# History of VOTING SYSTEMS in California

By Ed Arnold

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Dear Reader:

This publication, "History of Voting systems in California", was produced under the direction of Edward G. Arnold, who worked in the Elections Division of the Secretary of State's Office for 27 years. His retirement in January of 1999 coincides with the publication of this book, and nicely "bookends" Ed's career in our office. During his time here he was one of the foremost experts in the country on voting machines and equipment. This publication is, in a sense, a gift from Ed to all Californians, representing as it does the only such history of voting systems and equipment used in California elections. This publication contains factual information, research, and many personal observations and opinions of the author, and should be read as such. As technology changes in the world at large, so will it change in the process of voting, and a portion of Ed's legacy to us will be this historical document to remind us, as we move forward, where we have been and how we used to do things.

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## About This Publication

This paper explores the historical, legal as well as technical aspects of the development of voting systems in California. It covers the past and current methods of voting and vote counting, including lever machines, mark-sense/optical scan systems, and punch card voting systems. It also speculates about some possible, future voting systems for use in California, such as early voting, all mail voting, DRE computerized voting machines, voting through Interactive TV and various potential voting systems through personal computer.

## Introduction

Former Los Angeles county Registrar of Voters Ben Hite used to say that with a hand-counted paper ballot, people can't count accurately.[1] There is an error rate of approximately 5% in the vote count in each precinct, yet such an error rate was random and was balanced across all the precincts so that the winners were still winners, and the losers, losers.[2]

As voting machine specialist Roy G. Saltman notes in a special publication on computerized vote tallying for the National Bureau of Standards, the vulnerabilities of hand-counting paper ballots include: 1) inaccurate counting: due to human inattention and fatigue; 2) ballot frauds: counterfeit ballots being substituted; and, 3) malicious invalidation: extra marks being made to the ballot in order to invalidate the votes for opposing candidate (26). "One reason for the acceptance of the machines ( lever voting

[1] Conversation with Edward G. Arnold Jr. on March 17, 1967
[2] Ibid.

machines) was the existence of significant fraud in the use of paper ballots," Saltman writes (27).

Voting fraud is not the product of the modern age. Fraud has come been along with the history of voting. Roman Constitutional historian E. S. Staveley suggested that the first formal voting was employed in a Council in Sparta in 750 BC (19). Though it is speculative to date the first voting in Greece, a list of archons of 681 BC indicates the existence of a Council which formed policy and made decisions by vote in Athens (Staveley 24-25). The earliest known laws to counteract against frauds have been traced back to Rome. Rome established three ballot laws to prevent electoral abuse in oral vote by providing written ballot in the second century (Staveley 158). In the Constitution of Athens *Athenaion Politeia* of Aristotle, Lex Gainia of 139 introduced ballots for elections, Lex Cassia 137 for judicial decisions, and Lex Papiria of 130 for legislative votes (Staveley 158-159). Before going into various attempts to incorporate technology in voting to prevent frauds in the nineteenth century, we need to first know that voting machines, like frauds, existed earlier than we thought.

We might think it was a magnificent innovation to invent a voting machine at the end of 19th century, but the first voting-related machine was probably the Athenian allotment machine *cleroterion*. The earliest mention of the allotment machine is in Aristophanes' play *Ecclesiazusae* written in 390 BC (Staveley 62). Athens used a system that involved voting by black and white beans. According to Staveley, the total of the black and white beans amount to the total number of candidates. White beans represent the number of open seats, while black beans represent the number by which candidates exceed the seats to be filled (Staveley 61). The candidates are selected through a drawing

by lot using the allotment machines. This use of different color balls in Greece was the origin of the Italian word "ballotta" meaning little ball, which became the English word "ballot."[3]

The idea of voting by a machine started in the middle of 19th century. In 1849, Josef Baranowski, a French inventor of a commercial calculating machine published a pamphlet "Nouveau systeme de voter" ( "New Voting System" ) in which a voting machine was designed that allowed voters to vote by turning the handles or pushing the buttons on the names of the candidates on a machine closet (Zuckerman 18). In 1859, German Werner von Siemens constructed a primitive type of voting machine, which would only permit a "yes" or "no" choice for legislative use (Zuckerman 19). English inventors furthered Baranowski's design, yet the first machines ever to be used were modified by Americans (Zuckerman 19). In 1869, Thomas Edison invented the first vote count machine for congressional use. In 1888, Jacob Myers generalized the voting and vote-counting machine for election purposes. In 1892, Lockport, New York conducted the first election by voting machines: Myers' Automatic Voting Machines (AVM). The history of voting thus entered a new era. The following section is concerned with the development of the right to vote and the history of human voting from Greece and Rome until present.

History of Voting in United States

We might easily take for granted our right to vote, but to achieve equality of the franchise for every citizen in the country has required a long striving struggle. In the early days of our nation, the right to vote was granted only to white, land owning, 21

[3] Grolier on-line, American Presidency, Ballot http//www.grolier.com/presidents/ea/side/votemchn.html

years or older male citizens. The U.S. Constitution once allowed the states to decide who should have the right to vote, yet subsequent amendments limited the states' power to deny the right to vote based on race, sex, and tax-related issues. Nevertheless, the states still upheld the right to set qualifications such as the ownership of property, literacy, poll tax and length of residency. In 1870, the 15th Amendment to the U.S. Constitution declared: "The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any state on account of race, color, or previous condition of servitude." Granting black males the right to vote by the constitutional amendment was one of the issues that led to civil war, despite the relatively small number of black males in the nation as a whole (Flanigan and Zingale 2). In order to prevent blacks from voting during the last century in the South and occasionally in the North, only whites were allowed to vote in party primaries in one-party states in the belief that primaries to nominate candidates were "internal functions of a private organization" (Flanigan and Zingale 4). The Supreme Court ruled this unconstitutional in 1944 on the grounds that selecting candidates for elections is a public function in which racial discrimination should be prohibited (Flanigan and Zingale 4-5). In addition to the white-only primaries, the poll tax, the requirement of each voter to pay fees for registration to vote, was another way to block poor blacks as well as poor whites from voting (Flanigan and Zingale 5).

Women were enfranchised by the 19th amendment which provided that the right to vote should not be deprived "on account of sex" in 1920. In 1964, the 24th amendment declared that the right to vote should not be taken away from citizens "by any reason of failure to pay any poll tax or other tax." Moreover, some districts

implemented literacy tests to exclude less educated people from registering to vote up until the Voting Right Act (VRC) of 1965 (Flanigan and Zingale 5). Finally, the Twenty-sixth Amendment lowered the minimum voting age to 18 years old in 1971.

The following is a table which indicates the development of the right to vote.

Table 1: Development of the Right to Vote in the United States

| Time | Amendment | Change in the right to vote |
|---|---|---|
| 1870 | 15th Amendment | Regardless of race |
| 1920 | 19th Amendment | Regardless of sex |
| 1964 | 24th Amendment | No preliminary tax |
| 1971 | 26th Amendment | Lowering the minimum voting age from 21 to 18 |

## Federal Elections Campaign Act (FECA)

To protect the freedom and fairness of elections, in 1975 the U.S. Congress created an independent regulatory agency, the Federal Elections Commission (FEC) to administer and enforce the Federal Elections Campaign Act (FECA). The primary functions of this watchdog agency are to disclose campaign finance information, enforce the limits, prohibitions, and other provisions of the election law; as well as administer the public funding of presidential elections.[4]

[4] "About the Federal Election Commission" http://www.fec.gov/1996/txt/about.htm

The commission consists of six members, appointed by the President and confirmed by the Senate. No more than three members can be of the same party and the term of tenure is six years. The chairperson of the group rotates among the members with no member serving as chair more than once during his/her term.[5]

**Voting by Paper Ballot**

In colonial America, early voters substituted beans, kernels of corn, seashells, or rocks for the multi-colored balls used in Greece, as well as using a show of hands and voice to conduct elections (Rusk 313). In 1629, the first vote credited with using paper ballots took place in a Salem, Massachusetts church and by the Civil War only Kentucky and Virginia were still voting by voice.[6] In 1800, the Northwest Territory enacted a law stating that elections should be held by ballot.[7]

**Pre-printed Party Ballots**

In the early 1800's, some states permitted voters to bring their own ballots to the polling place (Rusk 330). As a result, the parties decided to print ballots to encourage voters to choose preferred candidates and measures (Rusk 330). In 1850, voters in California provided their own ballots to write in the names of the candidates for whom they were voting (Gaylord 101). The ballot was not filled out by the voters, but was instead completed by the party, with the office, candidates and measure choices pre-printed (Rusk 329-330). The pre-printed ballots were a demonstration of parties' manipulation in the elections. This was the typical voting procedure until the Australian, or "secret ballot" was introduced to the United States (Rusk 330).

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[5] "About the Federal Election Commission" http://www.fec.gov/1996/txt/about.htm
[6] http//www.grolier.com/presidents/ea/side/ballot.html
[7] Ibid.

## Voting Machines in California

Many people felt that the election process was abused by the ballots which were pre-printed by political parties. As Hermet notes, one-party election ballots fail to represent the voters' true preference (Hermet et al. 1). In other words, political parties, instead of voters, were voting. Or, stated another way, because the voters were casting ballots furnished by political parties, their "choice" essentially consisted of which "straight party ticket" to vote for. An example of this type of procedure is the so-called Vallejo "tapeworm" ballot[8] in 1871. The Republican ticket was so small that registered Republicans could simply drop this "tapeworm" ballot in the ballot box *without* being able to read it. The ballot was approximately ½ inch high by six inches wide, overloaded with the listing of 11 state and 15 county office nominees including name and title as well as two state propositions.

As a reaction to growing voter frauds, in 1888, Massachusetts first adopted the Australian secret ballot for elections (Rusk 313). The Australian secret ballot is 1) an official ballot being printed at public expense, 2) on which the names of the nominated candidates of all parties and all proposals appear, 3) being distributed only at the polling place and 4) being marked in secret."[9] Within eight years, about 90% of the states accepted the secret ballot (Rusk 313). In 1891, California adopted measures to amend the Political Code to provide for the use of the Australian ballot at public expense (Gaylord 165).

Voting machines, modeled after a mechanical Australian ballot, grew out of the need to correct the abuses which developed with the paper ballot and the need to

provide a prompt and accurate count. Its use reduces, as much as possible, fraud, error, and carelessness on the part of both the voters and the election officials.[10] Voting machines greatly facilitate the totaling of election results.

The following is a chart of important events of voting in California from Edison's invention of the first vote count machine in the United States in 1869 to the shift of responsibility of approving voting machines to Secretary of State from the State Commission of Voting machines in 1982.

Table 2: History of Voting Systems in United States and California[11]

| | |
|---|---|
| 1869 | Edison's invention of the voting machine, used for congressional vote count |
| 1888 | Generalization of lever machines to public use |
| 1889 | First elections using lever machines by Jacob Myers in Lockport, New York |
| 1897 | California State Commission on Voting Machines created |
| 1901 | Legislature proposes Proposition 6: "Elections Provision for Adoption of Mechanical Devices" |
| 1902 | Proposition 6 passed (66.07%) |
| 1904 | San Francisco's first use of voting machines in California |
| 1906 | All elections conducted by voting machines in S.F. |
| | S.F. Grand Jury finding evidence of count fraud |
| | Destruction of voting machines by fire and earthquake in SF |
| 1907 | Law amended to assure the reliability of voting machines; |
| 1907 | Sealing all machines until election day |

[8] Republican ticket 1871, Vallejo Tapeworm Ballot, Housed at the California History Room at the California State Library.
[9] Webster's Seventh New Collegiate Dictionary, G&C Merriam Company, Springfield Massachusetts, USA, 1967: 59.
[10] Grolier on-line, The American Presidency-, "Voting Machine" http//www.grolier.com/presidents/ea/side/votemchn.html.
[11] Gaylord, Stats. 1891, c.130, p.165.

1924 S.F. resumes the use of voting machines

1928 Los Angeles County's first use of voting machines in some precincts in the general election

1952 L.A. cancels the use of voting machines due to the length of the ballot

1956 Mark Sense/Optical voting system being approved

1957 Permission to use mechanical, electrical, and electromechanical tabulating machines to counties with less than 30 districts

1959 "State Commission on Voting Machines" changed to "State Commission on Voting Machines and Voting Tabulating Devices"

1961 Requirement of county clerks to examine voting machines at least once every two years; option for punch card voting

1982 Responsibility of approving voting machines shifted to Secretary of State from State Commission on Voting Machines and Tabulating Devices

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Since 1984, Secretary of State has been in charge of the approval and the examination of all the voting machines and tabulating devices in California. Keeping in mind the history of voting systems from Edison's first congressional vote count machine, now let us look at the development of laws in accordance with the advancement of voting machines from the end of last century.

California State Legislation Regarding Voting Machines [12]

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12 Gaylord, History of Election Law, 1961

At the 1897 session, the California Legislature established a state commission for examining, testing and investigating Voting Machines.[13] In Statutes 1897, Chapter 167, section 1 states:

> A special commission of three persons is hereby created for the purpose of examining, investigating, and testing voting machines, and reporting... Such commission shall consist of three persons, who shall not be members of the same political party, to be appointed by the Governor.

This Commission first met in San Francisco, May 21, 1897. In its report to the Governor dated November 15, 1898, it stated that it had notified 65 voting machine inventors and had received 38 replies.[14]

In 1901, the Legislature proposed[15] the addition of Section 6 to Article II of the State Constitution permitting the Legislature to "provide that mechanical devices may be used within designated subdivisions of the state at the option of the local authority indicated by the Legislature for that purpose."

The people adopted this legislative constitutional amendment on November 4, 1902.[16] Proposition 6: Elections Provision for Adoption of Mechanical Voting Devices passed by 83,966 votes (66.07%). The next year the Legislature adjusted the required members of the Commission on Voting Machines.[17] The Statutes 1903, Chapter 226 added to Chapter 167 that "The governor, secretary of state and attorney-general, and their successors in office are hereby created and constituted the state commission on

13 Stats.1897,c. 167, p. 222

14 Report of the Commission for the purpose of examining, testing and investigating voting machines, to the Senate and Assembly thirty-third session of the Legislature of the state of California. Enquirer Publishing Company, Oakland, 1898.

15 Stats.1901, Resolutions c. 41, page 960.

16 November 4, 1902, Proposition 6: Elections—Provision for Adoption of Mechanical Voting Devices (Legislative Constitutional Amendment). Yes 83,966 (66.07%); No 43,127 (33.93%).

17 Stats.1903, c. 226, p. 262.

voting or ballot machines." The same officers had remained in the Commission until the code was repealed in 1984.

San Francisco was the first city in California to use voting machines in 1904. The following year, all elections were conducted by voting machines in San Francisco. In a severe fire in 1906, most of the voting machines in the city were destroyed. Therefore, manufacturers offered the city a loan for the needed voting machines in the elections that year, as Zuckerman describes, "... to make possible the conduct of the 1906 elections in the same fashion" (36).

Fraud or error was found in the use of voting machines in these elections. As Zuckerman notes, "... the Grand Jury having found that some of the counters had already registered some voters at the opening of the polls" (36). San Francisco discontinued the use of voting machines after the 1906 elections and in 1921 the act was repealed.[18] The law was amended in 1907 so as to permit legislative committees to ascertain the votes cast and the mechanical working of the machines.[19] At the same session of 1907 the Legislature also passed a separate act providing that the county clerk should notify political parties and independent candidates and in their presence inspect and then seal the voting machines which were then to remain sealed until Election Day.[20] Statues 1907, Section 2 states:

> representatives are invited to attend, to observe the final adjustment, testing and sealing of such voting machines... and to see that the said machines are set at zero, and without any vote registered thereon for the advantage of any party or candidate or other wise. When the said machines are so sealed they shall not be unsealed again, except by the precinct election board on the day

18 Stats 1921, c. 525, p. 828.
19 Stats 1907, c. 342, p. 644.
20 Stats 1907, c. 343, p. 647.

> of election and except for trial as to their correctness after transportation to the various booths or polling places...

Statues 1907, Section 12 continues to define the timing of sealing:

> The inspectors of election shall, as soon as the result is fully ascertained and declared, as in the preceding section required, lock the machine so that the record of each election shall be preserved for the period of six months following such election, except in cases where the machine is required for use in a subsequent election during such period...

Other amendments of minor importance to the act were made at the 1907 session,[21] in 1911, both at the regular session[22] and at the special session,[23] and in 1913.[24]

San Francisco conducted its next election and all the following elections by voting machine (Zuckerman 36). A new act was adopted in 1923.[25] Some cities like Pasadena and Oakland, as well as counties like Los Angeles and Sacramento, have also used and discarded voting machines for various reasons (Zuckerman 36).

In 1928, Los Angeles County started its first use of voting machines in some precincts in the general elections. In 1932, one hundred fifty machines were used for the Presidential Primary in the county. Nevertheless, Los Angeles County canceled its use of voting machines due to the length of the ballot after its general elections in 1952.

In 1953, the Legislature permitted voting by marking the ballot with a special pencil readable by electronic readers.[26] Statues 1955, Section !.5. amended[27]:

> in any county where electronically operated machines are used for counting the ballots, as to any election the marking of the ballots shall be done with a specially prepared pencil which will mark the ballot with a substance such that an electronic tabulator will register the vote. In lieu of the canvass at the polls, the ballots shall be transmitted to a central canvassing place where the

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[21] Stats.1907, c.228, p.288.
[22] Stats.1911, c.492, p.980.
[23] Stats.1911, Ex.Sess.c.61, p.244.
[24] Stats.1913, c.341, p.691.
[25] Stats.1923, c.96, p.182.
[26] Stats.1953, c.1046, p.2514.
[27] Stats.1955, c.229, p.691; 1955, c.1378, p.2472.

> vote shall be counted and tabulated by electronically operated machines devised for that purpose.

In 1957, both the above amendments and the amendment added in 1949 which permitted punch card voting, were repealed.[28] In that same year the Legislature expanded the use of mechanical, electrical or electromechanical tabulating ballots from counties with thirty or more Assembly Districts (Los Angeles)[29] to any county electing the system.[30]

In 1959, the Legislature changed the name of "State Commission on Voting Machines" by adding the words "and Vote Tabulating Devices."[31] The Statues 1959, Chapter 1585, Section 1 states:

> The Governor, Secretary of State, and Attorney General, and their successors in office are the State Commission on Voting machines and Voting Tabulating Devices. Any reference in the law to the State Commission on Vote Machines shall be construed to refer to the State Commission on Voting Machines and Vote Tabulating Devices. The Governor shall be chairman and the Secretary of State shall be secretary of the commission.

The Commission was called "State Commission on Voting Machines and Vote Tabulating Devices."

In Statues 1959, Section 6807.5 defines the procedure for electronic and electromechanical tabulation of ballots:

> The State Commission on Voting Machines shall prescribe the procedure to be followed in tabulating ballots by means of any type of mechanical, electrical, electromechanical or electronic tabulating device approved by it... The procedure shall be devised to insure accuracy in tabulation.

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[28] Stats.1957, c. 1942, p. 3476.
[29] Stats.1957, c. 1290, p. 2610.
[30] Stats.1959, c. 358, p. 2279. The Chapter also was amended by 1959, c. 1158, p. 3250. It is now Chapter 7 (beginning with Section 15400) of Division 9 of the 1961 Elections Code.
[31] Amending Section 6150 of 1939 Elections Code, by Stats.1959, c. 1585, p. 3915, now Section 14970.

In the same act, it also provided that prior to giving its decision on a machine the Commission shall hold a public hearing.[32] In 1961 the Legislature again provided for punch card voting[33] to be adopted at the option of the election board (i. e. Board of Supervisors, City Council, or similar body).[34] In 1961, the Legislature required every county clerk in a county using voting machines or vote tabulating devices to examine the machines or devices at least once every two years, and permitted the commission to re-examine machines or devices which it had approved.[35]

In 1982, the responsibility of approving voting systems was shifted to the Secretary of State from the "State Commission of Voting Machines and Voting Tabulating Devices." Due to the need for technical expertise in actual examination of voting machines, and the fact that no previous acts had obligated the members of the commission to personally examine the machines, Statues 1982, Chapter 1190 abolished the "State Commission of Voting Machines and Voting Tabulating Devices," which originally consisted of the Governor, the Attorney General and the Secretary of the State. The Commission's function was transferred to the Secretary of State. The Secretary of State has established the Voting Systems and Procedures Panel to review proposals and to make suggestions. The Panel functions in a similar way as the Commission did, but the Secretary of State instead is the decision-making authority.

## VOTING MACHINES

The development of voting machines has come a long way with the demand of democracy, as addressed in the first section of the article. In 1869, Thomas A. Edison

[32] Adding Section 5169 to 1939 Elections Code, by Stats.1959, c. 1585, p. 3915, now Section 14980.
[33] Chapter 8 added to Division 9 of the Elections Code by Stats.1961, c.547.
[34] Section 44 of the Elections Code.

designed the first machine that recorded congressional votes. In 1888, Jacob Myers created the first voting and vote count machine for public use. In 1892, Lockport, New York conducted the first elections in the United States using a mechanical voting machine: Automatic Voting Machine.

California has implemented three voting systems: 1) lever machines, 2) mark sense/optical scan voting systems, and 3) punch card systems. No county in California has yet conducted any elections by Direct Record Electronic (DRE) computer voting system (up to early 1999). In the following section, I would like to introduce each system, different machines within a system, comparison and contrast of models by different companies, as well as the advantages and disadvantages of the systems.

Lever Machines

Lever machines are large metal units, which combine the ballot and counting mechanism. The ballot is a fixed part of the machine. Voters cast a ballot by pushing down a lever over the name/choice on the ballot. After completing the voting, voters move a master lever, which records the vote within the machine and also returns other levers to the original voting position. After the polls close, election officials open the back of each machine and record the vote count. The machines have interlocking devices, which prevent voting for more than one candidate or for the parties to which the voter is not entitled to cast a ballot, even though such parties may appear on the ballot.

There are two primary types of lever voting machines: Automatic Voting Machine (AVM) and the Shoup voting machine. The Automatic Voting Machine was invented

[35] Stats.1961, c.1775.

by Jacob Myers in 1888 and was first used in Lockport, New York in 1892. Myers, a safe maker, who "determined to use his specialized knowledge to stop election fraud,"[36] initiated the Automatic Voting Machine Corporation to manufacture the new invention in 1898.

AVM presents a ballot listing the offices and names of candidates horizontally. Each party's candidates are listed on its own line. Internal counters are connected with each lever through straps in the back of the machine. As each vote is cast, the counter records one vote in the corresponding position. At the end of the voting, the counters are read and the totals are manually recorded on a tally sheet. AVM also has a Printomatic "Printer Pak" which embosses the figures on the back of the machine simultaneously onto the tally sheet as the machine is opened. The advantage is time efficiency and error avoidance in miscounting the numbers. The following is a table showing the time of invention of all kinds of voting machines, their first use in California and their time of popularity.

[36] Describe, Analyze, and Compare the Currently Available Methods of Vote Counting Equipment and to Make Appropriate Recommendations. 1-28.

Table 3: Time of Invention and Implementation of Voting Machines in California:

| Machines | Time of Invention | First use in CA | Time of popularity |
|---|---|---|---|
| Lever AVM | 1888 by Myers | 1904 San Francisco | 1920 to mid 1970's |
| Shoup lever | 1905 by Shoup | | |
| Mark sense/Optical | 1960 Norden corp. | | 1965-1990's |
| Coleman scan | Same | 1962 Kern | 1964-1984 in Orange |
| Votronic scan | | 1964 Sacramento and San Diego | 1970-1980 |
| Punch Card | 1960 by Coyle | Only in Ohio | |
| Votomatic | 1962 by Harris | 1964 Monterey | 1970's to present |
| Datavote | 1970 by Diamond corp. | 1966 Ventura | Late 1980's until today |
| Pollstar | 1985 Stevens | 1992 Sacramento San Bernardino | 1990's |

The following is a table of the comparison and contrast of different voting systems used in California.

Table 4: Comparison and Contrast of Major Voting Machines:

| Voting Systems | Brands | Strengths | Weakness |
|---|---|---|---|
| Lever Machines | *AVM<br>* Shoup | 1. no need to distribute and count ballots | 1. no audit trail to record events during the voting<br>2. long waiting lines |
| Optical scan/ Mark Sense | *Coleman<br>*Votronic | 1. audit trail<br>2. little wait time | 1. ambiguous marks<br>2. extreme carefulness |
| Punch Card | * Coyle | 1. audit trail | |
| | * Votomatic | 1. one-card ballot: no need to buy extra readers<br>2. little wait time | 1. hanging chad problems<br>2. no overvote protection<br>3. no names on the ballot |
| | * Datavote/ Accuvote | 1. use of hole puncher: avoid the hanging chad issue in Votomatic<br>2. names on the ballot to match better | 1. several pages of ballot: more card readers needed |
| | *Pollstar | 1. one-card ballot as Votomatic<br>2. better match of names than Votomatic | 1. difficulties to translate horizontal layout to vertical format |

## The Shoup

Twelve years after the lever machine was first used, Samuel R. Shoup followed the path of Myers and created a similar lever machine. Shoup organized the principal rival to A.V.M., the Shoup Voting Machine Corporation in 1905 (Dugger 165). The Shoup voting machine is different from the AVM in its vertical arrangement of the ballot, which is capable of listing 10 columns with a maximum of 50 names each. The counters face the front of the machine so that the precinct officials can read the counters quickly and record them accurately onto a tally sheet. The Shoup does not have a Printomatic feature.

## Prevalence of Lever Machines

By 1928, one of every six American voters used a lever machine: either A.V.M. or Shoup[37] and by the early 1960's the lever machine was the predominant form of voting within the United States.[38]

## Advantages and Disadvantages of Lever Machines:

There are at least three positives of the lever machines. The first one is that there is no need to handle, distribute or count ballots. The second one is the prevention of overvotes because of the machine set-up. The third advantage is that the precinct site limits the impact of a single machine fraud.

There are also several negatives related to lever machines. To begin with, lever machines, though recording the sum of the votes, do not have an audit trail or a manual recount to record individual votes. In addition, it is not easy to detect failure in

[37] Describe, Analyze, and Compare the Currently Available Methods of Vote Counting Equipment and to Make Appropriate Recommendations GAO Report, October 1974:46.
[38] Ibid.

counting for reliability tracing. Moreover, it is difficult to set up, store, and back up the voting machines. Also, it requires tremendous efforts to test the machines in quantities. Finally, the write-in mechanism on the machine is difficult to use.[39]

**Comparison of AVM and Shoup:**

AVM had been used by the city of Pasadena, the counties of San Francisco, Stanislaus, Calaveras, Colusa, Del Norte, Madera, Merced, Plumas, San Benito, and Tuolumne for a long period of time ( in some cases more than 30 years). Shoup voting machines were used by San Luis Obispo and San Mateo for more than two decades. The major difference between AVM and Shoup is the arrangement of candidates' names and the offices on the machines. AVM is horizontal, thus the number of candidates will affect the arrangement of the next race. On the other hand, Shoup is vertical. Therefore, the number of candidates above or below does not influence the layout of the ballot. The arrangement of AVM causes variance with the candidates in offices. The second difference is the capacity of the two systems. Resulting from the variance of candidates and offices, AVM could not offer the maximal possible space as Shoup could. Other than these differences, AVM and Shoup are quite similar.

To conclude the section of lever machines, the common advantages of AVM and Shoup include 1) secrecy of the ballot, 2) overvote protection, 3) speed of tally, and 4) accuracy and conclusiveness of the count (Zuckerman 47). Meanwhile, three disadvantages of lever machines are 1) difficulties to use, 2) long waiting time, 3) being costly (Zuckerman 6 and 65).

[39] Saltman. "Accuracy, Integrity And Security in Computer Voting with Emphasis on Federal Elections." 25.

## Optical scan/mark sense voting system

In the late 1950's, Los Angeles, with a rapidly growing population, contracted with the Norden Division of United Aircraft for one million dollars to develop an easier and faster way to count the ballots. Norden invented the second type of voting machine: optical scan/mark. Optical scan/mark sense voting systems are designed for the use of a pencil or special pen to color in the voter's selection or mark a certain area on the ballot. After voting is done for the day, all ballots are sent to a central tallying station where optical scan readers read them. On December 14, 1960, the Director of Motor Vehicles in Los Angeles, representing the Commission of Voting Machines and Vote Tabulating Devices (the Governor, Deputy attorney and the Secretary of State) held an extensive hearing on the approval of the Norden Vote Tallying Device which had been manufactured for the County of Los Angeles. On January 12, 1961, the Director of Motor Vehicles, another deputy attorney general, and the Secretary of State met at the State Capitol. At this meeting, the Director of Motor Vehicles and the Secretary of State voted to approve the device while the deputy attorney general voted "No." In a letter dated February 9, 1961, the Attorney General questioned the validity of this approval.[40]

L.A. County did not use mark sense/optical scan voting system which it requested Norden to develop, neither did it implement lever machine county-wide due to the length of the ballot. Orange County, however, used the Coleman mark sense/optical scan voting system, originally developed by Norden for L.A. county, for 20 years from 1964 to 1984 before switching to the Datavote punch card voting system in 1986.

Despite the Attorney General's lack of support, the optical scan voting machines gained approval and are still in use today for voting. Beyond voting, this type of choice recorder is often used for academic purposes as a testing tool. When taking a test, filling out an application, or responding to a poll, a student "bubbles" in the circle that corresponds to the correct answer. It is used by a majority of universities and secondary schools as well as testing agencies that administer the SAT, GMAT, GRE, LSAT, CTBS, etc.

## Advantages and Disadvantages of Mark sense/Optical Scan Systems

There are five advantages to optical scan/mark sense voting systems. The first one is that they apply an audit trail to record each individual's vote and every single event during the election process (whether or not the machine has been turned off) for reliability measurement. The second is inclusion of the candidates' names and choices on the ballot. The third is its convenience—the ballots are easy to understand and to use. The fourth is that voters can deposit their own ballot in the precinct located unit. Efficiency is the fifth attribute—little time is wasted in waiting for a place to vote.

The two major disadvantages of the optical scan/mark sense voting system include the required extreme carefulness in ballot layout procedures, and difficulties in ascertaining voters' intentions if a mark is ambiguous. [41]

The optical scan system, created by the Norden Division, was purchased and marketed by the Coleman Company until 1971, at which time Gyrex bought the right

[40] Commented upon in LXXIV Los Angeles Daily Journal of February 21, 1961, No. 37, pp. 1, 4.
[41] Saltman, "Accuracy, Integrity And Security in Computer Voting with Emphasis on Federal Elections", 29

to manufacture and distribute this system.[42] Various companies followed this technology of optical scan and it is now being marketed through Cubic, Control Data Corporation, Optivote, Mark-a-Vote, Optech Eagles, and the AIS 115 and 315 machines.

**Comparison between three major mark-sense/optical scan systems: Coleman, Votronic, and Mark-a-Vote systems**

The Coleman is a paper-based ballot system, using optical scan, developed by Norden aircraft for LA county, but Orange county is the only county in California ever to have used the Coleman system for more than an experiment. Kern county tried it in the general elections of 1964 and the primary elections of 1966, while Contra Costa county used it for the general elections of 1964 and then returned to a hand count system.

The Votronic, a second paper-based optical scan system, develop by Norden, on the other hand, has been more widely used. Alameda, Contra Costa, El Dorado, Glenn, Imperial, Mendocino, Napa, Placer, Riverside, San Diego, Ventura and Yolo counties have used Votronic system at some point. The Coleman and Votronic are almost identical except the size of the ballots and the scanners. The reason why so many counties implemented the Votronic paper ballot system rather than the Coleman is that the Coleman paper ballot and the readers are large and not easy to move to each precinct.

The Mark-a-Vote system is a card-based, rather than paper-based ballot system. It is a more current version of mark-sense/optical scan systems promoted by Business Records Corporation (BRC). Contra Costa changed to Mark-a-Vote in 1982 after using Votronic for 12 years. Santa Barbara, Solano and Lake counties shifted from Votomatic

[42] Describe, Analyze, and Compare the Currently Available Methods of Vote Counting Equipment and to Make Appropriate Recommendations. GAO Report, October 1974: 1-24.

to Mark-a-Vote in 1984 and continue using it today. Sutter county, too, followed up in 1990. The major difference between Mark-a-Vote and Coleman or Votronic is the size of the ballots. The Mark-a-Vote scanner only accepts 3 1/4"x 7 3/8" mark sense ballot cards, the length of standard punch cards.

### Punch Card Systems

In 1960, Martin Coyle invented the third type of voting machine, the punch card. The premise of the punch card machine is that the voter "punches" out his choice on the ballot card with a stylus or other voting tool. Coyle's voting machine was used in some localities of Ohio as early as 1960, but is no longer being manufactured today. Coyle machines were approved for use in California, but were never distributed here.

As early as 1949 the California Legislature provided for the optional use of punch card voting. It required that the State Commission on Voting Machines approve both the cards and the tabulating machines.[43] The number of people currently using the punch card voting system varies from 40 percent of the American population to more than 60 percent. According to Professor Kenneth Warren of St. Louis University, about 60 percent of the US voting population used the punch card system in 1988.[44] While Martin Coyle receives credit for inventing the punch card machine, Joseph Harris is accredited with popularizing and marketing this type of voting system with the creation of the second punch card machine: the Votomatic voting system.

Joseph P. Harris, a professor at the University of California, Berkeley, once worked for AVM, supervising the installation of lever voting machines in 1920's. He was struck

[43] Stats.1949,c.41,p.57.

[44] Youman, Charles, Risks Digest, "More on Missouri Voting Decisions", Volume 6: Issue 4, December 24, 1987, http://catless.ncl.ac.uk/Risks/6.04.html#subj2.

by the weight, cost, complexity of the machine as well as the corruption of politicians in elections (Dugger 45). In the 1930's, he began to construct a mechanical voting machine, based on the principal of the player piano. One votes on Harris's device by pressing keys that make perforations in a paper roll, and the machine would automatically count the perforations and print the results. Harris did not win a patent until 1934 for the project. At this point, Harris offered IBM to develop and market his device, but the company turned him down in 1937 (Dugger 46). Harris had forgotten his own idea of the 1930s until the early 1960's when a former student asked him if he had ever thought of using a standard IBM computer punch card for vote-recording (Dugger 46).

In 1962, Harris envisioned "a computer card in an inexpensive holder with a permanent election 'book' with candidates and issues. (Dugger 51). With the help of William S. Rouveral, Harris began to create a new voting device, named the Votomatic, derived from a shoeshine machine Shine-O-Matic (Dugger 51).

On September 9, 1964, Joseph Harris' Votomatic voting machine was first used in an election in Fulton and DeKalb Counties in Georgia. In 1965, Harris sold the Harris Votomatic to IBM and served as a consultant to the company. In 1969, plagued with bad publicity, IBM decided to sign license agreements with five companies. IBM released the patents to a Votomatic trust, and sold the patent rights to Computer Election Services (CES) in 1972.

A voter uses the Votomatic by inserting a prescored ballot into the top of the voting device. A ballot booklet of candidates' names and issues to be voted is affixed in the voting device. Alongside the choices printed on each page, arrows point to holes that

match numbered rectangles on the underlying card. The voter turns the pages and punches out the rectangles that express his or her choices by a stylus chained to the device (Dugger 54). The completed ballot is then placed in a ballot envelope, which will be dropped in the ballot box.[45] If the voter chooses to vote write-in, they simply need to write the names on the outside of the ballot.

### Counties using Votomatic

Votomatic systems have been used by many counties in California, but have been replaced later by other systems in some counties for various reasons. Monterey county shifted to Datavote in 1976 after using Votomatic for 12 years. Santa Barbara changed to Mark-a-Vote (DFM) mark sense/optical scan system in the 1982 general elections. Solano county, too, changed to Mark-a-Vote in 1984 after using Votomatic for 16 years. Santa Cruz started to use Datavote in 1984 after using Votomatic for 12 years. A total of thirteen counties had changed from Votomatic to other systems. In the general elections of 1980, 22 counties in California used Votomatic systems. However, in 1996 general elections, the number of the counties using Votomatic dropped to 9. These nine counties still using Votomatic were larger counties, including Alameda, Fresno, Los Angeles, San Diego and San Francisco.

### Advantages and Disadvantages of Votomatic

The advantages of Votomatic are similar to the original punch card. It has an audit trail to record each individual vote and event to allow a reliability check. Little waiting time is spent at polling places, compared to the lever machines. Typically only one ballot is needed per voter. No extra readers are required to finish card reading before deadline.

[45] Describe, Analyze, and Compare the Currently Available Methods of Vote Counting Equipment and to Make Appropriate Recommendations. GAO

While it is difficult to determine the primary reasons underlying a county decision to continue or discontinue a voting system, there are four weaknesses of Votomatic systems. To start with, the "hanging chad" issue is one of the major problems of Votomatic punch card voting. Hanging chad is a situation when the prescored holes are only partially punched out, without being noticed by the voters. Voters intent is thus difficult to determine. According to voting consultant Robert J. Naegele's interview with the San Francisco Examiner, the problem of hanging chad "has not been insignificant"[46] and at time causes inaccuracy in vote counting.

Another problem with the Votomatic is the lack of overvote/undervote prevention and the possibility for fraud. Unlike lever machines, Votomatic systems are not designed to avoid voters from "overvoting"—voting for more candidates than one should. An example is the 1984 general election in Ohio. About 137,000 among 4.7 million voters did not cast valid ballots for President, primarily because of overvote, according to the Ohio's Secretary of State (Dugger 2).

In addition, the fact that there are no candidate names on the Votomatic prescored ballots could compound the problem. The names of the candidates are printed, instead, in the booklet attached to the machines to save space so that the ballot could remain one card for card-reading efficiency. Since card readers in the past were extremely costly, the one-card ballot system requires no extra card readers to finish card reading on election night. Overvotes and undervotes may happen when voters miss the right hole and punch a hole in a wrong race.

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Report, October 1974: 1-23.

[46] Gordon, Rachel. "Invitation to test new voting machines." 27 Nov 97, 4A.

Moreover, the possibility of overvote makes Votomatic fraud-prone in that if an election official, were to be dishonest, he or she could vote one more time to invalidate the correctly punched ballots or vote on the offices that voters did not vote, as Dugger points out (2-3). In view of this, the Federal Election Commission (FEC) hired Robert J. Naegele, the State of California's chief exert in certifying voting systems and the president of a computer consulting company, to rewrite the national standards for computerized vote-counting equipment and programs (Dugger 2). California law also includes multiple securities against fraud of this kind.

In short, while Votomatic provides an audit trail and is economical in card reading equipment, it also has some disadvantages. First of all, for hanging chad, the punched out holes might still be attached to the ballot by one or two sides. This might create difficulty in reading the ballots. In addition, it does not have overvote protection. Thirdly, candidates' names are not listed on the ballot. Voters might be confused about which holes correspond to which candidates. Finally, the write-in process is indirect.[47]

### Other Punch Card Systems: Datavote and Accuvote

In 1970, similar machines were created by the Graphic Arts Division of Diamond International Corporation and a division of Litton Industries, Carlisle-Graphics. These machines were named **Datavote** and **Accuvote**. They differ from the Votomatic system in that the candidates and propositions are printed directly on the punch card ballot and that the ballot card is not pre-scored.

A voter uses this system by placing a ballot on a holding tray, moving the punch unit to position it over X corresponding with the desired selection, and depressing the

punch unit which punches a hole in the card. Write-in votes are accomplished by punching the X beside the blank position and writing in the candidates' names.[48]

Most of the positives to the Datavote and Accuvote punch card system are similar to Votomatic punch card system. The ballots in Datavote and Accuvote allow an audit trail to trace all the votes. The ballots are easy to understand. Voters deposit their own ballot in a precinct located ballot box. Voters do not need to wait to vote.

Two differences from Votomatic are the print of candidate names and choices on the ballot, as well as the prevention of voter ambiguity by the use of a hole puncher.[49]

There are also some negatives to Datavote and Accuvote punch card systems. In addition to the need to account for the ballots carefully, the limited space on the ballot card would also require more than one card, which may lead to voter confusion.

In the mid 1980's, another punch card system, Pollstar, was created by Dick Stevens. This machine is a hybrid of the Votomatic punch card system, with a "vote by numbers" approach. By increasing the number of voting positions, the pollstar design mitigates the size restriction of Votomatic. Pollstar was first used in San Bernardino and Sacramento counties in 1992.

### Absentee Voting and Mail Voting

In addition to using voting machines, California law permits absentee voting or vote by mail. Absentee voting or vote by mail is a voting option that allows a registered voter to request, receive, and mail back a ballot to their county election officials or drop

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[47] Saltman. "Accuracy, Integrity And Security in Computer Voting with Emphasis on Federal Elections." 32.
[48] Describe, Analyze, and Compare the Currently Available Methods of Vote Counting Equipment and to Make Appropriate Recommendations. GAO Report, October 1974: 1-23.
[49] Saltman. "Accuracy, Integrity And Security in Computer Voting with Emphasis on Federal Elections." 31.

it in a specified drop box, instead of voting at a polling place. The earliest notion of absentee voting dates back to 1647 in the Massachusetts colony. According to a colonial legislative action, eligible voters who remained at home could send their votes to the court of elections on open papers or papers folded twice.[50]

The first occurrence of absentee voting in a California election dates back to the American Civil War, when the Legislature enacted a law stating that soldiers could vote from where they were stationed. California soldiers making up Company A, Second Massachusetts Cavalry took advantage of this law and in 1863 cast absentee ballots in Centreville, Virginia. After they had voted, the ballots were mailed home to the California Secretary of State, where they were counted and recorded.[51]

Currently in California, absentee voting is open to more than soldiers stationed out of the state. It is a system of voting that is open to all registered voters, if they request an absentee ballot from the county in which they are registered. In addition, the Legislative has authorized experimental all mail elections in Monterey, San Diego and Stanislaus County. Alpine County regularly holds all mail ballot elections due to the small population and wide area of that particular county.

The California Legislature allowed an experimental all mail election for Stanislaus and Placer County through the passage of a 1992 statute. Stanislaus chose to participate in this all mail experiment and did so in the November 1993 statewide special election. Of the 180,000 voters who participated in this special election, turnout was 44.2%, which was 16.2% higher than the state average. In contrast, voter turnout in previous

[50] Grolier on-line, American Presidency, Ballot http//www.grolier.com/presidents/ea/side/votemchn.html
[51] California Statement of Vote 1992, by Secretary of the State, back

elections was consistently lower than the state average. Also, by using this type of system, the county claims to have saved $200,000 in election costs.[52]

In response to the all mail ballot program, Stanislaus County Clerk Karen Mathews found the process was "more convenient to the voters, improved voter turnout, reduced election costs, and did not result in a higher incidence of fraud." She claimed that "the all mail election had not one incident of voter fraud," though the mail system would increase voter fraud, proven by the fact that 1992 General Election had four incidents of voter fraud.[53]

### Other States Using Mail Elections

Oregon, Florida, and Colorado are extremely interested in broadening vote by mail campaigns to more than experiments. Oregon Secretary of State Phil Keisling stated that the debate over mail elections in Oregon is virtually over with statistics showing that 36% of Oregon voters now vote by absentee ballot in polling place elections and that in the November 1996 General election, 50% of the ballots were voted absentee.[54] Through mail elections, Oregon consistently saves about 30-50% of what an average polling place election costs.[55] Secretary of State Keisling is currently attempting to make all elections mail and has proposed bills in the Oregon Legislature that would expand vote-by-mail to all primary and general elections.

Professors Traugott and Mason of the University of Michigan conducted phone interviews that focused on political attitudes and behaviors of 1,483 Oregon residents six weeks after the January 1996 election to fill the US Senate seat.

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[52] Seiler Report. "Stanislaus Election Official Submits Report on Mail Ballot Election Pilot Program." November 18, 94:6.
[53] Ibid.
[54] Seiler Report. "Election Administrators and Academics Analyze Mail Ballot Election Experiments." August 31, 96:3.

Of those who were questioned: 55% preferred voting by mail, 28% had no preference, and 17% preferred going to the polls. Regarding what they would like to see in future elections: 61% prefer vote by mail, 23% have no preference, and 15% prefer going to the polls. Most, 79%, said voting by mail is more convenient. Election official preference was allocated as: 74% stating vote by mail is more convenient; 100% said vote by mail is less expensive; 89% said polling place elections pose extra burdens; and 23% saying that there were extra burdens in mail elections.[56]

Fort Collins, Colorado conducted a similar vote by mail election in April of 1995. The turnout was placed at 42 percent with a total of 22,489 votes being cast. Positive outcomes that were noticed by the City Clerk included the increased voter turnout, compliance with ADA requirements, elimination of the need to train and manage election poll workers, and reduction of worries about insurance coverage.[57]

California: Current Voting Systems

The following is the current voting situation in California by mark sense/optical scan voting systems and punch card systems. According to Deborah Seiler by 1994, 44% of American voters were using voting equipment which does not rely on computers to tally the votes while 56% were using voting equipment which does rely on computerized vote counting. The percentages breakdown further with the number of voters using specific machines being: 11% paper ballots, 33% lever machines, 40% the Votomatic punch card, 4% the Datavote punch card, 8% Mark Sense, and 4% the DRE

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[55] Ibid, 7.
[56] Seiler Report "Election Administrators and Academics Analyze Mail Ballot Election Experiments" August 31, 9&3.
[57] Azari, Ann. "City of Fort Collins- Mail Ballot Elections."
http://www.clearlake.ibm.com/Alliance/newstuff/mayors/fortcoll.com.

system.[58] In 1993, the percentage of voters using compute-reliant equipment rose to about 60%.

The following is a table of all the voting systems being used in the general elections of 1996 in California.

Table 5: Voting systems in the 1996 general election

| Name of the voting system | Percentage of counties using this system | Percentage of voters using this system |
|---|---|---|
| Punch Card System | 70.69% | 80.9% |
| Datavote | 48.28% | 19.9% |
| Votomatic | 15.51% | 43.6% |
| Pollstar | 5.15% | 13.8% |
| Accuvote | 1.72% | 3.6% |
| Mark Sense/Optical Scan | 29.31% | 19.1% |
| Mark-a-Vote | 20.69% | 15.7% |
| AIS | 5.17% | 1.0% |
| BRC | 3.45% | 2.4% |
| Lever: AVM/ Shoup | 0% | 0.0% |

California no longer used lever machines after the 1994 general elections. Merced county had used AVM voting machines until the 1994 primary elections, while all the other counties were using either mark sense/optical scan systems or punch card voting

[58] Saltman. "Accuracy, Integrity And Security In Computer Voting With Emphasis On Federal Elections." 11.

systems. Currently, the most common type of voting systems is the punch card system. Among the punch card voting systems, the Datavote punch card voting system is the most common used type of system in the general elections of 1996, sharing 48.28% of all county voting systems, based on the information from the Statement of the Vote, 1996. Votomatic is the next, sharing 15.52%. However, as a percentage of voters, only 20% use the Datavote system, compared to 44% using Votomatic.

According to the November 1996 Statement of the Vote,[59] there were 41 counties (70.69%) using punching card systems: 28 counties (48.28% ) using Datavote, 9 counties (15.52%) using Votomatic, 3 counties using Pollstar ( 5.12%) and 1 county using Accuvote (1.72%). Mark Sense/Optical Scan systems share 29.31% of the market: 12 counties (20.69%) using Mark-a-Vote, 3 counties using AIS (5.17%), and 2 counties (3.45%) using BRC mark sense/ optical scan system.

Among 41 counties using punch card systems in California, 28 counties used Datavote punch card system, including Monterey, San Luis Obispo, and Sierra.

Mark-a-Vote mark sense/ optical scan system is the second popular, being used in 12 counties, including Contra Costa, San Joaquin, and Sonoma.

Votomatic punch card system is next, with 9 large counties like Los Angeles and San Francisco using it.

Pollstar punch card system is used by 3 counties: Sacramento, San Bernardino, and Santa Clara. Likewise, AIS mark sense/ optical system are used by 3 counties: Nevada, Merced, and Tuolumne. BRC Mark sense system are used by 2 counties: Amador and San Mateo. Accuvote is used by Humboldt.

According to Ian Michael Shamos, the primary functions of electronic voting systems are to capture voter preferences reliably and report them accurately, while giving utmost concern to the secrecy of a voter's ballot.[60] However, as with most things, computer-voting systems are not perfect. Problems associated with computerized voting machines are typically attributable to the unreliability and difficulty of the programs, a lack of administrative control, the confusion of ballots, the overwork and under-training of election officials, and an over-reliance on computer experts to operate the machines rather than the election officials.[61]

California: Future Voting Systems

Many counties and states are looking for new and more advanced voting systems. In addition to mail voting, there are some other potential systems for California including: 1) DRE computerized voting system, 2) voting by phone, 3) faxing ballots, 4) voting on-line at home or through an ATM like terminal, voting via e-mail, 5) using interactive TV, or using the lottery system as a basis for a voting system.[62]

Direct Recording Electronic Computerized voting machine (DRE)

The most recently developed voting machine is the Direct Recording Electronic machine (DRE). It operates on the same premise as the lever machine. A voter votes on a giant ballot, which is printed on the front of the machine, which automatically computes all votes after the registration. The use of a touch screen/panel is the primary difference between DRE and lever machines. Instead of pulling levers, the voter either

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[59] California Statement of Vote, by Secretary of the State, November 5, 1996 p. xi.

[60] Shamos "Accuracy, Integrity And Security In Computer Voting With Emphasis On Federal Elections" 11.

[61] Ihde, Use of Computerized Vote Counting "What are the Technical Risks in Computerized Vote Counting", June 6, 1996, http://www.se.stanford.edu/class/cs201/current/Projects/electronic-vote-counting/index.html.

pushes a button that is located right next to a vote preference and candidates, or uses a light pen to show preference by touching the appropriate area of the screen that matches the voting choice.

### Advantages and Disadvantages of DRE

The DRE shares some other potential positives and negatives of lever machines. First, as with the lever machine, a DRE eliminates the need to print, distribute and count ballots. Secondly, it also prevents overvotes. Thirdly, DREs have the advantage of ease of use with computerized touch screens. Fourthly, unlike the Votomatic punch card system, DREs do not have the potential problem of clearly illuminating for the voter the correspondence between his or her vote choice and where that choice is indicated on the ballot.

DRE systems also have some potential disadvantages. First, like lever machines, DREs provide no audit trail or a manual recount. Secondly, DREs can be extremely expensive. Thirdly, pollworker training is required for operation and the write-in function. Fourthly, some people question the reliability of the computer programs. The DRE system is currently being used in New York and Florida. A DRE system has just been approved in California in 1998.

### Vote by phone

Voting by phone is a popular idea that many people see as a more convenient way to vote and a tool to increase voter turnout. In September of 1992, Nova Scotia's Liberal party had a vote by phone election to choose a new party leader. The first attempt of voting by phone in this election created such a response that the main computer was

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[62] Shamos "Accuracy, Integrity And Security In Computer Voting With Emphasis On Federal Elections." 11.

overloaded and cut off most calls. Two weeks after the first attempt, computer problems were solved and a new party leader was elected in a new vote by phone election. According to a Wall Street Journal report, four times as many voters participated in the phone voting as compared to previous conventions.[63]

The primary concerns, with regards to a phone voting system, are the large amount of security issues that must be first solved, including: [64]

- Secrecy and confidentiality of choices and sender identification
- lack of an audit trail, which allows manual recount
- Non user-friendliness for long ballots, e.g. California's general election ballot that includes federal, state, county, city offices, and numerous propositions
- proof of identity
- accounting and accountability
- secure against malicious mischief
- reliability

Other potential problems with voting by phone include: insufficient fiber optic systems to handle the high volume of telephone calls placed into electronic databases, difficulties in conducting recounts in contested elections, and potential lack of voter acceptance.[65]

Roy G. Saltman, a member of the National Institute of Standards and Technology, states in a report[66] that phone voting acceptance will rely on "voter friendliness, ability

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[63] Seiler Report. "Telephone Voting Efforts Achieve Mixed Results." 1.
[64] Saltman. "Vote-by-Phone Promises and Pitfall." 2-3.
[65] Seiler Reports. "Election Officials Take a Peek at the Future of Election Technology." October 5, 1996: 6
[66] Saltman. The Third Conference on Computer Freedom and Privacy: "Assuring Accuracy, Integrity, and Security in National Elections- The Role of the U.S. Congress." March 1993.

to attract additional voter participation (over current methods), cost effectiveness, and security."

The following is a table of comparison of possible future voting systems.

**Table 6: Potential Future Voting Systems:**

| System name | Strengths | Weaknesses |
|---|---|---|
| DRE<br>Computer | 1. touch screen panel:<br>no need to count ballots<br><br>2. overvote protection<br><br>3. little wait time | 1. costly<br><br>2. the need of training for operation and write-in |
| Mail voting | 1. higher turnout<br>2. less expensive | 1. identification<br>2. need to update registered voters |
| Voting by Phone | 1. easy access | 1. confidentiality<br>2. identification of sender<br>3. identification of voters |
| Faxing | 1. effective for voters in military or abroad | 1. confidentiality<br>2. identification of voters<br>3. fax machines required |
| Voting by computer Internet/e-mail/smart card | 1. convenience for people with computer access | 1. confidentiality<br>2. identification of voters<br>3. Availability |
| Interactive TV | 1. Greater interest | Same as above |

### Faxing votes

Faxing voted ballots to elections officials is an idea that originated as a way to make voting for American military and civilians living abroad easier to transact. Problems with this system are similar to that of voting by phone.

### Voting by Computer

The increasingly widespread availability of personal computers has created the potential option of voting by computer online, through an ATM terminal with a "smartcard" [67], by e-mail, or by interactive TV. These types of systems would advance the present voting systems technologically, but there are potentially significant security problems with personal computer use systems: confidentiality, integrity, and availability.

In addition, the cost-effectiveness of modem-related computer voting systems needs to be examined due to the fact that elections are held at a maximum of twice a year and that modems and computers are still not universal home appliances. In the continuing search for new voting systems, counties are looking not only at the security and integrity of the machines, but are also concerned with the availability of resources both to develop and purchase a new voting system technology. Bob Naegele, a consultant with the California Secretary of State's office, has expressed apprehension about the future of voting machine technology. He noted in a 1991 speech to election officials, that past innovation in voting systems technology depended upon the defense/aerospace programs for its economic and intellectual base. There might be a limitation in

[67] Saltman. "Accuracy, Integrity And Security In Computer Voting With Emphasis On Federal Elections" 12

advancing election technology due to reduced defense research budgets in the 21st century.[68]

Beyond limited defense budgets, another barrier to advances in election technology is simple economics. Voting systems have a limited market and profits may not be promising in view of the costs of research and development. Thus, many companies with the capabilities of creating new systems have simply avoided developing and marketing a new voting system. One possible solution addressed by election officials may be the creation of a partnership with a university for assistance in research and development, or for example:[69]

- photo and signature identification downloaded to polling places;
- automated fingerprints;
- cryptographic based digital signatures;
- voter identification accomplished by voice, fingerprint, or signature verification; and audio-tactile interfaces.

Technological problems can be solved by technology. Other issues include reliability, accuracy, public acceptance, security and cost-effectiveness.

## Conclusion

In conclusion, the history of voting systems in California has been marked by increased use of technology, as it became available, moving from hand counts to lever machines to mark sense/optical scan to punch card systems and finally now to DRE and other computer-involved voting systems. As we have seen, no voting system is perfect. Every voting system has its own strengths and weaknesses. The size of each county may

[68] Seiler Reports. "Telephone Voting Efforts Achieve Mixed Results." September 4, 1992: 1.

be the primary reason for choosing among the different voting systems. Major counties like Los Angeles, San Francisco, and Fresno continue to use the Votomatic punch card system, recognizing the high cost of replacing the system. Each system has advanced the voting process in some way. Lever machines overcame paper-ballot vote-count inaccuracy; mark sense/optical scan systems overcame the costly no audit-trail lever machines; the Votomatic punch card systems overcame the ambiguity of mark sense/optical scan reading and the lever's long wait time; Datavote overcame the Votomatic's hanging chad issue and its lack of overvote protection; DREs overcame the Votomatic's hanging chad issue and Datavote's need of handling and counting punch card ballots. Voting machines have come a long way since the 1871 Vallejo tapeworm ballot event to the approval of DRE computer voting machines in 1998. Given the history of voting systems in California, we as California citizens ought to cherish the precious opportunity to vote, with whatever form of voting and vote-counting devices.

[69] Seiler Reports "Taskforce Examines Future of Voting Systems." February 29, 1996: 9.

## Appendix 1: Voting Systems Used in each County in California from 1960 to present

Description of the Codes used in Tables:

| Voting Systems | Codes | Names |
|---|---|---|
| Human Counting | HC | Hand Count |
| Lever | AVM | Automatic Voting Machines |
| | Shoup | Shoup Voting Machine |
| Mark Sense/Optical Scan | Cole<br>ATS | Coleman paper scanner |
| | Votr | Votronic paper scanner |
| | DFM | Mark-A-Vote mark sense ballot |
| Mark sense/optical | DIMS | Optivote mark sense ballot |
| | BRC | BRC Optech |
| | AIS | AIS Optical scan system |
| Punch Card system | Vot | Votomatic pre-scored ballot |
| | DV | Datavote pre-scored ballot |
| | AccuV | Global AccuVote |
| | PS | Pollstar |

Table One: 1960-1968

| County | 1960 Prim | 1960 Gen | 1962 Prim | 1962 Gen | 1964 Prim | 1964 Gen | 1966 Prim | 1966 Gen | 1968 Prim | 1968 Gen |
|---|---|---|---|---|---|---|---|---|---|---|
| Alameda | HC | HC | HC | HC | HC | HC | Votr | Votr | Votr | Votr |
| Alpine | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Amador | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Butte | HC | HC | HC | HC | HC | HC | HC | Vot | Vot | Vot |
| Calaveras | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Colusa | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Contra Costa | HC | HC | HC | HC | HC | Cole | HC | HC | Votr | Votr |
| Del Norte | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| El Dorado | HC | HC | HC | HC | HC | HC | HC | HC | HC | Votr |
| Fresno | HC | HC | HC | HC | HC | HC | HC | HC | Vot | Vot |

| County | 1960 Prim | 1960 Gen | 1962 Prim | 1962 Gen | 1964 Prim | 1964 Gen | 1966 Prim | 1966 Gen | 1968 Prim | 1968 Gen |
|---|---|---|---|---|---|---|---|---|---|---|
| Glenn | HC | HC | HC | HC | HC | HC | HC | HC | HC | Votr |
| Humboldt | HC | HC | HC | HC | HC | HC | Vot | Vot | Vot | Vot |
| Imperial | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Inyo | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Kern | HC | HC | HC | Cole | Cole | HC | HC | HC | HC | HC |
| Kings | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Lake | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Lassen | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Los Angeles | HC | HC | HC | HC | HC | HC | HC | HC | Vot | Vot |
| Madera | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Marin | HC | HC | HC | HC | HC | HC | Vot | Vot | Vot | Vot |
| Mariposa | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Mendocino | HC | HC | HC | HC | HC | HC | HC | HC | Votr | Votr |
| Merced | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Modoc | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Mono | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Monterey | HC | HC | HC | HC | HC | Vot | Vot | Vot | Vot | Vot |
| Napa | HC | HC | HC | HC | HC | HC | Votr | Votr | Votr | Votr |
| Nevada | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Orange | HC | HC | HC | HC | HC | Cole | Cole | Cole | Cole | C/AM |
| Placer | HC | HC | HC | HC | HC | HC | VTR | VTR | VTR | VTR |
| Plumas | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Riverside | HC | HC | HC | HC | HC | HC | HC | HC | Votr | Votr |
| Sacramento | HC | HC | HC | HC | HC | H/VR | HC | Vot | Vot | Vot |
| San Benito | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| San Bernardino | HC | HC | HC | HC | HC | HC | HC | Vot | Vot | Vot |
| San Diego | HC | HC | HC | HC | HC | Votr | Votr | Votr | Votr | Votr |
| San Francisco | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| San Joaquin | HC | HC | HC | HC | HC | Vot | Vot | Vot | Vot | Vot |
| San Luis Obispo | S/HC | S/HC | S/HC | S/HC | S/HC | S/HC | S/HC | S/HC | S/HC | S/HC |
| San Mateo | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup |
| Santa Barbara | HC | HC | HC | HC | HC | HC | HC | HC | Votr | Votr |
| Santa Clara | HC | HC | HC | HC | HC | HC | HC | Vot | Vot | V/VR |
| Santa Cruz | HC | HC | HC | HC | HC | HC | Vot | Vot | Vot | Vot |
| Shasta | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Sierra | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Siskiyou | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Solano | HC | HC | HC | HC | HC | HC | Vot | Vot | Vot | Vot |
| Sonoma | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Stanislaus | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Sutter | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Tehama | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Trinity | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |

| County | 1960 Prim | 1960 Gen | 1962 Prim | 1962 Gen | 1964 Prim | 1964 Gen | 1966 Prim | 1966 Gen | 1968 Prim | 1968 Gen |
|---|---|---|---|---|---|---|---|---|---|---|
| Tulare | HC | HC | HC | HC | HC | HC | HC | HC | Vot | Vot |
| Tuolumne | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Ventura | HC | HC | HC | HC | HC | HC | HC | HC/DV | DV | DV |
| Yolo | HC | HC | HC | HC | HC | HC | HC | HC | Votr | Votr |
| Yuba | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |

## Table Two: 1970-1978

| County | 1970 Prim | 1970 Gen | 1972 Prim | 1972 Gen | 1974 Prim | 1974 Gen | 1976 Prim | 1976 Gen | 1978 Prim | 1978 Gen |
|---|---|---|---|---|---|---|---|---|---|---|
| Alameda | Votr | Votr | Votr | Votr | Votr | Votr | Vot | Vot | Vot | Vot |
| Alpine | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Amador | HC | HC | HC | HC | HC | Vot | Vot | Vot | Vot | Vot |
| Butte | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Calaveras | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Colusa | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Contra Costa | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr |
| Del Norte | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| El Dorado | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | DV | DV |
| Fresno | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Glenn | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr |
| Humboldt | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Imperial | Votr | Votr | Votr | Votr | Votr | DV | DV | DV | DV | DV |
| Inyo | HC | HC | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Kern | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Kings | HC | HC | DV | DV | DV | DV | DV | DV | DV | DV |
| Lake | HC | HC | HC | HC | HC | HC | Vot | Vot | Vot | Vot |
| Lassen | HC | HC | HC | HC | DV | DV | DV | DV | DV | DV |
| Los Angeles | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Madera | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Marin | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Mariposa | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Mendocino | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Vot | Vot |
| Merced | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Modoc | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Mono | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Monterey | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | DV | DV |
| Napa | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | DV | DV |
| Nevada | HC | AVM | HC | HC | DV | DV | DV | DV | DV | DV |
| Orange | Cole | Cole | Cole | Cole | Cole | Cole | Cole | Cole | Cole | Cole |
| Placer | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr |
| Plumas | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Riverside | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr |
| Sacramento | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| San Benito | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| San Bernardino | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| San Diego | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr |
| San Francisco | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | DV | Vot |
| San Joaquin | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| San Luis Obispo | S/HC | S/HC | Shoup | Shoup | Shoup | Shoup | DV | DV | DV | DV |
| San Mateo | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup |

| County | 1970 Prim | 1970 Gen | 1972 Prim | 1972 Gen | 1974 Prim | 1974 Gen | 1976 Prim | 1976 Gen | 1978 Prim | 1978 Gen |
|---|---|---|---|---|---|---|---|---|---|---|
| Santa Barbara | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr | Votr |
| Santa Clara | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Santa Cruz | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Shasta | HC | HC | HC | HC | Vot | Vot | Vot | Vot | Vot | Vot |
| Sierra | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Siskiyou | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Solano | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Sonoma | HC | HC | HC | HC | AVM | AVM | AVM | AVM | AVM | AVM |
| Stanislaus | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Sutter | AVM | AVM | AVM | AVM | Vot | Vot | Vot | Vot | Vot | Vot |
| Tehama | HC | HC | HC | HC | HC | HC | HC | HC | HC | HC |
| Trinity | HC | HC | HC | HC | Vot | Vot | Vot | Vot | Vot | Vot |
| Tulare | Vot | Vot | Vot | Vot | AVM | AVM | AVM | AVM | AVM | AVM |
| Tuolumne | AVM | AVM | AVM | AVM | DV | DV | DV | DV | DV | DV |
| Ventura | DV | DV | DV | DV | Votr | Votr | Votr | Votr | Votr | Votr |
| Yolo | Votr | Votr | Votr | Votr | DV | DV | DV | DV | DV | DV |
| Yuba | HC | HC | DV | DV | DV | DV | DV | DV | DV | DV |

## Table Three : 1980-1988

| County | 1980 Prim | 1980 Gen | 1982 Prim | 1982 Gen | 1984 Prim | 1984 Gen | 1986 Prim | 1986 Gen | 1988 Prim | 1988 Gen |
|---|---|---|---|---|---|---|---|---|---|---|
| Alameda | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Alpine | HC | HC | HC | HC | HC | HC | DV | DV | DV | DV |
| Amador | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Butte | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | DV | DV |
| Calaveras | AVM | AVM | AVM | AVM | DV | DV | DV | DV | DV | DV |
| Colusa | AVM | AVM | AVM | AVM | AVM | DV | DV | DV | DV | DV |
| Contra Costa | Votr | Votr | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Del Norte | AVM | AVM | AVM | AVM | DV | DV | DV | DV | DV | DV |
| El Dorado | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Fresno | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Glenn | Votr | Votr | DV | DV | DV | DV | DV | DV | DV | DV |
| Humboldt | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Imperial | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Inyo | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Kern | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Kings | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Lake | Vot | Vot | Vot | Vot | DFM | DFM | DFM | DFM | DFM | DFM |
| Lassen | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Los Angeles | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Madera | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Marin | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Mariposa | HC | HC | HC | HC | DFM | DFM | DFM | DFM | DFM | DFM |
| Mendocino | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Merced | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Modoc | HC | HC | HC | HC | HC | HC | DV | DV | DV | DV |
| Mono | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Monterey | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Napa | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Nevada | DV | DV | DV | DFM | DIMS | DIMS | DIMS | DIMS | DIMS | DIMS |
| Orange | ATS | ATS | ATS | ATS | ATS | ATS | DV | DV | DV | DV |
| Placer | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Plumas | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | DV | DV |
| Riverside | Votr | Votr | Votr | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Sacramento | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| San Benito | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | DV | DV |
| San Bernardino | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| San Diego | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| San Francisco | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| San Joaquin | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| San Luis Obispo | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| San Mateo | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup | Shoup |

| County | 1980 Prim | 1980 Gen | 1982 Prim | 1982 Gen | 1984 Prim | 1984 Gen | 1986 Prim | 1986 Gen | 1988 Prim | 1988 Gen |
|---|---|---|---|---|---|---|---|---|---|---|
| Santa Barbara | Vot | Vot | Vot | Vot | DFM | DFM | DFM | DFM | DFM | DFM |
| Santa Clara | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Santa Cruz | Vot | Vot | Vot | Vot | Vot | DV | DV | DV | DV | DV |
| Shasta | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Sierra | HC | HC | HC | HC | HC | HC | DV | DV | DV | DV |
| Siskiyou | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Solano | Vot | Vot | Vot | Vot | DFM | DFM | DFM | DFM | DFM | DFM |
| Sonoma | AVM | AVM | AVM | AVM | DV | DV | DV | DV | DV | DV |
| Stanislaus | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM | AVM |
| Sutter | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Tehama | HC | HC | HC | HC | DV | DV | DV | DV | DV | DV |
| Trinity | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Tulare | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Tuolumne | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Ventura | Votr | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Yolo | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Yuba | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |

## Table Four: 1990-1998

| County | 1990 Prim | 1990 Gen | 1992 Prim | 1992 Gen | 1994 Prim | 1994 Gen | 1996 Prim | 1996 Gen | 1998 Prim | 1998 Gen |
|---|---|---|---|---|---|---|---|---|---|---|
| Alameda | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Alpine | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Amador | Vot | Vot | BRC | BRC | BRC | BRC | BRC | BRC | BRC | BRC |
| Butte | DV | DV | DV | DV | DFM | DFM | DFM | DFM | DFM | DFM |
| Calaveras | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Colusa | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Contra Costa | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Del Norte | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| El Dorado | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Fresno | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Glenn | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Humboldt | Vot | Vot | Vot | Vot | Vot | Vot | AccuV | AccuV | AccuV | AccuV |
| Imperial | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Inyo | Vot | Vot | Vot | Vot | DV | DV | DV | DV | DV | DV |
| Kern | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Kings | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Lake | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Lassen | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Los Angeles | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Madera | AVM | DV | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Marin | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Mariposa | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Mendocino | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Merced | AVM | AVM | AVM | AVM | AVM | AIS | AIS | AIS | AIS | AIS |
| Modoc | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Mono | DV | DV | DV | DV | DFM | DFM | AccuV | DV | DV | DV |
| Monterey | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Napa | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Nevada | DIMS | DIMS | DIMS | DIMS | AIS | AIS | AIS | AIS | AIS | AIS |
| Orange | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Placer | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Plumas | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Riverside | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Sacramento | Vot | Vot | PS | PS | PS | PS | PS | PS | PS | PS |
| San Benito | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| San Bernardino | Vot | Vot | PS | PS | PS | PS | PS | PS | PS | PS |
| San Diego | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| San Francisco | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| San Joaquin | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| San Luis Obispo | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| San Mateo | DV | DV | Shoup | BRC | BRC | BRC | BRC | BRC | BRC | BRC |

| County | 1990 Prim | 1990 Gen | 1992 Prim | 1992 Gen | 1994 Prim | 1994 Gen | 1996 Prim | 1996 Gen | 1998 Prim | 1998 Gen |
|---|---|---|---|---|---|---|---|---|---|---|
| Santa Barbara | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Santa Clara | Vot | Vot | Vot | Vot | PS | PS | PS | PS | PS | PS |
| Santa Cruz | DV | DV | DV | DV | DV | DV | DV | DFM | DV | DFM |
| Shasta | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Sierra | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Siskiyou | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Solano | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot | Vot |
| Sonoma | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Stanislaus | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Sutter | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Tehama | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Trinity | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Tulare | Vot | Vot | DFM/ Vot | DFM | DFM | DFM | DFM | DFM | DFM | DFM |
| Tuolumne | Vot | Vot | Vot | Vot | AIS | AIS | AIS | AIS | AIS | AIS |
| Ventura | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Yolo | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |
| Yuba | DV | DV | DV | DV | DV | DV | DV | DV | DV | DV |

Appendix 2:

## Voting Systems and Procedures Panel
## Office of the Secretary of State

## State Commission on Voting Machines and Vote Tabulating Devices

Systems and Equipment Approved for Use in California Elections

**Automatic Voting Machine, Jamestown, New York** — c. 1904
United States Standard Voting Machine.

**Columbia Voting Machine** — c. 1904

**Dean Ballot Machine** — c. 1904

**Automatic Voting Machine, Jamestown, New York** — 1917
United States Standard Voting Machine (Displays candidates and offices in rows across the face of the machine.)

**Statutory Revocation of 1904 Approvals** (Statutes 1921, Chapter 525) — July 30, 1921

**Shoup Voting Machine, Memphis, Tennessee** — May 5, 1947
Print Totalizer for a machine which displays candidates and offices in columns.

**Remington Rand Corporation** — Mar. 8, 1950
Ballot card form with UNIVAC 120 Punched Card Computer and Alphabetical Tabulator.

**Keith and Feraud, Inc.** — Feb. 8, 1955
Keith-Feraud Ballot Tabulator

**United Aircraft Corp., Norden Div., Hartford, Connecticut** — Mar. 28, 1961
Norden Electronic Vote Tallying System (VTS). Scans paper ballots voted with fluorescent ink marking device.

**Seismographic Service Corp., Seiscor Div., Tulsa, Oklahoma** — Aug. 1, 1961
Seiscor Voting Machine, Model 480-A. Counter type, with 10 columns for candidates and offices, one column for measures, and a 7-position party select switch.

**Shoup Voting Machine Co., Memphis, Tennessee** — Oct. 18, 1961
California Model. (Candidates arranged in vertical columns), A 7-column, 40-row, dual personal choice voting machine.

**Coyle Voting Machine Co., Ohio** — Oct. 19, 1961
Coyle Ballot Marking Device. Candidates and offices are printed on a standard IBM card. Requires a built-in magnifying glass. Requires that ballot cards produced for and marked by this machine be processed on IBM computer and tab card equipment, Model numbers 402, 403, 419, 407, 408, 409, 1620, and 1401.

**Coleman Engineering, Los Angeles and San Leandro (Successor to United Aircraft Corp.)** — Aug. 9, 1962
Coleman VTS. Models 2901 (Single Ballot Reader System) and 2902 (Dual Ballot Reader System, in which two Model 2901 units operate under a single control. In the Model 2902, only one unit can scan ballots at a

time, although the second unit can punch out the summary vote totals while the first unit is scanning ballots).

Rockwell Manufacturing Co., Automatic Voting Machine Div., Jamestown, New York — Aug. 9, 1962
Printer Pak added to AVM Model 105.

Sigma Corp., — Oct. 31, 1962
'Procedures for Verification of the Operational Accuracy of Electronic or Electromagnetic Vote Tabulating Devices' adopted for use of and by the Coleman VTS for tabulating the returns of the November 6, 1962 General Election in Kern County.

Coleman Engineering, Los Angeles and San Leandro — Nov. 22, 1963
Procedures adopted for the use of the Coleman VTS.

Votronic, San Diego — Feb. 25, 1964
Votronic Vote Counter Model 23PB (a paper ballot scanner which can accommodate a 4-column ballot with 30, 40 or 50 rows. Must be used with "Procedures for the Operation of the Votronic Vote Counter," dated Feb. 3, 1964.

Harris Votomatic Vote Recorder, Berkeley — July 2,1964
Harris Votomatic vote recorder, model 100, a punchcard enabling device using a prescored ballot card containing 235 voting positions and a stylus with a special point.

Candidates and offices are printed on hinged ballot pages which fit into a vote recorder. There may be as many as twelve ballot pages - one for each column on the ballot card. Write-in votes are recorded on a security envelope which holds the voted ballot card.

The system shall be used in conjunction with IBM Data Processing Machine (computers) numbers 1401, 1410, 1460, 1620, 7010, and 7040 used in combination with the 1402 card reader and punch and the 1403 line printer.

The above listed data processing machines shall be used in accordance with those procedures set forth in the document entitled "Procedures Applicable for Use of the Harris Votomatic Vote Recorder and Electronic Data Processing Machines", and dated July 2, 1964.

Cybernetics General Co., San Diego — July 30, 1964
Votemaster Mechanical Voting Machine, Model 300D.

International Business Machines (IBM) Corp., (Successor to Harris Votomatic Vote Recorder) — June 8, 1965
IBM Votomatic Vote Recorder, Model 100, approved for use with:

1. IBM Data Processing Machine numbers 1401, 1410, 1460, 7010, and 7040 computers used in combination with the 1402 card reader and punch and the 1403 line printer and related data processing machines which use the 1402 card reader and punch and the 1403 line printer.
2. The UNIVAC 1004 Data Processing System.

Cubic Industrial Corp., San Diego (Successor to Votronic) — Sept. 13, 1965
Votronic Vote Counter Model 5-62.

IBM Corp., Oakland — Nov. 30, 1965
Model 1440 Computer.

Seismographic Services Corp., Seiscor Div., Tulsa, Oklahoma — Nov. 30, 1965
Model 240 Votomatic Vote Recorder.

Mathematical Systems Corp., Irvine — Apr. 25, 1967
Mathematical Systems Voting System.

Uses Ballot Marking Device - a 2-sided prescored ballot card with 19 holes per side, an aluminum stylus with a felt covered foam rubber pad.
Candidates and offices are printed directly on the ballot card. Procedures for Use of System adopted.

Datamedia Corp., Binghampton, New York — Aug. 29, 1967
Datamedia Voting System – functionally equivalent to the Harris or IBM Votomatic vote recorder. Uses the Votomatic Procedures.

IBM Corp., Oakland — Sept. 28, 1967
Adopted revised 'Procedures Applicable for the Use of the IBM Voting System.'

Diamond National Corp., San Francisco (Successor to Mathematical Systems) — Mar. 15, 1968
Diamond Datavote System, (Same as previous Mathematical Systems Corp entry, 2-sided prescored ballot card with 19 holes per side, uses plastic stylus with a felt covered foam rubber pad in a plastic tray). Adopted appropriate procedures which must be used when this system is used.

IBM Corp., Oakland — Apr. 1, 1968
Model 360 Computer.

Honeywell, Inc. — Apr. 1, 1968
Computer.

National Cash Register — Apr. 1, 1968
NCR-15 Computer.

Cubic Industrial Corp., San Diego — Dec. 18, 1968
CM-15 Buffer Unit.

Digital Equipment Corp. — Dec. 18, 1968
Card Reader.

Davis — June 3, 1969
Voting System.

Burroughs Corp., Sacramento — June 3, 1969
Card Reader.

Datamedia Computer Service, Inc., Dallas (Successor to Datamedia Corp., New York) — June 3, 1969
Datamedia Voting System. Identical in appearance and functionality with the IBM Votomatic Voting System. This system shall be used only in conjunction with those computers, computer equipment and procedures approved and certified by this Commission for the IBM Votomatic System.

County of Los Angeles — Dec. 29, 1970
Punch card ballot and punching stylus. The layout and appearance of the ballot card are identical in appearance and functionality with Datavote ballot card. The voter places the ballot card on a synthetic foam rubber pad and marks the ballot by punching out a prescored quarter-inch diameter circle located in the voting field. This process is equivalent to the method of marking the Datavote ballot card. The specifications include:

1. Foam rubber pad, polyester, charcoal, Spec. Mil-P-26514, Type II – Class Type II, 3.8 lb. density in a pad at least 8 inches square by ¼ inch thick.
2. Stylus: Hardwood dowel, 3/16 inch x 4 inches. Ends cut square at right angle to length of rod.

This system shall be used only in conjunction with those computers, computer equipment and procedures approved and certified by this Commission for the Diamond Datavote System.

Computer Election System (CES), Berkeley (Successor to IBM Votomatic) June 19, 1970
Model III Vote Recorder in a self-contained, 2-position voting booth.

Voting Instruments and Products Jan. 28, 1971
Electra 220 (Model 3) Vot-A-Maker Vote Recorder (self-contained, 2-station voting booth).

Diamond National Corp, San Francisco Jan. 28, 1971
Electronic Ballot Punch, Model MP-3033 – a 19-hole ballot punch of cast aluminum, used for non-scored ballot cards.

CES, Berkeley Jan. 28, 1971
Absentee Voting System. Uses Styrofoam backing, plastic cellular material, polystyrene Class I, Grade A per Spec. Mil-P-40619A (CES part number 1601A). Until otherwise specified, approved and certified, a dot shall appear in the center of the punch chad. Accompanying instructions approved.

Diamond National Corp, San Francisco Jan. 28, 1971
Electronic Ballot Counter Model 220 for use with Datavote ballot cards. The appropriate approved procedures shall be used when this Counter is used.

Diamond National Corp, San Francisco Apr. 7, 1971
Ballot Counter Printing Unit Model 230 for use with the previously approved Electronic Ballot Counter Model 220. The appropriate approved procedures shall be used when this Printing Unit is used.

Secretary of State, Sacramento June 1, 1971
Amendment to all Procedures – requires that an Election Observer Panel Plan be filed with the Secretary of State whenever voted but uncounted ballots are removed from the precinct and tallied elsewhere.

Voting Instruments and Products June 1, 1971
Model 1 Vot-A-Maker Vote Recorder (mounted in small blue frame). Identical in appearance and functionality with the IBM Votomatic Vote Recorder.

Counties of Alameda, Butte, Contra Costa, El Dorado, Fresno, Glenn, Imperial, Kern, Los Angeles, Marin, Mendocino, Monterey, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Joaquin, Santa Barbara, Santa Clara, Santa Cruz, Solano, Tulare, and Yolo. Aug. 25, 1971
Approval of respective and county-specific Election Observer Panel Plans.

Radio Corporation of America (RCA), San Francisco Aug. 25, 1971
RCA Card Reader 70/237.

Sperry Rand Corp., UNIVAC Division, San Francisco Aug. 25, 1971
Card Readers 0711-00 (400 cpm) and 0711-05 (600 cpm)

Counties of Humboldt, Napa, and Ventura. Sept. 8, 1971
Approval of respective and county-specific Election Observer Panel Plans.

County of Los Angeles Sept. 27, 1971
Compact Vote Recorder Model L.A.1, a new base for holding the standard IBM Votomatic assembly.

Computer Election Systems, Berkeley Sept. 27, 1971
Compact Votomatic Vote Recorder Model L.A.C.

Compuvote/Datamedia Computer Service Inc. Sept. 27, 1971
Vote-A-Corder, Model Mark I, Series 600 Voting Instrument – Votomatic Vote Recorder

**Election Equipment Corp.** Dec. 16, 1971
California Model, Shoup Voting Machine.

**Datamedia Computer Service Inc., Dallas, Texas** Dec. 16, 1971
Vote-A-Corder Light Weight Series 700.

**Carlisle Graphics, San Francisco** Feb. 11, 1972
1. Accu-Vote Ballot Card Punch (Produces 19 rectangular holes)
2. Accu-Vote Electronic Ballot Counter Model 240
3. Mohawk Card Reader
4. Seiko Printer

System is identical in appearance and functionality with the Datavote Voting System. The approved procedures for the Datavote Voting System shall be used when and where this voting system is used.

**Cubic Industrial Corp., San Diego** Feb. 11, 1972
Card Programmer Model P-4; an accessory to the Votronic Vote Counter Model 5-62.

**County of Orange** Mar. 10, 1972
Modifications to the Coleman VTS Model 2902 Dual Ballot Reader System. Converts two Model 2902 Dual Ballot Reader Systems to four Model 2901 Single Ballot Reader Systems by:
1. Adding 2 Model 940 Reading and Analysis Units;
2. Substituting an EECO Model TR-8300 Tape Reader (300 cps) for the Photocircuits Corp. Model 100 Paper Tape Reader (60 cps); and,
3. Substituting an UNIVAC 0600 Card Punch for the IBM 526 Summary Punch.

**Modernage, Los Angeles** Mar. 10, 1972
IBM Model 1130 Computer System, using IBM 1442 Card Reader/Punch, 8Kb words of storage, IBM Model 1132 Line Printers and IBM Disk Units.

**Voting Instruments and Products/Howard International, Inc., El Segundo** May 12, 1972
VIP/Howard Model 6 Punch Card Vote Recorder and Booth (combines the VIP Electra 220 with a new booth (designed by Howard International, Inc.)

**Control Data Corp. (CDC)** May 12, 1972
CDC Model 405 Card Reader (1200 cpm)

**Gyrex Corp., Santa Barbara (Successor to Coleman, Santa Ana)** Sept. 8, 1972
Change of name from 'Coleman Vote Tally System' to 'Gyrex Vote Tally System.'

**Cubic Industrial Corp., San Diego** Sept. 8, 1972
Models 23PB and 5-62 Vote Counters
1. Card Programmer Model P-7
2. Solid state semi-conductor memory modification in place of the magnetic drum memory.

**County of Los Angeles** Sept. 8, 1972
Polystyrene (plastic) backing material for use with Votomatic Absent Voter Ballot.

**CES, Berkeley** Oct. 13, 1972
CES Ballot Tab (AKA XBIP, Extended Ballot Tab Program).
1. Data General NOVA 1200 Digital Computer,
2. Documation Model M300L Card Reader (300 cpm),
3. Seiko Model EP-101 Line Printer.

IBM Corp., San Francisco — May 11, 1973

Card Readers approved for use with IBM S/360 Model 195, or S/370 Models 125 through 195

1. IBM 3504 Model A1 and 3505 Model B1 (800 cpm),
2. IBM 3504 Model A2 and 3505 Model B2 (1200 cpm).

Gyrex Corp., Santa Barbara — May 11, 1973

Gyrex VTS Model 3021, an off-line system and Model 3022, an on-line system.

1. DEC PDP 11-40 Digital Computer with 32Kb words of memory,
2. CR11 Card Reader (300 cpm),
3. PC11 Paper Tape Reader/Punch,
4. TU10 Magnetic Tape Drive with TM11 Controller,
5. Teletype Model ASR33 Keyboard/Printer,
6. LP11JA Printer (300 lpm),
7. RP02 Disk Drive with RP11 Disk Controller,
8. Basic DEC Software,
9. KT11-0 Memory Management and Protect, and
10. RSX118 Real-time Executive and Disk Operating System (DOS).

Diamond International Corp. (formerly Diamond National Corp.), San Francisco — June 8, 1973

Commission adopted amendments to previously approved Procedures applicable for use of the Datavote punch card ballot and vote tabulating system.

CES, Berkeley — Aug. 10, 1973

Ballot Multiplex System (BMX), a card-to-tape system using

1. Data General NOVA 1220 Digital Computer
2. Documation Model M1000L Card Reader
3. Wang Computer Products MOD-10 Tape Drive with Decision, Inc. Model 3120 Magnetic Tape Controller
4. Teletype Model ASR33 Keyboard/Printer
5. Singer Console

Diamond International Corp., San Francisco — Aug. 10, 1973

Model D226 Variable-Pitch Datavote Ballot Punch (19 or 26 voting response positions per column; i.e., 38 or 52 voting positions per ballot card) - has a tilted base.

Cubic Industrial Corp., San Diego — Feb. 8, 1974

Modification to Votronic Vote Counter Model 5-62 by substitution of an Addmaster Model 55 Parallel Entry Line Printer for the Addmaster Model 35/45 Serial Entry Line Printer.

Gyrex Corp., Santa Barbara (through Major Data Corp., Costa Mesa) — Feb. 8, 1974

Substitution of components in Gyrex VTS Model 3022:

1. DG Loaded NOVA, 2/Series, 1220 Series or 800 Series for DEC PDP 11-40;
2. Standard DG interfaces for standard DEC interfaces; and,
3. Standard DG peripherals for standard DEC peripherals.

CES, Berkeley — Mar. 15, 1974

Substitution of components in previously approved:

1. Ballot Tab (10-13-72) - Digital Computer Controls Corp. (DCC) D116 Digital Computer or DG NOVA 2/4 or NOVA 2/10 for the NOVA 1200 Digital Computer;
2. Ballot Multiplexor System (BMX) (8-10-73):

... a. DCC 116 or DG NOVA 2/4 or NOVA 2/10 for the NOVA 1220; and,

... b. Datum Model 5091 Tape Formatter/Controller for the Decision Inc. Model 3120 Magnetic Tape Controller.

County of Orange — Mar. 15, 1974
Revised Procedures for Use of the Gyrex VTS.

Fidlar and Chambers, Moline (St. Charles), Illinois — Mar. 15, 1974
1. Vote Recorder I – Votomatic device with a top cover of ABS plastic and a metal base/frame with a lamp. Replaces the rubber backing surface of the original Votomatic ballot punch which was formed of a series of "T"-shaped slots which hold the chad with a series of plastic ribs with a slotted rubber sheet cemented across their tops. The vote punch stylus has a uniform diameter.
2. Compact Vote Recorder – similar to the one used in Los Angeles county. Has the same modification as the Vote Recorder I. The main frame is of extruded aluminum, and the ballot punch assembly is secured by four screws accessible from the bottom surface. **Approved with Conditions:** The Compact Vote Recorder must be secured in some manner to the voting booth shelf, and the vendor is provide paper or plastic seal for covering the set screw access hole. The vote punch stylus has a necked-down section in the shaft with a larger diameter punching 'button' at the end.

Carlisle Graphics, San Francisco — May 17, 1974
1. ACCU-VOTE Ballot Card Punch – 26 voting positions per card side.
2. ACCU-VOTE Ballot Tabulating System, HS-600-1.
   a. Digital Computer Controls D116 Computer, 8Kb Core Memory
   b. Documation M600L Card Reader
   c. Teletype Model ASR33 Keyboard/Printer (Optional IBM Selectric)

Diamond International Corp., San Francisco — May 17, 1974
Multiple card readers with an IBM S/360 interface:
1. DG NOVA 2/10
2. One to four Documation card readers (M300L, M600L, M1000L)
3. One to four card reader interfaces, DG 4036/4016
4. TTY interface, DG 4007/4010
5. IBM S/360 interface, DG 4025
6. Teletype Model ASR33 keyboard/printer

Diamond International Corp., San Francisco — Sept. 20, 1974
1. Datavote MBC600 Ballot counter
   a. DG NOVA 2/10, with 16K or 32K words of memory
   b. Documation card readers (M300L or M600L)
   c. Centronics Model 101A Printer
   d. Teletype Model ASR33 keyboard/printer or Texas Instruments KSR33 keyboard/printer
   e. DG interfaces for card reader, printer and printer control.
2. Multiple card readers to tape (MCRT) system
   a. DG NOVA 2/10
   b. Four Documation card readers (M600L or M1000L) with DG interface
   c. DG 4030 J or Wang Tape Unit
   d. Teletype Model ASR33 keyboard/printer.

Fidlar and Chambers, Moline (St. Charles), Illinois — Sept. 20, 1974
1. Ballot seal punch card Vote Recorder ballot frame assembly.- a disposable or one-time assembly CONDITION: Assembly to be used only with uncoated label pages or with an acceptable combination of adhesive material and label surfaces as field.
2. Change of name from 'VIP/HOWARD Model 6 punch card vote recorder and booth' to 'Self-contained vote recorder and booth.'

Gyrex Corp., Santa Barbara — Aug. 15, 1975
Gyrex MTB-1 Electronic Ballot Box, a mark sense ballot card tabulating device for use at precincts.
1. Special purpose ballot readers

2. Special purpose electronic processor
3. ADDMASTER Model 56 parallel entry numeric printer.

CES, Berkeley — Aug. 15, 1975

1. CES printed card feature – a ballot frame, template and metal mask assembly for voting with a printed ballot card containing 26 pre-scored voting positions on either side.
2. CES Votomatic Vote Recorder, Model IV.
   a. Change of name from 'Model L.A.C.'
   b. Modification consists of adding a lamp, power cord and convenience outlet.
3. State procedures for use of Votomatic device amended to include procedure for use of above approved Model IV Vote Recorder.
4. Substitution of components in CES Ballot Tab. International Digital Systems (IDS) 16-4 for the DG D116, the DG NOVA 2/4 or the DG NOVA digital computers.
5. Substitution of components in CES BMX system. The IDS 16-10 or IDS 16-17 for the DG NOVA 2/10, the NOVA 1200 or the NOVA 1220 computers.

Diamond International Corp., San Francisco — Aug. 15, 1975

1. Modifications to Model D226 Variable pitch Datavote Ballot Punch:
   a. Installing a latching pawl in the punch head;
   b. Replacing the punch handle pivot pin by one made of hardened steel; and,
   c. Lowering the head position pointer.
2. Substituting components in the MBC 600 Ballot Counter and MCRT System:
   a. DCC D116 for the DG NOVA 2/10; and,
   b. TI Silent KSR 700 TelePrinter for the Teletype Model ASR33 Keyboard/Printer.

Data Entry Systems, El Segundo — Aug. 15, 1975

Power Stylus – a punch card vote marking device intended for use with pre-scored ballot cards. Approval withdrawn on December 21, 1976. (See below.)

Cubic Productron, Inc., (successor to Cubic Industrial) — Aug. 15, 1975

Modifications to 'Procedure for Operation of the Votronic Vote Counter,' Models 23P and 5-62. Allows duplication and control of damaged ballots.

Burroughs Corp., Sacramento — Aug. 15, 1975

B9115 Card Reader Device (AKA B9116 or B9117) (300 or 600 cpm).

City of Bellflower — Nov. 6, 1975

UNIVAC 9480 Card Reader Model 0716 (600 cpm).

City of Escondido — Nov. 6, 1975

NCR Integrated Card Reader No. 682-100.

Gyrex Corp., Santa Barbara — Jan. 15, 1976

Modification to MTB-1 Electronic Ballot Box (AKA Precinct Ballot Card Reader and of procedures for use. Includes 'multi-precinct ballot tabulation configuration.' Modification allows card reader to read both sides of ballot card simultaneously and 'multi-precinct ballot tabulation configuration.'

AVM, Election Systems Div., Jamestown, New York — Feb. 19, 1976

1. AVM 440 Precinct Counter – Precinct level ballot card reader system – mark sensing.
2. AVM 440 Ballot Marking Template with 150 and 300 voting positions.

CES, Berkeley — Mar. 25, 1976

Precinct Ballot Counter:

1. with Intel 4040

2. a 4-bit microprocessor; Special purpose card reader
3. Seiko Model 102 printer; and,
4. operational procedures for use.

CES, *Berkeley* Apr. 29, 1976

1. Substitution of components in CES Ballot Tab:
   a. Tally T-2000 Line Printer (200 lpm) for Seiko Model EP-101 Line Printer.
2. Substitution of components in CES BMX System:
   a. DEC Writer II for the Singer Console.
3. CES Election Management System:
   a. HP 21MX CPU;
   b. Documation M1000L Card Reader;
   c. HP 7905 Cartridge Disk Drive;
   d. HP 2640 Terminal
   e. HP 12987 Printer or HP 12975 Printer.

**Amendment to all Procedures Manuals** Apr. 29, 1976

Moves earliest time for normal manufacturer's maintenance checks and adjustments from not earlier than 24 hours preceding election day to not earlier than 72 hours preceding election day.

Automatic Voting Machines, Election Systems Div., Jamestown, New York May 13, 1976

AVM 880 Tabulator, a central tabulating system, consisting of:

1. DEC Data System 354 with DEC PDP-11 (either /10 or /34 version) together with either floppy disk or cartridge disk drives;
2. Documation TM600 Punch/Mark Card Reader;
3. Two Rk 05 disk drives;
4. Gould Model 5000 Electrostatic Printer; and,
5. DEC VT50 CRT terminal.

Compuvote Corp., Beverly Hills Sept. 8, 1976

Compuvote (Electronic) Punch Card on-line VTS, consisting of:

1. Intel 4004 microprocessor;
2. Modified Votomatic Vote Recorder (Guide template which overlays the ballot card replaced by a 2-level printed circuit card;
3. Seiko Model 106 printer;
4. Standard Motorola modem; and,
5. *Operation Procedures for Use.*

**County of Orange** Sept. 8, 1976

Modification to its Election Observer Panel Plan.

**Data Entry Systems, El Segundo** Dec. 21, 1976

Power Stylus – a punch card vote marking device intended for use with pre-scored ballot cards.
**Approval withdrawn.**

**City of Santa Monica** Feb. 4, 1977

HP Model 2893A Card Reader, an 80/51 column, 600 cpm vacuum card picking device. (Variation of *Documation M600L card reader.*)

**Amendment to Votomatic Procedures Manual** May 5, 1977

Requires polling place clerk to instruct voter to place ballot card into Vote Recorder unit and to use only the stylus in marking the ballot.

Valtec Corp., West Boyleston, Massachusetts (successor to Gyrex Corp.) June 9, 1977
Change of name from 'Gyrex MTB-1 Electronic Ballot Box' to 'Valtec MTB-1 Electronic Ballot Box.'

CES, Berkeley Nov. 3, 1977
312-position Votomatic Vote Recorder Template. Approval effective Jan. 1, 1978, the effective date of the enabling legislation, AB 1376 (Stats. 1977 Ch. 1205, sec. 52.)

Counties of Riverside and San Diego Jan. 1, 1978
Adoption of regulation, pursuant to Elections Code section 16002 (Stats. 1977, Ch. 1008, sec. 2) regarding early pickup and processing of precinct ballots.

Election Data Corp., St. Charles, Illinois Mar. 2, 1978
1. Change of corporate name from 'Electronic Marketing Inc.'
2. Change of name of previously approved devices or products:
   a. 'Model I Vote Recorder and Demonstrator' for 'Compuvote/DataMedia Vote-A-Corder, Model Mark I, Series 600 Vote Recorder and Demonstrator.'
   b. 'Model I Vote Recorder and Demonstrator' for 'VIP Model I Vote-A-Marker Vote Recorder' (mounted in small blue frame.'
   c. Model III Self-contained Voting Booth' for 'Compuvote/DataMedia Vote-A-Corder, Model Mark I, Series 600 Vote Recorder and Demonstrator' in a self-contained booth.

Diamond International Corp., San Francisco Mar. 2, 1978
1. Substitution of components in:
   a. MBC 600 Ballot counter:
   .....1. DG NOVA 3 Series (3/4, 3/12 and 3/D) central processor for the NOVA 2/10;
   .....2. Printronix Model 300 line printer with MICOS (mini-Computer Inc.) interface or DG Model 4218 line printer with DG interface, or Centronics Model 701 bi-directional line printer with MICOS interface for Centronics Model 101;
   .....3. DEC Decwriter II Model LA36 with MICOS interface or MICOS Midas II CRT with MICOS interface for the Teletype model ASR33 keyboard/printer/controllers;
   .....4. Pertec Model 8640A magnetic tape unit for the Wang Model 10;
   .....5. Diablo Model 40, 10Mb cartridge disk drive, or CDC Model 9760 and 9762 40Mb/80Mb storage module disk drives as and additional component; and,
   6. MICOS card reader interface for the DG card reader interface.
   b. MCRT:
   1. DG NOVA 3 Series (3/4, 3/12 and 3/D) central processor for the NOVA 2/10;
   .....2. DEC Decwriter II Model LA36 with MICOS interface or MICOS Midas II CRT with MICOS interface for the Teletype model ASR33 keyboard/printer/controllers;
   .....3. Pertec Model 8640A magnetic tape unit for the Wang Model 10;
   .....4. MICOS card reader interface for the DG card reader interface; and,
   5. Addition of two Documation M600 or M1000 card readers to a total of 6 reader per system module.

Data Mark Systems, Inc., Omaha, Nebraska June 8, 1976
DMS-600 Processing System, a paper ballot optical scanner.

City and County of San Francisco June 8, 1978
Approval of Election Observer Panel Plan.

Counties of Amador, Lake, Lassen, Nevada, San Luis Obispo, and Shasta. Sept. 8, 1971
Approval of respective and county-specific Election Observer Panel Plans.

Election Data Corp., St. Charles, Illinois July 12, 1978
1. Compact Vote Recorder for Votomatic ballot cards;

2. Laminated mask for formats no-hole, 228, 235, or 312 configurations; and,
3. Disposable Ballot Seal Ballot Frame made of nylon and glass filled.

NOTE: Approval applies only to frame but not the mylar tape hinge.

Data Control Engineering, Buena Park — Mar. 30, 1979

Model 78 Micro Ballot Counter:

1. Intel 8080A, 18.432 Mhz, 8K EPROM, 5K RAM, associated circuitry and hardware interfaces;
2. Documation Model M600L card reader; and,
3. Victor Comptometer Corp. Printer Mechanism Model 150, dot-matrix, 22 columns of A/N data (same as Victor Model 2200 printing calculator.

The program resides permanently in PROM. Header cards define types of election and specific information as voting positions used, ballot type, etc.

Amendment to Procedures Manuals — Mar. 30, 1979

Updates cited statutory references changed as result of Elections Code recodification.

Data Mark Systems, Inc., Omaha, Nebraska — May 18, 1979

1. Ballot and Envelope concept.
2. DMS Election Procedures for use with their voting system.

Major Data Concepts, Inc., Costa Mesa (successor to Valtec) — July 27, 1979

Modifications to MTB-1 VTS (aka Valtec MTB-1 Electronic Ballot Box):

1. Two-sided card feature (MTB-2)
2. Substitute Removable Memory (M-Pak) for existing memory (MTB-1M; MTB-2M); and,

Major Data Concepts, Inc., Costa Mesa — Sept. 7, 1979

Consolidated Computer International, Inc., Anaheim — Oct. 1 and 18, 1979

CES, Berkeley — Apr. 24, 1980

Martel Systems, Inc. (successor to Major Data concepts), Costa Mesa — Apr. 24, 1980

Counties of Mono, Siskiyou, and Tuolumne — June 7, 1980

Approval of respective and county-specific Election Observer Panel Plans.

County of Orange — June 7, 1980

Approval of modification to previously approved Election Observer Panel Plan.

Martel Systems, Inc., Costa Mesa — Oct. 31, 1980

County of Orange — Oct. 31, 1980

County of Riverside — Oct. 31, 1980

County of Santa Barbara — Oct. 31, 1980

Elections Supplies, Ltd., Napa — June 9, 1981

DFM Associates, Irvine — June 9, 1981

CES, Berkeley — June 9, 1981

Airmac Technology Systems, Inc. (successor to Major Data Concepts), Costa Mesa — June 9, 1981

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| Diamond International Corp., Emeryville | Sept. 15, 1981 |
| DFM Associates, Irvine | Sept. 15, 1981 |
| Elections Supplies, Ltd., Napa | Sept. 15, 1981 |
| Westinghouse, Data score Systems, Sunnyvale | Sept. 15, 1981 |
| County of Orange | Sept. 15, 1981 |
| County of Kern | Oct. 13, 1981 |
| Diamond International Corp., Emeryville | Nov. 13, 1981 |
| Diamond International Corp., Emeryville | Apr. 6, 1982 |
| Diamond International Corp., Emeryville | June 22, 1982 |
| Elections Supplies, Ltd., Napa | Sept. 3, 1982 |

# Voting Systems and Procedures Panel,
## Office of the Secretary of State

Systems and Equipment Approved for Use in California Elections

**Smurfit Diamond Packaging Corporation, Emeryville** Aug. 5, 1983

Punched card ballot, in formats of 228 and 312 circular voting response positions which are 0.125 inch in diameter. These cards shall be used only with following card readers:

1. IBM Models 2501, 2540R and 3505;
2. Documation Models M600L and M1000L;
3. P.D.I. rated at 600 cards per minute.

CES, Berkeley Aug. 5, 1983

Punched card ballot with office and candidate information printed on the two faces of the card, and with 26 pre-scored rectangular (0.070 x 0.125 inch) voting response positions along both the right and left edges (the 9 and 12 rows of standard 80-column data processing card), thereby giving 52 total voting positions on both sides of the ballot card. Each side of the ballot card has the appropriate voting response positions to the right.

This ballot card has four versions:

1. with timing holes between the center rows of the card, and with two sets of locator holes in the stub;
2. with timing holes between the center rows of the card, and without any locator holes;
3. without any timing holes, and with two sets of locator holes in the stub; and,
4. without any timing holes, and without any locator holes.

These ballot cards are approved for any card reader with is or shall be hereafter approved and which can read a pre-scored voting response position of rectangular size and 0.070 x 0.125 inch in dimension.

County of Sacramento, Sacramento Aug. 5, 1983

Approval of modification to its Election Observer Panel plan of use when voted ballots are counted at some place other that at the precinct.

**Computer Elections Systems, Berkeley** Aug. 11, 1983

CES Automatic Precinct Ballot Counter (APBC) consisting of:

1. CES Precinct Ballot Counter 4 (PBC4), consisting of :
   a. Intel 8085, and 8-bit microprocessor chip, encased with
   b. Seiko Model 102 printer
2. Peripheral Dynamics, Inc. (PDI) series 6111 card reader rated at up to 500 cards per minute.
3. Set of operational procedures for use in preparing for and conducting elections.

The APBC, which can operate in either the hand fed or high-speed read mode, produces a numeric precinct report on adding machine tape. This tape is affixed to a preprinted election result sheet for result posting. The programming of election data for each election is accomplished either by control card entry encoded by the elections staff or by data pack chip burning.

CES, Berkeley Aug. 11, 1983

CES OPTECH 1 Mark Sense Voting System, consisting of:

1. Ballot Tabulator/Ballot Box Unit Intel
   8085, an 8-bit microprocessor chip with 2Kb of static read-write memory (RAM) for the card reading process; CES designed and built card reader; Firmware is contained in 4 EPROMs of 32Kb (4K x 8) each; and, Ballot card definition is in an EPROM of 16Kb (2K x 8) in a removable MEMORYPACK
   Vote totals are accumulated in 3K of RAM with battery backup in the MEMORYPACK, and may be read out via a serial RS-232C ASCII interface or an RJE connector from a 300 Baud full duplex modem.
2. Ballot card
   Single- or double-card two column ballot, variable length (12, 18, or 24 inches), single width (5.970 inches) Timing Marks, offset in relation to voting position, down the center of the ballot card

Voting position 0.100 x 0.200 inch (typical)
Number of voting positions varies, according to card length, whether card is a single- double-sided, and whether card is to be folded or not.

| Ballot length | Single (double) sided without fold | Single (double) sided without fold |
|---|---|---|
| 24 inch | | |
| | 170 | (340) |
| | 162 | (324) |
| 18 inch | | |
| | 124 | (248) |
| | 116 | (232) |
| 12 inch | | |
| | 76 | (152) |
| | 68 | (136) |

3. Ballot Marker - Non-erasable ink pen or marker in lieu of the standard Number 2 pencil
4. Ballot security envelope
5. Operational procedure for use in preparing for and conducting elections
6. Operator's manual containing all information necessary to perform normal servicing and routine preventive and corrective maintenance.

Sequoia Pacific Systems Corporation (formerly Smurfit Diamond Packaging Corporation), EmeryvilleOct. 17, 1983
1. Vote Recorder Template and Stylus designed for use with format 312 prescored round-hole punched ballot cards. The template with its hole diameter of 0.078 inch and stylus of 0.075 inch supplements those currently in use for format 312 prescored ballot cards.
2. Vote Recorder Stylus with a shaft diameter of 0.050 inch for use with those templates having a hole diameter of 0.056 inch.

Both styli have a straight, unstepped shaft with a sharp cone point at the end.

Computer Election Systems, Berkeley Apr. 10, 1984

Addition of write-in stub to the Votomatic ballot card in formats 235, 228, and 312. This stub: is in addition to the binding and voter receipts stubs; is used in place of the secrecy envelope; and is the same size, 3 1/2 . 7 3/8 inch, as the ballot card. After having voted, the voter folds the write-in stub across the face of the ballot and hands it to the precinct officer, who detaches the voter receipt stub and deposits the folded ballot and write-in stub, still attached, into the ballot box.

County of San Joaquin, Stockton Apr. 10, 1984

Sperry UNIVAC card reader model 0716-02 for use with the port-a-punch (Votomatic) ballot card which has prescored voting response positions measuring 0.070 x 0.125 inch. This card reader operates at 1,000 cards per minute and is a faster version of the previously approved (November 6, 1975) Model 0716.

County of Placer, Auburn — Apr. 10, 1984

Approval of a modification to its Election Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Yolo, Woodland — Apr. 10, 1984

Approval of a modification to its Election Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

City and County of San Francisco — Apr. 12, 1984

1. Modifications to the Documation card reader Model 1000 consisting of the removal of the board controlling the top row of error indicator lights on the readers. These lights revealed the status of the error check function, now performed by the DFM voter count software, of determining pre-punch errors, header checks, and data checks.

2. Data General model 9838 ECLIPSE MV/6000 Computer System
a. CPU with 2Mb of memory;
b. Choice of 147Mb, 190Mb, or 277Mb DG/Disk Storage Subsystem;
c. 800/1600 bpi magnetic tape unit;
d. 16-line intelligent asynchronous controller (IAX/16); and
e. DASHER TP2/LP2 system console printer.

Data Control Engineering, Buena Park — Apr. 12, 1984

Model BC83 Ballot Tabulator, a modification of previously-approved (March 30, 1979) Model 78 Vote Tabulator, by substituting:
1. Intel 8085, a faster and newer 8-bit microprocessor, for the Intel 8080, and older 8-bit microprocessor
2. Epson MX80 or RX80 series for Victor Model 130 printer
3. An increase in read-write memory (RAM) from 8Kb up to 64Kb
4. Additional software changes
a. Print candidates names, race titles and page headings
b. process DFM's Mark-a-Vote (mark sense) ballots

City of Whittier — Apr. 18, 1984

Honeywell Type CR500 Card Reader Model CRU-9611, which reads 500 cards per minute, to be used with the Honeywell Computer Model DPS 6/48.
Note: System software problems exist in the reading of Votomatic ballot cards when non-hollerith data patterns are generated in the normal port-a-punch positions. Upon encountering a proper but non-hollerith punch pattern during testing, the card reader stopped processing the test ballot cards and generated a hardware error message. The reading a tabulation of the ballot cars for that precinct could not be continued from that point. The offending ballot card had to be removed from the precinct ballot deck which then had to be read anew.
Our examiner found that no such problems occurred when a new test deck of Votomatic ballot cards was prepared which contained punches only in the first four Votomatic ballot pages (card rows 12, 11, 0 and 1).
Our examiner recommended that system software be revised to enable the card reader to accept any possible combination of valid voting punches in order to avoid future problems.
The use of this card reader is approved for a one-time use at the April 10, 1984 municipal election conducted in the City of Whittier.

CES, Berkeley — Apr. 18, 1984

Modification to their previously approved CMX (April 24, 1980) by the substitution of components:

1. Data General (DG) Desktop Computer models 10, 20 or 30 with a micro ECLIPSE central processing unit with 256 Kb of memory;
2. 15Mb Winchester disk;
3. Peripheral Dynamics Inc (PDI) model 6111 card reader rated at 600 cpm, and Documation models M600L and M100L card readers rated at 600 and 1000 cpm, respectively;
4. Printronics M300 and Epson RX80 printers.

The new system, known as TARGET, functionally the same as a CMX with a single card reader, will use a single minicomputer, card reader and printer, and will use a cartridge tape for backup; a 15Mb Winchester disk; and a 368Kb 5 1/4 inch floppy disc. TARGET produces summary vote totals.

Data Information Management Systems, Inc (DIMS), Ventura — May 3, 1984

DIMS Opti-Vote Voting System, consisting of:

1. Chatsworth Data Corporation's model 4800 optical mark sense card reader which uses an optical scanning assembly, a light source, and an interface board to convert Hollerith formatted pen and ink marks, pre-printed marks, and key-punched holes to a usable serial ASCII RS-232C output. The card reader has an auto card read feature which allows ballot cards to be read at up to 300 cpm depending on Baud rate and number of columns read. It also has a two-sided card scan feature. Data is output at a variable Baud rate of 110, 150, 300, 1200 or 2400 bps. A Hollerith to ASCII conversion mode converts Hollerith formatted characters to all 128 possible ASCII characters. There is also an EIA RS-232C interface.
2. The ballot card is printed on one or both sides, and the 3 1/4 inch card can vary in length from 7 3/8 to 13 inches. Inline timing marks shall be printed on the top and bottom edges of the ballot card with the leading edge of the card to the left when viewing the card face up. The same rule applies to the back side of the card when using double-sided cards. The inline timing marks are coincident with the pen and ink mark, the pre-printed marks, and the key-punched holes. The space, on centers, between timing marks shall be not less than 0.261 inch, thereby allowing a maximum number of 26 voting positions per side along the length of the 7 3/8 inch cards. These voting positions would correspond to the standard card columns, 5, 8, 11, 14, ..., 74, 77 and 80.
3. Ballot marker is a non-erasable ink pen or marker in lieu of the standard Number 2 pencil.
4. Ballot security envelope.
5. Operational procedure for use in preparing for and conducting elections.
6. Operator's manual containing all information necessary to perform normal servicing and routine preventive and corrective maintenance.

County of Mariposa, Mariposa — Aug. 15, 1984

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Trinity, Weaverville — Aug. 15, 1984

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

Sequoia Pacific Systems Corporation, Emeryville — Aug. 24, 1984

CompuPro microprocessor ballot tabulating systems and associated hardware

A. Datavote/MP Model A Ballot Tabulating System

1. CPU - CompuPro Model A, Dual Processor with 256Kb read-write (RAM) main memory expandable to 1Mb with Intel 8-bit 8085 and 8/16-bit 8088 8MHz microprocessors operating under the CP/M 8/16 single-user operating system.
2. Discs - Two 8-inch DSDD CompuPro floppy disk drives. 1.2Mb each, for a total capacity of 2.4Mb, expandable to 4.8Mb by adding two additional disc drives.
3. CRT/Terminal - one of:

a.

TeleVideo model 925. The 12-inch screen displays 25 lines of 80 characters each. The keyboard has 83 keys plus a 10-key numeric pad.

b. Qume model 102. The 12-inch screen displays 25 lines of 80 characters each. The keyboard has 83 keys plus a 10-key numeric pad.

c. Wyse model 50. The 12-inch screen displays 24 lines of 80 characters each. The keyboard has 83 keys plus a 10-key numeric pad.

4.

Printer - one of:

a. Mannesmann Tally model 160 or Model 180 dot matrix with a maximum speed of 160 cps.

b. Texas Instruments model 810 dot matrix at 150 cps.

c. Okidata Model 92 or Model 94 dot matrix at 150 cps.

d. Okidata Pacemark dot matrix at 350 cps.

e. Data Products model B600 band printer at 600 lpm.

f. C.ITOH model CI 300 band printer at 300 lpm.

5. Card Reader - one of:

a. PDI model 6111 which reads cards at 600 cpm.

b. PDI model 3155 which reads at 300 cpm.

c. Documation Models M600 and M1000 which read at 600 and 1000 cpm, respectively.

6. Additional option - Control Data Corp (CDC) 1600 bpi magnetic tape drive.

B. Datavote/MP Model C Ballot Tabulating system

1. CPU - CompuPro Model C, Dual Processor with 512Kb read-write (RAM) main memory expandable to 1Mb with Intel 8-bit 8085 and 8/16-bit 8088 8MHz microprocessors operating under the CP/M 8/16 single-user or the MP/M 8/16 multiple-user operating system. The processor has a single, but expandable to eight, 512b M/DRIVE board.

2. Discs - Same as in Model A (above), with options:

a.

CompuPro 40M bytes Winchester-type hard disc drive.

b. CompuPro 20M bytes Winchester-type hard disc replacing on of the 1.2M bytes floppy disc drives.

c. CompuPro M/DRIVE - a memory board that reacts as a disc drive (0.5Mb to 4Mb capacity).

3.

CRT/Terminal - Same as in Model A.

4. Printer - Same as in Model A.

5. Card readers - Same as in Model A, expect that the Datavote ballot counting software supports up to four readers in the Model C.

6. Additional option - Same as in Model A.

County of Alpine, Markleeville — Feb 26, 1985

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Calaveras, San Andreas — Feb 26, 1985

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Del Norte, Crescent City — Feb 26, 1985

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Sierra, Downieville — Feb 26, 1985
Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Stanislaus, Modesto — Feb 26, 1985
Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

Data Information Management Systems, Inc., Ventura — May 9, 1985
Modification of previously approved mark sense ballot card for use with the DIMS Opti-Vote Voting System. This ballot card, presently approved as varying in size from 3 1/4 x 7 3/8 inches to 3 1/4 x 13 inches, would vary in size from 3 1/4 x 7 3/8 inches to 3 1/4 x 14 inches, an increase of one inch in the maximum length. The ballot card can be pre-folded to allow the use of the standard secrecy and absentee envelopes.

County of Colusa, Colusa — May 9, 1985
Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Placer, Auburn — May 9, 1985
Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Tehama, Red Bluff — May 9, 1985
Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

Sequoia Pacific Corporation, San Francisco — July 25, 1985
Approval of its DATAVOTE MP JR Desktop Ballot Tabulating System.
1. CPU - ST Personal Computer ™ manufactured by Semi-Tech Micro Electronics Corporation. The processor, which has an 8/16-bit INTEL 80186 microprocessor chip with 256 Kbytes of main memory (RAM) expandable to 512 Kbytes, operates under the MS-DOS 2.11 Operating System.
2. Disk - Two 5-1/4 inch DSDD built-in disk drives, 1 Mbyte each for a total capacity of 2 Mbytes, expandable to 3 Mbytes by adding an additional, external disk drive.
3. CRT Monitor - Taxan Model KX-12. The 12-inch monochrome screen displays 25 lines of 80 characters each.
4. Printer - Data Product's Integral Data Systems Model DP 480 - has dot matrix characters and a maximum speed of 80 c.p.s.
5. Card Readers - P.D.I. Models 3155 or 61111 and Documation M600 and M1000.
Approval of its DATAVOTE MP JR Portable Tabulating System, consisting of the same components, as above, except:
6. CRT Monitor - An LCD unit displays 25 lines of 80 characters each on an electroluminescent back-lighted panel built into the CPU.

County of San Diego, San Diego — Sept. 3, 1985
Approval of the HANDIHOLD stylus manufactured by Election Data of St. Charles, Illinois.
The stylus is designed for use with the Votomatic vote recorder by handicapped persons with infirm or limited manual gripping ability. It resembles the regular Votomatic stylus but with a round knob on top. The knob, about the size of a ping pong ball, is available in plastic or natural rubber with the following specifications:

Body: ABS Plastic

Body: SBR/Rubber
Plated Bead Chain

Plated Bead Chain
Shaft: 440 Stainless Steel

Shaft: 440 Stainless Steel
Heat Treated

Heat Treated
Stylus length: 3-3/4"

Stylus length: 3-5/8"
Weight: 1-1/2 oz.

Weight: 2 oz.
Knob diameter: 1-1/2: OD

Knob diameter: 1-1/2: OD

County of Modoc, Alturas — Sept. 3, 1985
Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

VOTEC Corporation, Berkeley — Nov. 5, 1985
Their VOTEC Precounter for use as a voting system component in California.
The principal components of the VOTEC Precounter are:
1. Motorola 6802 microprocessor.
2. sockets for up to 16Kb of memory comprised of a mixture of either ROM and/or RAM memory chips.
3. a program-defined parallel port used for card reader control, three serial RS-232 ports, each with switch selectable baud rates from 110 to 19,200, and controllers.
4. five LED indicator lights under program control.
5. two momentary power switches.
6. an integral power supply.

The VOTEC Precounter is intended for use with Data General computers of the NOVA, ECLIPSE, and MV ECLIPSE families, with Documation M series card readers, and with 312 positions and 52 positions rectangular- and round-hole formats ballot cards. The VOTEC Precounter sends precinct summary vote totals to a central general-purpose Data General computer for final County wide tally and reporting.

NOTE: This certification for use is limited to the November 5, 1985 UDEL elections in the County of San Diego which will use two satellite counting centers, one in Vista and the other in Chula Vista, as well as the regular, central counting center at he county's Registrars of Voter's facility.

County of Contra Costa, Martinez — Jan. 15, 1986

Two modifications to the previously adopted IBM Specification for the Manufacture of Ballot Card Stock when used with the previously approved DFM Mark-a-Vote Voting System. They proposed the substitution on 90-pound index stock for the prescribed ballot card stock and standard scoring suing a straight perforation in place of the required modified M-4 and M-3 scores between the ballot card and the voter's stub and between the voter's stub and the binding stub, respectively.

County of Contra Costa, Martinez — Jan. 15, 1986

Any election jurisdiction which uses the DFM Mark-a-Vote Voting System may increase the number of voting response positions per ballot card side from 26 to 30 only when the increase can be effected without violating statutory requirements with regard to type size, and rules (or lines), and the placement of office and candidate of measure information on the ballot card.

City of Whittier — Feb. 21, 1986

Honeywell type CR500 Card reader Model CRU-9611, which reads 500 cards per minute, to be used with the Honeywell Computer Model DPS 6/48.
NOTE: Because of system software constraints in the reading of Votomatic ballot card when non-hollerith data patterns are generated in the normal port-a-punch positions, this card reader, when used with the Honeywell Computer Model DPS 6/48, is limited in use to elections to which contain not more than four Votomatic ballot pages, corresponding to card rows 12, 11, 10 and 9.

VOTEC Corporation, Berkeley — Feb. 21, 1986

Approval of their VOTEC Precounter for use as a voting system component in California.

The principal components of the VOTEC Precounter are:

1. a
n 8-bit Motorola 6802 microprocessor.
2. S
ockets for up to 16Kb of memory comprised of a mixture of eight ROM and/or RAM memory chips.
3.

a program-defined parallel port used for card reader control, three serial RS-232-C ports, each with switch selectable baud rates from 110 to 19,200, and controllers.
4. f
ive LED indicator lights under program control.
5. t
wo momentary power switches.
6.

an integral power supply.

The VOTEC Precounter is intended for use with Data General Computers of the NOVA, ECLIPSE families, with Documation M series card readers, and with 312 positions and 52 position rectangular- and round-hole formats ballot cards. The VOTEC Precounter send a precinct summary vote totals to a central general-purpose Data General computer for final countywide tally and reporting.

County of Alpine, Markleeville — Feb. 26, 1986

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Calaveras, San Andreas — Feb. 26, 1986

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Del Norte, Crescent City — Feb. 26, 1986

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Sierra, Downieville — Feb. 26, 1986

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

County of Stanislaus, Modesto — Feb. 26, 1986

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

Sequoia Pacific Systems Corporation, San Francisco — Mar 18, 1986

Modifications to their previously approved DATAVOTE MP Ballot Tabulating System to allow the use of the Okidata Models 182, 192, and 193 dot matrix (9-pin printhead) printers.

County of San Diego, San Diego — Mar 18, 1986

Data General ECLIPSE MV/10000 computer System to control remote, or satellite, counting centers wit Documation M1000 Card Readers.
The system includes:
1. Model E9786-MT ECLIPSE MV/10000 with 4Mb of random access main memory;
2. Model 4380 2Mb memory module;
Model 8819 MV/10000 second I/O controller;
3. Two each Model 4369-A (8-line) and Model 4370-A (16-line) Intelligent Asynchronous Controllers (IACs);
4. Model E6238-B Intelligent Controller for 354Mb, 592Mb and 1062Mb Disc Subsystems;
5. Model 6239 Rack-mounted Winchester-type 592Mb Disk Subsystem;
6. Model E4307-H 1600/6250 bpi Magnetic Tape Drive;
7. 30 Model E6166-WA DASHER D410 Alphanumeric Display Terminals with Keyboard;
8. Two Model E6308-WA DASHER D470C System console with Color Monitor and Printer;
9. Two Model 6161 147Mb Winchester-type Discs;
10. Two Model 4425 Laser Document Printer/12 (LDP/12); and,
11. Model 6240 1.776 Gb (1776Mb) Disc.

VOTEC Corporation, Berkeley — Mar 31, 1986

Modifications to their previously approved VOTEC Precounter:
1. Replacement of the internal power supply with an external power supply that is UL listed and is tested to provide at least 50% more power than is required by a fully loaded Precounter.
2. Addition to the certification to include use with Peripheral Dynamic Inc. card readers with both the Read Check option and the Documation Interface option.

Business Records Corporation, Dallas, Texas (for Computer Election Systems, Berkeley; Election Supplies Limited, Napa; and Governmental Data Systems, Charlotte, North Carolina) — Mar 31, 1986

IBM PC AT Model 5170, consisting of a 16/32-bit Intel 80286 microprocessor, rated at 8 MHz, 256 or 512 Kb Internal Memory (RAM), 1 or 2 1.2 Mb 5 1/4 inch DSDD floppy disk drives and a 20 or 30 Mb hard disk drive. The PC will be used with the previously approved series of PDI or Documation card readers and the Integrated Micro Systems (IMS) card reader board. The printer may be an Okidata Microline 92 or 93 Printer, and Okidata Pacemark 2410 Printer, and IBM 200 cps Color Graphics Printer or Pro-Printer, or an FLD Printer.

**Business Records Corporation**, Dallas, Texas, through Election Supplies Limited, Napa — Mar 31, 1986

EZE-GRIP Stylus, a modification to the previously approved rubber-bodied HANDIHOLD Stylus. The modification consists of a groove 5/8 to 3/4 inch in radius into the SBR/Rubber knob. The stylus is designed for use with the Votomatic vote recorder by handicapped persons with infirm or limited manual gripping ability. It resembles the regular Votomatic stylus but with a round knob on top. The natural rubber knob, about the size of a ping pong ball, is available with the following specifications:
Body: SBR/Rubber with a plated Bead Chain
Knob diameter: 1-1/2" OD
Shaft: 440 Stainless Steel Heat Treated
Stylus length: 3-5/8"
Weight: 2 oz.

**County of San Diego**, San Diego — Mar 31, 1986

Modified the Votomatic absent voter ballot card. The prescored AV ballot card would have only those 'hole' numbers printed on the face of the ballot card which are used for the valid voting positions for that ballot style for that particular election.

**County of Orange**, Santa Ana — Mar 31, 1986

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

**County of Orange**, Santa Ana — May 7, 1986

Data General ECLIPSE MV/4000 Computer system to control central and satellite, or remote site, counting centers with Chatsworth, Documation M-series, and Peripheral Dynamics Incorporated (PDI) Card readers. The system includes:
1. Model E9786-MT ECLIPSE MV/4000, a 32-bit architecture machine with 2Mb of random access main memory ad operating under AOS/VS and Super UNIX;
2. One Model 4543 MCP-1, a multi-communications processor consisting of a combination 8-line Intelligent Asynchronous Controller (IAC), two synchronous lines, and a parallel printer port, or one or two Model 4369-A (8-line) and Model 4370-A (16-line) IACs;
3. One or two Model 6236 rack-mounted Winchester-type 354Mb Disc Subsystems, or one or two Model 6061-H rack-mounted Winchester-type 73Mb Disc Subsystems;
4. Model 6026 800/1600 bpi dual-density start-stop 75 ips non-streaming magnetic tape drive;
5. Up to twelve Model 6169 DASHER D211 Alphanumeric Display Terminals with Keyboard, or D400 Model 6130 Terminal and Model 6131 Keyboard;
6. Model 6194-M DASHER TP2/LP2 180 cps System Console /dot-matrix Printer, or Model 4364 Data Products 600 lpm Band-type Printer;
7. Up to eight Documation M-series, Chatsworth, or PDI Card Readers;
8. for satellite, or remote site, operations a DG E91331 Model 30 or a DG NOVA 4C with two Documation, Chatsworth or PDI Card Readers.

**County of Glenn**, Willows — May 7, 1986

Texas Instruments (TI) Business Systems Computer, Model 600. The system includes:
1. TI Business Systems Model, a 24-bit processor, with 512K random access main memory operating under the DX10 operating system;
2. One Fujitsu Winchester 474Mb Disc;
3. Twelve TI Model 931 Terminals;
4. A Printronics P300 300 lpm Printer; and,
5. One P.D.I. Card Reader and one TI Card Reader.

**VOTEC Corporation**, Berkeley — May 7, 1986

Expands the intended use of their VOTEC Precounter as a voting system component in California elections to include 228- and 235-position Votomatic rectangular-hole format ballot cards.

County of Placer, Auburn — May 7, 1986
Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

Sequoia Pacific Systems Corporation, San Francisco — May 12, 1986
The IBM PC AT Computer system with the 16/32-bit Intel 80286 microprocessor, rated at 8 MHz, 512Kb Internal Memory (RAM), one 1.2 Mb 5 1/4 inch DSDD Floppy Disc Drive, and a 30 Mb Hard Disc Drive. The complete computer system will use the previously approved Okidata Microline 192 Printer and the Documation M-Series of Card readers (the M600 and M1000) with the previously approved Interface Serial Converter.

VOTEC Corporation, Berkeley — Aug. 29, 1986
Approval for use in California elections of their previously approved VOTEC Precounter with the IBM PC, IBM PC/XT, IBM PC/AT, and all other certified computers where the Precounter can be attached through standard serial connections, without the use of hardware modifications or card reader interface boards having to be added to the computer.

County of Nevada, Nevada City — Aug. 29, 1986
A modification to the previously approved DIMS Opti-Vote Voting System. The proposed change is the substitution of the Berol Boldliner 7735 Medium Fine Porous Tip Black Pen for the previously approved marking device. and is proposed for use only with the Chatsworth Data Corporation's Model 4800 Optical Mark Sense Card Reader.

Data Information Management Systems, Inc., Ventura — July 31, 1987
Approval for use in California elections of Data General's ECLIPSE MV/7800,, a 32-bit architecture, Computer System to control central counting centers with Chatsworth, Documation M-series, and Peripheral Dynamics Incorporated (PDI) Card Readers. The maximum configuration of the system includes 14Mb of main memory available in 2, 4, and 10Mb increments; 14 I/O controllers; 9.4Gb of disk storage; 8 tape units; 128 asynchronous communication lines; 8 synchronous communication lines; and 6 data channel printers. There are four operating systems available: AOS/VS, AOS/DVS, AOS/RT32 and DG/UX; and a variety of commercial and technical programming languages, including COBOL, FORTRAN, PL/1, Pascal, Common LISP, BASIC, APL, RPG II and DG/L, DG's structured programming language.

Elections Data, St. Charles, Illinois — July 31, 1987
Approval of their new Data Punch Vote Recorder and associated hardware (Format 52, 228, 235, or 312 Template with lexan spring, and Ballot Frame).
a. The Data Punch Vote Recorder is mad of high impact ABS and Texan, weighs 16 ounces, and measures 11-5/8 by 4-1/4 by 1-1/2 inches.
b. Universal ballot frame is made of high impact ABS and Lexan.
c. Formats 52, 228, 235, and 312 precision molded template made of G-141 Lexan with a beryllium copper spring.
d. HANDIHOLD stylus measuring 3-3/4 inches long and weighing 1-1/2 ounces with at PCR (Positive Chad Removal) tip. The body is made of ABS plastic with a plated bead chain and a shaft of 440 stainless steel heat treated.
e. PCR stylus measuring 2-1/4 inches and weighing 1 ounce. The body specifications are the same as in part d (above). Note: the recorder uses either stylus, as the voting jurisdiction requires.
f. Metal crimp bars.
g. Plastic yellow masks.
h. Ballot viewer with a polyurethane lens on an ABS plastic holder, if required by the voting jurisdiction.

Business Records Corporation, Berkeley — Nov. 16, 1987
Approval for use in California elections of their IBM-compatible BRC Series 300 and Series 500 microcomputers for ballot counting operations in addition to the previously approved IBM XT and IBM AT

P.C. microcomputers. The Series 300 includes Models 301 010, 314 010, 314 0020, 314 021, 314 022, and 314 024; the Series 500 includes Models 501 001, 514 021, 524 121, 524 122, 524 124, and 524 127. The specifications are appended to, and made a part of, this certification.
The BRC microcomputer will be used with the previously approved series of PDI or Documation card readers and the Integrated Micro Systems (IMS) card reader board.
The BRC microcomputer will be used with the previously approved series of printers including: Okidata Microline 92 or 93 Printer; Okidata Pacemark 2410 Printer; IBM 200 cps Color Graphics Printer or Pro-Printer; FLD Printer; Mannesmann Tally Model 160 or Model 180 dot matrix with a maximum speed of 160 cps; a Texas Instruments Model 810 dot matrix at 150 cps; an Okidata Model 92 or 94 dot matrix at 150 cps; a Data Products Model B600 band printer at 600 lpm, or a C.ITOH Model CI 300 band printer at 300 lpm.
The Series 300 includes for each model:
Model 301 010: Intel 8088 4.77 MHz processor, 640Kb of memory, and a 5-1/4 inch 360Kb floppy disc.
Model 314 010: Intel 80286 10.0 MHz one wait state processor, 640Kb of memory, and a 5-1/4 inch 360Kb floppy disc.
Model 314 020: Intel 80286 10.0 MHz one wait state processor, 640Kb of memory, and 5-1/4 inch 1.2Mb floppy disc.
Model 314 021: Intel 80286 10.0 MHz one wait state processor, 640Kb of memory, a 5-1/4 inch 1.2Mb floppy disc, and 20Mb hard disc.
Model 314 022: Intel 80286 10.0 MHz one wait state processor, 640Kb of memory, a 5-1/4 inch 1.2Mb floppy disc, and 40Mb hard disc.
Optional features:
a 5-1/4 inch 360Kb or 1.2Mb diskette drive, 20Mb, 40Mb fixed disc
External 2.2Gb 8mm cartridge tape drive with SCSI host adapter 384Kb memory upgrade (enlarges memory to 1Mb on planar board)
The Series 500 includes for each model:
Model 501 011: Intel 8088 4.77 Mhz processor, 640K of memory, a 5-1/4 inch 360Kb floppy disc, and 20Mb fixed disc.
Model 514 021: Intel 80286 10.0 Mhz one wait state processor, 640Kb of memory, a 5-1/4 inch 1.2Mb floppy disc, and 20Mb fixed disc.
Model 524 121: Intel 80286 10.0 MHz zero wait state processor, 1.0Mb of memory, a 5-1/4 inch 1.2Mb floppy disc, and 40Mb hard disc.
Model 524 122: Intel 80286 10.0 MHz zero wait state processor, 1.0Mb of memory, a 5-1/4 inch 1.2Mb floppy disc, and 80Mb hard disc.
Model 524 124: Intel 80286 10.0 MHz zero wait state processor, 1.0Mb of memory, a 5-1/4 inch 1.2Mb floppy disc, and 40Mb hard disc.
Model 524 127: Intel 80286 10.0 MHz zero wait state processor, 1.0Mb of memory, a 5-1/4 inch 1.2Mb floppy disc, 240Mb hard disc, and SCSI host adapter.
Optional features:
a 5-1/4 inch 360Kb or 1.2Mb diskette drive, 20Mb, 40Mb, or 80Mb fixed disc (Excluding model 127)
2 additional serial ports
1 additional parallel port
Internal or External 2.2Gb 8mm cartridge tape drive with SCSI host adapter
1Mb DRAM memory upgrade (enlarges memory to 2Mb on planar board)
2Mb DRAM memory upgrade (enlarges memory to 3Mb on planar board)
3Mb DRAM memory upgrade (enlarges memory to 4Mb on planar board)
Available displays and adapters:
12-inch monochrome (amber) display
14-inch color graphics display
14-inch enhanced graphics display
13-inch multi-sync graphics display
Monochrome display adapter
Enhanced Graphics Display Adapter
Technical information BRC 80286 microprocessor operating at 10Mhz with one wait state
Socket for optional 80287 math co-processor

ROM based automatic power-on self test of system components
Two 16-bit wide memory banks
designed to accept 64Kb and/or 256Kb chips; maximum on-board memory of 1Mb
additional memory expansion to 16Mb, using a suitable memory
expansion board in an expansion slot
Supports BIOS memory up to 64Kb
Includes IBM PC AT compatible BIOS with configuration setup program in ROM
Two direct Memory Access Controllers (DMAC) on-board
one DMAC provides 3 channels for 8-bit transfers
one DMAC provides 4 channels for 16-bit transfers
Six expansion slots
Four 16-bit
Two 8-bit
Real-time clock/RAM chip
provides clock/calendar function and stores configuration information
Includes 6 volt battery backup
One RS-232 serial port
One parallel port
200 watt switching power supply
1.2Mb diskette drive
Fixed disc and diskette drive adapter
101 key keyboard
Bi-directional keyboard interface
Directionally-mounted speaker
Technical information BRC 80286/0 CPU
Advanced high-performance Intel 80286 microprocessor operating at
10MHz with zero wait state
Socket for optional 80287 math co-processor
ROM based automatic power-on self test of system components
Two 16-bit wide memory banks
designed to accept 64Kb, 256Kb, and 1Mb DRAM chips
maximum on-board memory of 4Mb
additional memory expansion to 16Mb, using a suitable memory
expansion board in a expansion slot
Supports BIOS memory up to 128Kb
Includes IBM PC AT compatible BIOS with configuration setup program in ROM
Two DMA's on-board
one DMAC provides 3 channels for 8-bit transfers
one DMAC provides 3 channels for 16-bit transfers
Eight expansion slots
Six 16-bit
Two 8-bit
Real-time clock/RAM chip
provides clock/calendar function and stores configuration information
Includes 6 volt battery backup
One RS-232 serial port, expandable to three
One parallel port, expandable to two
200 watt switching power supply
360 Kb or 1.2Mb diskette drive
Fixed disc and diskette drive adapter
101 key keyboard
Bi-directional keyboard interface
Directionally-mounted speaker

Sequoia Pacific Systems Corporation, San Francisco — Mar. 1, 1988

Approval and certification for use in California elections for the IBM Person System/2 microcomputer equipment listed below.

Central Processing Units

IBM PS/2 Model 80

2-Mb Memory, 80386 Processor with 16MHz Clock, One 1.44Mb Floppy Disc, One 70Mb Hard Disc, One Serial Port for Card Reader, One Parallel Port for Printer, Up to three additional Serial Ports with Dual Async adapter Boards for Network or Serial Printer, Monochrome Monitor.

IBM PS/2 Model 60

1Mb Memory, 80286 Processor with 10MHz Clock, One 1.44Mb Floppy Disc, One 44Mb Hard Disc, One Serial Port for Card reader, One Parallel Port for Printer, Up to two additional Serial Ports with Dual Async Adapter Boards for Network or Serial Printer, Monochrome Monitor.

IBM PS/2 Model 50

1Mb Memory, 80286 Processor with 10MHz clock, One 1.44Mb Floppy Disc, One 20Mb Hard Disc, One Serial Port for Card Reader, One Parallel Port for Printer, Up to two additional Serial Port with Dual Async Adapter Boards for Network or Serial Printer, Monochrome Monitor.

IBM PS/2 Model 30

640Kb Memory, 8086 Processor with 8Mhz Clock, One 720Kb Floppy Disc, One 20Mb Hard Disc, One Serial Port for Card Reader, One Parallel Port for Printer, One additional Serial Port for Network or Serial Printer, Monochrome Monitor.

IBM PS/2 Model 25

640Kb Memory, 8086 Processor with 8MHz Clock, One 720Kb Floppy Disc, One Serial Port for Card Reader, One Parallel Port for Printer, One additional Serial Port for Network or Serial Printer, Monochrome Monitor (Built In).

Card Readers

Previously approved series of PDI or Documation Card Readers with Serial Interfaces.

Printers

IBM Pro-Printer, Models II, XL, X24, XL24

DataProducts Models 300 or 600 - CompuPro Line Printers

Epson Models FX85 or FX286

Mannesmann Tally Model 160

Okidata Serial Printers Models 192 or 2410

The IBM PS/2 microcomputer can also be used, with parallel or serial interfaces, as appropriate, with the following previously approved series of printers including:

C.ITOH Model CI 300 Band Printer at 300 lpm;

Data Products Model B600 Band Printer at 600 lpm;

Mannesmann Tally Model 160 or Model 180 dot matrix with a maximum speed of 160 cps;

FLD Printer;

IBM 200 cps Color Graphics Printer or Pro-Printer;

Okidata Microline Models 92, 93, or 94 dot matrix Printer at 150 cps;

Okidata Pacemark 2410 Printer;

Texas Instruments Model 810 dot matrix at 150 cps;

These units may be used in several configurations for ballot counting. The IBM PS/2 Models 30, 50, 60, and 80 may be used as single reader systems. The IBM PS/2 Models 50, 60, and 80 may also operate as servers in a Network to the other models in the line.

Each work station in a Network may consist of an IBM PS/2 Model 25, 30, 50, or 60 CPU and a card reader. The maximum number of work stations (Card reader and CPU) for the IBM PS/2 Model 80 is six. When the IBM PS/2 Models 50 or 60 are used as a server, the maximum number of work stations is two.

County of Placer, Auburn — Sept. 19, 1988

Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

Sequoia Pacific Systems Corporation, San Francisco — Feb. 7, 1989

The list of the IBM Personal System/2 microcomputer equipment approved and certified for use in California elections, as described in our certification issued March 1, 1988, is extended to include the following PS/2 Models and Machine numbers:
Model 25: 8528-001, -004, -G01, and -G04;
Model 30: 8530-002 and -021;
Model 30 286: 8530-E01 and -E21;
Model 50: 8550-021;
Model 50 Z: 8550-031 and -061;
Model 60: 8560-041 and -071;
Model 70 386: 8570-E61, -121, and -A21;
Model 80 386: 8580-041m -071m -111, and -311.
The processor's speed, the number of wait states, the user memory, the number of available expansion slots, the number of diskette drives, the amount of fixed disk storage, and the number of supported IBM displays and printers, as well as any other functions which do not vary, is indicated on the information sheet entitled "Person System/22 model comparisons" which is appended to and made part of the certification.
The previously approved described additional peripheral equipment, including card readers and printers is also included in this extended certification.
The units may be used in several configurations for ballot counting. All IBM PS/2 Models may be used as single reader systems. The IBM PS/2 Models may be used as single reader systems. The IBM PS/2 Models 50, 50 , 60, 70 386, and 80 386 may also operate as servers in a Network to the other models in the line. Each work station in a Network may consist of an IBM PS/2 Model 25, 30, 30 Z, 50, 50 Z, or 60 CPU and a card reader. The maximum number of work stations (Card Reader and CPU for the IBM PS/2 Model 80 is six. When the IBM PS/2 Models 50, 50 Z, or 60 are used as a server, the maximum number of work stations is two.

Business Records Corporation, Berkeley — Feb. 7, 1989
Our certification of March 27, 1986 is hereby amended to allow the use of the IBM PC AT Model 5170 in a Local Area Network (LAN). Novell, Ethernet will be used for the network software and file servers, when required, will be compatible with the previously approved IBM PC AT Model 5170.

Business Records Corporation, Berkeley — Feb. 16, 1989
Compaq Portable 286 and Compaq Deskpro 286 personal computers for ballot counting operations in addition to the previously approved IBM XT and IBM AT P.C. microcomputers and their IBM-compatible BRC Series 300 and Series 500 microcomputers. The Compaq Portable 286 and the Compaq Deskpro 286 personal computers may be used in a Local Area Network (LAN) environment.
The Compaq Portable 286 and Compaq Deskpro 286 person computers will be used with the previously approved series of PDI or Documation card readers and the Integrated Micro Systems (IMS) card reader board.
The Compaq Portable 286 and Compaq Deskpro 286 personal computers will be used with the previously approved series of printers including: Okidata Microline 92 or 93 Printer; Okidata Pacemark 2410 Printer; IBM 200 cps Color Graphics Printer or Pro-Printer; FLD Printer; Mannesmann Tally Model 160 or Model 180 dot matrix with a maximum speed of 160 cps; a Texas Instruments Model 810 dot matrix at 150 cps; an Okidata Model 92 or 94 dot matrix at 150 cps; a Data Products Model B600 band printer at 600 lpm, or a C.ITOH Model CI 300 band printer at 300 lpm.

The County of Kings, Hanford — Oct. 5, 1989
Compaq Deskpro 386 25MHz and Compaq Deskpro 386 16Mhz personal computers for ballot counting operations, which may be used in a Local Area Network (LAN) environment.
The Compaq Deskpro 386 personal computers may be used with the previously approved series of Documation card readers and Benton Data Converter Boxes.
The Compaq Deskpro 386 personal computers may be used with the Hewlett Packard LaserJet series II and Okidata 393 printers as well as with any of the previously approved printers.

A three-page document 'Kings County Government Center Elections Network' is incorporated as part of this certification.

**The Bella Vista Water District, Redding** Oct. 6, 1989

Apple Macintosh SE personal computer for ballot counting operations in a landowner district election; that is, on in which the number of votes each voter is entitled to is based on the assessed valuation of the land the voter owns in the district conducting the election.

The Apple Macintosh SE computer is configured with 2.5 megabytes of random access memory, and internal, built-in 20 megabyte hard disk drive, and an internal, built-in 20 megabyte hard disk drive, and an internal, built-in 3.5 inch 800 kilobyte micro-floppy disk. the computer has a Radius full page monitor, Videx 'Time Want' bar code readers with Videx Time Manager software, reading 'Code 3 of 9' bar code format, and one or more Apple LaserWriter IINT laser printers with 2 megabytes of internal memory using the Postscript page description language. The operating system is the Apple system software version 6.0 running MultiFinder. The vote count program is the Microsoft Excel Spreadsheet and Database program, version 2.2.

The proposed use of the Apple Macintosh SE computer as described is hereby approved conditionally for use subject to the following terms and conditions. After the election night vote counting process and before the certification of the election results, a manual recount and audit of the spreadsheet ballot images shall be performed on a sample size of not less than five percent of the ballots. Proper care must be taken to match ballots and images where the number of entitled votes is not unique. For example, if there are 20 ballots each entitles to 5,000 votes, each of the 20 ballots shall be pulled and checked.

**UniLect Corporation, Dublin** Oct 18, 1989

Their new, positive chad removal Triad E-C Vote Recorder and replacement unit to the Votomatic-style device.

**County of Alameda, Oakland** Oct 18, 1989

The Dell System 310 person computer consists of an Intel 80386 microprocessor, rates at 20 MHz, 2 MB Internal

Memory (RAM), one 1.44 MB 3-1/2 inch floppy disk drive, a 90 MB hard disk drive, and the standard Dell monitor.

The PC will be used with the previously approved series of Documation card readers and the DIMS 1000 Card Reader Controller. The Dell System 310 personal computer will be used with the Hewlett Packard LaserJet series II printer and may be used with any of the previously approved printers.

**Bella Vista Water District, Redding** Oct 18, 1989

Approval of a modification to its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

**City and County of San Francisco** Apr. 26, 1990

The Dell System 325 personal computer consists of an Intel 80386 microprocessor, rated at 25 MHz, 1 MB Internal Memory, one 3.5 inch 1.44 MB diskette drive, a 100 MB hard disk drive, VGA Color Plus, and the standard Dell monitor. The Dell System 325 computer will be used with the previously approved series of Documation card readers, four DIMS 2000 card reader control cards, one Hewlett Packard LaserJet series III printer, one Ethernet communication card, one IBM-3270 emulator card, one Microsoft bus mouse, and may be used with any of the previously approved printers.

**VOTEC Corp., Berkeley** Jan. 24, 1991

Modifications to their previously approved VOTEC Precounter. These modifications include replacing the circuit board with a plug-compatible board based on the 80C286 chip and supporting Integrated Chips (ICs) to replace the Motorola 6802 and its supporting ICs. The case, switches, lights, and power supply are identical to the previously approved VOTEC Precounter. This upgrade also responds to the recently adopted Votomatic procedures which call for records of card reader behavior including read checks, pick checks, and pre-punch checks.

Sequoia Pacific Systems Corporation, San Francisco — Feb. 21, 1991

The Toshiba Model T-3100SX Lap Top Computer consisting of a 386SX microprocessor rated at 16 MHz, 1 to 17Mb internal RAM memory, one 3.5 inch 1.44 Mb diskette drive, either a 40 or 80 Mb hard drive and a Canon BJ10E Bubble Jet Printer. The Toshiba may be used with any of the previously approved printers.

Business Records Corporation, Dallas, Texas — Mar. 13, 1991

The OPTECH IV-C, a successor to their previously approved CES OPTECH 1 Mark Sense Voting System is a stand-alone, self-contained central-count optical-scanning ballot tabulator that uses an automatic high-speed ballot feeder to process and a built-in sorting system to divert the processed ballots into one of three destination bins. Inside, the unit contains a ballot transport system, electronic controls and sensors, an internal battery-powered clock-calendar to provide the date and time for the audit trail, and a computer to control the entire system. The mechanical components include an AC motor which runs the ballot feeder and ballot transport system along with sensors, the optical read heads which are attached to the feed hopper, and the diverter gates used to segregate the ballots into the proper bins. The sensors, read heads, and motor are controlled by several proprietary BRC electronics boards which interface with the computer control bus.

The external parts of the unit consist of the main chassis with a central opening for the write-in bin, a top-mounted outstacked bin, a side opening for the main ballot bin, and ballot feed hopper. A roll around cart to hold the main ballot bin completes the external parts of the system.

Electronic components include a system of sensors that monitor the progress of the ballots through the system; solenoids that control the moments when a ballot is 'picked' off the bottom of the stack in the feed hopper; read heads that are sensitive to a broad spectrum of colors; and diverter gates to deflect ballots into the proper bin. Several electronic boards provide the power and control for these elements.

Computer devices complete the list of major components. The computer system unit that controls the OPTECH IV-C is an internal 'AT' class processor running the PC-DOS operating system version 3.3, with 640 KB of RAM and a 40-MB hard disk and both a 5.25 inch 1.2 MB and a 3.5 inch 1.44 MB floppy drive. A memory expansion board can be added to provide from 2 to 8 Megabytes in 2-MB increments of LIM 4.0 to permit processing of ballots from intermixed precincts. Also included is a VGA or EGA monitor with a touch screen interface driven through a serial port, a keyboard, and a parallel port printer.

The system reads single- or double-sided ballots of 1, 2, or 3 columns which may vary in width from 3.69 to 9.75 inches and length from 12 to 18 inches at the rate of 385 ballots per minute, for the 12-inch ballot. No orientation of ballots is needed.

Business Records Corporation, of Dallas, Texas — Mar. 13, 1991

The OPTECH III-P Eagle system, a successor to their previously approved CES OPTECH 1 Mark-Sense Voting System, records, tabulates, and prints results of the votes recorded on ballot cards voted at the precinct polling place by means of ballot tabulator (counter), ballot box, MEMORYPACK, a built-in printer, and an optional battery backup. The system reads single- or double-sided ballots of 1, 2, or 3 columns which may vary in length from 12 to 22 inches at the rate of 24 ballots per minute, for the 12-inch ballot.

The ballot tabulator consists of a manually-fed optical ballot reader, a keypad, a printer, a 4-digit display, a sound emitter, 'Power' and 'Ready' lights, a ballot striping (marking) mechanism, outstacking diverters, path sensors, and the electronics to control these items. The MEMORYPACK, which plugs into the back of the tabulator which rests on top of the ballot box and is locked into the tabulator by a numbered seal, stores the election totals for transfer to a central accumulation system. At the close of the polls, the built-in printer produces the precinct totals on the event log tape which lists the time the polls opened, the time the polls closed, any read errors, any operator interventions, and the election totals for each candidate and issue.

County of Sonoma — Apr. 17, 1991

Data General's ECLIPSE line of 32-bit architecture Computer Systems to control central counting centers with Documation Card Readers. The maximum configuration of the system includes 128 MB of main memory; 14 I/O controllers; 76.8 GB of disk storage; 8 tape units; 624 asynchronous communications lines; 16 synchronous communications lines; and, 6 data channel printers. There are two operating systems available: AOS/VS, AOS/VS II; and, a variety of commercial and technical programming languages, including COBOL,

FORTRAN, PL/1, Pascal, Common LISP, BASIC, APL, RPG II, C, and DG/LM, Data General's structured programming language.

**Diverse Integrated Systems, Inc. (DIS), Benicia** May 10, 1991
The DIS Ballot Tab is a version of the previously approved CES Ballot Tab, a card-controlled ballot tally system. The DIS Ballot Tab consists of a Data General NOVA 4, a general purpose 16-bit microcomputer, a Documation M600L card reader, and an Okidata Microline 84 serial printer. The DIS Ballot Tab may be used with any of the previously approved microcomputers, card readers, or printers.

**Benton Company**, Santa Ana June 4, 1991
Benton 80-Column Card Reader, a Documation Card Reader compatible, is a redesigned chassis using all of Documation Model M300L, M600L, and M1000L card transport and data transfer electronics including read station, electrical wiring and logic boards.

**Election Data Corporation**, Escondido Aug. 15, 1991
"Card Removal" Template and compatible mask for use with Votomatic vote recorder.

**Election Data Corporation**, Escondido Aug. 15, 1991
Pollstar voting system, with a reusable and fully punched out vote recorder mask, for use in Votomatic, Datavote, and Marksense voting jurisdictions.

**Diverse Integrated Systems, Inc.**, Benicia Aug. 21, 1991
D.I.S. 80-Column card reader, a remanufactured Documentation unit using new components and all of Documentation's original card transport and data transfer electronics, including electrical wiring, logic boards, and its own read station.

**Global Elections Systems, Inc.**, Albuquerque Aug. 21, 1991
D.I.S. BIOPTIC Card Reader, manufactured by Diverse Integrated Systems, Inc. (D.I.S.) of Benicia, California. The D.I.S. BIOPTIC Card Reader is a modified Documation or D.I.S. remanufactured card reader, modified by milling the upper support casting to allow for the insertion of D.I.S.'s special read head, and substituting D.I.S.'s special read array and the read array control board in place of the standard card reader light sensing arrays in the Documation family of card readers.

These modifications do not alter the present signal status of the card reader, making it possible to operate with any existing software that uses the present output of the Documation Card Reader. These modifications do allow a single card reader to interpret ballot cards with punches as well as mark sense marks at the same election.

**Global Elections Systems, Inc.**, Albuquerque Aug. 21, 1991
Chad-free Ballot Assembly Punch (CF-1), manufactured by Computer Elections Corporation of San Francisco. The Chad-free Ballot Assembly Punch (CF-1) is a vote recording replacement part which eliminates the need for a pre-scored card. It replaces the current ballot frame assembly in existing Format-312 Vote Recorders.

**Data Control Engineering**, Buena Park Feb 7, 1992
Data Control Engineering (DCE)'s P1000 Series Card Readers, a 1,000 card per minute punch card reader. The Model MP1000 is a punch or mark sense card reader formed by adding a second circuit board and an optical read head to the Model P1000 Card Reader. The mechanical parts are fabricated duplicates of the Documation M1000 and TM1000 Card Readers. The electronic components have been redesigned using modern circuit components, thereby reducing the number of board to board interconnects. The functional aspects of the Documation circuit cards have been included in the new circuits to ensure compatibility with the Documation interface.

Data Control Engineering, Buena Park — Feb 7, 1992

Modification to the DCE Model BC83 Ballot Tabulator be approved for use in California elections. The modification consists in the use of the DCE Model P1000 and Model MP1000 card readers with the DCE Model BC83 Ballot Tabulator.

DFM Associates, Irvine — Feb 7, 1992

Modifications to the Data Control Engineering (DCE) MP1000 Card Reader allowing the simultaneous reading of ballot voting positions on both sides of the ballot card.

Election Data Corporation, Escondido — Feb 7, 1992

The Poll Star Voting system uses a reusable and fully punched out vote recorder mask with a punch card type vote recorder. A voter uses an unattached candidate/measure source guide to determine the number which needs to be punched to reflect preference. The voter "votes by the numbers." The system was presented to the Secretary of State at a hearing conducted on July 17, 1991 and was conditionally approved for use in local elections only held between August 1 and December 31, 1991. The certification required Election Data Corporation to contract with an independent contractor to evaluate the system as used in one or more such local elections.

Triad Governmental Services, Inc., Xenia, Ohio — Apr. 27, 1992

Triad Intelligent Ballot Reader Interface for use with their previously approved GSI ELECtab Vote Tabulation System. The Interface is used to connect any of several types of ballot card readers to the RS-232C serial port of a control computer. The firmware for the interface is stored in hexadecimal representation and resides in a removable EPROM. The program is executed as soon as power is applied to the interface which cannot be modified while it is executing, nor can the program be stopped by user intervention in order to be modified. The GSI ELECtab Vote Tabulation System can use any of the previously approved card readers, printers, and personal computers.

Glenn County, Willows — May 21, 1992

Mini-Micro LAN of Yuba City assembled an IBM-compatible personal computer for ballot tally operations which the county purchased in March, 1988. The county has used it since, but not for any ballot tally operation. The attributes of this personal computer include an 8 MHz 80286 micro-processor, 1.6 MB RAM, a 40 MB Hard Drive, a 5-1/4 inch 1.2 MB Floppy Drive, and a 3-M Mini 200 Data Cartridge system for tape backup. The computer is connected with an Epson monochrome monitor and an NEC Pinwriter P5300 dot-matrix printer, and will be used with Sequoia Pacific's Election System software.

Business Records Corporation, Dallas — Aug. 27, 1992

Procedures for use of their previously approved BRC OPTECH IV-C Central Ballot Counter.

American Information Systems, Inc., Omaha — Aug. 27, 1992

Model 115 Ballot Scanner (AIS-115) and Model 315 ballot scanner (AIS-315). Both models are central counting systems, using Optical Mark Readers for use in paper ballot elections. The AIS-315 can record election results on magnetic tape.

Conditions: The use of the AIS-115 and the AIS-315 is approved, subject to two provisions: 1) the marking device must be non-erasable; and, 2) written procedures for the use of the ballot scanners must have been approved by the Secretary of State before either the AIS-115 or the AIS-315 can be used in an election in California.

Global Elections Systems, Inc., San Rafael — June 30, 1993

Election System-2000 (ES-2000), an optical scanning vote tally system for use at precincts and central counting centers and their Absentee Ballot Counting System (ABCS-1).

Conditions: The use of the Election System-2000 (ES-2000) is approved, subject to three provisions: 1) the marking device must be a non-erasable Berol Fine Point 7700 Marking Pen (with carbon ink), or equivalent; 2) a suitable security sleeve for the ballot must be used with the system when it is used at the precinct; and, 3)

written procedures for the use of the ballot scanners must have been approved by the Secretary of State before the Election System-2000 (ES-2000) can be used in an election in California.

Business Records Corporation, Berkeley — Oct. 4, 1994
Substitute power supply for OPTECH III-PE precinct ballot counter of Digital Power's US100 Series Universal Input 100 Watt Switchers for the previously approved in-house pseudo-switched design.

County of Modoc, Alturas — Oct. 4, 1994
GATEWAY P4D-66 personal computer. Intel 66MHz 80486DX2, AT case with 145-watt power supply, 128K SRAM cache (20ns), 8MB DRAM (70ns SIMMS) expandable to 128MB, 1.44MB 3.5-inch diskette drive, 340 MB Western Digital IDE (13ms) 17 MB DTR with 128K multi-segmented cache buffer, PCI fast IDE interface, PCI local-bus graphics accelerator with 1MB DRAM, 14-inch CrystalScan 1024NI color monitor (1024 x 768), Phoenix BIOS, Battery-backup clock/calendar, 4 ISA slots, 2 PCI and 1 PCI/ISA slots, 124-key AnyKey programmable keyboard, 250 MB CMS internal tape backup (w/tape), Intel Pentium technology ready, DOS 6.2/Microsoft Windows for Workgroups 3.11, Microsoft mouse & Gateway mouse pad, QAPlus hardware diagnostic program, and Fully FCC Certified.

City and County of San Francisco — Oct. 4, 1994
Dell System 433/T computer: i486DX, 33MHz ISA bus with 4MB of RAM and 340MB Hard Drives.

American Information Systems, Inc., Omaha, Nebraska — Oct. 4, 1994
Model 150 Ballot Scanner (AIS-150) and Model 550 ballot scanner (AIS-550). The AIS-150 is a modification of its previously approved AIS-115, and the AIS-550 of the AIS-315, both of which were certified on September 11, 1992. The AIS-150 and the AIS-550 are central counting systems, using high-speed OMR in counting centers to process paper ballots. The source document is a paper ballot, 8-1/2 inches by 14 inches, marked by the voter. Each ballot is individually coded with its own precinct identification. These codes permit the reading of ballots in any sequence without presorting.
The modifications to both the AIS-115 and the AIS-315 produce the AIS-150 and the AIS-550, respectively. The modifications consist of:
1. Adding a 3.5 inch floppy disk drive for memory backup and data storage. (For the AIS-315 the 3.5 inch disc replaces the original cassette tape drive.)
2. A membrane control panel replaces the original switch panel.
3. A stand-alone printer replaces the permanently attached printer.
4. A one-piece integrated mother board replaces the card cage.
5. Smaller cabinets with a new exterior finish replace the original cabinets.

County of Calaveras — Nov. 7, 1994
AST 386C Premium Computer with 4MB of RAM, 110 MB Hard Drive, and MS-DOS Rel. 3.30A.

County of Merced, Merced — Nov. 2, 1994
Approval of its Elections Observer Panel plan for use when voted ballots are counted at some place other than at the precinct.

DFM Associates, Irvine — July 31, 1997
Approval of its DFM BCWin election tally software used on Intel Pentium chip microcomputers operating in a Windows NT environment.

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