



COOPERATIVE EXTENSION

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EMBEDDED SYSTEMS AND Y2K

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Embedded Systems, often referred to as embedded chips, are one of the real unknowns related to Y2K issues. The real challenge for all sectors in a community is locating embedded systems because they exist in a wide variety of products. For example, from the most sophisticated manufacturing automation process to a simple VCR. The purpose of this fact sheet is to become familiar with embedded systems, and ways to locate and remediate embedded systems problems.



What are Embedded Systems?

Embedded systems are microchips containing software that is “burned into” the chip. Embedded systems include devices used to control, monitor or assist in the operation of equipment, machinery, or plant. These systems use dates in a variety of ways including: system clocks, data calculations, databases (recipes, inventory), and diagnostics. To further understand where embedded systems may exist, the following list provides some common occurrences within a community segment.

Manufacturing. Common items within manufacturing environments that contain embedded systems are: bar coding equipment (scanners), weld controllers, and instrumentation and scales.

Agriculture. Common agricultural items that may contain embedded systems are: grain elevators, grain analysis equipment, feeding systems, and milking machines.

Transportation. Common transportation items that may contain embedded systems include: global positioning systems (GPS), air traffic control/radar systems, and traffic lights.

Communications. Communications are highly dependent on embedded systems including: cabling systems, voicemail, and data networks.

Banking and Retail. Common banking and retail items that may contain embedded systems include: point of sale systems, bar code scanners, credit card readers, ATMs, vaults, and security systems.

Home and Office Equipment. Commonly used equipment items in the home or office environment include: telephones, dictation equipment, FAX machines, copiers, and video equipment.



How to Locate Embedded Systems

As described in the previous section, embedded systems can exist in several different areas of a business or household. Locating embedded systems can be an overwhelming task requiring a thorough inventory of all equipment, machinery, and other items that may be vulnerable. This is why a plan needs to be developed for locating and remediating embedded systems.

Identifying embedded systems is the first challenge facing many organizations and households. A fourteen-step criteria can be used for identifying embedded systems.

1. **Does the system display or print a date or time?** This would indicate some type of date function is integral to the operation of the device.
2. **Does the system produce regular (periodic?) reports?** If reports are generated by the device, and dates are part of the report, there may be a problem.
3. **Does the system store historical records?** If dates are stored, they may also be manipulated and sorted.
4. **Does the system time-stamp date?** If a system date-stamps records, logos, or products, it will likely be dependent on utilizing a date that may not be able to handle the year 2000.
5. **Does the system implement a timed sequence?** If the system starts or stops a function based on date or time, it may have a problem.
6. **Does the system perform an operation on a time or date basis?** Systems that perform a function based on date or time, such as locking doors on weekends, depend on the correct date.
7. **Does the system perform a calculation based on the differences between time and/or date?** Systems that determine intervals, averages, or total times could be at risk for year 2000 problems.

8. **Does the system request the date/time on start-up?** When power is turned on, a system dependent on date may request it as input.
9. **Does the system send date or time information to other systems?** If a system receives date information from other systems, it may have a date problem. Systems that must synchronize themselves with other systems will typically be dependent on knowing the exact date and time. **Does the system have a command that allows the date to be set?** If the device or system allows a date to be input, there is likely a need for a correct date.
10. **Does the system know which day of the week is based on a particular date?** For example, if the system can tell that June 1, 1998, is a Monday, then some kind of calendar function exists, and consequently a year 2000 problem is likely.
11. **Does the system generate an alert based on some type of interval?** If a system creates some kind of notification based on an elapsed period, an elapsed time counter may be involved, which has no date problem, but a real time clock may also be involved, which does. It is difficult to know which is being used, so these systems are suspect.
12. **Does the system display or print data based on a time sequence?** Logs or listings of events by date or time indicate a dependency upon knowing the correct date.

Source: *“Millennium Minefields”, Michael Harden, Century Technology Services*

If any of your equipment or systems meet any of the criteria above then it may be vulnerable to embedded system.



How to Remediate Embedded System Problems

Whether you are a business, governmental entity, or household, it is important that a Y2K plan include the following steps for remediating embedded system problems.

- 1) Establish group or person that will identify and remediate embedded system problems.
- 2). Develop an inventory sheet of machinery, equipment, or items that possess at least one or more characteristic presented earlier. Record make, model, serial number, and location of item.

- 3). Review list and rank level of importance to business or household. Rank as:
- A. Minimal: will not affect day to day operations.
 - B. Significant: will have a negative impact on day to day questions but still be able to function.
 - C. Catastrophic: will greatly impact day to day operations resulting in not being able to function.
- 4) Based on results from vendors, you have the option to repair, replace, or retire devices that have been identified as vulnerable. Once again begin with items of most importance.
- 5) Finally, continue to monitor devices even after the year 2000. Do not be surprised if you still have embedded system failures. However, the key is to try to address as many of these failures prior to them taking place.
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The main point for dealing with embedded system problems, as well with any Y2K problem, is to be prepared with a contingency plan. This plan should not only address the what if? but also how to respond to the Y2K problems. This is why a plan for testing and remediating problems is essential for all segments of a community.

Additional Y2K information can be obtained from your local Cooperative Extension office or by contacting Buddy Borden, Community Development Specialist with Nevada Cooperative Extension (702) 222-3130 or Tim Darden, Research Analyst with the Center for Economic Development (775) 784-6994.

Useful websites with Y2K information include:

<http://y2khelp.nist.gov>

<http://www.sba.gov/y2k>

<http://www.year2000.com>

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