and compiler. To calculate the MIPS rating, vendors compile and execute the Dhrystone program to determine how many times it can be executed in one second. The result is divided by 1757 (the rating for a VAX 11/780 executing the same Dhrystone program). The same method can be used to determine a MIPS rating using Dhrystone Version 2.1 by dividing by 1657.

SCO ODT 2.0 *Intel C V5.1.1 (beta)*	*DX/33* *w/ 256 KB cache*	*SX/25* *w/ 256KB cache*
MIPS w/ Dhry 1.1	31.97	24.01
MIPS w/ Dhry 2.1	23.75	18.34

Each system tested with 16 MB (80ns) system memory, Adpatec 1542 SCSI controller and Maxtor 535S MB Hard Drive.
SCO ODT 2.0 is based on X-Windows Version 11 Release 4.0 and Open Software Foundation's Motif Release 1.1

SPECMARK SUITE

SPECmark was developed by the Standard Performance Evaluation Corporation in 1989 in a cooperative effort by various companies to introduce a benchmark involving UNIX applications. The ten SPEC 1.2b programs perform CPU intensive, fixed integer arithmetic, floating point arithmetic and some disk I/O tests in a technical environment. SPEC publishes a comprehensive comparison of tested computer systems to document the configuration, compiler, operating system, and benchmark results. The suite executes each test twice for accuracy on a 32-bit tested system. Many times the SPECmark tests are divided into three separate areas to distinguish between CPU-intensive system performance (SPECint), floating point performance (SPECfp), and overall system performance (SPECmark). While the SPECmark89 suite established itself as the standard for UNIX testing, in some cases it is not the best predictor for commercial applications in a business environment.

Recently, SPEC released a new suite of 32-bit UNIX benchmarks to replace the SPEC 1.2b tests. The Cint92 suite is a collection of six compute-intensive integer benchmarks intended to stress the CPU/memory subsystem, cache subsystem, and software compiler. The result is the geometric mean of the six integer benchmarks called SPECint92.

SCO ODT 2.0 *Intel 'C' v5.1.1 (beta)*	*espresso*	*li*	*eqntott*	*compress*	*sc*	*gcc*	***SPECint92***
DX/33 w/256 cache	15.4	22.2	17	10.2	25.8	16.8	**17.1**
SX/25 w/256 cache	12	16.8	12.9	8.1	5.7	12.9	**10.8**

Each system tested with 16 MB (80ns) system memory, an Adpatec 1542B SCSI controller and a Maxtor 535S MB Hard Drive.
SCO ODT 2.0 is based on X-Windows version 11 Release 4.0 and the Open Software Foundation's Motif Release 1.1

Appendix A – User-Installable Upgrades

PERFORMANCE UPGRADES

SX-25

The Classic E-Series i486 SX/25 model incorporates a two-site CPU design, providing for a variety of upgrade possibilities. The first socket site (U59) contains the i486 SX/25 PQFP CPU soldered to the baseboard. The second socket site (U58) is the OverDrive Processor Socket, and will accept an OverDrive processor or an i487 SX math coprocessor. Refer to Table A-1 below when installing any upgrade processor or validating existing processor jumper positions.

DX-33

The Classic E-Series i486 DX/33 does not use the PQFP CPU site (U59). Instead, the i486DX CPU is installed in the 238-pin upgrade socket (U58). Upgrading the i486 DX model requires removing the main CPU from the low insertion force socket and replacing it with an upgrade processor. Table A-1 lists the variety of CPU upgrade options for the Classic-E.

Upgrade Processor...	*...should be in CPU Socket...*	*...and jumper settings should be...*			
		J5	*J6*	*J32*	*J33*
i486SX-25	(U59) PQFP	1-2	2-3	Don't Care	1-3, 2-4
i486SX-25	U58	1-2	2-3	3-4	4-6
i486DX-33	U58	2-3	2-3	1-2, 5-6	3-5, 4-6
i486DX2-66	U58	2-3	2-3	1-2, 5-6	3-5, 4-6
ODP486SX-20	U58	2-3	1-2	1-2, 5-6	1-3, 2-4
ODP486SX-25	U58	1-2	2-3	1-2, 5-6	1-3, 2-4
ODP486DX-33	U58	2-3	2-3	1-2, 5-6	1-3, 2-4
ODPR486DX-25	U58	1-2	2-3	1-2, 5-6	3-5, 4-6
ODPR486DX-33	U58	2-3	2-3	1-2, 5-6	3-5, 4-6
i487SX-25	U58	1-2	2-3	1-2, 5-6	1-3, 2-4

Table A-1. Classic E-Series CPU Upgrade Options.

OVERDRIVE PROCESSORS

Table A-2 lists the OverDrive Processors supported by the Classic E-Series. Contact Intel's Personal Computer Enhancement Division (800-538-3373) for more information.

Product Code	*Pins*	*External Clock Speed*	*Internal CPU Speed*
ODP486SX-20	169	20 MHz	40 MHz
ODP486SX-25	169	25 MHz	50 MHz
ODP486SX-33	169	33 MHz	66 MHz
ODP486DX-33	169	33 MHz	66 MHz
ODPR486DX-25	168	25 MHz	50 MHz
ODPR486DX-33	168	33 MHz	66 MHz
Future OverDrive	238	Future OverDrive based on Pentium microprocessor technology	

Table A-2. Intel OverDrive Processors supported by Classic E-Series.

SYSTEM MEMORY

Classic-E supports only single-sided page mode SIMMs in these sizes: 256 Kb x 36, 1 Mb x 36 and 4 Mb x 36. All SIMMs are 80 ns or faster. Table A-3 shows all possible memory combinations. Boldface rows indicate configurations using the 4 MB SIMM supplied with each system.

Bank 0 SIMM Type	*Bank 1 SIMM Type*	*Bank 2 SIMM Type*	*Bank 3 SIMM Type*	*Total Memory*
256 Kb X 36	Empty	Empty	Empty	1 MB
256 Kb X 36	256 Kb X 36	Empty	Empty	2 MB
256 Kb X 36	256 Kb X 36	256 Kb X 36	Empty	3 MB
256 Kb X 36	256 Kb X 36	256 Kb X 36	256 Kb X 36	4 MB
1 Mb X 36	**Empty**	**Empty**	**Empty**	**4 MB**
1 Mb X 36	**1 Mb X 36**	**Empty**	**Empty**	**8 MB**
1 Mb X 36	**1 Mb X 36**	**1 Mb X 36**	**Empty**	**12 MB**
1 Mb X 36	**1 Mb X 36**	**1 Mb X 36**	**1 Mb X 36**	**16 MB**
1 Mb X 36	**256 Kb X 36**	**Empty**	**Empty**	**5 MB**
1 Mb X 36	**256 Kb X 36**	**256 Kb X 36**	**Empty**	**6 MB**
1 Mb X 36	**256 Kb X 36**	**256 Kb X 36**	**256 Kb X 36**	**7 MB**
1 Mb X 36	**4 Mb X 36**	**Empty**	**Empty**	**20 MB**
1 Mb X 36	**4 Mb X 36**	**1 Mb X 36**	**Empty**	**24 MB**
1 Mb X 36	**4 Mb X 36**	**256 Kb X 36**	**Empty**	**21 MB**
1 Mb X 36	**4 Mb X 36**	**256 Kb X 36**	**256 Kb X 36**	**22 MB**
1 Mb X 36	**4 Mb X 36**	**1 Mb X 36**	**1 Mb X 36**	**28 MB**
1 Mb X 36	**4 Mb X 36**	**4 Mb X 36**	**Empty**	**36 MB**
1 Mb X 36	**4 Mb X 36**	**4 Mb X 36**	**256 Kb X 36**	**37 MB**
1 Mb X 36	**4 Mb X 36**	**4 Mb X 36**	**1 Mb X 36**	**40 MB**
1 Mb X 36	**4 Mb X 36**	**4 Mb X 36**	**4 Mb X 36**	**52 MB**
4 Mb X 36	Empty	Empty	Empty	16 MB
4 Mb X 36	4 Mb X 36	Empty	Empty	32 MB
4 Mb X 36	4 Mb X 36	4 Mb X 36	Empty	48 MB
4 Mb X 36	4 Mb X 36	4 Mb X 36	4 Mb X 36	64 MB

Table A-3. Possible SIMM Memory Configurations.

CACHE SRAM

The Classic E-Series can be upgraded with a second level cache by adding industry-standard SRAM components to DIP sockets on the baseboard. The design requires 20 ns data SRAM and 15 ns tag and dirty bit SRAM. Appendix B lists required jumper settings.

	SRAM Size			
Cache Size	*Bank 0 U42-U45*	*Bank 1 U54-U57*	*Tag U50*	*Dirty Bit U62*
64 KB	(4) 8Kb x 8	(4) 8Kb x 8	(1) 8Kb x 8	(1) 64Kb x 1
128 KB	(4) 32Kb x 8	none	(1) 32Kb x 8	(1) 64Kb x 1
256 KB	(4) 32Kb x 8	(4) 32Kb x 8	(1) 32Kb x 8	(1) 64Kb x 1

Table A-4. Possible Second Level Cache Combinations.

Table A-5 lists the part numbers for cache components from several vendors.

Device Type	*Motorola*	*Cypress*	*IDT*	*Samsung*	*Mitsubishi*
8 Kb x 8, 15 ns	MEM6264PC15	CY7C185-15PC	7164S15TP	KM68685BP-15	N/A
8 Kb x 8, 20 ns	MEM6264PC20	CY7C185-20PC	7164S20TP	KM68685BP-20	N/A
32 Kb x 8, 15 ns	MEM6206PC15	CY7C199-15PC	71256S15TP	KM68257BP-20	N/A
32 Kb x 8, 20 ns	MEM6206PC15	CY7C199-20PC	71256S20TP	KM68257BP-20	N/A
64 Kb x 1, 15 ns	MEM6287P15	CT7C187A-15PC	7187S15P	N/A	M5M5187BP-15

Table A-5. Sampling of Cache Component Vendors.

Appendix B – Jumpers (* denotes default setting)

FLASH BOOT BLOCK (J3)

1-2 Boot from Boot Block (recovery mode) 2-3* Boot from standard BIOS

SUPER I/O PC87311AVF (J4)

1-2* Enable 2-3 Disable

CPU SPEED SELECT (J5, J6)

	J5	*J6*
16 MHz	1-2	1-2
20 MHz	2-3	1-2
25 MHz	1-2	2-3
33 MHz	2-3	2-3

Table B-1. CPU Speed Select Jumper Settings.

PASSWORD JUMPER (J7)

1-2 Clear Password 2-3* Enable Password function

PARALLEL PORT DIRECTION VIA HARDWARE (J9)

1-2* Parallel port is output 2-3 Parallel port is input

PARALLEL PORT DIRECTION HARDWARE/SOFTWARE (J11)

1-2 Software select for redirection 2-3* Hardware select for redirection

BATTERY TYPE SELECT (J17)

1-2 6 volt 2-3* 3.6 volt or 4.5 volt

FAN POWER (J29)

1-2 No connect 2-3 Connect secondary 12V DC fan*

FLASH WRITE (J30)

1-2* Enable +12V to FLASH (erasable) 2-3 Disable +12V to FLASH

LOCAL BUS READY MODE (J31)

1-2* Delayed Local Bus Ready 2-3 Direct Local Bus Ready

UPGRADE SOCKET CPU TYPE (J32, J33)

Upgrade Socket (U58) CPU Type	*J32*		*J33*	
i486DX	1-2	5-6	3-5	4-6
i487SX	1-2	5-6	1-3	2-4
i486DX2	1-2	5-6	3-5	4-6
OverDrive processor (ODP)	1-2	5-6	1-3	2-4
i486SX	3-4		4-6	
None	Don't Care		1-3	2-4

Table B-2. Upgrade Socket CPU Type Jumper Settings.

CACHE SIZE (J34)

Cache Size	*Jumpers*			*SRAM Required*
0 KB	Don't Care			None
64 KB	Out			8K x 8 (both banks)
128 KB	1-2	5-6		32K x 8 (bank 0)
256 KB	1-2	3-4	7-8	32K x 8 (both banks)

Table B-3. Cache Size Jumper Selections.

CMOS CLEAR (J25)

1	3	5	7	9	11	13	15	17*
2	4	6	8	10	12	14	16	18*

No jumper Clear CMOS on boot-up

17-18* Use saved CMOS settings on boot-up

* Note: The CMOS clear jumper shares the same connector header with the speaker, reset, hard drive LED and power LED circuitry. The J25:17-18 connection is located on the side closest to the cache SRAM sockets.

Appendix C – Setup Options

SETUP PAGE 1

Choice	*Default Settings*	*Comments*
System Time	Current time	Can also change from DOS
System Date	Current date	Can also change from DOS
Onboard Floppy	Enabled	
Diskette A	3 1/2-inch, 1.44 MB	
Diskette B	Not Installed	
Onboard IDE	Disabled	
Hard Disk 1	Not Installed	
Hard Disk 2	Not Installed	
User Definable Drives	48 and 49	
Boot Device	Floppy or Hard Drive	
Post Setup Prompt	Enabled	

SETUP PAGE 2

Video Card	VGA/EGA	Display mode
Primary Video Display	Color	
Keyboard	Not Installed	
Numlock On at Boot	No	
Password	Not Installed	

SETUP PAGE 3

Base Memory	Set by system	Display only; cannot be changed.
Extended Memory	Set by system	Display only; cannot be changed.
Base Memory Above 512K	Enabled	
Speaker	Enabled	
Parallel Port	Base Address 378H: Compatible	
Serial Port 1	Enabled	
Serial Port 2	Enabled	
Console Redirection/Serial Port 1	Disabled	
Console Redir/ Serial Port 2	Disabled	

SETUP PAGE 4

CPU Speed	Fast	
Cache	Enabled	Optimum performance
Shadow C0000H to C3FFFH	Disabled	
Shadow C4000H to C7FFFH	Disabled	
Shadow C8000H to CBFFFH	Disabled	
Shadow CC000H to CFFFFH	Disabled	
Shadow D0000H to D3FFFH	Disabled	
Shadow D4000H to D7FFFH	Disabled	
Shadow D8000H to DBFFFH	Disabled	
Shadow DC000H to DFFFFH	Disabled	

Appendix D – Connectors

SERIAL PORTS COM1 & COM2 (J16 & J18)

J16 & J18	*DB9 Pin*	*Name*	*Description*
1	**1**	DCD	Data Carrier Detected
3	**2**	RXD	Receive Data
5	**3**	TXD	Transmit Data
7	**4**	DTR	Data Terminal Ready
9	**5**	GND	Ground
2	**6**	DSR	Data Set Ready
4	**7**	RTS	Request to Send
6	**8**	CTS	Clear to Send
8	**9**	RIA	Ring Indication Active

Table C-1. Serial Ports Pin-Out

PARALLEL PORT (J19)

J19 Pin	*DB25 Pin*	*Name*	*J19 Pin*	*DB25 Pin*	*Name*
1	**1**	STROBE*	**2**	**14**	AUTOFD*
3	**2**	D0	**4**	**15**	ERROR*
5	**3**	D1	**6**	**16**	INIT*
7	**4**	D2	**8**	**17**	SLCTIN*
9	**5**	D3	**10**	**18**	GND
11	**6**	D4	**12**	**19**	GND
13	**7**	D5	**14**	**20**	GND
15	**8**	D6	**16**	**21**	GND
17	**9**	D7	**18**	**22**	GND
19	**10**	ACK*	**20**	**23**	GND
21	**11**	BUSY	**22**	**24**	GND
23	**12**	PE	**24**	**25**	GND
25	**13**	SLCT			

Table C-2. Parallel Port Connector Pin-Out

FLOPPY CONNECTOR (J13)

Pin	*Name*	*Function*
1	(NC)	Docking drive only, usually GND
2	HD_In	High Density In
3	(NC)	Docking drive only, usually GND
4	(NC)	Docking drive only, usually GND
5	(Keyed)	
6	ED_In	Extended Density In
7	+5V	Docking drive only, usually GND
8	INDEX*	L = Beginning of track
9	+5V	Docking drive only, usually GND
10	MOTENA*	Motor A select
11	+5V	Docking drive only, usually GND
12	DRVSELB*	Drive B select
13	GND	
14	DRVSELA*	Drive A Select
15	GND	
16	MOTENB*	Motor B Select
17	GND	

Pin	*Name*	*Function*
18	DIR*	Head Move to Center
19	GND	
20	STEP*	Step (Supplies step pulses)
21	GND	
22	WRDATA*	Write Data
23	GND	
24	FLPYWE*	Enable Head to Write
25	GND	
26	TRACK0*	Indicates Head on Track 0
27	GND	
28	WP*	Write Protected
29	ED_Out	Extended Density Out
30	RDDATA*	Read Data
31	GND	
32	HDSEL*	Head Select side 1
33	HD_Out	High Density Out
34	DSKCHNG*	Disk Changed

Table C-3. Floppy Drive Connector Pin-Out

IDE CONNECTOR (J14)

1	IDERST	Reset signal from CPU
2	GND	Ground
3	ID7	Data bit 7
4	ID8	Data bit 8
5	ID6	Data bit 6
6	ID9	Data bit 9
7	ID5	Data bit 5
8	ID10	Data bit 10
9	ID4	Data bit 4
10	ID11	Data bit 11
11	ID3	Data bit 3
12	ID12	Data bit 12
13	ID2	Data bit 2
14	ID13	Data bit 13
15	ID1	Data bit 1
16	ID14	Data bit 14
17	ID0	Data bit 0
18	ID15	Data bit 15
19	GND	Ground
20	KEY	No connection

21	IDEDRQ - CHRDY	I/O Channel Ready
22	GND	Ground
23	IDEIOW*	I/O write
24	GND	Ground
25	IDEIOR*	I/O read
26	GND	Ground
27	CHRDY	I/O channel ready
28	IDEBALE	Address latch enable
29	IDEDAK*	
30	GND	Ground
31	IDEIRQ14	IRQ 14
32	CS16	
33	IDESA1	Address bit 1
34	PDIAG*	
35	IDESA0	Address bit 0
36	IDESA2	Address bit 2
37	IDECS0*	Chip select 0
38	IDECS1*	Chip select 1
39	IDEHDACT*/ DR1PRES*	Disk activity light
40	GND	Ground

POWER CONNECTOR

J1

Pin	*Name*	*Function*
1	PWRGD	Power Good
2	+5 V	+ 5 volts
3	+12 V	+ 12 volts
4	-12 V	- 12 volts
5	GND	Ground
6	GND	Ground

Table C-5. Power Connector Pin-Out J1

J2

Pin	*Name*	*Function*
1	GND	Ground
2	GND	Ground
3	-5 V	- 5 volts
4	+5 V	+ 5 volts
5	+5 V	+ 5 volts
6	+5 V	+ 5 volts

Table C-6. Power Connector Pin-Out J2

Appendix E – BIOS Recovery

The Classic E-Series incorporates a Phoenix Technologies system BIOS on a FLASH component. FLASH BIOS allows easy upgrades without the need to replace an EPROM. The upgrade utility fits on a floppy diskette and provides the capability to save, verify, and update the system BIOS. The utility can be run from a hard drive or a network drive, but no memory managers can be installed during upgrades.

The latest upgrade utility and BIOS code are available in the *public* section of the iPAN bulletin board.

USING THE UPGRADE UTILITY

If the utility is obtained from iPAN, UNZIP the archive and copy the files to a bootable MS-DOS 3.3, 4.01, 5.0, or 6.0 bootable diskette. Reboot the system with the upgrade diskette in the bootable floppy drive and follow the directions in the easy to use menu-driven program.

RECOVERY MODE

In the unlikely event that a FLASH upgrade is interrupted, it is possible the BIOS may be left in an unusable state. Recovering from this condition requires the following steps.

1. Change jumper J3 to position 1-2.
2. Install the bootable upgrade diskette into drive A:
3. Reboot the system.
4. Because of the small amount of code available in the non-erasable boot block area, no video is available to direct the procedure. The procedure can be monitored by listening to the speaker and looking at the floppy drive LED. When the system beeps and the floppy drive LED is lit, the system is copying the recovery code into the FLASH device. As soon as the drive LED goes off, the system can be turned off.
5. Reset jumper J3 to position 2-3.
6. Leave the upgrade floppy in drive A: and turn the system on.
7. Continue with the original upgrade.

Appendix F – Memory Map

Address Range (Decimal)	*Address Range (hex)*	*Size*	*Description*
16384K-32768K	1000000-2000000	16384K	Extended Memory
16256K-16383K	FE0000-FFFFFF	128K	System & Video BIOS Copy
1024K-16255K	100000-FDFFFF	15232K	Extended Memory
960K-1023K	F0000-FFFFF	64K	Phoenix System BIOS
952K-959K	EE000-EFFFF	8K	FLASH Boot Block (Available as himem)
948K-951K	ED000-EDFFF	4K	User available
928K-947K	E8000-ECFFF	20K	Phoenix Setup Program (message disable via setup pre-boot only; with this option open to himem after boot)
896K-927K	E0000-E7FFF	32K	BIOS reserved
800K-895K	C8000-DFFFF	96K	User available
768K-799K	C000-C7FFF	32K	User available (many VGA cards use for video BIOS)
736K-767K	B8000-BFFFF	32K	VGA Display Memory (available unless VGA card present)
704K-735K	B0000-B7FFF	32K	VGA & Mono Display Mem (user available if no VGA/Mono)
640K-703K	A0000-AFFFF	64K	VGA Display Memory (available if no VGA present)
639K	9FC00-9FFFF	1K	Extended BIOS Data (moveable by QEMM,386MAX)
512K-638K	80000-9FBFF	127K	Extended conventional
0K-511K	00000-7FFFF	512K	Conventional

Table E-1. Classic E-Series Memory Map

Appendix G – System Interrupts

IRQ	*System Resource*
NMI	Parity Error
0	Reserved, Interval Timer
1	Reserved, Keyboard buffer full
2	Reserved, Cascade interrupt from slave PIC
3	On-board Serial Port 2
4	On-board Serial Port 1
5	User available
6	On-board Floppy controller
7	On-board Parallel Port
8	Real Time Clock
9	User available
10	User available
11	User available
12	User available
13	Reserved, Math coprocessor
14	IDE if enabled
15	User available

Appendix H – Baby AT Chassis Suppliers

Axxion Group Corporation
11 B. Leigh Fisher
El Paso, TX 79906
(915) 772-0088

Olsen Metal Products
1001 Crossroads Boulevard
Seguin, TX 78155
(512) 379-2799

Bermo Inc.
4501 Ball Road
Northeast Cir. Pines, MN
55014 (612) 786-7676

Appendix I – Environmental Standards

Parameter	*Condition*	*Specification*
Temperature	Non-Operating	-40°C to +70°C
	Operating	+10°C to +35°C
Humidity	Non-Operating	95% Relative Humidity max. @ 35°C
	Operating, no hard disk	85% RH max.
	Operating, w hard disk	Not to exceed 26°C wet bulb
Altitude	Non-Operating	50,000 feet (15,240 meters)
	Operating	10,000 feet (3048 meters)
ESD	1.0kV	No Errors
	2.5kV	No Errors
	5.0kV	5% Soft Errors, 0% Hard Errors, No physical damage
	7.5kV	10% Soft Errors, 0% Hard Errors, No physical damage
	10.0kV	25% Soft Errors, 5% Hard Errors, No physical damage
	12.5kV	50% Soft, 10% Hard, No physical damage
	15.0kV	100% Soft, 25% Hard, No physical damage
	25.0kV	100% Soft, 100% Hard, No physical damage
Shock	Non-Operating	30.0G, 11ms, 1/2 sine
Acoustical Noise	1 meter, peripherals idle	Less than 41 dB max.

SAFETY CERTIFICATIONS

Underwriters Laboratories	UL1950 1st edition	Listed
Canadian Standards Assn.	CSA C22.2 No.950-M89	Certified
TUV Rheinland of N.A.	EN 60 950-1988 + A1/A2	Certified
NEMKO (Norway) (includes SEMKO, Sweden, SETI, & Finland Certifications)	EN 60 950-1988 + A1/A2	Certified

EMI CERTIFICATIONS

Federal Communications Commission	CFR 47, Parts 2 and 15 Class B	Authorized
German Post Office	CISPR 22, Class B	Registered to Vfg. 243/1991
Canadian Dept. of Comm.	C.R.C., c.1374, Class B	Compliant
Voluntary Control Council	Class 2 I.T.E.	Registered
VDE (Germany)	VDE 0871 Class B	Tested/Compliant
NEMKO (Norway) (includes SEMKO, Sweden, SETI, & Finland Certifications)	EN 55 022, Class B	Certified

Appendix J – Reliability Data

The Mean-Time-Between-Failures (MTBF) data is calculated from predicted data @ 35C and 55C.

Classic E-Series baseboard (4 MB)	141,834 hours @ 55°C, 100% duty cycle
Power Supply (Astec SA201-3440)	100,000 hours @ 50°C, 100% duty cycle
Floppy drive (Teac FD-235HF-4240)	30,000 hours @ 50°C, 100% duty cycle
Classic E-Series system (4 MB, floppy)	82,772 hours @ 35°C

Appendix K – Physical Specifications

SYSTEM

Height	15.875 cm	6.25" (with feet installed)
Width	41.529 cm	16.35"
Depth	42.545 cm	16.75"
Weight	9.55 kg	21 lbs (floppy installed)

BOARD

Length	33.1216 cm	13.040"
Width	21.8948 cm	8.62"
Height (no heatsink)	2.921 cm	1.15" including 4MB SIMM. *
Weight		1.42 pounds

*measured from the bottom of the PBA (not including the pins sticking out) to the top of an installed SIMM module.

Appendix L – Customer Support

The Classic E-Series is backed by Intel's industry-leading support groups in the OEM Products and Services Division (OPSD), including IntelTechDirect.™ OPSD can support many of your network integration and service needs, including worldwide integration and system repair services. IntelTechDirect provides these services:

IPAN (INTEL PRODUCT ASSISTANCE NETWORK)

An electronic Bulletin board with current product information, demo software and more...

- Available worldwide through direct-dial
- Modem speeds up to 14.4k baud with standard software
- FLASH BIOS upgrade files
- Modem set at no parity, 8 data bits, 1 stop bit.

IPUB (INTEL PRODUCT UPDATE BULLETIN)

- Monthly Product updates available 24 hours a day from iPAN
- Official notification of engineering changes and technical data
- Easy information retrieval using Windows Help file format
- Intel platform system, board, and BIOS revision histories
- Hardware and software compatibility notes
- Documentation updates, spare parts and order information

IPALS (INTEL PHONE ACTION LINE SUPPORT)

A direct telephone support line backed by highly qualified and well trained technical personnel.

- Toll-free access to Intel support engineers for problem resolution
- Responses within 24 hours Monday-Friday
- Expert assistance geared to the secial needs of OEMs and VARs

FAXBACK™

- Product descriptions and technical data sent to any fax machine from a touchtone phone
- Information on End-of-Life products

For information about IntelTechDirect please contact your local Intel Sales Representative.

Appendix M – Product Codes

SYSTEMS

DT486SX254F	i486 SX/25 system, 4 MB, 3.5" floppy
DT486DX334F	i486 DX/33 system, 4 MB, 3.5" floppy

*All systems ship with an accessories kit

BOARDS

BDT486SX254	i486 SX/25 baseboard, 4 MB (Bulk shipped in quantities of 10)
BDT486DX334	i486 DX/33 baseboard, 4 MB (Bulk shipped in quantities of 10)

ACCESSORIES

Accessory kit includes:

- One power cord
- One product guide (Order # 469281-001)
- Two keys
- One IDE cable

DOCUMENTATION

The Classic-E system ships with a product guide, but also will have an online electronic Technical Reference manual using a Windows Help engine interface. The electronic Technical Reference manual will be available via the iPAN bulletin board system.