

YEAR 2000 UPDATE

by Alan Bridle

This is an update about "Y2K", the "Millennium Bug" in computers, programs and computer chips that track only the last two digits of the year. Because some will misbehave when those digits reach 00, the Millennium Bug can interfere with many aspects of daily life that depend on computers if it is not eradicated by the end of 1999.

There is both good news and bad news about Y2K since I wrote about it here a year ago. The good news is that many organizations are much more aware of the dangers and are working hard to ensure that essential operations and services will not be compromised by it.

At the NRAO, we inventoried all of our date-aware systems in 1997. Any hardware, and most software, considered essential to observatory operations but which was not already Y2K ready will have been replaced or modified by the end of 1998. The remaining essential items will be replaced early in 1999. The systems replaced include some older computers, and telephone systems. Purchasing and payroll processing software, which we get from outside contractors, will be Y2K ready by the end of 1998. The VLA and the 12 meter telescope have been tested successfully in simulated post 2000 conditions after fixing minor Y2K bugs. The VLBA was ready by design, but its test must wait for the sky itself to be more Y2K ready. (The motion of the Earth's axis in space makes the VLBA harder to test than the other telescopes until 1999.) The Green Bank interferometer is Y2K ready. The 140 foot telescope is not expected to be in use after 31 December 1999 but we know what needs to be updated in its computers if this changes. Items less essential to NRAO operations may not be updated to full Y2K compliance when their expected misbehavior is only cosmetic, or easily worked around. They will instead be upgraded as part of their normal replacement cycle. More tests will be done in 1999, with the goal that remaining Y2K problems in NRAO systems will be no more than an occasional nuisance.

Outside the NRAO, most businesses, utilities and government agencies are taking a similar approach; focusing effort on their most essential systems first. Some Y2K problems that were obvious a year ago (e.g. nonacceptance of credit cards with '00' expiry years) have already been fixed. The bad news is that the bug is more pervasive than first thought, and some fixes are taking much longer than expected. It is still unclear how prepared some sectors of the world economy will be for the century rollover. Y2K tests have produced surprises: a Chrysler assembly plant locked everyone "in" when its security system failed a test, but a California prison found that its doors would default to "open". Over-hasty Y2K bug fixers have created new bugs: Y2K changes to automated traffic lights caused big tie-ups in Dublin, automated banking systems failed in New Hampshire, some Kansas consumers with electronic debit agreements for their bills got instant overdrafts (and bad credit ratings) because their payees' computers overestimated their debits. One error

went the other way, as a brokerage (briefly) credited over half a million clients with an "extra" \$19 million. (Attempting to prefix a 19 onto every YYMMDD date in its database, it instead added 19,000,000 to every balance.) With much still to be done, many services that rely on "just-in-time" inventory management, accurate data exchange, or prompt transportation of goods and materials may still be at some risk when the Year 2000 arrives.

The most troublesome areas are where fix-up work started late, but manual methods have disappeared and human staff were "downsized" as computers proliferated. Computer chips and micro-controllers embedded in other hardware are potentially a big problem because chips in supposedly "identical" systems aren't always identical, and individual testing is needed. Some embedded chips, which cannot be reprogrammed, stop working altogether if the year reaches 00. Some date-aware chips are used even where no dates were required, as custom chips are expensive to design. Here are some examples of where Y2K is a concern:

Will the power stay on? This is critical: without power nobody can fix anything else. Electric power is generated in the U.S. by over 7000 independent small and large companies feeding a complex transmission grid. Power must also be generated on demand; when you turn an appliance on or off, a generator somewhere must respond almost instantaneously. Most of the systems that generate power and match it to demand can be operated without computerized controls, although doing so can be tricky for plant operators. The good news is that electric utilities are practiced at dealing with spot outages and large-scale emergencies, and they are testing and replacing vulnerable systems. The bad news is that tests have found that some power plants can indeed be shut down by Y2K problems, and that date-aware chips are present in parts of the power distribution system. It is hard to estimate how close to normal the supply of electric power will be in January 2000 because no one agency has access to all the data needed to do this. Some experts expect that load sharing and power generation may be (temporarily) more regionalized, so we could depend more than usual on the status of power plants closest to where we live. The century rollover itself could be a white-knuckle event for utility operators, but there are longer-term issues as well. Most fossil fuel plants are refueled by rail, and many railroads removed their manual switches as they computerized their operations. Large-scale power blackouts are considered unlikely, but brownouts and "spikes" (both in voltage and in consumer prices where utilities were ill-prepared) could be more common for a while.

Will water be safe to drink? Y2K tests of some water (and sewage) treatment plants have revealed problems with date-aware micro-controllers that could affect water quality (or even release raw sewage) after 1 January 2000 if not upgraded. The good news is that tests are being done; the bad news is that they are needed.

Will oil and gas supplies be normal? Date-aware micro-controllers are used throughout oil production and distribution. For example, a typical offshore oil-drilling rig contains thousands of embedded chips, many below the

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sea floor. One oil distributor found that a chip controlling a type of flow valve had to be replaced everywhere, with serious consequences; replacement chips required new circuit boards that were too large to fit in the old valves, so whole valve assemblies had to be replaced just to replace the defective chip. Supertankers now operate with tiny crews because they are so computerized, but tests have found Y2K problems in shipboard radar systems and in ballast-and performance-monitoring systems. The risks are clear, but it is hard to assess how ready suppliers will be when 2000 comes.

Will banks be immune? Most large US banks have been preparing for Y2K for years. Banks are highly regulated, so more is known about their Y2K readiness than for other institutions. Large US banks are thought to be on track for Y2K, but still have work to do. A few small banks have been warned by the FDIC about their lack of readiness. The Federal Reserve has contingency plans for handling transactions at banks that remain ill-prepared. It seems clear that a "Y2K bank run" by consumers wanting to hoard cash (which is always in short supply relative to bank deposits) could be much more dangerous to the banking system than Y2K itself. Financial advisers say that now is a good time to ask your own bank, mortgage company, or loan institution about its Y2K preparations. If you do not like what you hear, there is time to make other arrangements. There may also be a time ahead when paper transactions are more reliable than computerized ones. It will be prudent to make sure that your own paper records of financial accounts, deposits, mortgages and loans are in good order, and to get printouts of your credit report and Social Security account status before the century rollover. You may also want to consider whether all of your automatic payment arrangements are strictly necessary, in case computer problems at your payees cause incorrect debits from your accounts.

Will hospitals be safe? Most medical equipment will keep working, but the safe use of some devices involves date-aware logging. Y2K problems have been reported in the logging systems of some pacemakers, defibrillators, IV systems and anesthesia machines. Diagnosis and treatment can also be affected if medical records are corrupted or inaccessible, or if computerized pharmacies get confused about expiry dates of drugs. The risks are obvious, so most hospitals have had Y2K teams in place for some time. Again, "local mileage may vary."

Will air travel be safe? There is no reason to believe that Y2K will make planes fall out of the sky. There are Y2K issues that could affect whether they get off the ground. There have been conflicting signals from the FAA (optimistic) and from other agencies (not) about the Y2K readiness of air traffic control systems. Uncertainties remain about flight scheduling and booking systems, and about date-aware airport functions such as fuel metering, baggage handling, fire alarms, environmental controls and even the cooling systems of airport radars. Several airlines have stated that they may not fly to all their usual world destinations in early 2000 if they anticipate Y2K problems on the ground.

What's happening in other countries? The USA has the world's most highly computerized economy. It may also be where manual methods and work-arounds have been left furthest behind. Countries with more regulated approaches to electric power distribution, transportation and communications are finding it easier to assess their Y2K readiness, but the USA appears to be making one of the biggest efforts to fix Y2K problems. In countries that are now distracted by economic crises or natural disasters, little Y2K work is being done. Y2K readiness is likely to vary enormously from country to country. The implications are, once again, hard to assess because the problem is potentially so widespread and could show up everywhere at once.

The bottom line is that it is still very unclear whether Y2K will be merely a nuisance, or something that will severely disrupt daily life. You can expect to hear much more about the impact of the Millennium Bug on daily life in 1999, as preparations around the world become more intense. If you want to find out more about these issues now, the NRAO Y2K Web Page at <http://www.cv.nrao.edu/y2k/> has links to information on the Internet about Y2K outside the NRAO, as well as to our internal Y2K documents.



Top 10 StressBusters for the Holidays

1. Avoid excess food, alcohol and caffeine.
2. Take time to nurture yourself with a brisk walk outdoors, your favorite music, a warm bath and a good book.
3. Surprise an old friend with a phone call instead of a card.
4. Appreciate the simple pleasures of the season: snowflakes falling, a child's expression of wonder, candlelight, a hot cup of cocoa.
5. Forget the "shoulds" and make commitments to do only those things you and your family really want to do.
6. Practice seeing the humor in all your holiday challenges.
7. Plan a special event for you and your family in the New Year to beat the post-holiday blues.
8. Spend within your budget, and avoid January's financial hangover.
9. Remember that each year presents opportunities for remaking old and adding new traditions to your family's celebrations.
10. Embrace a positive attitude of gratitude for all your blessings.

**Happy
Holidays!**

