WHITE PAPER

June 5, 1998

Prepared by Enterprise Solutions Division

Compaq Computer Corporation

CONTENTS

Preparing for the Year 2000

With the turn of the century rapidly approaching, the computer industry and computer users alike face what has become known as the Year 2000 problem. For PCs, this problem arises from the IBM AT x86 specification itself; that is, from the prescribed method by which PCs update the system date and time. Making the Year 2000 transition successfully will require firmware, operating systems, and applications that are Year 2000 ready.

Compaq Computer Corporation is leading industry efforts to resolve the Year 2000 problem by enabling Compaq computers to handle the Year 2000 transition correctly.

This white paper defines the Year 2000 problem, explains what Compaq has done to resolve Year 2000 issues, provides information about Year 2000 readiness of leading operating systems, and identifies sources for obtaining more detailed information.

UNDERSTANDING YEAR 2000 ISSUES

A Year 2000 transition problem will occur if a computer is unable to determine the correct year when the date advances from December 31, 1999, to January 1, 2000. To keep track of the current date and time, PCs use a battery backed-up hardware timer called a real-time clock (RTC). To comply with the IBM AT x86 specification for PCs, the standard RTC was designed to store only the last two digits of the year. This limited storage is the hardware issue.

To overcome the hardware limitation, a static CMOS byte was allocated to track the century information. When the PC is turned on, the ROM BIOS combines the century CMOS information with the RTC's decade information to yield a four-digit year. Unfortunately, when the RTC rolls forward from 11:59 PM on December 31, 1999, to 12:00 AM on January 1, 2000, the decade information "99" correctly increments to "00", but the CMOS century information remains at "19". The failure of the ROM BIOS to increment the century byte is the firmware issue.

The operating system (OS) software is typically initialized immediately following the completion of the hardware power-on self-test (POST) routine. The majority of existing OSs are capable of handling the century rollover and updating the date. In some instances, the OS vendor may have generated software upgrades to handle the rollover. Applications typically acquire date information from the OS. However, many older applications could be at risk because they may either track the date as a two-digit number or bypass the OS and query the BIOS directly. The capabilities and interaction of the OS and applications define the software issues.

One of the greatest difficulties of the Year 2000 transition is determining all the places where dates are located. In a computer system, the date can be located in the hardware, operating system, and multiple applications. Thus, it will require the combined efforts of hardware, operating system, and application vendors, as well as in-house systems analysts, to resolve the problem. Compaq is leading the efforts to minimize this problem by enabling Compaq computers to handle the Year 2000 rollover.

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Preparing for the Year 2000
Fourth Edition (June 5, 1998)
Document Number ECG055/0698

COMPAQ SOLUTION TO HARDWARE AND FIRMWARE ISSUES

To resolve hardware and firmware Year 2000 issues in its computers, Compaq has modified the ROM BIOS in two ways. The first modification addresses a system that is powered off while the date rollover occurs. When that system is powered on after the rollover, an incorrect date may be supplied. Compaq has added an algorithm in the ROM BIOS that looks at the RTC data during the POST routine and calculates "IF YEAR LESS THAN 50 SET CENTURY EQUALS 20." This algorithm allows the ROM BIOS to increment the century byte correctly upon system startup after the rollover.

NOTE:
Any application that bypasses the OS and ROM BIOS to obtain date data directly from the RTC may receive an incorrect date.

The second modification addresses a system that is running during the date rollover. In most cases, the OS will handle detection of the rollover and CMOS century updates. To provide for applications that may bypass the OS during date queries and for OSs that are incapable of handling the rollover correctly, Compaq has created another algorithm in the run-time ROM BIOS. Upon date requests, this second algorithm looks at the RTC data and calculates "IF YEAR EQUALS 00 SET CENTURY EQUALS 20." Any valid, date-data function call after the roll-over, whether it occurs during the hardware boot cycle or during regular operation, will result in the correct date response and a century byte update.

Regardless of the method used, once the century byte has been updated to "20", manual intervention by the user or date manipulation via the OS would be required to change the century value back to "19". Year 2000 is a leap year and the RTC correctly handles it as such.

The amount of required customer intervention will depend on the revision level of the system ROM BIOS and on software issues. The tables located at http://www.compaq.com/year2000/NSTLlist.html identify the minimum ROM BIOS revision level required for Compaq systems to pass the NSTL test (which is described later in this paper). The following sections explain how to determine the ROM BIOS version of your system and how to update the ROM BIOS if necessary.

Determining ROM BIOS Using Compaq Utilities

To know whether your computer already has an upgraded ROM BIOS, use one of the three methods described below to determine the revision date of the ROM BIOS.

If Compaq Insight Manager is installed on your computer, you can use the management console to collect ROM BIOS information online across the network. In addition, Compaq works with 14 leading providers of LAN, systems, and enterprise management software to enable Compaq management information to be available to their applications. For details about Insight Manager, see the Compaq Website at http://www.compaq.com/support/techpubs/whitepapers. Move to the section titled, "Compaq Technology." This section includes documents about the following topics: Insight Manager, Intelligent Manageability, and Remote System Management.

Another method offered to users on some systems is the F10 prompt that occurs during the POST routine. Pressing F10 at this prompt will initiate Compaq Utilities. Select INSPECT and view the ROM BIOS version.

For Compaq servers that are not using Insight Manager and cannot afford operation interruption, another utility is available: the Compaq Survey Utility. Several technical documents are available describing capabilities, limitations, and use of this tool. The downloadable file and associated documentation can be found on the Compaq Website at http://www.compaq.com/products/servers/management/survey.html.

Upgrading ROM BIOS

Compare the current ROM BIOS revision of your system to the tables listed at http://www.compaq.com/year2000/NSTLlist.html. If the ROM BIOS revision of your system is not equal to or later than the revision listed in the tables, an upgrade should be performed. Note that the ROM revisions listed in these tables are minimum level requirements to pass the NSTL YMARK2000 hardware test. In some cases, a more recent ROM release may have occurred that includes further enhancements and updates to the system ROM.

NOTE:
Any system interruption during the ROM upgrade process could prevent proper completion of the upgrade and leave the system unable to restart.

To upgrade the ROM BIOS on your system, complete these steps:

1. To obtain the appropriate SoftPaq file for your system, visit the Compaq Website at http://www.compaq.com/support/index.html. Select DOWNLOADABLES and then the product family and model of your system.
2. Select ROM FIRMWARE UPGRADE. From the list displayed, select the version needed for your system. Then select the SoftPaq number associated with that version.
3. Follow the screen prompts and insert a new, never-used diskette of the type specified. Continue following the screen prompts to download the file and create a bootable, ROM upgrade diskette.
4. Power down your system, restart it from the diskette you created, and follow the screen prompts.
5. To complete the upgrade, power down your system again, and then restart it.

Once begun, the process of upgrading the ROM should not be interrupted. Any system interruption (for example, a power outage) could prevent proper completion of the ROM upgrade and leave the system unable to restart.

While Compaq recommends upgrading the ROM BIOS of each machine, we recognize that performing upgrades could be time consuming or difficult in remote areas. Therefore alternatives to ROM BIOS upgrades exist. Please refer to the section entitled “Methods for Setting the System Date” further in this document.

NSTL YEAR 2000 TEST PROGRAM

Compaq Computer Corporation has engaged NSTL (National Software Testing Laboratories)—the world's leading independent information technology testing organization—to verify the Year 2000 readiness of Compaq commercial and consumer desktop PCs, portable PCs, servers, and workstations. Compaq products were the first in the world eligible to carry the NSTL Tested Year 2000 Hardware Compliant logo—meeting one of the industry's leading open, globally available standards to verify proper date handling during the roll-over to the Year 2000.

To carry the NSTL Tested Year 2000 Hardware Compliant logo, computer equipment must pass the NSTL YMARK2000 test, which is administered by NSTL or under their guidance.

The NSTL YMARK2000 test can be obtained at no charge by visiting the NSTL Website at http://www.nstl.com. Details about the test are included in the YMARK2000 readme file and in the NSTL white paper *Year 2000 Companies and the “Industry Standard” Personal Computer*.

The YMARK2000 test verifies the following:

- The date is at compatible indices, so that non-DOS based operating systems that access the clock directly will obtain the correct date.

- MC146818 RTC compatibility. This test determines that the date and time indices are compatible to the MC146818 RTC and that the data is in packed BCD format. Some non-DOS-based operating systems, such as UNIX, may use the drivers rather than the BIOS to access the clock directly. If the chip is not compatible, these non-DOS-based operating systems or programs that read the clock directly may fail.
- The century byte is in the correct location in CMOS.
- Real-time progression from December 31, 1999, to January 1, 2000, is enabled.
- Recognition of leap year, when appropriate, for years 2000 through 2009 exists.

WARRANTY CLARIFICATION

Current Compaq commercial and consumer desktop PCs, portable PCs, servers and workstations will pass the YMARK2000 test (Version 97.08.15). A complete listing of current products by model number is available on the Compaq Year 2000 Compliance Program Website at http://www.compaq.com/year2000.[1]

Failure to pass the YMARK2000 test by any Compaq product on the list purchased on or after October 7, 1997 (the announcement date of the Compaq Year 2000 Compliance Program), will be treated by Compaq as a defect covered under its limited product warranty, subject to warranty limitations.[2] A full statement of Compaq limited product warranty is available in the product documentation. However, until all product documentation can be fully updated, the Compaq Year 2000 Compliance Program Website serves as warranty clarification.

With respect to current products purchased prior to October 7, 1997, the products may still pass the NSTL YMARK2000 test. Compaq has been working for many months to bring its entire system product line into compliance. Since all products were not brought into compliance on the same date, certain products purchased prior to October 7, 1997, may require a ROM BIOS upgrade to pass the test. Upgrades can be downloaded free of charge from the Compaq Year 2000 Compliance Program Website. All upgrade installations are the responsibility of the customer. Consequently, ROM upgrades on these products are not eligible for warranty claims. For NSTL test results or ROM upgrade details specific to an individual model and the most current information, go to http://www.compaq.com/year2000.

Older Compaq products may require a ROM BIOS upgrade to pass the NSTL YMARK2000 test. Available upgrades for these older products can de downloaded free of charge from the Compaq Year 2000 Compliance Program Website. Upgrades are not available for all products. All upgrade installations are the responsibility of the customer. NSTL test results for these older products are also available on the Compaq Website.[3]

Some older products that do not have upgradable ROM BIOS or that are not on the Website listing will not be able to be upgraded. Such products will require manual adjustment to update the century data. Please review the following alternative methods of setting the date to see which

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[1] All new Compaq commercial and consumer desktop PCs, portable PCs, servers and workstations released on or after the date of this announcement will have passed the YMARK2000 test unless they are identified in the listing as not having passed.

[2] Until all product documentation can be fully updated, the Compaq Year 2000 Web page (http://www.compaq.com/year2000) will serve as a warranty clarification. Despite a system's ability to pass the YMARK2000 test, actual rollover results in specific operating environments may vary depending on other factors including, but not limited to, other hardware, operating systems, and applications.

[3] With respect to any current Compaq product purchased prior to October 7, 1997, or older product requiring a ROM BIOS upgrade, the customer is responsible for installing the upgrade. Not all older Compaq products are able to pass the YMARK2000 test.

best fits your situation. In many cases, all three alternatives can be employed to give maximum coverage.

METHODS FOR SETTING THE SYSTEM DATE

All Compaq PC products will accept 2000 as a date, but the rollover to the Year 2000 may not occur automatically. The Year 2000 ROM upgrades were created to make the changes occur automatically. If a ROM upgrade is not available for your computer, you will have to reset the system date to update the century data in the PC CMOS. The three methods for making this adjustment are described below.

Regardless of which alternative you choose, after setting the date you should test all elements of your system (hardware, firmware, OS, and applications) to confirm that the Year 2000 transition occurs correctly.

Manual Date Set

- Change the date via the DATE command at the MS-DOS prompt, or
- Change the date via the DATE icon in the Windows Control Panel. After the date has been changed, exit from the Applet and close the Control Panel.

The century byte in CMOS will be updated. This method of updating the century data in the PC CMOS has been verified with these operating systems: MS-DOS 6.2, Windows 3.1, Windows 95, Windows NT 3.51, and Windows NT 4.0.

Network Date Set

Many corporate networks are configured to synchronize the internal clock of all PC clients at login. The date and time are kept on a server via a master/system login script. The century byte in CMOS of such network-connected PCs will be updated, and the correct date will be maintained. Contact your local Network Administrator to determine if your network is configured in this way.

Operating System Date Set

In many cases the operating system will handle the Year 2000 rollover correctly and will adjust the CMOS accordingly. For this to happen, your machine must be powered on with your operating system initialized during the rollover. For more information regarding operating systems, please read the following section.

SOFTWARE ISSUES

Operating systems vary in their treatment of the Year 2000 transition. Many operating system vendors have already incorporated changes that allow the system to roll over from 1999 to 2000. This section provides some information about how the following operating systems currently handle the roll-over: Windows 95, Windows NT, MS-DOS, NetWare, SCO Unix, OS/2 WARP, Solaris, and Banyan Vines. For the most up-to-date information over time, consult each vendor's Website. Since these OSs are not Compaq products, you should contact the relevant vendors before making any OS-related decisions affecting your systems.

Microsoft Windows 95, Windows NT, and MS-DOS

Microsoft Windows 95 and Windows NT are designed to support dates well into the 21st century. Programs and applications running under Windows 95 and Windows NT access the current date

and time using well-defined APIs designed to handle 4-digit year formats. The values returned by these APIs are based on the internal OS system time; therefore, these OSs will handle the Year 2000 transition correctly, whether the system is powered on or off during the transition. Microsoft DOS, Version 3.1 or later, is also capable of handling the century rollover.

For more information about MS-DOS, Windows 95, Windows NT, and the Year 2000, visit the Microsoft Website at http://www.microsoft.com.

Novell NetWare

Novell is committed to providing Year 2000 support for all of its current products. For complete details regarding the Novell product line and Year 2000 readiness, please go to http://www.novell.com/p2000/product.html.

For more information about Novell Netware and Year 2000, see the Novell Website at http://www.novell.com/year2000.

SCO UNIX

Some versions of SCO UNIX and some other SCO products are designed to support the rollover to the Year 2000 without requiring any additional action. For information about SCO products, visit the SCO Website at http://www.sco.com/. SCO support information can be found at http://www.sco.com/support/ssl.html.

IBM OS/2 Warp

For technical information, white papers, and supported software lists, visit the IBM Year 2000 Support Center at http://www.software.ibm.com/year2000/index.html. For general information, education, and planning guides, visit http://www.ibm.com/year2000. IBM OS/2 customers should continue to monitor the IBM Website for additional information.

SunSoft Solaris

The core of the Solaris for Intel Edition OS environment is designed to handle the Year 2000 rollover. However, after the Year 2000, known problems will occur with non-core elements such as libraries or utilities that combine with the core elements to make up the complete OS. SunSoft plans to offer OS patches or upgrades that eliminate such problems related to all libraries, functions, and utilities. These upgrades are planned to be compatible with previous versions of the OS, including Versions 2.4 and 2.5.

The first version of Solaris that will not require a Year 2000 patch or upgrade will be Version 2.6. All date-related libraries, functions, and utilities in this version will be designed to support the Year 2000 rollover and leap year as shipped.

For more information about SunSoft products, visit the SunSoft Website at http://www.sun.com.

Banyan VINES

Initial rollover testing of Banyan VINES shows the system must be up and running during the rollover from 1999 to 2000. If the system power remains on, the OS is capable of handling the rollover; so when the system is rebooted after the rollover, the date will remain correct. If, however, an existing system is shut down during the rollover and then powered up sometime after January 1, 2000, the date will be incorrect. These scenarios apply to the Year 2000 leap year transition as well. If the system stays operational, the date will roll over correctly. If the system is down during the rollover, the date will be incorrect.

For more information about Banyan products, visit the Banyan Website at http://www.banyan.com.

Applications

It is not enough that the hardware and OS handle the Year 2000 transition correctly. Applications must also be Year 2000 ready. Industry applications and custom software such as accounting, payroll, and commerce transactions require correct date handling. Contact your application vendors for complete information about the Year 2000 readiness of your applications.

Compaq is currently testing its utilities and applications. For up-to-date information about readiness of a specific Compaq product, visit the Compaq website.