Year 2000 and the Personal Computer

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Topics of Discussion

- How the PC clocks work
- Identify the Y2K problem
- Identify the risk
- Test methodologies
- Solutions

Operating systems and applications are not part of this discussion
Warning!

No “industry standard” PC can be made 100% Year 2000 fool proof!

The standard hardware clock uses a two digit year:

1998 is read as 98,
2000 is read as 00

The clock has no knowledge of centuries
Don’t Fret,

- Year 2000 compliance can be achieved via the BIOS
  - A BIOS is software that resides permanently in the PC
- Century information is maintained by the BIOS in CMOS memory
  - CMOS memory is a separate component of the hardware clock
Year 2000 and the Personal Computer

Year 2000 Compliance?

- Compliance can be achieved through standard interfaces
  - Operating system
  - BIOS

There are no standards for obtaining the date by any other means!
The PC Clock

- Industry Standard PC provides two separate and independent clocks
  - Physical hardware clock known as Real Time Clock (RTC)
    ✦ Always on with battery backup
  - System Clock (DOS clock)
    ✦ Exists only when PC is turned on
System Clock

- “Virtual,” exists only when PC is on
- The system clock (DOS clock) is not really a clock.
- System clock is a 24 hour counter.
  - Increments 18.2 times every second or once every 55 milliseconds
  - System Timer Routine (interrupt 8)
- Value set from RTC
Real Time Clock (RTC)

- Runs even when PC is off
- Only knows of years 00 - 99
  - Has no knowledge of centuries
  - Date Format: mm/dd/yy (05/28/98)
- Contains memory referred to as CMOS
  - System setup, CMOS setup, BIOS setup
**BIOS**

- Provides the date by reading the two digit year from the clock and combining it with the century date kept in CMOS.
- By implementing an algorithm, the BIOS can detect the next century.
  
  If (year=00 and century=19)  
  Then (century=20)
Most operating systems obtain the date via the BIOS during initialization

- DOS
- Windows
- Novel
Where is the Time?

Applications can get the date and time from many sources:

- Operating system (system clock)
- BIOS
- From outside sources
  - LAN, WAN, etc.
  - Internet
- Physical clock hardware (RTC)

Guesstimates*

- 98% →
- 1% →
- 0.5% →

* Data is purely a guess on my part.
Year 2000 Testing

- Transition while off
  - Cold boot
  - Warm boot
- Progression while on
- Progression while in standby/suspend
- Leap Years

† Indicates very important!
How to Test a PC

- Do NOT test the PC in its normal operating environment
  - Always boot to a DOS diskette
  - Never test within Windows or Unix

- Manual reboot test

- Automatic progression test
  - Cannot be tested manually
  - Can only be tested using a program
How to Test a PC: Manual Transition Test

1. Create a bootable DOS diskette
   FORMAT A: /S
2. Boot to the diskette
3. Set the date to 12/31/99
   DATE  12/31/99
4. Set the time to 23:59:50
   TIME  23:59:00
5. Turn off the system and wait 15 seconds.
How to Test a PC: Manual Transition Test

6. Turn on the PC. (Be sure to boot to the DOS diskette!)

7. Look at the Date
   Current date is Sat 01-01-2000
   Enter new date (mm-dd-yy):

8. Be sure to restore the PC’s date and time!
How to Test a PC: Automatic Transition Test

- Check for the ability of the system to report the occurrence of the next century while operating
- Must use a test tool
  - YMark2000
  - Can be downloaded for free at http://www.nstl.com
Beware!

- Y2K is a **HOT** topic
- Don’t get caught in the frenzy
- Y2K is not rocket science
  - Everyone has an opinion
  - Stay with the experts
- If the PC is not Y2K compliant, then its software certainly won’t be!
Beware!

- Unscrupulous vendors selling Y2K solutions
  - Some vendors are preying on people’s fears, so stay **COOL**

Because no PC can be 100% foolproof, ethically challenged vendors use this fact to sell unneeded solutions.
A BIOS Solution

- Always resident
- Not normally circumvented
- Upgrades are simple on newer systems (flash memory)
- Older systems may require a service technician to apply a BIOS upgrade
- Really old systems may require the dreaded software “patch”
Year 2000 and the Personal Computer

Recommendations

- Use BIOS upgrades to resolve Y2K problems
  - Do not use software based Y2K solutions

- Beware of PC test tools that offer Y2K “fixes” as well

- Use PC’s that fail Y2K in non date-sensitive roles
Recommendations

- Contact software and hardware vendors for Year 2000 statements
- Test software with your data
- Test software with other software and hardware that run concurrently
Call to Action

- Get started *now*
- Test PCs with objective test tools
  - Beware of tools that also provide a fix!
- Test the solution
- Know your software
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Questions?

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