

Swatting the Y2K Bug: A Survey of Patented Solutions to the Year 2000 Problem

by Richard J. Basile

As the new millennium approaches, so does the spectre of the "Y2K" bug. The "Y2K," "Year 2000," or "Millennium" bug are common names for the erroneous results generated by computers that perform date operations using only two digits to represent the year of dates after December 31, 1999. For example, if a computer calculates the number of years between 2005 and 1995 by subtracting the two-digit representation of the earlier year from the two-digit representation of the later year, the result is an erroneous negative number, -90 ($05 - 95 = -90$), instead of the correct result, 10 ($2005 - 1995 = 10$).

Whereas some computer owners are just beginning to grapple with the removal of the Y2K bug from their computers, inventors have been well aware of, and working on ways to exterminate, the Y2K bug for several years. Since 1997, at least 27 Y2K patents have issued in the United States, each proffering at least a partial solution to the Y2K problem. This article surveys these Y2K patents, and focuses on selected patents that demonstrate the various types of Y2K solutions proposed by inventors. Only by being aware of the various solutions proposed by the Y2K patents can computer owners avoid infringement of these patents, as they go about choosing a "swatter" for terminating the Y2K bug in their own computer systems.

Although each of the Y2K patents has its own approach to solving the problem, they can be divided, with a few exceptions also discussed herein, into three groups based on the method employed for modifying a computer program or database to correct the Y2K problem. Specifically, the Y2K patents can generally be classified as (1) date format conversion patents,¹ (2) date windowing patents,² and (3) system search patents.³ Patents from each of the three groups are surveyed below.

Date Format Conversion Patents

The date format conversion patents teach methods for converting standard six-digit date formats used in computer programs and databases to modified six-digit or expanded eight-digit date formats. For example, US Patent No. 5,668,989, "Two-Digit

Hybrid Radix Year Numbers for Year 2000 and Beyond," teaches a method for converting a standard six-digit date format to a modified six-digit date format using a two-digit "hybrid radix" numeric field for inputting, generating, storing, processing, and outputting year numbers ranging from 1900 to 2059. In the two-digit hybrid radix year number, the higher digit (representing the decade of a year) is treated as hexadecimal, but displayed in a decimal-like style with font patterns such as 0-9 and '0-'5, whereas the lower digit (representing the last digit in a year) is treated as an ordinary decimal. For example, the year 1901 is represented as 01 while the year 2013 is represented as '13.

The Y2K patents can generally be classified as date format conversion patents, date windowing patents, and system search patents.

Another method for converting a standard six-digit date format to a modified six-digit date format is set forth in US Patent No. 5,761,668, "Method and Apparatus for Converting Computer Software and Databases for the Year 2000." This patent teaches a method for converting dates in a standard six-digit date format to a modified six-digit CYYDDD date format where C indicates the century, YY indicates the year, and DDD indicates the Julian Calendar day (001-365). Accordingly, the date May 8, 1996 would be written as 196129, where 1 (C) represents the 20th century, 96 (YY) represents the 96th year, and 129 (DDD) represents May 8, the 129th day of the year. Similarly, the date May 8, 2000 would be written as 200129.

In contrast to these six-digit-to-six-digit conversion formats, US Patent No. 5,644,762, "Method and Apparatus for Recording and Reading Date Data Having Coexisting Formats," converts a six-digit date format to an expanded eight-digit date format.⁴ Specifically, the patent covers a method for converting the two-digit representation for years of dates after 1999 to four decimal digits using previously unused binary integer values. This invention is based on the understanding that a sequence of two eight-bit bytes

Richard J. Basile is an associate at the law firm of St. Onge Stewart Johnston & Reens in Stamford, CT.

using binary integer values (zeros and ones) can represent any value from zero through 65,535. The known character sets of ASCII and EBCDIC use only a small portion of the two-byte sequences for the numbers 00 to 99, leaving more than 60,000 potential two-byte combinations unused. Pursuant to the patent, some of these 60,000 unused binary integer values are used to represent years after 1999 as four-decimal-digit years. Once the years after 1999 have been converted to four-decimal digits, the computer must then examine each date's combined binary integer value to determine which format the date is in. If the date's combined binary integer value falls within the given range of binary integer values for the known character sets of ASCII (12,336–14,649) or EBCDIC (61,680–63,993), then the date is understood to be a year between 1900 and 1999. If the combined binary integer value falls outside these given ranges, then the combined binary integer value is treated as representing the four digits of a year after 1999.

Date Windowing Patents

In contrast to the date format conversion patents, patents in the second group—date windowing patents—do not convert the date format. Instead, they convert the dates themselves, to insure that all the dates fall within a single century or 100-year “window” before any date operations are performed by the program. One such patent, US Patent No. 5,600,836, “System and Method for Processing Date-Dependent Information Which Spans One or Two Centuries,” covers a method for converting all the actual or “local time” dates to be used in a date operation to a single century or “zone time” prior to any date calculations being performed by the program.⁵

For example, if the date operation to be performed is the addition of three years to the year 2005, and all the dates in the database fall within a range of dates from the years 1920 to 2019, then the first step of the patented method is to subtract a value of 20 from the year 2005 ($2005 - 20 = 1985$) to convert the date into the proper century or “zone time.” The value of 3 is then added to the zone time of 1985 to achieve the resultant output of 1988. Once the date operation is completed, a value of 20 is added to the resultant output to reconvert it back to actual or “local” time ($1988 + 20 = 2008$).

Another example of a date windowing patent is US Patent No. 5,845,286, “Date Value Reduction System.” This patent covers a method for processing two-digit year values by converting each two-digit year to a reduced year value by subtracting a

year reduction value, preferably a multiple of 28 (because the calendar cycle repeats itself every 28 years), from the two-digit years so that all the dates fall in the same century or 100-year window. After the reduced year value is processed according to the program instructions to achieve the desired result, the year reduction value is then added back to the reduced year value.

For example, if the processing instruction in a program is to subtract the year 1946 from the year 2000, the first step is to modify the dates so that they fall in the same century by subtracting 28 from the years 1946 and 2000 to convert them to the reduced year values of 1928 and 1972, respectively. The reduced two-digit year values of 28 and 72 are then processed according to the program to achieve a valid positive result ($72 - 28 = 54$). The year reduction value 28 is then added back to the reduced year values before the dates are printed, or otherwise outputted, by the program.

The Journal of **PROPRIETARY RIGHTS**

Edited by the Technology and Proprietary Rights Group of Weil, Gotshal & Manges LLP

Copyright © 1999 by Aspen Law & Business,
A Division of Aspen Publishers, Inc.
A Wolters Kluwer Company

THE JOURNAL OF PROPRIETARY RIGHTS (ISSN 1041-3952) (USPS P0000-041) is published monthly for \$374 per year by Aspen Publishers, Inc., at 7201 McKinney Circle, Frederick, Maryland 21704. Application to mail at Periodicals postage rate is pending at Frederick, MD. Postmaster: Send address changes to **THE JOURNAL OF PROPRIETARY RIGHTS**, 7201 McKinney Circle, Frederick, MD 21704. Send editorial correspondence to Aspen Law & Business, 200 Orchard Ridge Drive, Suite 200, Gaithersburg, MD 20878. To subscribe, call 1-800-638-8437. For customer service, call 1-800-234-1660.

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional services. If legal advice or other professional assistance is required, the services of a competent professional person should be sought.

—From a *Declaration of Principles* jointly adopted by a committee of the American Bar Association and a Committee of Publishers and Associations.

Visit Aspen's Web site on the Internet at:
<http://www.aspenpublishers.com>

System Search Patents

The third and by far the largest group of Y2K patents is that of the system search patents. These cover methods of searching the data or software operations within a computer system to locate areas in the data or software where invalid results may occur, and then modify the data and software operations at those locations to ensure that valid results are obtained. They generally differ from one another in the type of search that is conducted to locate the areas of the program that need to be modified. Some of these patents search for two-digit or ambiguous year dates,⁶ others search for calculation errors or other operations that use date fields,⁷ and still others search for dates that share similar characteristics so that the dates can be grouped together for simultaneous modification.⁸ Representative examples of each type are reviewed in more detail below.

System search patents cover methods of searching the data or software operations within a computer system to locate areas in the data or software where invalid results may occur, and then modify the data and software operations at those locations to ensure that valid results are obtained.

US Patent No. 5,809,500, "System for Converting Programs and Databases to Correct Year 2000 Processing Errors," is an example of a system search patent that searches a program for two-digit or ambiguous year dates. It covers methods of (1) examining a database to find all the locations of abbreviated representations of dates; (2) creating an auxiliary file that includes expanded representations of all of the abbreviated dates; (3) cross-referencing the dates with tags linking the expanded dates with the abbreviated dates; and (4) modifying the program so that references in the program to abbreviated dates are altered to instead obtain expanded dates from the auxiliary database.

For example, a database is examined for all abbreviated representations of dates, such as 96/03/15, that are in a YY/MM/DD format, where YY is a number between 1 and 99, MM is a number between 1 and 12, and DD is a number between 1 and 31.

Once the abbreviated dates are located, an expanded version of each date with a YYYY/MM/DD format, such as 1996/03/15, is created in an auxiliary file with tags linking the expanded date to the abbreviated date. The computer program using the dates is then modified to use the expanded date in the auxiliary file when appropriate.

System search patents that search for calculation errors or other operations using date fields are illustrated by US Patent No. 5,808,889, "System and Method for Identifying and Correcting Computer Operations Involving Two Digit Year Dates." This patent covers a method of searching an entire program for all operations involving two-digit year dates and then inserting instructions in the program to modify either the two-digit year dates or any erroneous results, so as to obtain a corrected result.

For example, if a computer operation requires subtracting the year 1998 from the year 2002 using two-digit year dates (02 - 98), it will yield an erroneous negative result of -96. According to one embodiment of the patent, after searching for and locating the negative result, instructions are inserted into the computer operation to add several two-digit numbers whose sum is 100 (80+20) to the negative result to achieve a positive result (-96 + 80 + 20 = 4).

Other system search patents search for date data with similar characteristics, which are then grouped and modified together. This approach is exemplified by US Patent No. 5,812,849, "Software Redevelopment System."⁹ This patent covers a method for modifying large, complex software libraries and databases by separating date data found in the libraries and databases into partitions based on the shared characteristics of the date data. Once divided into partitions, all the related date data in the partition is modified in the same manner.

Other Patented Methods of Dealing with the Y2K Bug

Although most of the Y2K patents can be separated into one of these three basic groups, there are three additional Y2K patents that do not fall clearly within any of them. Two can be considered hybrids of the date format conversion patents and the date windowing patents, because they require that all the dates fall within the same 100-year window before their six-digit date format is converted to an expanded eight-digit format.¹⁰ The final patent uses the days of the week to determine the correct century of a two-digit year date.¹¹

One of the two hybrid patents is US Patent No. 5,806,063, "Date Formatting and Sorting for Dates Spanning the Turn of the Century." This patent covers a method for reformatting dates represented in a six-digit format to dates represented by an expanded eight-digit format of CCYYMMDD, where CC is the two-digit century designation, YY is the last two digits of the year, MM is the two-digit month identifier, and DD is the two-digit day identifier. However, because the method will only work if all the dates to be converted fall within the same 10-decade window, the first step in the method is to select a 10-decade window of time starting before the earliest date in the database, with a $Y_a Y_b$ value representing the last two digits of the first year of the 10-decade window selected. If a date in the database has a year value YY that is less than $Y_a Y_b$, then the century designation CC is 20. If YY is equal to or greater than $Y_a Y_b$, then CC is 19.

Those responsible for correcting Y2K problems in computer systems should review all the Y2K patents referenced in this article to be sure that any programming changes implemented to correct existing Y2K problems do not create new problems of patent infringement.

For example, if 1950 is chosen as the first year of the 10-decade window ($Y_a Y_b = 50$) and if the date in the database is 03/18/43, having a year value YY of 43, then YY is less than $Y_a Y_b$ ($43 < 50$), and the century designation CC is 20, indicating that the year is 2043. Alternately, if the date in the database is 03/18/63, having a year value YY of 63, then YY is equal to or greater than $Y_a Y_b$ ($63 = 50$), and the century designation CC is 19, indicating that the year is 1963. The dates are then reformatted to the eight-

character CCYYMMDD format of 2043/03/18 and 1963/03/18, respectively.

Conclusion

Those responsible for correcting Y2K problems in computer systems should review all the Y2K patents referenced in this article to be sure that any programming changes implemented to correct existing Y2K problems do not create new problems of patent infringement. Companies who hire service providers to rid their computer systems of the Y2K bug, should be sure to receive full indemnification from that service provider against any charges of patent infringement resulting from the provider's correction of the Y2K problem.

Moreover, as the millennium approaches and efforts continue to focus on solving the Y2K problem, it is likely that more patents will issue covering new Y2K solutions. Accordingly, those responsible for correcting Y2K problems, be they computer owners or service providers, should continue to search for any newly issued Y2K patents that may expose them to potential liability.

Notes

1. US Pat. Nos. 5,644,762; 5,668,989; 5,737,735; 5,758,336; 5,761,668; 5,797,117; 5,812,841; 5,832,509; and 5,903,895.
2. US Pat. Nos. 5,600,836; 5,835,909; 5,845,286; and 5,852,824.
3. US Pat. Nos. 5,630,118; 5,740,442; 5,794,048; 5,802,354; 5,806,067; 5,808,889; 5,809,500; 5,812,849; 5,813,012; 5,828,890; 5,838,979; 5,862,380; 5,878,422; 5,897,633; and 5,898,872.
4. See also related US Patent Nos. 5,737,735 and 5,812,841, issued to Soeder.
5. See also related US Patent No. 5,835,909, issued to Alter.
6. US Patent Nos. 5,630,118; 5,806,067; 5,809,500; 5,878,422; and 5,897,633.
7. US Patent Nos. 5,740,442; 5,794,048; 5,808,889; 5,828,890; 5,862,380; and 5,898,872.
8. US Patent Nos. 5,802,354; 5,812,849; 5,813,012; and 5,838,979.
9. See also US Patent Nos. 5,813,012 and 5,832,509, issued to Chrysler Corp.
10. US Patent Nos. 5,758,346 and 5,806,063.
11. US Patent No. 5,765,145.