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COMMENTS

ADMITTING COMPUTER GENERATED RECORDS: A PRESUMPTION OF RELIABILITY

The American obsession with the computer is intensifying at an astounding pace.¹ Not since the invention of the automobile has a machine had so profound an impact on our lives.²

1. Since 1980 the growth in the computer equipment market has been overwhelming. One expert observes that "computers, including home, personal and office machines, are being shipped at the rate of one every eight seconds . . . almost exactly the same rate at which babies are being born in this country." F. Fitzgerald, Keynote Address to Intech '83 Conference (Nov. 1983), *reprinted in COMPUTERS AND PEOPLE*, Jan.-Feb. 1984, at 9. In 1982 there were 12 periodicals available concerning computer equipment. In just two years, that number has exploded, with more than 46 publications on the market now. *Id.* See also *An Avalanche of Personal Computer Magazines*, *BUS. WK.*, Aug. 22, 1983, at 90. For a look at the impact of computers in today's scientific, engineering, business and home markets, see generally *A Buyer's Guide to Home Computers*, *FORBES*, Oct. 10, 1983, at 198-200; Bazoia, *How New Software Makes Managing Easier*, *Nations Bus.*, Oct. 1983, at 66-8 (computers can decrease production costs by enhancing inter-departmental communications and work scheduling); Chamberlin, *Technophobia v. Technomania*, *USA TODAY*, Nov. 1983, at 50-51 (discussing social and educational impact of computers); Hawkins, *Low-Cost Computers*, *Popular Sci.*, Nov. 1983 at 144-52 (small size and low prices are making home computers more affordable); *Is the Real Revolution in Personal Computers Just Beginning?*, *BUS. WK.*, Oct. 31, 1983, at 95-100 (smaller computers are becoming more affordable and powerful, acquiring capabilities formerly found only in large computers); Schriffres, *IBM Makes Its Big Move in Home Computers*, *U.S. NEWS & WORLD REP.*, Nov. 14, 1983, at 63, 64 (low cost will cause growth of the \$8 billion industry).

2. An entire body of law has grown up around the automobile. See generally BLASHFIELD, *AUTOMOBILE LAW AND PRACTICE* (P. Kelley 3d ed. 1965). The potential applications of computer technology are seemingly limitless. See generally *United States v. Scholle*, 553 F.2d 1109 (8th Cir. 1977) (routine computer analysis of drugs seized and tested across the country used to identify possible conspiracies in illegal drug traffic); Traxler, *Using Computer Systems in Small Law Offices*, 89 *CASE & COM.* 26 (1984) (mini- and micro-computers can assist small law firms in maintaining client files, drafting documents, legal research, and general accounting). Not every result of computer technology is desirable. See Freedman, *The Right of Privacy in an Age of Computer Data and Processing*, 13 *TEX. TECH. L. REV.* 1361 (1982) (computer processing storage and retrieval of information threaten individual privacy); Trubow, *Fighting Off the New Technology*, 10 *HUM. RTS.* 26 (1982) (computers permit unprecedented collection and dissemination of information which threaten personal privacy). The full range of criminal uses of computer systems is yet unexplored. See generally R.

Businesses, public offices, and individuals are increasingly aware that computer systems can generate and maintain an infinite variety of records, with an efficiency and accuracy unseen in conventional methods.³ This technological explosion has resulted in an endless variety of mainframe computers, microcomputers and minicomputers that have revolutionized America's view of electronic data processing.⁴

Computerized record systems present significant evidentiary issues for both civil and criminal litigation.⁵ Broadly

Levy, *Criminal Liability for Computer Offenses and the New Wisconsin Computer Crimes Act*, 56 WIS. B. BULL. 21 (1983) (computer offenses include unauthorized access, alteration or destruction of data bases or programs, and theft of a program or unauthorized program copying); Comment, *Some Aspects of Theft of Computer Software*, 4 AUCKLAND U.L. REV. 273 (June 1982) (growth of computer use may decrease personal crime but increase white collar crime). Some commentators have even suggested that the failure to use a computer may constitute negligence where it can be shown that such use is widespread and a reasonable person in the same circumstances would not have failed to use one. See Hermann, *Impact of Computers on Medical Malpractice*, 5 NEW ENG. 135 (1970) (use in medicine); Petras & Scarpelli, *Computers, Medical Malpractice, and the Ghost of the T.J. Hooper*, 5 RUT. J. OF COMPUTERS & THE L. 15 (1975) (use in medicine).

3. Accounting records, invoices, utility bills, summaries of customer transactions, agents' commission balances, telephone call listings, inventories and cost comparison analyses are but a few of the commercial records that have been adapted to electronic systems. See *United States v. Fendley*, 522 F.2d 181 (5th Cir. 1975) (agent's commission balances); *United States v. DeGeorgia*, 420 F.2d 889 (9th Cir. 1969) (summaries of auto rental transactions); *Leone v. Precision Plumbing & Heating of S. Ariz., Inc.*, 121 Ariz. 514, 591 P.2d 1002 (1979) (cost comparison analyses); *Merrick v. United States Rubber Co.*, 7 Ariz. App. 433, 440 P.2d 314 (1968) (accounting records); *Chrysler Credit Corp. v. Bank of Wiggins*, 358 So. 2d 714 (Miss. 1978) (parts inventories). See also Jacobson, *The Use of Computer Printouts as Evidence in Commercial Litigation*, 82 COM. L.J. 14 (1977) ("every type of record that is normally made in the regular course of business"). Public offices have also discovered varied uses for computerized records systems. See *United States v. Farris*, 517 F.2d 226 (7th Cir.) (printouts of tax records), *cert. denied*, 423 U.S. 892 (1975); *Ed Guth Realty, Inc. v. Gingold*, 34 N.Y.2d 440, 315 N.E.2d 441, 358 N.Y.S.2d 367 (1974) (printouts showing data used to determine assessed values for property tax); *City of Seattle v. Heath*, 10 Wash. App. 949, 520 P.2d 1392 (1974) (driving records maintained by state department of motor vehicles). See generally Annot., 71 A.L.R. 3d 232 (1974). As to the possible uses for personal computer systems, see *infra* notes 135-36 and accompanying text.

4. See generally COMPUTER BUYER'S GUIDE AND HANDBOOK NO. 13 (1983). R. TOCCI & L. LASKOWSKI, MICRO-PROCESSORS AND MICROCOMPUTERS (2d ed. 1982); R. WALKER, UNDERSTANDING COMPUTER SCIENCE (1981). The availability of personal computers raises profound questions with regard to the role educators should play in equipping our children to function in an automated world. A good introduction to such concerns may be found in *Computers: A Kaleidoscopic View*, 65 PHI DELTA KAPPAN 103-34 (1983).

5. See generally Abelle, *Evidentiary Problems Relevant to Checks and Computers*, 5 RUT. J. OF COMPUTERS & THE L. 323 (1976) (admissibility of computer records of direct financial transactions); Bender, *Computer Evidence Law: Scope and Structure*, 1 COMPUTER L.J. 699 (Spring 1979) (presentation of computer records into evidence); DeHetre, *Data Processing*

stated, the legal concerns over the admissibility of computer generated records center on their authenticity and reliability.⁶ For example, a computer printout is hearsay where offered to prove the truth of the matters contained therein, unless it will fit within a recognized exception to the hearsay rule.⁷ The best evidence rule, which requires the production of the original of a writing, may become an issue where a litigant offers computer output as the best evidence of the information stored in the computer.⁸ Whether a computer record is admissible often depends, therefore, on the application of these rules and the proof of authenticity and reliability necessary to preclude their exclusionary effect.⁹

Evidence—Is It Different?, 52 CHI.-KENT L. REV. 567 (1976) (impact of computer evidence on litigation); Freed, Fenwick & McGonigal, *Mock Trial: Admissibility of Computerized Business Records*, 15 JURIMETRICS J. 206, 209 (1975) (considerations of admissibility of computer records can be a factor in system design, tort liability, and communications regulation); Johnson, *A Guide for the Proponent and Opponent of Computerbased Evidence*, 1 COMPUTER L.J. 667 (1979) (admissibility of computer records); North, *Computer Evidence in Illinois*, 71 ILL. B.J. 590 (1983); Roberts, *A Practitioner's Primer on Computer Generated Evidence*, 41 CHI.-KENT L. REV. 254 (1974); Tapper, *Evidence From Computers*, 8 GA. L. REV. 562 (1974) (admissibility of computer printouts); Younger, *Computer Printouts in Evidence: Ten Objections and How to Overcome Them*, 2 LITIGATION 28 (1975) (admissibility of computer printouts); Comment, *Computer Print-Outs of Business Records and Their Admissibility in New York*, 31 ALB. L. REV. 61 (1967) (admissibility of computer printouts); Annot., 7 A.L.R. 4TH 8 (1980) (admissibility of computerized private business records); Annot. 71 A.L.R. 3D 233-40 (1972) (proof of public records stored on electronic computing equipment). This comment does not deal with the issues surrounding computer evidence generated specifically for purposes of litigation. For an excellent discussion of the foundation requirements for admitting "comp-lit" evidence, as it is called, see Comment, *Guidelines for the Admissibility of Evidence Generated by Computer for Purposes of Litigation*, 15 U.C.D.L. REV. 951 (1982). See also *Perma Research and Dev. Co. v. Singer Co.*, 542 F.2d 111 (2d Cir.) (computer simulation used to demonstrate potential of automotive anti-skid device), *cert. denied*, 429 U.S. 987 (1976); *United States v. Dioguardi*, 428 F.2d 1033, 1037-39 (2d Cir.) (computer model used to prove fraud regarding inventory in bankruptcy action), *cert. denied*, 400 U.S. 825 (1970); Dombroff, *Demonstrative Evidence: Computer Reconstruction Techniques*, 18 TRIAL 52 (1982); Jenkins, *Computer Generated Evidence Specially Prepared For Use at Trial*, 52 CHI.-KENT L. REV. 600 (1976) (computer manipulation of evidence for trial). The introduction of computer records also raises issues relevant to the discovery of such evidence. See Comment, *Discovery of Computerized Information*, 12 CAP. U.L. REV. 71 (1982) (discussing use of computers for discovery).

6. The authenticity and the reliability of computer records are discussed *infra* at notes 29-45 and accompanying text.

7. The hearsay character of computer printouts is generally conceded whether courts admit them or not. See *infra* note 78.

8. See *infra* notes 46-72 and accompanying text.

9. An analysis of the cases that have excluded computer generated records is presented *infra* at notes 159-81 and accompanying text.

Some courts have adopted multi-level tests for admitting computer evidence to ensure that the computer is reliable and that its output is trustworthy.¹⁰ Concededly born of judicial distrust and unfamiliarity with computer technology,¹¹ one may question this guarded approach in light of the realities of modern science and business.¹² To require that the proponent establish the reliability of each step of the computer's process before a court will even admit a computer record places a great burden on the proponent of such evidence. The proliferation of computers demands more workable solutions.

The evidentiary integrity of computer records now produced depends upon the scientific reliability of today's computers. This comment begins, therefore, with an overview of technological advances that have increased the computer's accuracy in processing information. This comment then considers a rationale for defeating "best evidence" objections in the context of computer output and questions the tendency of some courts to draw artificial distinctions between conventional and computerized records for the purposes of applying the exceptions to the hearsay rule. The comment traces the gradual move by some courts to admit conventional private records and argues that personal computer records should be admissible under the same theories. Finally, this comment attempts to identify the elements of an adequate foundation, taking into account the approaches recommended for the "best evidence" and hearsay problems. It is urged that, in lieu of requiring extensive foundation testimony, judges take judicial notice of the presumed reliability of regularly kept computer records.

10. The most comprehensive scheme to date was proposed in *Monarch Fed. Sav. & Loan Ass'n v. Genser*, 156 N.J. Super. 107, 383 A.2d 475 (1977). In *Monarch*, the court announced a seven-part test covering each step in the processing of the data and required that the reliability of each step be proved prior to admitting the computer printouts. *Id.* at 124-32, 383 A.2d at 484-88. The application of this approach to a wide range of cases could produce absurd results. For example, it would be ludicrous to require a retail department store to prove up every step incident to the preparation of a customer's computerized credit bill in a suit to collect a delinquency of \$500.

11. Many commentators have expressed dissatisfaction with judicial evaluation of the reliability of computer evidence. A few have argued that the admissibility requirements are too lenient. See Singer, *Proposed Changes to the Federal Rules of Evidence as Applied to Computer-Generated Evidence*, 7 J. OF COMPUTERS, TECH. & L. 157, 158 (1979) (federal rules could adequately handle computer evidence, but judges must understand the nature of this evidence); Note, *A Reconsideration of the Admissibility of Computer Generated Evidence*, 126 U. PA. L. REV. 425, 437-51 (1977) (some courts have been too lenient in light of the possibilities for unreliability).

12. See *infra* text accompanying notes 29-45.

COMPUTER TECHNOLOGY

Aided by the development of the integrated circuit chip,¹³ the computer has undergone a remarkable metamorphosis in recent years. As a result, a dizzying array of electronic equipment is now available to both the computer specialist and novice.¹⁴ These new systems are affordable, easy to operate, adaptable to a wide variety of tasks, complete, and compact.¹⁵

Increased operational accuracy and output reliability are inevitable accompaniments of such technological advances.¹⁶ In contrast to their predecessors, the computers marketed today benefit from years of trial-and-error attempts to achieve precision. Consequently, the design and attributes of today's computers are relevant in formulating new admissibility requirements.¹⁷

13. A "chip" is a mass-produced 1/8" to 3/4" piece of silicon inscribed with tens of thousands of transistors and other circuits. *COMPUTER BUYER'S GUIDE AND HANDBOOK*, *supra* note 4, at 191. Storage media are discussed *infra* at note 17.

14. *See generally* authorities cited *supra* at note 1.

15. *See generally* authorities cited *supra* at note 1.

16. *See generally* authorities cited *supra* at note 1.

17. Although "mainframe" computers were prevalent throughout the 1960s and 1970s, the trend had notably shifted to microcomputers. R. TOCCI & L. LASKOWSKI, *supra* note 4, at 84-90. "Mainframe" is a term generally used to distinguish large computers from the new mini and micro models. *COMPUTER BUYER'S GUIDE AND HANDBOOK*, *supra* note 4, at 192.

A microcomputer is a miniaturized version of a traditional system made possible by the development of microprocessors. R. TOCCI & L. LASKOWSKI, *supra* note 4, at 89. Basically, a microprocessor is a computer subsystem itself, exclusive of memory, input and output functions. *Id.* at 159-60. Ordinarily, a microprocessor is contained on a single integrated circuit "chip".

Every electronic data processing system, including the microcomputer, is comprised of five basic components: (1) the arithmetic/logic unit (ALU), (2) the control unit, (3) storage or memory, (4) input units, and (5) output units. R. TOCCI & L. LASKOWSKI, *supra* note 4, § 3.4 at 92. The ALU is half of the computer's "brain," responsible for performing all arithmetic and logic operations on inputted data. These operations are generally referred to as "hardware operations" because they are the pure result of the electronic operation of the computer and cannot be altered by programming instructions. *See* 14 AM. JUR. 2D PROOF OF FACTS 173, 186 (1977). Operations known as programmable read only memories (PROMS) can be added to the hardware operations to enable the computer to perform additional specialized tasks which cannot be altered. *Id.*, at 187. Such features increase the overall reliability of a computer system. The control unit is the other half of the computer's "brain." R. TOCCI & L. LASKOWSKI, *supra* note 4, § 3.4 at 94. Through instructions retrieved from the computer's memory, it orchestrates the operations of other units by means of timing and control signals. *Id.*

Storage units or memories store groups of binary encoded data that represent both the program which instructs the control unit, as well as the results of the operations the ALU performs. The language a computer uses is not complex. The most basic unit is referred to as a bit and is represented by the binary digits 0 or 1. Bits are generally stored in groups or

The various controls, checks, and tests used in today's computers provide greater accuracy and reliability. The use of these

words to facilitate ease in processing. For convenience, a group of eight bits is referred to as one byte, while four-bit groupings are fondly known as nibbles. *Id.* at 95.

Computer programs or "software," as they are often referred to, contain the instructions which control the computer's operation. Computer programmers generally write these instructions in specialized computer languages which combine English and mathematical characters and are identified by various acronyms. See 14 AM. JR. 2D PROOF OF FACTS 173, 188 (1977). Examples include BASIC (Beginners All-Purpose Symbolic Instruction Code), C BASIC (used in microprocessors), COBOL (Common Business Oriented Language), FORTRAN (FORMula TRANslator) and Pascal (named for Blaise Pascal). See COMPUTER BUYER'S GUIDE AND HANDBOOK, *supra* note 4, at 191-92.

Today, both the novice and the expert can choose between thousands of "canned software" (pre-programmed) packages designed to make the operation of a computer as simple as any other household appliance. *Id.* at 102. The typical software package includes a magnetic disk or tape, as well as user instructions, display examples, an error message glossary and a manufacturer's "hot line" number. *Id.* Examples of "canned" programs presently on the market include accounts payable, accounts receivable, database (which include the error check detection systems discussed *infra* at notes 18-25), general ledger, graphics, inventory, legal practice, medical practice, payroll, spread-sheeting, tax preparation, telecommunications and word processing. *Id.*

The most significant advances in storage mediums have been in the techniques developed for microcomputers. See generally, R. TOCCI & L. LASKOWSKI, *supra* note 4, § 7.10, 7.11, at 281-88. Among the most familiar innovations are the floppy magnet disks or "diskettes." *Id.* For storage, the first microcomputers utilized a punched paper tape. Characters were represented by a hole for the binary digit 1 and no hole for the digit 0. This system proved slow, costly and cumbersome. See *Data Storage in a Nutshell*, COMPUTERS & ELECTRONICS, July 1983, at 36-48. Recent computer technology has produced an assortment of highly sophisticated and reliable storage systems. IBM was the first to market the "floppy-disk" systems. A floppy or "diskette" is an 8-inch diameter paper-thin platter coated with a magnetic surface similar to that used on conventional magnetic tapes. A typical diskette can hold up to 246 kilobytes. *Id.* (A kilobyte is 1024 bytes.) See COMPUTER BUYER'S GUIDE & HANDBOOK, *supra* note 4, at 191.

Input units are utilized to introduce data external to the computer into the computer's memory. A good technical description of keyboard input devices may be found in R. TOCCI & L. LASKOWSKI, *supra* note 4, at 271-79. Output units receive data from the memory and transfer it into an intelligible form for external use. R. WALKER, *supra* note 4, at 2-2. A microcomputer ordinarily performs input and output operations through the use of a keyboard, a cathode ray tube (CRT) terminal and a high-speed printer.

A comprehensive listing of available input and output units appears in COMPUTER BUYER'S GUIDE & HANDBOOK, *supra* note 4. Closely related to these devices are MODEMS (Modulator/Demodulator), which are used to interface (link) the computer to a telephone line. *Id.* at 192. Telecommunication networks now permit input and output access to the computer from remote locations. For example, LEXIS and WESTLAW, the computerized legal research systems, both depend upon teleprocessing. See, *The Latest on Westlaw, Lexis, and Dialog*, 70 A.B.A.J. 85 (1984). An interesting use of modems involves the concept of "telecommuting" where employees avoid rush-hour traffic by using a remote access terminal to the company's computer to do their work at home two or three days of the week. See, *It's Rush*

techniques are so widespread among manufacturers and programmers that one could presume a computer system's reliability unless proof exists that a crucial control or test was omitted and that the omission was likely to have caused output error. Such a presumption would shift the burden of evaluating the reliability of the computer record for the purposes of admissibility to the record's opponent and move the forum for identifying defects from trial to discovery.

Error elimination techniques include such things as "check edits" designed to prevent or locate and warn of input errors. "Check edits" force the computer operator to enter commands in a correct sequence to access a particular computer function, require the operator to match a customer's name with the correct account number in order to process a transaction, or place numerical limits on values that may be entered so as to identify unreasonably high or low figures.¹⁸ Eliminating human involvement in inputting data also prevents input errors. For example, the innovative bar-coded pricing on foodstuffs has cut the waiting time at the supermarket checkout line in half, with an equivalent improvement in the accuracy of the bill.¹⁹ The use of security measures, including such things as passwords to limit access to the computer, restricted access to disk storage files and careful selection of operators and technicians, further improves input integrity.²⁰ Input errors can also be detected by a proofreading operation known as "echoing."²¹ The data is actually inputted twice or "echoed" and the two versions compared for keystroke errors. If a discrepancy is detected, the computer will alert the operator.²²

A method known as "parity" guards against errors in the data or the loss of data that may occur during its transfer from one location in the computer to another, as a result of faulty memory.²³ Memory errors can also be precluded by "redundant

Hour for 'Telecommuting,' BUS. WK., Jan. 23, 1984, at 99-102. (Two Hundred U.S. companies are experimenting and 30 have formal programs.)

18. DeHetre, *supra* note 5, at 587 n.20; Sprowl, *Evaluating the Credibility of Computer Generated Evidence*, 52 CHI-KENT. L. REV. 547, 553 (1976); 14 AM. JUR. 2D PROOF OF FACTS 173, 190 (1977).

19. See Sprowl, *supra* note 18, at 558. Another example is the magnetic striped credit cards that are read by machine.

20. 14 AM. JUR. 2D PROOF OF FACTS 173, 190 (1977). See also K. SHERMAN, DATA COMMUNICATIONS: A USER'S GUIDE 174-75 (1981).

21. Sprowl, *supra* note 18, at 553.

22. *Id.*

23. K. SHERMAN, *supra* note 20, at 175-79; Sprowl, *supra* note 18, at 550 n.11. Basically, parity is a coding mechanism that attaches an additional binary "bit" to each bit configuration sought to be transferred. Parity can be either odd or even, and the computer will be instructed according to which parity method is chosen. In an even-parity method, the value of the

recording."²⁴ Basically, "redundant recording" is a technique used to eliminate errors that might result from a scratched or worn disk. It permits the computer to compare two versions of the recorded information and thereby determine the presence of discrepancies.²⁵

The use of turnkey systems and expansive software testing further reduce the probability of computer error.²⁶ Much of the software available today is marketed in a prepackaged or "canned" form.²⁷ All software, however, generally undergoes extensive testing and debugging before being utilized to actually process data.²⁸ A comprehensive explanation of software testing procedures is beyond the scope of this article. Nevertheless, the widespread use of such techniques increases computer reliability.

Some courts and commentators that have considered the reliability of computers identify various sources of error which allegedly affect the trustworthiness of any computer output.²⁹ These sources of error include equipment or "hardware" failure,

parity bit will be chosen so that the total value of "1's" in the bit configuration plus the parity bit equals an even number. For example, if the bit configuration contains an odd number of "1's", 00010011, the parity value will be 1 so that the total number of "1's" in the bit configuration is an even number, or 10010011. When the computer is programmed using an even parity method, it will detect all transmitted configurations totaling an odd number. In this manner, any single error in the data can be ferretted out. For further explanation of the concept of parity, see R. TOCCI & L. LASKOWSKI, *supra* note 4, at 16-17; R. WALKER, *supra* note 4, at 2-33.

24. See R. TOCCI & L. LASKOWSKI, *supra* note 4, § 7.10, at 284-86. One drawback of magnetic storage media is the loss of the recorded information which results if the disk or tape is lost or accidentally destroyed. The use of a backup system can ordinarily prevent these kinds of problems. *Id.*

25. *Id.*

26. A "turnkey" is a complete computer system generally composed of all necessary hardware (equipment), software (programs), output and input units installed and fully tested. See COMPUTER BUYER'S GUIDE AND HANDBOOK, *supra* note 4, at 192.

27. See *supra* note 17.

28. There are numerous methods of testing software. For an introduction to such techniques, see generally A. KINDRED, INTRODUCTION TO COMPUTERS, DEBUGGING AND VERIFICATION OF PROGRAMS 160-64 (2d ed. 1982); Appelbe & Pournelle, *Big Projects on Small Machines, Software Engineering on Microcomputers*, BYTE, Sept. 1984, at 150, 448-51.

29. American Oil Co. v. Valenti, 179 Conn. 349, 426 A.2d 305 (1979) (hardware and software errors); Grand Liquor Co., Inc. v. Department of Revenue, 67 Ill. 2d 195, 367 N.E.2d 1238 (1977) (input, programming and operational errors); Note, *supra* note 11, at 439 (environmentally induced error hardware failure, programming, input and output errors); Note, *Appropriate Foundation Requirements For Admitting Computer Printouts Into Evidence*, 1977 WASH. U.L.Q. 59, 75 (human and mechanical error, as well as deliberate falsification of program or database); 14 AM. JUR. 2D PROOF OF FACTS 173 (1977) (input integrity, hardware integrity, system security, and output integrity).

programming mistakes and inadequacies or "software" failure, and human operational error, including fraud. To admit a computer printout, so the argument runs, the proponent must present specific proof of the measures taken to eliminate or reduce the occurrence of error from each of these sources.³⁰

Hardware malfunctions, however, are infrequent.³¹ Their possible, but unlikely, occurrence should not be allowed to diminish the evidentiary integrity of a computer's output. As already noted, error detection and correction circuits available in most systems prevent incorrect processing of information without first warning the user or taking corrective measures.³² Moreover, many businesses and public offices rely on turnkey systems. With refinements appearing daily, the mechanical reliability of computer hardware should be presumed, absent contrary proof.³³

Undetected "bugs" in a computer's software concededly can produce inaccuracies in processed data.³⁴ Evidence does not become inadmissible, however, simply because there is a chance that it is incorrect. Juries and judges constantly confront testimony that may contain untruths and inaccuracies. Apart from problems of relevance, admissibility depends upon circumstantial probabilities which demonstrate that the evidence is reliable, not that the evidence cannot be refuted.³⁵

The software programs in existence today presumably contain sufficient circumstantial guarantees of reliability unless

30. It is upon the purported necessity of such proof that the foundation requirements in some jurisdictions for computer records stand. See *infra* notes 159-81 and accompanying text. Some courts attempt to distinguish systems which perform calculations from those which merely store data, holding that the former require greater scrutiny to determine their reliability. See *People v. Bovio*, 118 Ill. App. 3d 836, 842, 455 N.E.2d 829, 833 (1983); *People v. Mormon*, 97 Ill. App. 3d 556, 567, 422 N.E.2d 1065, 1073 (1981), *aff'd*, 92 Ill. 2d 268, 442 N.E.2d 250 (1982). The distinction is artificial. No computer merely "stores" data. Instead, all information entered in a computer must be translated into binary language and then processed according to software instructions. See *supra* note 17 and accompanying text.

31. Singer, *supra* note 11, at 163. Even one commentator, who has argued that the incidence of error in computer systems requires additional proof of circumstantial reliability, freely admits that "despite its reputation for making errors, a computer is a precise machine, substantially more accurate than people." Note, *supra* note 28, at 75; 14 AM. JUR. 2D PROOF OF FACTS 173, 189 (1977).

32. Sprowl, *supra* note 18, at 553. See also discussion of "parity," *supra* note 23.

33. Case law supports such a presumption. See *infra* note 103. See also discussion of judicial notice of scientific principles, *infra* at notes 196-204 and accompanying text.

34. 14 AM. JUR. 2D PROOF OF FACTS 173, 188-99 (1977).

35. See *infra* notes 101 and 102 and accompanying text.

other reliable circumstances compel a contrary conclusion.³⁶ Widespread reliance on pre-programmed software has become an industry standard.³⁷ The industry applies time-tested, sophisticated, "debugging" techniques on a regular basis to newly developed programs.³⁸ Moreover, fierce competition among software manufacturers ensures that defective offerings will be held closely in check.³⁹ Given these factors, it is unreasonable to believe that the chance occurrence of software failure, without more, is sufficient to require extensive testimony concerning the reliability of the software used.⁴⁰

The greatest source of error in any record system results from human interaction with the information and data recorded.⁴¹ This is true whether the error is the product of fraud or pure mistake.⁴² While no system, either manual or electronic, can boast an error-free record, the use of controls and security measures can minimize the incidence of error.⁴³

The distrust of computerized record systems proceeds, in part, from the unsupportable proposition that conventional techniques are less susceptible to tampering and can somehow produce more reliable results. Modern computerized record systems, however, have markedly reduced the frequency of human interaction with the information and data and have correspondingly minimized the introduction of human error. Moreover, computer systems have incorporated a number of controls and security measures to ensure the integrity of the data, controls which are not available under conventional methods.⁴⁴ It should not follow that computer generated results may be pre-

36. R. WALKER, *supra* note 4, at 10-4.

37. See *supra* notes 17 and accompanying text.

38. See authorities cited *supra* at note 27.

39. There are literally hundreds of companies that now produce software. See COMPUTER BUYER'S GUIDE & HANDBOOK, *supra* note 4, at 120.

40. A rule of evidence that would require the computer user to find and produce the software manufacturer or an equivalent expert at trial to attest to the reliability of the software arguably would work a profound hardship on the proponent. See discussion of foundation witness, *infra* at notes 205-18 and accompanying text.

41. "Whenever a human serves as part of the conduit over which evidentiary information flows, human errors will occur." Sprowl, *supra* note 18, at 553.

42. Commentators differ on whether the possibility of fraud in computer records affects their admissibility. Compare Singer, *supra* note 11, at 164-67 (noting that the possibility of tampering may effect a computer record's admissibility) with 5 J. WEINSTEIN & M. BERGER, WEINSTEIN'S EVIDENCE § 1001(4)[07], at 1001-97 (1983) [hereinafter cited as WEINSTEIN'S EVIDENCE] (suggesting that the issue of fraud is for the jury).

43. See *supra* notes 19-20 and accompanying text.

44. See *supra* notes 18-28 and accompanying text.

sumed less reliable than the results of a system which requires human interaction at each step of the process.

In addition to those factors mentioned, the high degree of reliance that most users must place in their computer systems provides further circumstantial guarantees that the records they produce are trustworthy. The law should not presume that competent businesses, public servants, or for that matter, private individuals, will maintain defective systems in the pursuit of pecuniary and other selfish interests. It should be recognized that computer generated records carry a strong presumption of reliability which only an equally strong showing of a lack of trustworthiness should overcome. The application of the rules of evidence to computer records should incorporate such a presumption.⁴⁵

THE RULES OF EVIDENCE

The Best Evidence Rule

Before the introduction of any written physical evidence at common law, the proponent had to establish that the writing was original, unless, through no fault of the proponent, the original was unavailable.⁴⁶ The purpose of the rule was to guard against inaccuracies,⁴⁷ although it has also been justified as a guarantee against fraud.⁴⁸ Whatever the underlying rationale, most courts adopted a standard of reasonableness in their application of the rule and, therefore, required only the "best obtainable evidence" of a writing to be produced at trial.⁴⁹

45. This approach accords with FED. R. EVID. 803(6), *infra* at note 92; FED. R. EVID. 803(8), *infra* at note 121; and the exceptions relevant to personal computers, *infra* text accompanying notes 135-58.

46. C. McCORMICK, HANDBOOK OF THE LAW OF EVIDENCE §§ 229-35 (2d ed. 1972) [hereinafter cited as McCORMICK]; 4 J. WIGMORE, A TREATISE ON THE ANGLO-AMERICAN SYSTEM OF EVIDENCE IN TRIALS AT COMMON LAW §§ 1177-1282 (rev. ed. 1974) [hereinafter cited as WIGMORE]; Cleary and Strong, *The Best Evidence Rule: An Evaluation in Context*, 51 IOWA L. REV. 825 (1966). The rule was based, in part, on the common law notion that "the best proof that the nature of the thing will afford is only required." McCORMICK, *supra*, § 229, at 559 (quoting *Ford v. Hopkins*, 91 Eng. Rep. 250 (1700)). For the most part, however, the "best evidence" concept has been superseded by the requirement of producing the original of any writing. See FED. R. EVID. 1001(3).

47. McCORMICK, *supra* note 46, § 231, at 561.

48. See, e.g., Singer, *supra* note 11, at 184; Note, *supra* note 11, at 431 (also suggesting that the rule was designed to facilitate interpretation of words of art contained in writings). One commentator suggests that it is the problems of fraud and not inaccuracies which affect computers. He adds, however, that the issue of fraud is one of fact for the jury. 5 WEINSTEIN'S EVIDENCE, *supra* note 39, § 1001(4)[07], at 1001-97.

49. McCORMICK, *supra* note 46, § 237, at 570. The "best obtainable evidence" approach did not ignore the production of the original writing re-

The introduction of computer output into evidence raises two issues related to the best evidence rule.⁵⁰ First, does the output constitute a writing?⁵¹ Assuming that it does, its relationship to the other steps of the record-generating process becomes significant. Often the output contains data and information culled from other documents, such as purchase orders, invoices, bills of lading and receipts.⁵² A second consideration arises: whether the available output is the "best obtainable evidence" of those underlying documents or of the data stored in the computer.⁵³

Historically, courts have had difficulty formulating concrete rules to distinguish "writings" from other objects. Where the proponent seeks to prove the contents of an object which is susceptible to inaccuracies or fraud similar to traditional written documents, the object is usually classified as a writing.⁵⁴ Thus, the definition of a writing has been expanded to incorporate photographs, x-ray films, video tapes and sound recordings.⁵⁵ Because computer output, including printouts and CRT displays, is also arguably susceptible to inaccuracies and fraud, it also should be classified as a "writing" for the purposes of the rule. If it is, the proponent of the computer record must be prepared to respond to an objection that the record violates the rule.

The voluminous writings exception has been suggested to justify admitting computer output in lieu of underlying source documents.⁵⁶ Where it was impractical to require the trier of fact to dissect the thousands of source documents from which the computer records were prepared, a few courts allowed the introduction of computer generated summaries.⁵⁷ Cases involv-

quirement. It merely recognized a balance that had to be struck between the necessity of acquiring the original and the burden of doing so. *Id.*

50. Where the printout itself is not introduced, but sought to be relied on, additional problems may be encountered. For example, one court has held that, even where a computer printout was otherwise admissible, a witness' testimony as to the printout's contents in lieu of an offer of the record itself violated the best evidence rule. *State v. Springer*, 283 N.C. 627, 197 S.E.2d 530 (1973).

51. *See infra* notes 54-55 and accompanying text.

52. 5 WEINSTEIN'S EVIDENCE, *supra* note 42, § 1001(4) [07], at 1000-95.

53. *See generally* Note, *supra* note 11, at 430-35.

54. 4 WIGMORE, *supra* note 46, § 1182, at 421-23. *See also* McCORMICK, *supra* note 46, § 232, at 562.

55. *See* FED. R. EVID. 1001.

56. 5 WEINSTEIN'S EVIDENCE, *supra* note 42, § 1001(4) [07], at 1001-5. FED. R. EVID. 1006 is the codification of the rule for federal courts. Professor Wigmore provides an excellent explanation of the rule. 4 WIGMORE, *supra* note 46, § 1230, at 535-46.

57. *See, e.g.*, *Transportation Indem. Co. v. Seib*, 178 Neb. 253, 260, 132 N.W.2d 871, 875 (1965) (record of insurance claims stored on tape); *State v.*

ing a small number of underlying transactions limit this theory. For example, the theory cannot justify the introduction of a computer record to prove the receipt of a single payment on an account.

A better approach to finding computer output to be the "best evidence" of underlying transactions recognizes that a majority of businesses utilizing computerized systems, for reasons of practicality and necessity, consider the computer's records as permanent records of that enterprise.⁵⁸ Underlying documents are often routinely destroyed once the information they contain has been entered in the system.⁵⁹ Moreover, many computers, particularly personal models, permit "records" to be created by direct operator input or other computer transmissions, thereby eliminating the need for a paper source.⁶⁰

Under these circumstances, a determination that computer generated records violate the best evidence rule would effectively destroy their usefulness.⁶¹ The rules of evidence should conform to the record systems widely used and relied upon. Therefore, where it can be shown that the computer record is relied upon as the only permanent record, the best evidence concerns should be considered satisfied.

The Federal Rules of Evidence present the most well-reasoned solution.⁶² The plain language of Rule 1001 demonstrates congressional awareness of the issues surrounding computer generated evidence.⁶³ Subsection (1) of Rule 1001 defines a

Kane, 23 Wash. App. 107, 112, 594 P.2d 1357, 1360 (1979) (record of bank accounts stored on tape).

58. See, e.g., *Brandon v. Indiana*, 272 Ind. 92, 396 N.E.2d 365 (1979); *State v. Staley*, 37 N.C. App. 18, 245 S.E.2d 110 (1978). This approach is also suggested by Professor Weinstein, 5 WEINSTEIN'S EVIDENCE, *supra* note 42, § 1001(4)[07], at 1001-95.

59. Singer, *supra* note 11, at 185. "Depending on the exigencies of the business, documents from which information to feed a computer system is obtained may be destroyed in the ordinary course of that business." *Id.*

60. *Id.* "On-line" systems permit the computer operator to input data by viewing a CRT screen and merely typing in the relevant information. Accordingly, in many businesses phone orders are regularly received by a computer operator who "keys in" the purchase information. No written record of the transaction is ever made. Advances in teleprocessing now permit a remote computer system to transfer data to another. See *supra* note 17.

61. See *King v. State ex rel. Murdock Acceptance Corp.*, 222 So. 2d 393 (Miss. 1969) (absent some form of output, computer records are "unavailable and useless").

62. FED. R. EVID. 1001-1004. Rule 1002 is the original document rule expanded to include recordings and photographs. It provides, in pertinent part: "To prove the content of a writing, recording, or photograph, the original writing, recording, or photograph is required, except as otherwise provided in these rules or by Act of Congress." *Id.*

63. The advisory committee's notes to the federal rules point out that the technological advances in information processing made it necessary to

"writing" as consisting of "letters, words, or numbers, or their equivalent, set down by . . . magnetic impulse, mechanical or electronic recording, or other form of data compilation."⁶⁴ Subsection (3) of Rule 1001 expressly provides that "if data are stored in a computer or similar device, any printout or other output readable by sight, shown to reflect data accurately, is an original."⁶⁵ The combined application of 1001(1) and 1001(3) should be sufficient in cases involving business or personal computers to show that the computer output constitutes a writing and, if it accurately reflects the data stored in the computer,⁶⁶ is the "best evidence" of that data.⁶⁷

Federal Rule 1005 provides that public records "including data compilations in any form, if otherwise admissible, may be proved by copy, certified as correct in accordance with Rule 902

expand the definition of "writings" to include computer output. Advisory Committee Notes to Federal Rules of Evidence, Rule 1001(1), 56 F.R.D. 183, 341-42 (1972). Additionally, the committee indicates that considerations of practicality and common usage require that a computer printout constitute an "original" for the purpose of applying Rule 1002. *Id.*

64. FED. R. EVID. 1001(1).

65. FED. R. EVID. 1001(3). It is interesting to note that the phrase, "other output readable by sight," could be used to include the CRT display of an "on-line" computer system. This could be helpful in a case where a party, having brought its CRT terminal into the courtroom and connected it by means of a telephone line to its central computer network, would seek to introduce the information displayed on the screen into evidence. Admittedly cumbersome, the technology nevertheless exists to create such an exhibit. Telecommunications and on-line systems are briefly discussed *supra* at note 17.

66. Under Rule 1001(3), a determination that the computer printout is an original writing is incomplete unless the printout is shown to accurately reflect the data stored in the computer. FED. R. EVID. 1001(3). Generally, if a foundation adequate to preclude the effect of the hearsay rule is established for the computer printout, there should be no difficulty in finding sufficient accuracy to exist under the rule. *See infra* notes 159-218 and accompanying text.

67. As a practical matter, liberalized discovery procedures in most jurisdictions may remove the reason for the rule altogether. *See* Advisory Committee Notes to Federal Rules of Evidence, Rule 1001. *But see* Singer, *supra* note 11, at 184-92, recommending that Federal Rules 1001-1006 be changed to require the computer process that generated the proffered evidence satisfy the elements of the commentator's proposed Federal Rule 901(c) and that the proponent of the computer evidence make available for examination (1) the data, (2) the computer program(s), and (3) documentation thereof. *Id.* at 189. This proposal is unacceptable for two reasons. First, it attempts to engraft a voluminous test for the authenticity and reliability of computer output onto the best evidence rule, a change which is both unnecessary and unsupported in law. (The particulars of the proposed Rule 901(c) are discussed *infra* at notes 188-90 and accompanying text.) Second, the requirements that the data and programs be made available for examination are unnecessary to establish the accuracy of the printouts (*see supra* notes 29-45 and accompanying text) and duplicative of the discovery procedures available under the Federal Rules of Civil Procedure. *See* FED. R. CIV. P. 27-36.

or testified to be correct by a witness who has compared it with the original."⁶⁸ Public records are treated differently than private business records due to the consequences which would attend their removal from the office where they are kept.⁶⁹ Computerized public records, as long as they are properly certified, should be considered the best obtainable evidence of the events recorded.

States have widely adopted rules similar to the federal rules, but by no means is the adoption universal.⁷⁰ A majority of states have enacted provisions that provide for the admission of computer printouts as original writings either by express language or by strong analogy.⁷¹ Generally, the approaches have been confined to the context of records prepared in the regular course of business, voluminous records exceptions, or certification of public records.⁷²

The Hearsay Rule

Hearsay has been defined as "a statement, other than one made by the declarant while testifying at the trial or hearing, offered in evidence to prove the truth of the matter asserted."⁷³ Admission of written hearsay is objectionable because it deprives litigants of the opportunity to test the evidence by cross-examination.⁷⁴ The use of hearsay in criminal prosecutions may

68. FED. R. EVID. 1005. Rule 902 is discussed *infra* at note 133.

69. See generally 4 WIGMORE, *supra* note 46, §§ 1215-1228, at 496-534. McCORMICK, *supra* note 46, § 204, at 574-75.

70. See generally WEINSTEIN'S EVIDENCE, *supra* note 42, § 1001 [02], at 1001-99 - 1001-03; § 1002 [05], at 1002-18 - 1002-23; 1003 [04], at 1003-16 - 1003-19; 1004 [02], at 1004-31 - 1004-34.

71. For an excellent discussion of the state statutory treatment of the best evidence rule as it relates to computer evidence, see Note, *supra* note 11, at 434-36.

72. See Note, *supra* note 11, at 434-36. For example, an Illinois statute provides that microfilm or computer printout copies of the records of marriage, dissolution of marriage, and declaration of invalidity of marriage will be considered the original of those records for all purposes. ILL. REV. STAT. ch. 40, § 902 (1983).

73. FED. R. EVID. 801(c). Used in this context, a "statement" included oral and written assertions, as well as nonverbal assertive conduct. FED. R. EVID. 801(a). For other definitions of hearsay, see CAL. EVID. CODE § 1200(a) (West 1982); McCORMICK, *supra* note 46, § 246, at 584; 5 WIGMORE, *supra* note 46, § 1362, at 3; Maguire, *The Hearsay System: Around and Through the Thicket*, 14 VAND. L. REV. 741, 768-69 (1961); Wheaton, *What is Hearsay?*, 46 IOWA L. REV. 207, 210-11 (1961).

74. See Advisory Committee Notes to Federal Rules of Evidence, 56 F.R.D. 183, 288-89 (1972); McCORMICK, *supra* note 46, § 245, at 581-84 (citing the personal presence of a witness in court and the significance of testimony given under oath as additional reasons for refusing to admit hearsay). *But see* 5 WIGMORE, *supra* note 46, § 1362, at 3 (suggesting that the oath requirement is incidental and unimportant). For additional materials on the reasons for the hearsay rule, see generally Morgan, *Hearsay Dangers and*

also violate the defendant's constitutional right to confront the witnesses against him.⁷⁵ Where, however, an out-of-court declaration carries certain circumstantial guarantees of trustworthiness, courts will admit the evidence despite its hearsay character.⁷⁶ These circumstantial guarantees form the basis for the recognized exceptions to the hearsay rule.⁷⁷

To the extent offered to prove the truth of the matters asserted therein, computer output is hearsay.⁷⁸ Its admissibility

the Application of the Hearsay Concept, 62 HARV. L. REV. 177, 192-93 (1948); Tribe, *Triangulating Hearsay*, 87 HARV. L. REV. 957, 958-61 (1974); Note, *supra* note 11, at 426.

75. U.S. CONST. amend. VI. The precise relationship between the confrontation clause of the sixth amendment and the hearsay rule has not been well defined. See, e.g., *California v. Green*, 399 U.S. 149 (1970) (holding that although they may overlap, the confrontation clause is not a codification of hearsay rules). For the most part, however, business and public records have withstood the challenge that their admission would violate the purposes of the clause. See *United States v. Lipscomb*, 435 F.2d 795 (5th Cir.) (admission of bill of lading under federal business records exception did not violate confrontation clause), *cert. denied*, 401 U.S. 980, *reh'g denied*, 402 U.S. 966 (1971); *Reed v. Beto*, 343 F.2d 723 (5th Cir.) (introduction of certified public record did not deny accused's right of confrontation), *aff'd*, 385 U.S. 554 (1965); *State v. Finkley*, 6 Wash. App. 278, 492 P.2d 222 (1972) (admission of hospital's medical record under UBREA did not violate right to confront witnesses). *But see State v. Tims*, 9 Ohio St. 2d 136, 224 N.E.2d 348, *overruled*, 67 Ohio St. 2d 405, 423 N.E.2d 1122 (1967) (admission of hospital records under UBREA held to have violated confrontation clause).

76. See Advisory Committee Notes to Federal Rules of Evidence, 56 F.R.D. 183, 293-99 (1972).

77. *Id.* *But cf. McCORMICK*, *supra* note 46, § 325, at 751. Dean McCormick argues that many of the hearsay exceptions are actually ineffective in establishing the reliability of the out-of-court statement. *Id.*

78. For various uses of computer records constituting hearsay, see *Rosenberg v. Collins*, 624 F.2d 659 (5th Cir. 1980) (as evidence of insolvency, computer summary of trading activity by bankrupt commodities investment firm); *United States v. Scholle*, 553 F.2d 1109 (8th Cir.) (printouts from computer retrieval system of drug evidence introduced to establish chain of conspiracy), *cert. denied*, 434 U.S. 940 (1977); *United States v. Fendley*, 522 F.2d 181 (5th Cir. 1975) (life insurance company's computer sheets showing total unearned commission advances to agent offered as evidence of misappropriation of employer's funds); *United States v. DeGeorgia*, 420 F.2d 889 (9th Cir. 1969) (auto rental company's computerized records to prove allegedly stolen vehicle was not rented); *Allen v. State of Indiana*, 439 N.E.2d 615 (Ind. 1982) (computer printouts of vehicle registration used as evidence of identity in criminal prosecution); *Monarch Fed. Sav. & Loan Ass'n v. Genser*, 156 N.J. Super. 107, 383 A.2d 475 (1977) (to prove account in default in mortgage foreclosure, bank's computer records reflecting account transactions); *Grand Liquor Co., Inc. v. Department of Revenue*, 67 Ill. 2d 195, 367 N.E.2d 1238 (1977) (computerized records used to assess sales tax deficiency against retailer); *Estate of Buddeke v. MacNeal Memorial Hosp. Ass'n*, 49 Ill. App. 3d 431, 364 N.E.2d 446 (1977) (computer printouts of amounts allegedly due hospital not allowed as evidence). See also Annot., 7 A.L.R. 4th 8 (1980) (admissibility of computerized private business records); Annot., 71 A.L.R. 3d 232 (1974) (proof of public records kept or stored on electronic computing equipment). A computer printout should not, however, be considered hearsay where it is offered for a purpose other

depends, in part, therefore, on whether the printout qualifies under one of the exceptions to the hearsay rule.⁷⁹ For example, one court held that a corporation's computerized ledger sheets introduced by opposing counsel were admissible against the corporation as admissions by a party opponent.⁸⁰ Computer generated evidence may also qualify as a past recollection recorded.⁸¹ Primarily, though, a proponent should seek to introduce computer printouts under a form of the business records⁸²

than to prove the truth of the matter asserted, i.e., for the limited purpose of circumstantially showing the probable inferences that may be drawn from the printout or to show the effect on the reader. *McCORMICK, supra* note 46, § 249, at 589. *Cf. Scholle v. Cuban-Venezuelan-Oil Voting Trust*, 285 F.2d 318, 321 (2d Cir. 1960).

79. Jacobson, *supra* note 3, at 14 n.2; Singer, *supra* note 11, at 176; Note, *supra* note 29, at 66.

80. *Ferris v. Polycast Tech. Corp.*, 180 Conn. 199, 429 A.2d 850 (1980). See also *Leone v. Precision Plumbing & Heating, Inc.*, 121 Ariz. 514, 591 P.2d 1002 (1979) (admission is admissible regardless of reliability). Under the Federal Rules of Evidence, an admission by a party-opponent is treated as a nonhearsay statement rather than an exception to the hearsay rule. See *FED. R. EVID.* 801(d)(2)(A). It should be recognized that where the computer printout contains admissions, but does not constitute an admission itself, a double hearsay problem may exist. In such a case, both the printout and the out-of-court statements it contains are hearsay and both must be qualified under a recognized exception before the printout can be admitted. The concept of "double hearsay" is explained in Laughlin, *Business Entries and the Like*, 46 *IOWA L. REV.* 276, 296-99 (1961).

81. Note, *supra* note 29, at 66 (citing Laughlin, *Business Entries and the Like*, 46 *IOWA L. REV.* 276, 278 (1961)). Under the Federal Rules of Evidence, a past recorded recollection is not excluded by the hearsay rule if it is

a memorandum or record concerning a matter about which a witness once had knowledge but now has insufficient recollections to enable him to testify fully and accurately, shown to have been made or adopted by the witness when the matter was fresh in his memory and to reflect that knowledge correctly. If admitted, the memorandum may be read into evidence but *may not itself be received as an exhibit unless offered by an adverse party.*

FED. R. EVID. 803(5) (emphasis added). As a practical matter, the use of this exception essentially forecloses the opportunity to have the printout itself admitted. This could prove harmful where recitation of large amounts of seemingly unrelated data would merely confuse a jury or where the credibility of the reading witness might negatively impact on the veracity of the printout.

82. For cases that looked to the Commonwealth Fund Act, 28 U.S.C. § 1732, to determine the admissibility of computer records, see *United States v. Russo*, 480 F.2d 1228 (6th Cir. 1973), *cert. denied*, 414 U.S. 1157 (1974); *United States v. Fendley*, 552 F.2d 181 (5th Cir.), *cert. denied*, 434 U.S. 839 (1972); *United States v. Edick*, 432 F.2d 350 (4th Cir. 1970); *Olympic Ins. Co. v. H.D. Harrison, Inc.*, 418 F.2d 669 (5th Cir. 1969); *D & H Auto Parts v. Ford Mktg. Corp.*, 57 F.R.D. 548 (D.C.N.Y. 1973); *United States v. DeGeorgia*, 420 F.2d 889 (9th Cir. 1969). For those decisions applying Federal Rule of Evidence 803(6), see *United States v. Vela*, 673 F.2d 86 (5th Cir. 1982); *Rosenberg v. Collins*, 624 F.2d 659 (5th Cir. 1980); *United States v. Jones*, 554 F.2d 251 (5th Cir.), *cert. denied*, 434 U.S. 866 (1977); *United States v. Scholle*, 553 F.2d 1109 (8th Cir.), *cert. denied*, 434 U.S. 940 (1977); *United States v. Verlin*, 466 F. Supp. 155 (N.D. Tex. 1979). For those decisions under a form

or public records exceptions.⁸³

The Business Records Exceptions

At common law, two distinct doctrines, the "shop-book rule"⁸⁴ and the "regular entries rule"⁸⁵ provided exceptions for the admission of business records. The "shop-book rule" permitted the introduction into evidence of books of a party who was not available to testify at trial provided the proponent first established a proper foundation for the admission of the books.⁸⁶ The "regular entries" exception permitted the admission of a record if it contained original entries produced in the regular course of business so long as the recorder was unavailable to testify. Someone with personal knowledge of the source of information must have made the entries at or near the time of the transaction.⁸⁷

Underlying these exceptions was the assumption that business records contained an unusual degree of circumstantial reliability evidenced by their systematic preparation, the high degree of reliance the businesses themselves placed on their records, and the duty of the employees to make accurate records as a condition to their continued successful employment.⁸⁸ Although dissatisfaction with the limitations of the common law approach ultimately led to the development of statutory excep-

of the Uniform Business Records as Evidence Act, see *Merrick v. United States Rubber Co.*, 7 Ariz. App. 433, 440 P.2d 314 (1968); *American Oil Co. v. Valenti*, 179 Conn. 349, 426 A.2d 305 (1980); *Missouri Valley Walnut Co. v. Snider*, 569 S.W.2d 324 (Mo. 1976); *Union Elec. Co. v. Mansion House Center N. Redev. Co.*, 494 S.W.2d 309 (Mo. 1973); *Bobbie Brooks, Inc. v. Hyatt*, 195 Neb. 596, 239 N.W.2d 782 (1976); *State v. Watson*, 192 Neb. 44, 218 N.W.2d 904 (1974); *Transportation Indem. Co. v. Seib*, 178 Neb. 253, 132 N.W.2d 871 (1965); *Endicott Johnson Corp. v. Golde*, 190 N.W.2d 752 (N.D. 1972); *Westinghouse Elec. Supply Co. v. Allen*, 138 Vt. 84, 413 A.2d 122 (1980); *State v. Kane*, 23 Wash. App. 107, 594 P.2d 1357 (1979); *State v. Bradley*, 17 Wash. App. 916, 567 P.2d 650 (1977); *City of Seattle v. Heath*, 10 Wash. App. 949, 520 P.2d 1392 (1974).

83. See *infra* notes 120-34.

84. See *Radtke v. Taylor*, 105 Or. 559, 210 P. 863 (1922) (contains a good analysis of the origin and evolution of the English common law rule); MCCORMICK, *supra* note 46, § 305, at 717-19; 4 WEINSTEIN'S EVIDENCE, *supra* note 42, § 803(6) [01], at 803-148; *Business Entries in Mississippi*, 16 MISS. L.J. 266 (1944) (dated but good history of the rule in Mississippi).

85. See 4 WEINSTEIN'S EVIDENCE, *supra* note 42, § 803(6) [01], at 803-148; 5 WIGMORE, *supra* note 46, § 1518, at 426-30.

86. The rule was based, in part, on necessity and convenience, primarily because the party would not have been allowed to testify in his own behalf. MCCORMICK, *supra* note 46, § 394, at 178.

87. For a good explanation of the elements of the regular entries exception, see Note, *supra* note 29, at 67.

88. Notes of Advisory Committee on Federal Rules of Evidence, *supra* note 74, Rule 803(6). See also MCCORMICK, *supra* note 46, § 306, at 720.

tions,⁸⁹ the rationale remained undisturbed.⁹⁰

In federal courts the *Commonwealth Fund Act*⁹¹ governed the admission of business records until 1975, when Congress enacted the Federal Rules of Evidence.⁹² Rule 803(6) specifically covers the admission of business records as an exception to the hearsay rule.⁹³ Rule 803(6) embodies the rationale of the common law business records exceptions but also adds language designed to reflect the realities of modern record-keeping.⁹⁴

The present formula discards the requirement that records be prepared in a true business setting in favor of admitting

89. See *infra* notes 108-10 and accompanying text.

90. Notes of Advisory Committee on Federal Rules of Evidence, *supra* note 74, Rule 803(6). 4 WEINSTEIN'S EVIDENCE, *supra* note 42, § 803(6), at 803-38.

91. 28 U.S.C. § 1732 (1936). A study of the law of evidence completed by the Legal Research Committee of the New York Commonwealth Fund in 1927 produced the first major legislation concerning the admission of business records. Professor Edmund Morgan chaired the committee whose distinguished members included, among others, Professor John Wigmore. 4 WEINSTEIN'S EVIDENCE, *supra* note 42, § 803(b), at 803-37. The proposed act provided as follows:

Any writing or record, whether in the form of an entry in a book or otherwise made as a memorandum or record of any act, transaction, occurrence, or event shall be admissible in evidence in proof of said act, transaction, occurrence, or event, if the trial judge shall find that it was made in the regular course of any business, and that it was the regular course of such business to make such memorandum or record at the time of such action, transaction, occurrence or event or within a reasonable time thereafter. All other circumstances of the making of such writing or record, including lack of personal knowledge by the entrant or maker, may be shown to affect its weight, but they shall not affect its admissibility. The term business shall include business, profession, occupation, and calling of every kind.

E. MORGAN, THE LAW OF EVIDENCE: SOME PROPOSALS FOR ITS REFORM 63 (1927). The New York legislature adopted the proposed statute intact that year, and Congress soon followed by enacting an identical provision in 1936 for use in federal courts. 4 WEINSTEIN'S EVIDENCE, *supra* note 42, 803(G) at 803-37.

92. See Note, *supra* note 29, at 69.

93. The text of Rule 803(6) is as follows:

A memorandum, report, record, or *data compilation*, in any form, of acts, events, conditions, opinions, or diagnoses, made at or near the time by, or from information transmitted by, a person with knowledge, if kept in the course of a regularly conducted business activity, and if it was the regular practice of that business activity to make the memorandum, report, record, or data compilation, all as shown by the testimony of the custodian or other qualified witness, *unless the source of the information or the method or circumstances or preparation indicate lack of trustworthiness*. The term 'business' as used in this paragraph includes business, institution, association, profession, occupation, and calling of every kind, whether or not conducted for profit.

Fed. R. Evid. 803(6) (emphasis added). See *infra* note 97 (data compilation) and note 103 (lack of trustworthiness).

94. See generally STAFF OF SENATE COMM. ON THE JUDICIARY, 93 CONG., 2D SESS., REPORT ON FED. R. EVID., No. 93-1299 (Oct. 1974).

records made pursuant to a "regularly conducted activity."⁹⁵ To achieve this result, the rule defines "business" to include "business, institution, association, profession, occupation, and calling of every kind, whether or not conducted for profit."⁹⁶ This provision appears sufficiently broad to encompass the records that clubs, schools, churches and private individuals regularly maintain.

The expression "data compilation" was added to include records maintained in a computer within the types of records admissible under Rule 803(6).⁹⁷ The change codified judicial recognition that computer records are admissible under a business records exception.⁹⁸ It is significant that the rule prescribed no different requirements of circumstantial trustworthiness for data compilations than it did for conventional records.⁹⁹ The failure of Congress to make such a distinction implies a legislative determination that regularly maintained computer records are as reliable as any other business records.

How much evidence of reliability must be shown to admit a computer record under the business records exception is a matter over which judges regularly disagree.¹⁰⁰ A fundamental distinction may be drawn, however, between proving the accuracy of computer output and demonstrating its circumstantial reliability for the purpose of negating the hearsay rule.¹⁰¹ The for-

95. FED. R. EVID. 803(6). The change was made to include the regularly kept records of those who would not fall within the traditional definition of a business. See REPORT ON FED. R. EVID., *supra* note 94, at 14.

96. This language is nearly identical to that used in the Uniform Business Records as Evidence Act. Compare *supra* note 93 with *infra* note 110.

97. Advisory Committee's Note on Rule 803, *supra* note 74. See also 4 WEINSTEIN'S EVIDENCE, *supra* note 42, at 803(6), 803-41. The expression "data compilation" was copied from Rule 34(a) of the Federal Rules of Civil Procedure. FED. R. CIV. P. 34(a).

98. See *supra* note 82.

99. FED. R. EVID. 803(6) does not distinguish between the circumstantial reliability of memoranda, reports, records or data compilations. All are equally admissible to the extent that they qualify as records of a regularly conducted activity. See *supra* note 82.

100. Compare *supra* note 99 with *infra* notes 159-81 and accompanying text.

101. Accuracy is generally defined as "freedom from error" while reliability is no more than an "implied assurance based upon faith and experience" that the thing will not fail. WEBSTER'S SEVENTH COLLEGIATE DICTIONARY 7, 724 (1971). "It is too late in the day to insist that evidence derived from a computer should be kept from a jury because it is 'mysterious and remote from common experience.'" Commonwealth v. Hogan, 7 Mass. App. Ct. 236, 243 n.13, 387 N.E.2d 158, 167 n.13, *aff'd*, 379 Mass. 190, 396 N.E.2d 978 (1979). "'[T]he scientific reliability of such machines [electronic computers], in light of their general use and the general reliance of the business world on them, can scarcely be questioned.'" *Id.* (quoting King v. State *ex rel.* Murdock

mer affects the weight to which evidence is entitled while the latter determines only its admissibility.¹⁰² It is one thing to require a proponent to show the probable integrity of proffered evidence; it is quite another to refuse to admit the evidence unless its contents are established as facts. The language of the business records exceptions are instructive on this issue.

A record of a regularly conducted activity is admissible under Federal Rule 803(6) "unless the source of information or the method or circumstances of preparation indicate a lack of trustworthiness."¹⁰³ Thus, to make computer records inadmissible under this rule, courts have held that the opponent must raise specific, supported objections.¹⁰⁴ The mere failure of the

Acceptance Corp., 222 So. 2d 393, 398 (Miss. 1969) (*quoting with approval* JONES, EVIDENCE § 609 (5th ed. Supp. 1968)).

102. See, e.g., *United States v. Scholle*, 553 F.2d 1109 (8th Cir.) (failure of proponent of computer evidence to present evidence as to input controls, test for computer's accuracy, affect weight, not admissibility), *cert. denied*, 434 U.S. 940 (1977); *Union Elec. Co. v. Mansion House Center N. Redevel. Co.*, 494 S.W.2d 309 (Mo. 1973) (objection as to accuracy of computer cards held to affect weight not admissibility). "Given the complexity of modern institutions one cannot expect routine record-keeping to be completely error-free. Where actual error is suspected the challenge should be to the accuracy of the business record, not to its admissibility." *State v. Ben-Neth*, 34 Wash. App. 600, 633 P.2d 156, 158-59 n.2 (1979). Courts have taken a similar approach regarding the accuracy of other scientific processes. See *City of Highland v. Pollution Control Bd.*, 66 Ill. App. 3d 143, 383 N.E.2d 692 (1978) (lack of scientific evidence of accuracy of EPA sound pressure level tests went to weight, not admissibility); *People v. Abdallah*, 82 Ill. App. 2d 312, 226 N.E.2d 408 (1967) (failure to prove accuracy of speed measuring device will affect weight of evidence); *McCORMICK*, *supra* note 46, § 210, at 515; Annot., 49 A.L.R. 2d 460 (1955) (discussion of proof by means of radar and photographic devices). See also discussion of judicial notice of scientific reliability of mechanical devices, *infra* at notes 196-204 and accompanying text.

103. FED. R. EVID. 803(6). See *supra* note 93. The Commonwealth Fund Committee's proposed act and former 28 U.S.C. § 1732 did not include such a provision. See *supra* note 91. Instead, those statutes expressly provided that the circumstances surrounding the making of the record were to affect only the weight to be given the evidence and not its admissibility. Such a statutory approach would seemingly foreclose any argument that, where records are maintained in a computer, additional proof of the computer's reliability is necessary to make the printouts admissible. While the circumstances surrounding the preparation of the printouts may affect the weight to which they are entitled, the statute expressly forbids consideration of such factors in determining admissibility. But see Illinois' treatment of computer records under such a business records exception discussed *infra* in text accompanying notes 112-17.

With regard to circumstances indicating a lack of trustworthiness, the courts have generally been concerned with reports that were prepared in anticipation of litigation. See *Palmer v. Hoffman*, 318 U.S. 109 (1943) (signed statement of deceased railroad employees); *Gilmour v. Strescon, Ind., Inc.*, 66 F.R.D. 146 (E.D. Pa.) (crane operators report to employer regarding accident), *aff'd*, 521 F.2d 1398 (3rd Cir. 1975).

104. *Rosenberg v. Collins*, 624 F.2d 659 (5th Cir. 1980) (computer records held admissible absent specific objection to accuracy). *Accord* *United States v. Fendley*, 522 F.2d 181 (5th Cir. 1975) (to make computer records

proponent to identify the computer model or certify its reliability are not circumstances indicating a lack of trustworthiness.¹⁰⁵ This approach is consistent with the unusual degree of reliability accorded records made in the regular course of business¹⁰⁶ and the strong presumption of reliability of computer generated records.¹⁰⁷

A majority of states have adopted a form of either Federal Rule 803(6)¹⁰⁸ or the Uniform Business Records as Evidence Act (UBREA).¹⁰⁹ In contrast to the federal approach, the UBREA expressly requires the judge to determine if, in his opinion, the "sources of information, method and time of preparation [of the business record] were such as to justify its admission."¹¹⁰ This

inadmissible, opponent must raise specific, supported objections); *United States v. DeGeorgia*, 420 F.2d 889 (9th Cir. 1969) (mechanical accuracy of computer need not to be shown to admit printouts).

105. *United States v. Vela*, 673 F.2d 86 (5th Cir. 1982).

106. *E.g.*, *Olympic Ins. Co. v. Harrison Inc.*, 418 F.2d 669 (5th Cir. 1969) (computer printouts which qualify as business records have a "prima facie aura of reliability").

107. *See supra* notes 29-45 and accompanying text.

108. Twenty-six states have adopted 803(6) substantially intact or with only minor revisions. They include Alaska, Arizona, Arkansas, Colorado, Delaware, Florida, Hawaii, Iowa, Maine, Michigan, Minnesota, Montana, Nebraska, Nevada, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, South Dakota, Texas, Utah, Vermont, Washington, Wisconsin, Wyoming. 1 WEINSTEIN'S EVIDENCE, *supra* note 42, at T-1.

109. The following states utilize the UBREA: California, Connecticut, Georgia, Idaho, Missouri, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Tennessee. *See Note, supra* note 29, at 69 n.60.

110. The Uniform Business Records as Evidence Act eliminated the Committee's proposal that the circumstances surrounding the making of the record, apart from the "regular course of business" concept, should be addressed to weight, not admissibility. *See supra* note 91. It provides as follows:

An Act to make uniform the use of business records as evidence:

Section 1. (Definition.) The term 'business' shall include every kind of business, profession, occupation, calling, or operation of institutions, whether carried on for profit or not.

Section 2. (Business Records.) A record of an act, condition or event shall, insofar as relevant, be competent evidence if the custodian or other qualified witness testifies to its identity and the mode of its preparation, and if it was made in the regular course of business, at or near the time of the act, condition or event, and if, in the opinion of the Court, the sources of information, method and time of preparation were such as to justify its admission.

Section 3. (Uniformity of Interpretation.) This Act shall be so interpreted and construed as to effectuate its general purpose to make uniform the law of those states which enact it.

Section 4. (Short Title.) This Act may be cited as the Uniform Business Records as Evidence Act.
9A U.L.A. 506 (1965).

Indiana, Kentucky, Louisiana, and Mississippi have looked to the common law business exceptions in deciding whether to admit computer generated records. *See, e.g.*, *Allen v. State*, 439 N.E.2d 615 (Ind. 1982); *Brown v.*

provision turns the determination of the circumstantial reliability of regularly kept computerized business records on its head. It allows the exclusion of records where the trustworthiness of any element of their preparation is not conclusively established.¹¹¹

Jurisdictions that have developed their own statute have taken an equally questionable approach. Illinois is a prime example. In Illinois, two rules govern the admission of regularly kept business records, one for civil matters and the other for criminal.¹¹² Both contain the admonition that all circumstances of the making of the record other than its regular preparation "may be shown to affect its weight, but they shall not affect its admissibility."¹¹³

Nevertheless, when the admissibility of computer generated records is in issue, Illinois courts have consistently disregarded the express language of the statutory exceptions without explanation. Thus, Illinois courts have held computer records inadmissible because the proponent failed to identify the computer model or failed to present specific evidence as to the sources of information or the time and method of preparation.¹¹⁴ In fact, this "test" for computer record admissibility strongly resembles the requirements of the UBREA.¹¹⁵

Illinois applies its own business records exception when considering the admissibility of conventional business records but applies a different exception when confronted with business records generated by the computer. This "double standard" renders meaningless the rationale underlying the business

Commonwealth, 440 S.W.2d 520 (Ky. Ct. App. 1969); *State v. Hodgeson*, 305 So.2d 421 (La. 1975); *McKee v. Mississippi Bank & Trust Co.*, 376 So.2d 654 (Miss. 1979).

111. See *infra* notes 165-70 and accompanying text.

112. See ILL. REV. STAT. ch. 110A, § 236 (1983) (civil cases) and ILL. REV. STAT. ch. 38, § 115-5 (1983) (criminal cases).

113. *Id.*

114. See *Grand Liquor Co., Inc. v. Department of Revenue*, 67 Ill. 2d 195, 367 N.E.2d 1238 (1977) (failure to present evidence as to input procedures, programming and operation of computer held to affect admissibility of computer records); *People v. Bovio*, 118 Ill. App. 3d 836, 455 N.E.2d 829 (1983) (failure to demonstrate that computer was standard and how computer record was prepared went to admissibility); *Estate of Buddeke v. MacNeal Memorial Hosp. Ass'n*, 49 Ill. App. 3d 431, 364 N.E.2d 446 (1977) (reversible error for judge to admit computer printout without testimony as to its preparation); *Department of Mental Health v. Beil*, 44 Ill. App. 3d 402, 357 N.E.2d 875 (1976) (computer printouts qualified as business records held inadmissible where no evidence presented as to sources of information, time and method of preparation).

115. Compare *supra* note 110 with *Grand Liquor Co., Inc. v. Department of Revenue*, 67 Ill. 2d 195, 367 N.E.2d 1238 (1977).

records exception.¹¹⁶ It draws an artificial distinction between conventional and computerized records.¹¹⁷ Moreover, it carries the potential of transforming rulings on the admissibility of computer evidence into mini-trials where the court hears extrinsic testimony regarding every phase of the records' production. The burden imposed upon the litigants and the courts far outweighs the minimal gains in circumstantial reliability.

The presumption of trustworthiness available under Federal Rule 803(6) avoids the foregoing problems.¹¹⁸ It shifts the inquiry from the courtroom to pre-trial discovery.¹¹⁹ Moreover, the federal rule focuses the determination of admissibility upon the specific factors that could have affected output reliability, rather than indulge a series of hypotheticals. Jurisdictions following the Illinois approach should re-examine their treatment of computerized business records taking into account the presumption of trustworthiness that FRE 803(6) provides.

Public Records

Computerized records systems are widely used in public offices and agencies.¹²⁰ Where these records are introduced into evidence, they must also qualify under an exception to the hearsay rule.¹²¹ Federal Rule of Evidence 803(8) covers the admission of public records, including "data compilations."¹²² The

116. See *supra* notes 88-90 and accompanying text.

117. Even though the scrivener's quill pens in original entry books have been replaced by magnetic tapes, microfiche files and computer printouts, the theory behind the reliability of regularly kept business records remains the same and computer generated evidence is no less reliable than original entry books provided a proper foundation is laid. *Brandon v. State*, 272 Ind. 92, 99, 396 N.E.2d 365, 370 (1979).

118. See *supra* note 93.

119. See *supra* note 67.

120. The earlier computers were developed specifically for government use. See *supra* note 4. Their applications include illegal drug analysis records, *United States v. Scholle*, 553 F.2d 1109 (8th Cir.), *cert. denied*, 434 U.S. 940 (1977); driving records, *City of Seattle v. Heath*, 10 Wash. App. 949, 520 P.2d 1392 (1974); jury selection, *Hackney v. United States*, 389 A.2d 1336 (D.C. 1978), *cert. denied*, 439 U.S. 1132; income tax filings, *United States v. Farris*, 517 F.2d 226 (7th Cir.), *cert. denied*, 423 U.S. 892 (1975); and tax assessments, *Ed Guth Realty, Inc. v. Gingold*, 34 N.Y.2d 440, 315 N.E.2d 441, 358 N.Y.S.2d 367 (1974).

121. See *supra* notes 78-79 and accompanying text.

122. Rule 803(8) provides as follows:

(8) Public records and reports. Records, reports, statements, or data compilations, in any form, of public offices or agencies, setting forth (A) the activities of the office or agency, or (B) matters observed pursuant to duty imposed by law as to which matters there was a duty to report, excluding, however, in criminal cases matters observed by police officers and other law enforcement personnel, or (C) in civil actions and proceedings and against the Government in criminal cases, factual

rule allows admission of reports of a public office or agency or of matters observed by a public officer or employee, other than a law enforcement official.¹²³

Public records are presumed reliable because public officials are under a duty to prepare accurate records and the inconvenience and expense that would result from routinely requiring such officials to testify as to the trustworthiness of these records.¹²⁴ The routine preparation of official records and the daily reliance of public employees on them add additional guarantees of trustworthiness.¹²⁵ Yet, despite these assurances of reliability, several commentators have urged that the reasons for admitting manually prepared public records cannot logically support the admission of official records maintained in a computer.¹²⁶

This argument is no more sound than the theories advanced to justify a distinction between conventional and computerized business records.¹²⁷ No basis exists for the propositions that computers increase the incidence of human error or more effectively mask its presence in public recordkeeping.¹²⁸ Moreover, case law supports a contrary conclusion.

In *United States v. Orozco*,¹²⁹ the United States Court of Appeals for the Ninth Circuit held that computer records of automobile license numbers prepared by border authorities were qualified for admission under Rule 803(8) where nothing in their preparation indicated a lack of trustworthiness.¹³⁰ In *United*

findings resulting from an investigation made pursuant to authority granted by law, unless the sources of information or other circumstances indicate lack of trustworthiness.

FED. R. EVID. 803(8).

123. *Id.* In the latter case, the observer must also have been under a duty imposed by law to observe and to report his observations. *Id.* There is no requirement that the records have been made pursuant to some regularly conducted activity. Professor Weinstein notes that the "reliance of public offices on electronic computers justifies the admission of data compilations prepared or stored in public offices on the same basis of assumed authenticity as [conventionally] prepared records." 5 WEINSTEIN'S EVIDENCE, *supra* note 42, § 901(b)(7)[01], at 901-101. Under this exception, public records are admissible only in criminal cases where the government is not a defendant but may be excluded if the "sources of information or other circumstances indicate lack of trustworthiness." This phrase is identical to the exclusionary clause in 803(6). See *supra* notes 103-07 and accompanying text.

124. 4 WEINSTEIN'S EVIDENCE, *supra* note 42, § 803(8)[01], at 803-171.

125. 5 WEINSTEIN'S EVIDENCE, *supra* note 42, § 901(b)(7)[01], at 901-101.

126. Singer, *supra* note 11, at 181-84; Note, *supra* note 11, at 449-50.

127. See *supra* notes 97-99 and accompanying text.

128. See *supra* notes 41-44.

129. 590 F.2d 789 (9th Cir.), *cert. denied*, 439 U.S. 1049 (1979).

130. *Id.*

States v. Farris,¹³¹ the United States Court of Appeals for the Seventh Circuit held that the government's certified and regularly prepared computer printouts of the defendant's tax records were self-authenticating under Rule 902 and admissible, without more, to prove that the records contained no filing for the tax years in question.¹³² Under the reasoning of these decisions, computer generated public records are admissible unless their certification is improper¹³³ or specific circumstances indicate a lack of trustworthiness.¹³⁴

Private Records

If current market trends are indicative, the personal computer will be a standard household appliance by 1990.¹³⁵ As users become more familiar with available equipment and software, as well as more sophisticated in applying their systems to personal pursuits, the use of privately generated computer records in litigation will increase. Although few users are likely to consider it, whether courts will admit personal computer records may ultimately affect the value of using a personal computer to produce and store personal records.¹³⁶

131. 517 F.2d 226 (7th Cir.), *cert. denied*, 423 U.S. 892 (1975).

132. *Id.* at 228. Rule 803(10) covers the situation where the absence of an entry in a public record is sought to be proved. It provides as follows:

(10) Absence of public record or entry. To prove the absence of a record, report, statement, or data compilation, in any form, or the nonoccurrence or nonexistence of a matter of which a record, report, statement, or data compilation, in any form, was regularly made and preserved by a public office or agency, evidence in the form of a certification in accordance with Rule 902, or testimony, that diligent search failed to disclose the record, report, statement, or data compilation, or entry.

FED. R. EVID. 803(10). This rule is essentially the counterpart of FED. R. EVID. 803(7) which covers the absence of an entry in business records. Rule 803(10) does not, however, provide the judge with an opportunity to exclude the evidence if the circumstances surrounding the preparation of the records indicated a lack of trustworthiness. *Compare* FED. R. EVID. 803(10) with *supra* note 93.

133. FED. R. EVID. 902(4) essentially provides that "extrinsic evidence of authenticity as a condition precedent to admissibility is not required with respect to . . . (4) certified copies of public records." *Id.*

134. This requires the opponent to raise specific objections to reliability. *See supra* note 104.

135. *See Is 'the Real Revolution' in Personal Computers Just Beginning?*, *Bus. Wk.*, Oct. 31, 1983, at 95-100. One source estimates that IBM alone will build 2 million personal computers in 1984. *Personal Computers: And the Winner is IBM*, *Bus. Wk.*, Oct. 3, 1983, at 76.

136. For example, in an action to recover income tax allegedly overpaid, a ruling that private tax records prepared on a personal computer are inadmissible would seriously diminish the value of owning and using such a system.

Personal records, even when regularly prepared, were traditionally considered not to constitute "business records" within the meaning of the shopbook or regular entries exceptions.¹³⁷ Private memoranda, diaries and checkstubs were therefore generally excluded as hearsay,¹³⁸ though in some cases they were permitted to refresh the memory of a witness¹³⁹ or were admissible as admissions or declarations against interest.¹⁴⁰ Underlying the reasons for their inadmissibility was the conclusion that their inherent self-serving character demonstrated an overall lack of trustworthiness.¹⁴¹

Recent decisions signal judicial willingness to find personal records reliable if they are regularly kept and systematically prepared. In *Sabatino v. Curtiss National Bank of Miami Springs*,¹⁴² the United States Court of Appeals for the Fifth Circuit held that a decedent's checkbook was admissible under the Federal Business Records Act¹⁴³ to prove the absence of an entry therein. Noting that federal courts follow a liberal policy regarding admissibility,¹⁴⁴ the court found that "private records, if kept regularly and if incidental to some personal business pursuits" could be introduced under the federal business records exception.¹⁴⁵

The language of Federal Rule of Evidence 803(6) is broad enough to encompass personal records made pursuant to a "regularly conducted activity."¹⁴⁶ The expression "business" expressly includes "callings of every kind, whether or not conducted for profit."¹⁴⁷ In *Keogh v. Commissioner*,¹⁴⁸ the United States Court of Appeals for the Ninth Circuit held that a diary regularly kept by the taxpayer's coworker was admissible under FRE 803(6) to prove the amount of income received from tips. The court cited, with authority, Professor Weinstein's observation that "a housekeeper's records kept neatly and accu-

137. For a history of the treatment of personal records, see Comment, *Admissibility of Personal Checking Records*, 1970 U.I.L.F. 288, 289 (1970).

138. 29 AM. JUR. 2d *Evidence* §§ 867-69 (1964).

139. *Id.*, § 869, at 971.

140. See Comment, *supra* note 137, at 290.

141. Professor Laughlin points out, however, that if "being self-serving rendered records inadmissible, any rule admitting regular entries would lose much of its value." Laughlin, *supra* note 80, at 285. Thus, the mere recognition that personal records may be self-serving does not make them less reliable than any other regularly kept records.

142. 415 F.2d 632 (5th Cir. 1969), *cert. denied*, 396 U.S. 1057 (1970).

143. 28 U.S.C. § 1732 (1966). See *supra* note 91 and accompanying text.

144. *Sabatino*, 415 F.2d at 635-36.

145. *Id.* at 636.

146. See *supra* notes 95-96 and accompanying text.

147. See text accompanying *supra* note 96.

148. 713 F.2d 496 (9th Cir. 1983).

rately for purposes of balancing bank statements, keeping strict budgets and preparing tax returns could qualify under the statute."¹⁴⁹

Federal Rule 803(6) should admit personal records generated by a computer if kept in the course of a regular conducted activity and if it was the regular practice of that person to keep such a record, unless other circumstances demonstrate a lack of trustworthiness.¹⁵⁰ In view of the strong presumption of reliability of computer records, the mere fact that the information is entered in a personal computer rather than a checkbook or diary does not demonstrate a lack of trustworthiness.¹⁵¹ The high degree of reliance personal computer users will place in their records adds assurance that the information the records contain is reliable.

One criticism of this approach is that the inexperience of most personal computer owners will countermand any indicia of reliability that the meticulous preparation of such records creates.¹⁵² While unfamiliarity with a particular system may increase the opportunity for error, this potential infirmity should not be transformed into a *per se* rule of inadmissibility. The case law construing Federal Rule of Evidence 803(6) makes clear that such considerations are irrelevant to admissibility unless raised by specific, supported objections.¹⁵³ Thus, the fact that a personal computer user is a novice is not necessarily a circumstance indicating a lack of trustworthiness.

Personal computer generated records might also be admissible under Federal Rule 803(5) as a past recorded recollection.¹⁵⁴ This exception, however, requires the in-court testimony of the record's preparer before the record is admissible. Additionally, even if the record is admitted, only its contents are read into the record. The output itself is not an exhibit.¹⁵⁵

149. *Id.* at 499 (quoting 4 WEINSTEIN'S EVIDENCE, *supra* note 42, § 803(6)[03], at 803-155).

150. Dean McCormick notes that the regularity and continuity of systematic record preparation alone furnishes an unusual reliability. *See MCCORMICK, supra* note 46, § 306, at 720.

151. For the arguments supporting the presumptive trustworthiness of computer records, see *supra* notes 29-45 and accompanying text.

152. A distinction should be made between operator inexperience and irregularity in the preparation of records. The length of ownership of a personal computer should not necessarily be allowed to determine the continuity of its use. Only where output error can be linked to unfamiliarity with the system should the latter be considered relevant to reliability.

153. *See supra* note 104.

154. *See supra* note 81.

155. *See supra* note 81.

Federal Rule of Evidence 803(24), in conjunction with FRE Rule 901(b)(9), may allow computer records into evidence whether or not they qualify as records made in the regular course of business, if the proponent can demonstrate that reasonable persons in the conduct of serious affairs would rely on them.¹⁵⁶ In substance, FRE 803(24) is a "catch-all" hearsay exception which purports to cover statements that do not fall squarely within the other recognized exceptions but which carry "equivalent circumstantial guarantees of trustworthiness."¹⁵⁷ FRE Rule 803(24) does have its limitations. For example, if the proponent of computer output can reasonably obtain other evidence more probative on the point in issue, FRE 803(24) (B) will permit the judge to exclude it. Additionally, FRE 803(24) requires the proponent of the computer record to serve the adverse party with notice of the intention to ask for its admission.¹⁵⁸

Regularly kept personal records are no longer considered inadmissible because they are self-serving or because they did not originate from a traditional business environment. Their systematic preparation and necessity create a rebuttable presumption of trustworthiness. That presumption is not weakened, and indeed may be strengthened, where the records are maintained in a personal computer. Therefore, like business or public records, a presumption of reliability should extend to regularly kept personal computer records.

156. This approach is suggested by Professor Weinstein. See 5 WEINSTEIN'S EVIDENCE, *supra* note 42, § 901(b)(9)[02], at 901-113 (citing Sigmon, *Rules of Evidence Before the I.C.C.*, 31 GEO. WASH. L. REV. 258, 265 (1962)). Rule 901(b)(9) is discussed *infra* at note 185 and accompanying text. Rule 803(24) provides as follows:

A statement not specifically covered by any of the foregoing exceptions but having equivalent circumstantial guarantees of trustworthiness, if the court determines that (A) the statements is offered as evidence of a material fact; (B) the statement is more probative on the point for which it is offered than any other evidence which the proponent can procure through reasonable efforts; and (C) the general purposes of these rules and the interests of justice will be served by admission of the statement into evidence. However, a statement may not be admitted under this exception unless the proponent of it makes known to the adverse party sufficiently in advance of the trial or hearing to provide the adverse party with a fair opportunity to meet it, his intention to offer the statement and the particulars of it, including the name and address of the declarant.

FED. R. EVID. 803(24).

157. FED. R. EVID. 803(24).

158. *Id.*

THE FOUNDATION REQUIREMENTS FOR ADMITTING COMPUTER
GENERATED RECORDS

A cursory examination of the cases that have rejected computer generated evidence suggests a common theme: the failure of its proponent to lay an adequate foundation for its admissibility.¹⁵⁹ While the cases state the requirement of an adequate foundation succinctly, it is difficult to define its specifics.¹⁶⁰ Judicial effort to formulate precise guidelines has generally succeeded in broadening the scope of inquiry into the reliability of computer output beyond that necessary to determine its admissibility.¹⁶¹

Though not the first to consider the admissibility of computer printouts,¹⁶² in *King v. ex rel. Murdock Acceptance Corp.*,¹⁶³ the Supreme Court of Mississippi was the first to outline the elements necessary for an adequate foundation. In an extension of the common-law "shop-book rule"¹⁶⁴ the court held that computer printouts of business records were admissible provided

- (1) the electronic computing equipment is recognized as standard equipment;
- (2) the entries are made in the regular course of business at or reasonably near the time of the happening of the event recorded; and
- (3) the foundation testimony satisfies the court that the sources of information, method and time of preparation were such as to in-

159. See, e.g., *People v. Bovio*, 118 Ill. App. 3d 836, 455 N.E.2d 829 (1983) (failure to show that computer equipment was standard and how information at data center was processed constituted inadequate foundation for computerized bank records). But see, e.g., *State v. Mach*, 23 Wash. App. 113, 594 P.2d 1361 (1979) (holding that even absent technical information, computerized records of an established bank should carry presumption of reliability).

160. A wide-ranging list of foundation elements distilled from various cases may be found in Annot., 7 A.L.R. 4th 8, 15 (1980).

161. E.g., *Monarch Fed. Sav. & Loan Ass'n v. Genser*, 156 N.J. Super. 107, 383 A.2d 475 (1977). *Monarch* is discussed *supra* at note 10 and *infra* at notes 167-69 and accompanying text.

162. One of the earliest cases to deal with the admissibility of computer printouts was *Transportation Indem. Co. v. Seib*, 178 Neb. 253, 132 N.W.2d 871 (1965). In *Seib*, the court found the voluminous foundation testimony which indicated the calculations the computer results were based upon had been manually verified, which presented the accounting manager's detailed descriptions of the company's accounting procedures and which consumed over 141 pages of the trial record, was sufficient to establish the trustworthiness of the printouts. *Id.* at 257, 132 N.W.2d at 873.

163. 222 So. 2d 393 (Miss. 1969). In *King*, computerized accounting records offered to prove the balance due on various sales contracts were admitted in light of the computer department supervisor's extensive testimony. *Id.* at 396.

164. See *supra* note 84 and accompanying text.

dicare its trustworthiness and justify its admission.¹⁶⁵

The *King* test, however, failed to mark the outer limits of the required testimony as to the sources of information, method or time of preparation of computer records.¹⁶⁶ In an effort to redefine the *King* standards, the Chancery Division of the Superior Court of New Jersey, in *Monarch Federal Savings & Loan Association v. Genser*,¹⁶⁷ proposed a more elaborate set of guidelines. In addition to the requirements of the New Jersey business records exception,¹⁶⁸ the court held the foundation testimony must include five elements to establish the trustworthiness of a computer generated record:

- (1) the competency of the computer operators . . .
- (2) the type of computer used and its acceptance in the field as standard and efficient equipment . . .
- (3) the procedure for the input and output of information, including controls, tests and checks for accuracy and reliability . . .
- (4) the mechanical operations of the machine . . . and
- (5) the meaning and identity of the records themselves.¹⁶⁹

Courts that find foundation testimony inadequate generally do so because one or more of the foregoing elements are lacking.¹⁷⁰ The *King* and *Monarch* guidelines are, however, no

165. *King*, 222 So. 2d at 396. Compare this test and the requirements of the UBREA, *supra* note 110, with FED. R. EVID. 803(6) discussed *supra* at notes 93-107 and accompanying text.

166. One commentator has criticized the *King* requirements because they did not specify the factors which allegedly diminish the reliability of a computer's output nor did they indicate what testimony would be sufficient in future cases. Note, *supra* note 29, at 85-86. *Contra* Note, *Admissibility of Computer Kept Business Records*, 55 CORNELL L. REV. 1033, 1042 (1970).

167. 156 N.J. 107, 383 A.2d 475 (1977).

168. NEW JERSEY EVID. R. 63(13) parallels the UBREA, *supra* note 110, but eliminates the requirement that the custodian testify as to the authenticity of the record.

169. *Monarch Fed. Sav. & Loan Ass'n v. Genser*, 156 N.J. 107, 131-32, 383 A.2d 475, 487-88 (1977).

170. This is not to suggest that courts which admit computer generated evidence do so on the successful application of the *Monarch* test. Specifically, courts employ the following reasons for not admitting computer records: (1) no evidence that the computer is recognized as standard, *Grand Liquor Co., Inc. v. Department of Revenue*, 67 Ill. 2d 195, 367 N.E.2d 1238 (1977); *Vining v. State Farm Life Ins. Co.*, 409 So. 2d 1306 (La. App. 1982); *O'Shea v. IBM Corp.*, 578 S.W.2d 844 (Tex. Civ. App. 1979); (2) no evidence that the foundation witness was familiar with the operation of the computer, *Grand Liquor Co., Inc. v. Department of Revenue*, 67 Ill. 2d 195, 367 N.E.2d 1238 (1977); (3) no proof as to the accuracy of the printouts or the safeguards used to ensure reliability, *People v. Boyd*, 66 Ill. App. 3d 582, 384 N.E.2d 414 (1978); *People v. Gauer*, 7 Ill. App. 3d 512, 288 N.E.2d 24 (1972); (4) no evidence as to the sources of information, time, mode or method of preparation of the printouts, *Department of Mental Health v. Beil*, 44 Ill. App. 3d, 402, 357 N.E.2d 875 (1976); *People v. Gauer*, 7 Ill. App. 3d 512, 288 N.E.2d 24 (1972); *Vining v. State Farm Life Ins. Co.*, 409 So. 2d 1306 (La. App. 1982); *Hamilton Music Inc. v. York*, 565 S.W.2d 838 (Mo. App. 1978); and (5) no evidence of the meaning of the printouts, *Estate of Buddeke v. Mac-*

longer appropriate for various reasons. The elements are meaningless in the context of modern computer technology. They are predicated on false assumptions concerning the reliability of computers, and they are directly in opposition to the rationale supporting the business and public records exceptions to the hearsay rule.¹⁷¹

Whether the computer operator was competent is only relevant to the extent that specific proof demonstrates incompetency.¹⁷² The rationale underlying the business records exception presumes that the competent performance of employees is a condition to their continued employment.¹⁷³ To ignore this concept merely because the records are processed by a computer thrusts an artificial and unnecessary requirement of additional circumstantial reliability upon them.

The requirement that the computer must be standard is meaningless in the context of modern computer technology.¹⁷⁴ Recent publications covering available computer hardware reveal that variety is the only standard in the industry.¹⁷⁵ Satisfying this requirement cannot increase the probability that the record is accurate.

Like evidence of operator competency, credible testimony as to the use of controls, tests and checks for computer accuracy and reliability is necessary to determine printout admissibility

Neal Memorial Hosp. Ass'n, 49 Ill. App. 3d 431, 364 N.E.2d 446 (1977); *People v. Gauer*, 7 Ill. App. 3d 512, 288 N.E.2d 24 (1972). More Illinois decisions have excluded computer printouts than any other jurisdiction. This is particularly odd given the plain language of the business records exceptions in Illinois. See *supra* note 113 and accompanying text.

171. The Appeals Court of Massachusetts in *Commonwealth v. Hogan*, 7 Mass. App. Ct. 236, 387 N.E.2d 158, *aff'd*, 379 Mass. 190, 396 N.E.2d 978 (1979), firmly rejected the requirement of additional foundation testimony. There the court said:

[W]e do not believe it necessary to determine whether a special foundation requirement such as that suggested in *United States v. DeGeorgia*, 420 F.2d 889, 893 n.11 (9th Cir. 1969), should be imposed on business records stored in a computer. In that case the court stated that the offeror should present evidence of the trustworthiness of the computerized information but noted that 'everyday reliance on the information was an adequate indicium of trustworthiness'. . . . If the opponent of computer evidence challenges it on the basis of, for example, the mechanical accuracy of the computer, it remains within the court's discretion. . . to require the provision of additional foundation testimony.

Id. at 244, n.15, 387 N.E.2d at 168, n.15.

172. See FED. R. EVID. 803(6), *supra* note 93.

173. See *supra* note 88 and accompanying text.

174. "The failure to certify the brand or proper operating condition of [a computer] does not betray a circumstance of preparation indicating any lack of trustworthiness." *United States v. Vela*, 673 F.2d 86, 90 (1982).

175. See authorities cited *supra* note 1.

only to the extent that other credible testimony proves their defective use or nonexistence.¹⁷⁶ This applies with equal force to evidence of mechanical operation.¹⁷⁷ Modern computerized record systems exhibit error rates far lower than those experienced with conventional techniques.¹⁷⁸ There is no sound reason in science or law for such additional circumstantial guarantees.

Evidence of the meaning and identity of computer output is critical to its probative value.¹⁷⁹ Where such proof is totally lacking, the court should refuse to admit the computer records.¹⁸⁰ This should not be misread, however, to require more than testimony to show the record is what its proponent claims.¹⁸¹

The Requirement of Authentication and Identification

The authentication and identification of a writing as a prerequisite to its admission is recognized.¹⁸² From the outset, it is important to understand that the concept of authentication is an extension of the rules of relevancy.¹⁸³ Where authentication is established, it cannot substitute for the circumstantial guarantees of trustworthiness required to negate the hearsay rule. Nor can its requirement be employed to insist upon proof of trustworthiness in addition to the elements of the hearsay exception.¹⁸⁴

Federal Rule of Evidence 901 covers the authentication and identification of business records.¹⁸⁵ Simply stated, the rule re-

176. See *supra* note 104.

177. See *supra* note 104.

178. See *supra* notes 41-44 and accompanying text.

179. The concept of identification is discussed briefly *infra* at notes 182-87 and accompanying text.

180. On the inadmissibility of evidence which lacks probative weight altogether, see McCORMICK, *supra* note 46, §§ 51-60, at 109-38. See also Huber, Hunt and Nichols, Inc. v. Moore, 67 Cal. App. 3d 278, 136 Cal. Rptr. 603 (1977) (printout held inadmissible where confusion outweighed probative value).

181. See *infra* notes 186-87 and accompanying text.

182. See generally McCORMICK, *supra* note 46, §§ 218-28, at 543-58; 7 WIGMORE, *supra* note 46, §§ 2128-2169, at 562-665.

183. Notes of Advisory Committee on Proposed Rules, *supra* note 74, at 335-36. (FED. R. EVID. 901(a)).

184. See *supra* note 93.

185. FED. R. EVID. 901.

Requirement of Authentication or Identification

(a) General provision. The requirement of authentication or identification as a condition precedent to admissibility is satisfied by evidence sufficient to support a finding that the matter in question is what its proponent claims.

(b) Illustration. By way of illustration only, and not by way of limitation, the following are examples of authentication or identification conforming with the requirements of this rule:

quires nothing more than evidence that the record is what its proponent claims.¹⁸⁶ The rule illustrates that, where computer records are offered sufficient evidence of authentication may include "evidence describing a process or system used to produce a result and showing that the process or system produces an accurate result."¹⁸⁷

One commentator has suggested that FRE 901 does not provide an adequate foundation for the authentication and identification of computer generated evidence.¹⁸⁸ Despite contrary language in the rule, the commentator apparently believed a computer record could only be authenticated by evidence demonstrating the accuracy and reliability of the system that produced the records.¹⁸⁹ Accordingly, a new Rule 901(c) was proposed to ensure these requirements are met.¹⁹⁰

The proposed rule, however, incorporates the shortcomings of other foundation requirements for computer records that the courts have occasionally required.¹⁹¹ It insists upon guarantees of circumstantial reliability contrary to the plain language and meaning of Rule 901.¹⁹² It also confuses the purposes of authentication which concerns relevancy with the assurances neces-

.....
 (9) Process or system. Evidence describing a process or system used to produce a result and showing that the process or system produces an accurate result.

Id.

186. *Id.*

187. *But see* Advisory Committee Notes to Federal Rules of Evidence, 56 F.R.D. 183, 336 (1972) (*noting* that "Example (9) does not, of course, foreclose taking judicial notice of accuracy of the process or system."). Given the reliability of today's computers, this is the more reasonable solution. *See supra* notes 31-45 and accompanying text. *See also infra* notes 196-204 and accompanying text.

188. Singer, *supra* note 11, at 167-76.

189. *Id.* at 174. Rule 901 makes clear that subsection (9) is illustrative only, not directory. The requirement may, therefore, be satisfied by other means. *See supra* note 187.

190. Proposed Rule 901(c) Computer Program or System. Evidence describing a computer program or system of computer programs used to produce a result and showing by a description of the computer hardware, programming method, stored data base, operation of the system, system security, and specific application controls, that the program or system produces an accurate result, satisfies the authentication requirement for a computer programmer or system. Voluminous testimony should not be required to lay a foundation for the computer system or process. For instance, the explanation of the computer hardware need not be more than an overview by the manufacturer of the central processing unit and of the types of input/output devices used by the system.

Singer, *supra* note 11, at 174.

191. *Compare* Singer, *supra* note 11, at 174 *with* note 170 and accompanying text.

192. *See supra* note 185.

sary to obviate the hearsay rule.¹⁹³

Federal Rule of Evidence 901, in its present form, is the most acceptable authentication requirement. As a practical matter, liberalized discovery rules will resolve the necessity of all but the most elemental requirement of identification in open court.¹⁹⁴ Further, to satisfy the authentication requirement a court can take judicial notice of the fact that computers regularly produce accurate results.¹⁹⁵

Judicial Notice

It is a fundamental principle of law that "the doctrine of judicial notice is one of common sense."¹⁹⁶ When applied, its practical effect is to remove the necessity of proof of the fact noticed.¹⁹⁷ Matters of common knowledge, as well as a long list of discoveries, inventions, and common mechanical devices have been consistently recognized as proper subjects for judicial notice.¹⁹⁸ The computer has now become so widely relied upon and accepted that it is a viable candidate for addition to that list.¹⁹⁹

Rule 201 of the Federal Rules of Evidence governs judicial notice of adjudicative facts.²⁰⁰ Essentially, the rule provides that judicial notice may be taken of a fact if it is either "(1) generally known within the territorial jurisdiction of the trial court

193. See *supra* text accompanying notes 183-84.

194. 5 WEINSTEIN'S EVIDENCE, *supra* note 42, § 901(b)(9)[02], at 901-110 - 901-114.

195. See *supra* note 187. See also *infra* notes 196-204 and accompanying text.

196. McCORMICK, *supra* note 46, § 328, at 757 n.2 (quoting *Harper v. Killion*, 162 Tex. 481, 348 S.W.2d 521 (1961)).

197. See generally 1 WEINSTEIN'S EVIDENCE, *supra* note 42, § 200[05], at 200-24 - 200-28.

198. The list includes, among other things, airplanes, air conditioners, bicycles, locomotives, gasoline engines, motorboats, motorcycles, washing machines, watches, telephones, radios, refrigerators, sewing machines, and typewriters. 31 A.C.J.S. *Evidence* § 81, at 98, 99-108 (1955). Although judicial notice is generally taken of the reliability of speed measuring devices, one commentator has noted that moving radar devices which combine the Doppler principle with computer technology raise issues pertinent to the admissibility of computer generated evidence. Dixon, *Moving Radar*, ILL. MUNC. REV. 24 (Dec. 1983).

199. Judicial notice may be taken of the nature and manner of use of devices applying fundamentally known principles. In this age of rapid technological advance contrivances which a few years ago would have been considered novel in design or application have become commonplace and the accuracy of their product is generally recognized. For example, computer printouts are received in evidence in civil and criminal cases as a matter of course.

United States v. Foster, 580 F.2d 388, 390 (10th Cir. 1978).

200. FED. R. EVID. 201.

or (2) capable of accurate and ready determination by resort to sources whose accuracy cannot be reasonably questioned."²⁰¹ Of course, whether a court will take notice of any fact is within its broad discretion.²⁰²

The suggestion that computers are a proper subject for judicial notice is not offered as an alternative to proving the credibility or ultimate accuracy of the evidence they generate.²⁰³ The proponent must establish only circumstantial guarantees of trustworthiness to admit hearsay.²⁰⁴ Upon a showing that the computer record qualifies as a business, public or personal record, judicial notice can be taken of its presumable reliability and, absent specific contrary proof, form the basis for its admissibility.

The Foundation Witness

Finally, only a proper witness can authenticate the computer record and establish the elements of the relevant hearsay exception. Whether a computer record is admissible depends upon the testimony of the foundation witness.²⁰⁵ Therefore, the proponent of such evidence, to adequately prepare for trial, must know that the witness called to introduce the record is competent to lay the required foundation.

Concrete rules are difficult to extract from the cases. Much depends, of course, on the necessary foundational elements. For example, a bookkeeper who supervises the regular preparation of computerized payroll records, but who is neither a computer technician or a programmer, cannot vouch for the mechanical reliability of either the machine itself or its

201. *Id.*

202. The title of FED. R. EVID. 201(d), "*when mandatory*," would appear to define a situation in which judicial notice would no longer be considered discretionary. A close reading of this subsection reveals, however, that Congress directed that the court "shall" [not must] take judicial notice of a fact and then, only if a party so requests and provides information the court deems necessary to demonstrate widespread acceptance. *Id.*

203. "Even when admitted as business records, however, computer data acquires reliability as evidence from the system under which it is produced. If the original data fed in is not accurate, or if the machine and its program are not well designed and operated or if the data produced is not properly evaluated, it has no reliable probative force." 5 WEINSTEIN'S EVIDENCE, *supra* note 42, § 901(b)(9) [02], at 901-113.

204. *See supra* note 77.

205. *But see* People's Gas Light & Coke Co. v. Barrett by Bortman, 118 Ill. App. 3d 52, 454 N.E.2d 713 (1983) (accuracy of computer printouts proved by affidavit). As to the witnesses that may be called to establish admissibility of regularly kept records, see generally 5 WIGMORE, *supra* note 46, § 1530, at 449-61; MCCORMICK, *supra* note 46, § 312, at 729-30, Laughlin, *supra* note 80, at 294-96.

software.²⁰⁶ Conversely, a computer programmer cannot always attest to the competency of the computer operators or that the records are regularly kept.²⁰⁷ Where the foundation requires testimony as to the reliability of the computer and its software, the competency of the computer operators and the regularity of the process, the proponent faces a difficult choice. Under such an approach, the foundation witness must be both a computer expert and the custodian of the records or the proponent must call different witnesses for each element of the foundation.²⁰⁸

A more reasonable result is possible. First, most jurisdictions no longer adhere to the common law requirement that everyone who assisted in the preparation of the records must either testify as to their contribution to the process or be established as unavailable.²⁰⁹ Nor is the foundation witness generally required to have personal knowledge of the facts contained in the record.²¹⁰ Thus, an objection that the foundation witness did not prepare the computer record or lacks personal knowledge of the facts therein should not affect its admissibility.

Second, expert testimony as to the reliability of the programs the computer uses or other technical aspects of its operation is unnecessary to find computer generated records circumstantially reliable.²¹¹ A contrary rule imposes too great a burden on those who rely on computer records.²¹² Given the vol-

206. *E.g.*, *People v. Boyd*, 66 Ill. App. 3d 582, 384 N.E.2d 414 (1978) (computerized payroll records held inadmissible where bookkeeper could not testify that computer was standard or properly operating).

207. *E.g.*, *Railroad Comm'n v. Southern Pac. Co.*, 468 S.W.2d 125 (Tex. Civ. App. 1971) (expert in computerized cost analysis could not establish proper foundation because he was not the custodian of the records).

208. *Monarch Fed. Sav. & Loan Ass'n v. Genser*, 156 N.J. Super. 107, 383 A.2d 475 (1977). The *Monarch* court explained that "expertise in computers or setting up the particular program" was not required to establish an adequate foundation. *Id.* at 134, 383 A.2d at 489. Then the court held the records inadmissible because the witness

did not provide information on the type of computer used and its acceptance in the field as standard and accurate equipment . . . did not testify as to the competency of those who program the computer and process the daily input, nor did he fully explain the input controls or the mechanics of the machine.

Id. No one but a computer expert could satisfy the foregoing requirements.

209. *E.g.*, *Rosenberg v. Collins*, 624 F.2d 659, 665 (5th Cir. 1980); *United States v. Fendley*, 522 F.2d 181, 185 (5th Cir. 1975). Professor McCormick notes that virtually every statutory business records exception now rejects such a requirement. MCCORMICK, *supra* note 46, § 312, at 729-30.

210. *See supra* note 209.

211. *See supra* notes 31-45 and accompanying text.

212. A significant problem arises where the central computer is located apart from the place where the records are regularly maintained and relied upon. For example, a number of businesses utilize a data center to process their records. *See People v. Bovio*, 118 Ill. App. 3d 836, 455 N.E.2d 829 (1983) (banking); *Record Data, Inc. v. Vinylgrain Ind. of Georgia, Inc.*, 143 Ga. App.

atility of hardware and software markets, no computer user could ever be certain that a qualified manufacturer's representative or other competent expert would be available to certify the reliability of the particular system used.²¹³ Moreover, because the software and hardware that comprise many modern computer systems are often manufactured by different companies, additional problems might be encountered in obtaining different experts to establish the reliability of each piece.²¹⁴ The admissibility of regularly kept computer records would turn on the proponent's financial resources and the availability of a variety of experts, rather than the time-tested rules governing the admission of regularly maintained records.

A witness is competent to lay the foundation for systematically prepared computer records if the witness can demonstrate to the court that the computer record is what its proponent claims²¹⁵ and is sufficiently familiar with the record system used to satisfy the court that the record qualifies as a proper business, public, or personal record.²¹⁶ Thus, company officers, supervisors of accounting departments, assistant bank cashiers, record custodians and even data entry clerks, whether or not they are computer experts, may establish the necessary foundation.²¹⁷ This approach is consistent with the reasons underlying

854, 240 S.E.2d 223 (1977) (account for services). Others rely on telecommunication networks to link remote input terminals to the central processing unit. See *United States v. Scholle*, 553 F.2d 1109 (8th Cir. 1977) (computer retrieval system); *People v. Mormon*, 97 Ill. App. 3d 556, 422 N.E.2d 1065, *aff'd*, 92 Ill. 2d 268, 442 N.E.2d 250 (1981) (Avis Corporation). In these situations, the custodian of the records will usually be able to describe the systematic preparation of the records, their meaning and identity and the degree to which they are relied upon. The witness will not, however, be able to say what brand of computer or software the data center uses, nor will the witness be able to vouch for the reliability of the technical aspects of their operation. *People v. Bovio*, 118 Ill. App. 3d 836, 839, 455 N.E.2d 829, 831 (1983). To reject regularly maintained computer records on that basis alone arguably exhorts form far above substance. It can also be contended that such a rule unfairly discriminates against computer users who cannot afford to own a computer system themselves.

213. See generally authorities cited *supra* notes 1 and 4.

214. See generally authorities cited *supra* notes 1 and 4.

215. FED. R. EVID. 901. See *supra* notes 186-95 and accompanying text.

216. See *supra* notes 93, 122 and 150. The witness is not required to have been the custodian at the time the records were made. *Bobbie Brooks, Inc. v. Hyatt*, 195 Neb. 596, 239 N.W.2d 782 (1976).

217. Computer records were admissible in the following cases even though the foundation witness was not a computer expert: *United States v. Vela*, 673 F.2d 86 (5th Cir. 1982) (telephone company employee); *Rosenberg v. Collins*, 624 F.2d 659 (5th Cir. 1980) (company comptroller); *United States v. Veres*, 7 Ariz. App. 117, 436 P.2d 629 (1968) (assistant bank cashier), *cert. denied*, 393 U.S. 1014 (1969); *American Oil Co. v. Valenti*, 179 Conn. 349, 426 A.2d 305 (1980) (sales manager); *Reisman v. Martori*, Meyer, Hendricks & Victor, 155 Ga. App. 551, 271 S.E.2d 685 (1980) (president of lawyer's association); *Brown v. Commonwealth*, 440 S.W.2d 520 (Ky. 1969) (telephone com-

the business and public records exceptions to the hearsay rule.²¹⁸

CONCLUSION

Computer generated records, systematically prepared and maintained, carry a presumption of circumstantial reliability. Thus, they should be admissible in evidence to prove the truth of the matters asserted therein, unless other circumstances demonstrate a lack of trustworthiness. Those who rely on widely accepted scientific principles to conduct their daily affairs should not be required to reestablish those principles every time they become the subject of litigation.

The failure of a number of courts to recognize a distinction between proving the accuracy of computer output and merely establishing its circumstantial reliability has set a questionable precedent for admitting computer records in those jurisdictions. Requiring an extensive and technical foundation as a prerequisite to admissibility only perpetuates the judicial myth that electronic record systems are inherently less trustworthy than conventional systems. It increases the complexity of trials and diminishes efficiency in judicial rulings on admissibility. It also unfairly burdens the proponent of a computer record. For instance, due to the affordability and ease of operation of microcomputers, small businesses and individuals can now computerize their records. It would be ironic if the same lack of financial resources and technological expertise which long kept the computer beyond reach would now determine the admissibility of their computerized records.

The courts that distrust computer evidence can avoid such a harsh result by reexamining the erroneous assumptions on which this "presumption of unreliability" is based. The controls, checks and tests which virtually every piece of computer hardware and every software package now incorporate should not become worthless the moment the recordkeeper steps into the courtroom. Nor should the court ignore the assurances of reliability that surround regularly prepared records simply because they are maintained by a computer. Courts should take judicial notice that regularly kept computer records are ordinarily relia-

pany district account supervisor); *People v. Mormon*, 97 Ill. App. 3d 556, 422 N.E.2d 1065 (1981) (Avis security manager); *State v. Hodgeson*, 305 So. 2d 421 (La. 1975) (comptroller-office manager); *Bobbie Brooks, Inc. v. Hyatt*, 195 Neb. 596, 239 N.W.2d 782 (1976) (records custodian); *State v. Passmore*, 37 N.C. App. 5, 245 S.E.2d 107, *cert. denied*, 295 N.C. 556, 248 S.E.2d 734 (1978) (bank's assistant operations officer).

218. See *supra* notes 88 and 124 and accompanying text.

ble and require specific, supported objections to show any deficiency in the record-keeping process. Given that the widespread use of computer records in litigation is inevitable, this approach will ensure that their admissibility is based on circumstantial guarantees, while proof of their ultimate accuracy is reserved for the trier of fact.

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