Poll Monitors' and Poll Workers' Guide to Electronic Voting

Tools for Election Protection

Introduction and Overview

The 2004 elections present many voters with the challenge of voting on new and unfamiliar voting equipment. This guide provides poll monitors, poll workers, election officials, and other interested persons with information about voting technology and procedures with a focus on electronic voting machines.

It is a companion to the *Voters' Guide to Electronic Voting* also published by the Verified Voting Foundation.

Election officials across the United States are facing much pressure to "upgrade" voting technology, especially with the availability of funds legislated for this purpose by the Help America Vote Act (HAVA) of 2002.

Counties, boroughs, parishes, and even entire states are purchasing digital electronic recording (DRE) voting machines without a voter-verified paper ballot (VVPB) capability. A VVPB is a paper ballot that voters can see and verify that their votes are recorded accurately and stored in a secure ballot box so that election officials can use the ballots later for mandatory audits and meaningful recounts.

This *Poll Monitors' and Poll Workers' Guide to Electronic Voting* provides poll monitors, poll workers, election officials, and other interested persons with detailed information on the voting machines used in polling places and central tabulation facilities with pointers to how to keep voting technology working successfully and improve elections operations. We also cover how to investigate and get help when something goes wrong with the voting technology.

You can learn what choices voters have available in the jurisdiction where you are working. For example, in California, voters in one of the counties using electronic voting machines have the right to ask for a paper ballot if they prefer. In Hawaii and in Washington, D.C., voters may have the choice of using a paper optical-scan ballot instead of an electronic voting machine.

And in Nevada's Clark County, some of the voting machines will have VVPB and some will not, so a concerned voter may want to wait for the machine that does offer a reliable audit trail.

The more you can let voters, fellow poll monitors and poll workers, and election officials know about the options available in the voting process, the more likely you can ensure that voters can vote and that their votes will be recorded as intended.

Your Participation

As a nonprofit organization with limited resources, we rely on volunteers to help with research for guides like this one, as well as for a variety of other tasks. We are committed to continuous improvement of the

materials, so if you see a problem with any of these materials or if you would like to volunteer to do research, data gathering and display or other jobs, please let us know by volunteering at http://www.voteprotect.org.

Last but not least—and regardless of any problems with voting technology or election processes, procedures, and regulations—please remember to vote and encourage others to vote!

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This Voters' Guide has a variety of sections:

Online Versions

The online version of this document with the latest updates is available at:
http://verifiedvoting.org/article.php?id=5171

The online version of the *Voters' Guide to Electronic Voting* is available at:
http://verifiedvoting.org/article.php?id=5133

Voting Technology Overview

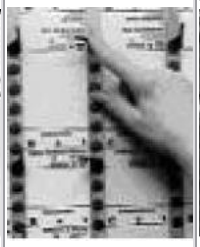
In the United States, we use a variety of voting technologies for elections for public office. The technologies, summarized in the table below, are:

- Optical scanners that read mark-sense forms [1] (footnotes available at end of this section)
- Electronic voting (e-voting) machines [2]
- Punch cards [3]
- Mechanical lever machines [4]
- Manually counted paper ballots.

When voters cannot physically go to their polling place, they can use mail-in (absentee) ballots. The ballots are then read by the appropriate optical scanner or punch card technology or are tallied and entered by hand. Finally, voters may eventually be able to use Internet-based voting technologies that are currently being developed. With all technologies, voters indicate, in secret, their choices on a ballot that bears the names of the candidates and the texts of the propositions.

The punch card, optical scan, and manual paper ballots are distributed to the voters at the polls and voter can confirm their selections before depositing them in the ballot box. In contrast, voters make selections by moving levers or touching the screen on lever machines and e-voting machines respectively; there is no paper ballot for the voter to mark. Some e-voting machines print a ballot that the voters can read; after the voter confirms the printed record, it is withdrawn into the machine and an electronic record of their vote is automatically stored inside the machine on removable computer memory cards.

Voting Technology Overview

Voting Technology Type Characteristic	Optical Scan 	Electronic Voting 	Punch Card 	Lever Machine 	Paper Ballot 
Expected use in Nov. 2004 [5]	32%	29% [6]	19%	13%	<1%
Ballot technology	Paper	Labeled choices on a computer screen	Paper	Labeled mechanical levers	Paper
In-precinct counting technology	Electronic	Electronic	Electronic	Manual / Electronic	Manuall
Central counting technology	Electronic	Electronic	Electronic	Electronic	Electronic
Ballots can be verified by the voter or manually checked during a recount or audit.	Yes	Some are equipped with paper ballots [7]	Yes	No	Yes

At the close of voting, punch card, and optical scan ballots are tallied and stored by scanning computers. E-voting ballots are transferred by memory card or by network/modem to a central tallying computer. Poll workers read lever machine counters and enter vote counts into a computer by hand. Ballot summaries are then sent by courier or sent electronically to central tabulation facilities.

Voting Technology Overview

Recount laws differ from jurisdiction to jurisdiction and recount techniques differ among the technologies. When there is a paper ballot, punch card, or optical-scan form, the voter's selections can be re-read by the equipment or, if need be, can be read and counted manually by poll workers. In the case of lever machines, only the written counter totals can be checked and re-entered. E-voting systems, having removable computer memory, can be re-read and, where available, a summary vote count printout from the e-voting system can be checked manually. If the e-voting machine retains electronic ballot images, election officials may print them out for an audit or recount, but there is no way that a poll worker can inspect selections that the voter has verified on a paper ballot unless the e-voting machine has a voter-verified paper trail.

There is potential for inaccurately recording and counting votes due to errors in the individual voting systems, in central tabulating systems, and in the design or performance of election procedures. The software and hardware in computerized voting systems present additional complexity, and therefore the possibility of error, in the process of counting, certifying, and auditing election results. Reported problems in past elections have resulted in widespread discussion and analysis of existing systems and procedures and a number of suggestions have been made: create higher standards for equipment and procedures, improve security standards, provide a voter-verified paper trail, improve certification, allow public scrutiny of software or make it "open-source", improve verifiability and transparency, ensure a meaningful recount based on the original ballot.

The reading list below is suggested as a starting point for obtaining a deeper understanding of the state of election systems and procedures in the U.S. today.

Voting Technology Overview

Reading List

Vendors of computerized vote tabulation systems, http://www.verifiedvoting.org/vendors . Provides links to vendors, basic information sheets on e-voting systems, standards, certification and studies.

Challenges to U.S. Democracy, http://www.fairelection.us/documents/index.htm . Comprises government documents, research papers, essays, and newspaper articles that introduce the general history of the U.S. electoral process and the evolution of voting rights and addresses the controversy over voter disenfranchisement, including felon disenfranchisement; voting technology, including the controversy surrounding the implementation of new electronic voting machines, as well as facts and opinions regarding the influence of wealth on the electoral system.

Eric A. Fischer, *Election Reform and Electronic Voting Systems (DREs): Analysis of Security Issues*, Congressional Research Service, RL32139, November 4, 2003. Provides an extensive background on voting systems and a history of the issue with e-voting systems. Includes analysis of the problem and proposals for resolving the issue.

Making Votes Count, http://www.nytimes.com/ref/opinion/making-votes-count.html . *The New York Times*, Editorial Series, January 18, 2004 – July 23, 2004. This series of editorials "[examines] the flaws in the mechanics of our democracy, including the reliability of electronic voting machines, obstacles to voter registration and turnout, and the lack of competitive congressional elections due to partisan drawing of district lines."

Electronic Frontier Foundation on E-Voting Activism, http://www.eff.org/Activism/E-voting/

[Acknowledgement: Thanks to Robert Lent (bob.lent@gmail.com) for authoring this *Overview of Voting Technologies* with support from Global Exchange and the Verified Voting Foundation.

Voting Technology Overview

Footnotes

[1] In a way similar to taking a standardized test in school, the voter indicates their choice on the ballot, a "mark-sense" form, by filling in a circle or completing an arrow with a pencil or other marker. Candidate names are printed on the ballot or on a label on a ballot machine. The completed ballots are counted on an optical scanning machine, either at the polling place, or at a central location. If scanned at the polling place, voters may have an opportunity to correct ballots that the optical scanner rejects for common errors, increasing the likelihood of reflecting the voters' intent in vote tallying.

[2] Touch screen, or direct recording electronic (DRE) systems, are the newest technology used for voting. Voters make their selections on a computer screen and the system records their selections on a removable computer memory card.

[3] Punch cards are cards where the voter "punches" out perforated holes to indicate their choices.

[4] A lever machine records the ballot choices in counters on the back of the machine that poll workers read, then they write the results on paper which are then entered into a computer.

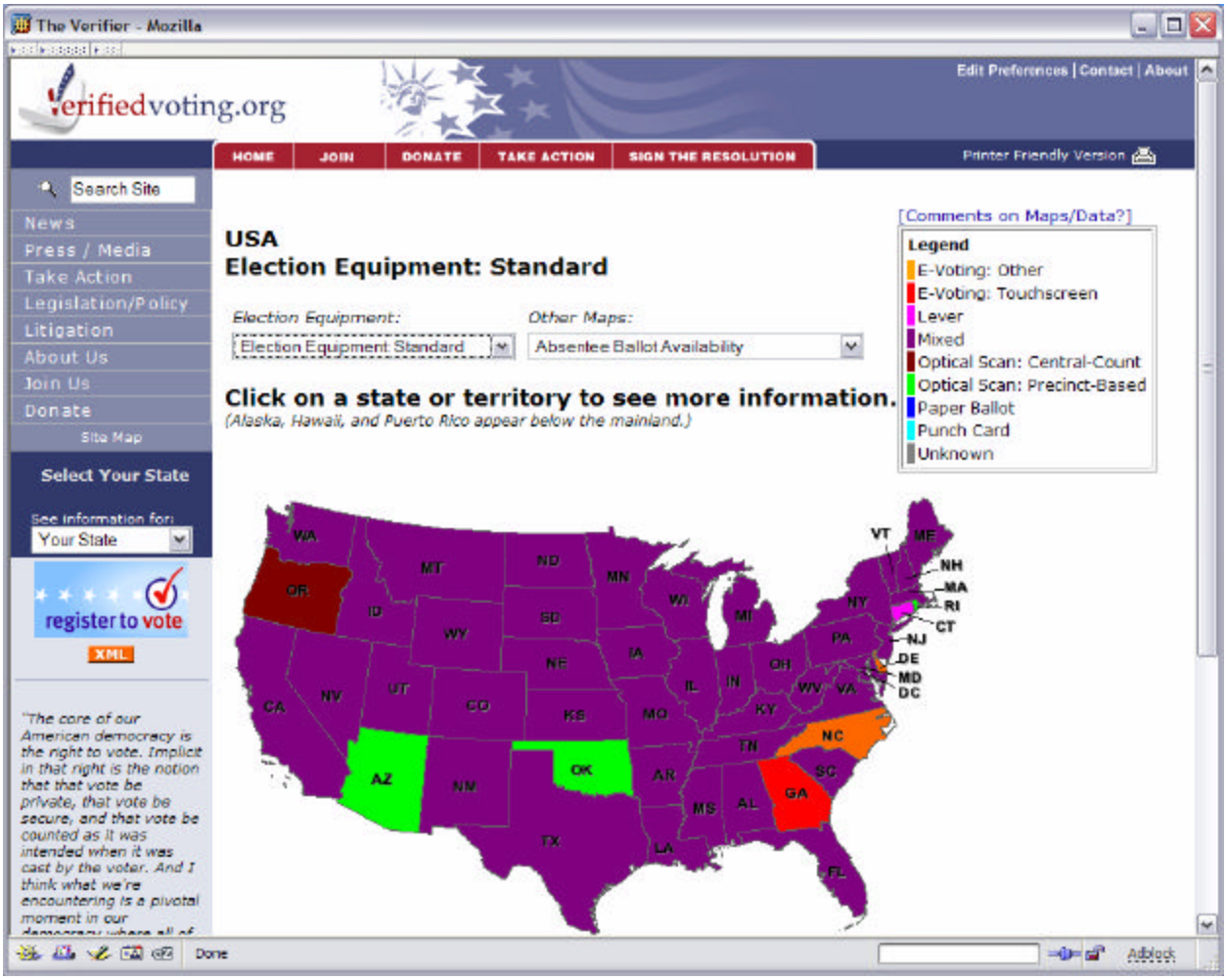
[5] New Study Shows 50 Million Voters Will Use Electronic Voting Systems, 32 Million Still with Punch Cards in 2004, Election Data Services, Press Release, February 12, 2004, http://www.electiondataservices.com/EDSInc_VEstudy2004.pdf . The listed percentages add to 93%. The remaining 7% of voters use a mixture of technologies.

[6] In November 2000, 11% of the voters used e-voting machines. Note that this category includes all computerized voting devices.

[7] Some e-voting systems do produce a paper copy of the ballot that can be inspected by the voter and used in a recount or audit.

Voting Technology Map

To best advise voters and administer or monitor elections, start by finding out what voting technology is used where you work. Below is a map of the United States that shows which voting technologies are used by state.



This map is available online at: http://verifiedvoting.org/verifier/ The online version of the "Election Equipment: Standard" map permits you to click to your state and then to your county, or equivalent jurisdiction, where it displays the voting technology in use in your county.

The county page provides links to Voter Information Sheets, Online Demos, and Full Information Sheets for the main electronic voting machines in use nationwide. Since the *Voters' Guide* presents Voter Information Sheets, this guide contains the Full Information Sheets.

Guidelines for Observing at the Polls

The legitimacy of elections depends on transparency – the ability of voters, concerned citizens, federal observers, and watchdog groups to observe the process of the election. Although you cast your vote in private, and no one has the right to know how or for whom you voted, the procedures by which the election is run can and should be observed in a healthy democracy.

Election Procedures

Poll monitors, or poll watchers or election observers as they are sometimes called, should observe the following election procedures, including but not limited to:

- Pre-election testing of voting equipment
- Poll-opening procedures as equipment is set up to run
- Procedures throughout the day as voters come to cast their ballots
- Poll-closing at the end of the day, including the posting of polling place vote totals

Poll monitors may also observe the central tabulation proceedings, usually located at a county election office, where the ballots, equipment and other materials are brought to be added up and reported. Monitors may be especially interested in observing the counting of absentee ballots, also typically conducted at the county election headquarters, and usually begun on Election Day. Finally, many jurisdictions now allow "early voting"—sometimes called "early absentee"—which is conducted in a limited number of locations within a county, parish or township. In many cases, counties use electronic voting machines for early voting even when they do **not** use them for Election Day. Early voting procedures therefore should also be monitored wherever possible. For central tabulation guidelines, see the next section "Guidelines for Observing Central Tabulation."

Poll Monitor Rules

Each state has its own rules about the rights of citizens to monitor election procedures. It is the responsibility of each poll monitor or observer to find out what rules apply in your local area! If you need to obtain credentials prior to be permitted to observe at close range (i.e. within the polling place itself, or anywhere closer than 100 feet away), you must do so in advance of Election Day. There may be deadlines; **contact your county official** to find out all relevant information. (You can get county election official contact information from this web page: http://verifiedvoting.org/verifier/index.php?state=&topic_string=1019 .)

Guidelines for Observing at the Polls

Credentials?

In some cases, poll monitors are only allowed inside the polling place if they have prior permission, in the form of **credentials** obtained either through a political party, or from a particular candidate, or from the county election official directly. Poll monitors credentialed by a party may be allowed to observe the updated roster of the local precinct's voters – to see who has come to vote, and who has not yet voted. A candidate's or party's worker could then contact voters or work with others to get out the vote for their party or candidate. Some party or candidate poll monitors may seek to challenge voters whom they believe are not eligible to vote in that precinct.

In other cases, any interested person may enter the polling place to observe, provided that they do not disrupt the proceedings in any way nor compromise any voter's right to privacy. It is usually up to the chief poll worker or election judge in the precinct to determine whether a person is being disruptive or not, so observers should exercise good judgment and seek to be cooperative at all times, so as not to risk being removed from the premises and forgoing your opportunity to observe.

Once you have your credentials or have confirmed that none are required, you will need to decide where you will observe. Don't forget: if you intend to serve as a poll monitor in another state, you must research the requirements in that state. For example, California makes no specific credentialing requirement of observers, but Florida does require prior credentials through a legitimate political party or a specific candidate on the ballot. In some states, for example Colorado, you are not permitted to serve as a poll watcher if you are not a registered voter in the specific county where you will observe. You **cannot** observe in another county.

Guidelines for Observing at the Polls

General Rules and Guidelines for Observing at Polling Places:

1. Make no contact with any voter inside the polling place.
2. Wear no political gear or buttons, nor partisan insignias of any kind. Do not wear candidate buttons, candidate t-shirts or candidate hats. (DO WEAR your TechWatch T-shirt!) Don't carry or distribute materials which may have partisan or candidate information. Keep to this rule even if credentialed by a party or candidate.
3. Remember that the election judge or poll worker is in charge, and can decide where you are permitted to sit or stand, and how many observers or poll monitors can be in the location at a time. They also may decide whether you can be permitted to come and go, or switch off with another poll monitor.

Observing the Polls

Prepare in advance for observing at the polls:

1. Find out what type of equipment will be used by going to this web page: http://www.verifiedvoting.org/verifier/
2. Familiarize yourself with the method of operation of the equipment. See the "Full Information Sheet" for the voting technology you will encounter, included later in this guide.

Poll Opening

Observe the following procedures at the opening of the polls:

Machine Set Up: Electronic voting machines are positioned (with enough distance between them and at such an angle as to allow privacy), set up (on built in stands or separate booths, with privacy shields), plugged in to an electrical outlet, and started up prior to the opening of the polling place. This can take hours or minutes, depending on the type of equipment used. For example, the ES&S iVotronic used in Miami-Dade County, Florida, has been known to take several hours to get up and running ready for use; for this reason it is usually set up and started the night before voting begins. Other machines may take as little as 10 minutes each to set up and start. Find out for your area, so that you can observe at the correct time!

Guidelines for Observing at the Polls

Zero Tape: Before voting can begin, each machine **MUST** produce a "zero tape." This means the poll-worker starts the machine, issues a series of commands to start the election, including asking the machine to print a totals tape showing that zero votes have been cast on the machine at the start of the election. Confirm that a zero tape was produced from each machine in use. If the machine could not produce a zero tape (example: it failed to remain "on" and would shut off while printing was underway), **IT SHOULD NOT BE USED FOR VOTING**. The machine should be taken out of service.

The zero tape is usually retained within the printer bay of the machine itself until the end of the day's voting, when the tally of all votes cast on that machine during the day will be printed further on the same tape. If it is not retained within the machine's printer bay, or if it is removed, observe what is done with the tape, and ask to view the serial number and printout of the zero tape.

Serial Numbers: Log the serial number of each voting machine as it is opened and prepared for the election. Compare this number at the end of the day to the serial numbers on the top of every report for the polling location.

Seals and Bays: Each machine has a drive bay for a memory unit; some machines have additional bays which may house wireless communications capability or other modem devices. Some states prohibit the use of wireless communication devices; most "best practices" reject the practice of allowing wireless communication capabilities. Ask if you can see inside the second bay door.

If you are permitted to observe at close range as the machines are set up at the start of the voting day, you should observe **tamper-proof seals** or **tamper-tape** covering the bay doors and locks prior to the machine being set up for the day. If NO tamper-proof seal was covering the bay door/s, or if it appeared the seal was broken or compromised prior to the setup of the machine, please make note of it. You may ask the poll worker or election official setting up the equipment if there is a policy in place regarding the seal(s). If a machine's seal was compromised, the equipment **should not be used** (even if it prints a zero tape).

Guidelines for Observing at the Polls

Other Setup

Many voting systems require the use of a voter card, sometimes called a smart card, which is provided to the voter after s/he signs in at the poll register. This card should be programmed before each use. The voter card programmer device must be set up, plugged in and booted up to the proper program before the polling place can open. This device programs the card so that the proper precinct and ballot type is presented on the voting machine when the voter inserts the card. Problems with voter card programmers (sometimes called precinct control centers or precinct control modules) have been known to delay poll-opening by hours, when the device fails to boot up to the proper screen, thus disenfranchising many voters who are unable to wait to vote. Observe that it is functioning as expected, and make note if it does not.

Some jurisdictions now use "electronic pollbooks" – please make note whether your polling place has a hard copy pollbook (list of registered voters for that precinct), or whether an electronic listing on a computer device is used. If the electronic pollbook is used, it must either contain all the data for that polling place or be connected to a central computer via an internet connection, for example. This is another peripheral device which, if it malfunctions or doesn't function the way it is expected to, can severely delay poll operations and disenfranchise voters. Please make note if there are any problems with the function of the electronic pollbook.

After Polls Open

Once voting begins, be alert to problems that may occur during the day.

Problems with voter card programmer? Do you hear any complaints from voters about not being able to find all the candidates they expect to see on their ballot, about a ballot seeming incomplete, or other indications that the card has been programmed incorrectly? (Note that incorrectly programmed voter cards have disenfranchised numbers of voters – particularly when they are voting on local issues and especially when precincts are combined into a "joint" polling place. This is happening with increasing frequency around the country, and is to be anticipated in Florida and other areas where hurricane damage caused election officials to have to regroup. Poll workers and election judges must take extra caution to provide the correct ballot type to the voter.)

Guidelines for Observing at the Polls

Problems with screen calibration? A common –and very alarming— problem with touchscreen voting machines occurs when calibration is "off" a little bit, which means that a voter will attempt to select a candidate on one part of the screen, and a different area of the screen will light up as selected. If repeated attempts to correct the problem are unsuccessful the machine probably should be taken offline (if there is a sufficient number of functioning machines in the polling place), as voters will find it very difficult to feel confident that their vote was accurately recorded under such circumstances. Calibration problems can occur when machines are jostled or dropped, and may possibly occur even in the process of transporting the equipment to the polling place. Note what happens with the machine in question; note whether voters are directed to different machines if they are available and if the problem machine has not been taken offline.

Problems with power loss? Most electronic voting machines have some battery power to serve as backup in the case of power loss. However, this may be limited to only two hours or less, depending on whether the machines were fully charged prior to set up. Poll workers should make sure the outlet being used is "live" at the start of the day; often a "battery" indicator will appear on the machine if it is plugged in but not receiving power. If the power goes out in the area for any reason, make note of how long the batteries operate before machines begin to shut off. If power does go out, find out if there is a sufficient supply of paper emergency ballots in case the power does not come back on before machines fail.

Guidelines for Observing at the Polls

Problems with machine function? Lack of familiarity with voting equipment may contribute to problems in use. Such problems can include:

- Accidentally resting a thumb on one side of the screen while selecting with the other hand which can result in the wrong candidate's name lighting up inadvertently;
- Inadvertently shifting a selector wheel (such as on the eSlate, which does not use a touchscreen) one position further than intended, especially when voting a straight ticket, which can result in selecting a straight ticket of a different party;
- A sleeve brushing a part of the screen can trigger a "selection" even when the voter did not intend it;
- Some machines must be touched once on the screen to cause them to start up and show the ballot so the voter can begin; if the voter does not know this, they may think the machine does not work, or may feel that they somehow do not know how to operate the machine correctly.

None of these are "voter error" but rather the effect of using a complex piece of equipment for voting. This may be the first time the election judges or poll workers are facing this equipment too (other than training they may have received), and so may not be familiar with how to resolve every issue. Note whether poll workers assist the voters, offer guidance in how to use the equipment, etc., or whether they react in an indifferent manner or appear not to know how to resolve the problem.

Problem with machine failure? What happens when a machine is not functioning properly? Make detailed notes about the problem which causes the machine to be taken offline, and observe carefully what is done with the machine. Were they able to print out a total of the votes cast on the machine before taking it down? Was the memory card left in the machine or removed? Were seals attached? Note the machine's serial number and whether any ballots were cast on the machine prior to its failure. Also, note whether the machine was replaced or not. If it was replaced, the new equipment should have undergone the IDENTICAL set-up procedures including printing a zero tape. Make note if any technical assistant was present and whether he or she worked for the county or was employed by a voting machine vendor.

Guidelines for Observing at the Polls

Voter Card Reprogramming: Should happen each time the card is used. If election workers are not reprogramming the cards for every use, please make note of it. If it is feasible to ask the chief election judge or other poll worker about policy on the matter, do so, but only if your question is not going to be perceived as hostile or disruptive.

Other issues to watch for:

- Do election judges keep a running tally and check the tally on a regular basis through the day to make sure the number of votes on the machines is consistent with the number of voters who came through the doors that day?
- Are accessibility devices (e.g. headset, keypad) for use with the voting machines set up in the morning and do they function properly?

Poll Closing

Once voting has finished for the day, poll workers must follow several procedures to complete the process and close the polls. Try to observe as closely as you are permitted as the poll worker goes through each step.

Note if there is a **running tally** of ballots cast on the face of the touchscreen or other voting machine (some show a number on the screen). **Make a note of this tally** in order to compare it with the tally tape and precinct totals, if at all possible.

Each machine's **vote totals should be printed** as part of the election closing procedures, so that no more votes may be cast on the machine. The supervisor will usually insert a supervisor's card (like a voter card, but with additional privileges) and select "close election" and go through the steps to produce the tally. This tally usually is printed on the same tape as the morning's "zero tape." The poll worker may print out several copies.

Then the **memory card** containing the voted ballots is removed from the port, and in some cases the poll worker may re-seal the port doors. Note whether seals are used.

The poll workers may have a procedure guide to follow; here are links to procedures for closing the polls for each of several types of electronic voting systems. See the Voting Technology Manuals section of the web page at http://verifiedvoting.org/article.php?list=type&type=63 .

Guidelines for Observing at the Polls

Typically, election officials will inventory all the equipment including the number of voter cards, supervisor cards, and the memory cards from each machine, etc.

Some procedures include the use of an "**accumulator**" machine: one voting machine is designated to accept vote totals from ALL the machines (including its own vote totals) to run an accumulated total. (On some machines, this may be done via **wireless transfer** of vote totals from one machine to another: *make note if this is the case* as it indicates the presence of wireless communication capabilities.)

Usually, the memory card from each voting machine is inserted into the accumulator machine and the results uploaded for accumulation. After all totals have been added to the one machine, a printout should be run of the accumulated total. This accumulated printout may be what is posted at the polling place.

If a **modem transfer** of results is to be used, the modem connection will then be made from the accumulator machine (usually via a phone line) to the jurisdiction's central election headquarters.

Alternately, if no accumulation is done in the polling place by machine, poll workers will note the totals from each machine's printout onto a card or form for that purpose, will make note of the number of provisional ballots cast and/or absentee ballots received (but not the votes from these—votes from the paper ballots will be counted at the central facility in most cases).

The **machines are turned off** and closed up. Some machines are held closed with zip-ties and possibly small seals, which may be numbered. Others may be packed into cases.

Memory cards are then bundled together with one copy of the tally tape from the machine the card pertained to, and all are packaged to be transferred to the central headquarters along with voting equipment.

Guidelines for Observing at the Polls

Many states' election laws prescribe the manner in which the polls are to be closed, including in some cases requiring that a printed copy of the total results from that polling place be posted in a prominent location for the public to view.

- Do election judges or poll workers print polling place totals at the polling place *before connecting any electronic communications* out of the polling place?
- Is a copy of **printed polling place totals posted for public review** at the polling place at the end of the day? It must be outside, on the door or wall so that the public may view the totals and log them to compare later with reported precinct totals.

Make note of the final vote totals from the polling place. Compare them with the running tally you logged at the end of the day from the machines themselves, and note any discrepancy.

- Note that few systems permit "**provisional ballots**" to be cast on the electronic machine; most of the time these are cast on paper to be checked and counted or disallowed later. The Diebold TSx system has the capability of allowing voters to cast provisionals on the machines; this may be true for other makes and models also. Find out whether provisionals were cast on the machines; this will affect the log. Provisionals are retained in memory but not counted into the tallies right away. They would show as part of the running tally of ballots cast, but not as part of the final tally of votes. Any manual summary must take into account any provisionals that were cast on the machines.

Finally, transportation of equipment and voting materials including memory cards and polling place total tapes should be done by no fewer than **two** poll workers, ideally from different parties. Local rules may differ: transport may be done by sheriffs or other county personnel. Make note of how ballots and voting materials were transported where you observed. Find out where the materials were taken: to a staging area? To county headquarters? To one of several counting locations? And make a note of the location if possible.

[Thanks to Roxanne Jekot, Co-Founder of CountTheVote.org, Lillie Coney at the National Committee for Voting Integrity, the NAACP, and to the gang at BlackBoxVoting.org for contributions to this section.]

Guidelines for Observing Central Tabulation

Observing the central tabulation of the votes in your jurisdiction is quite different from observing in the polling place and watching the poll-opening and closing procedures. In some cases this may be more "open" to the public, in that you may not have to have credentials from a party or candidate to watch, but keep in mind that this takes place in a much more limited space, and you must make arrangements in advance with the county, township or parish in order to observe.

Tabulator Definition

Generally speaking, the central tabulator is the central computer that tallies the votes and produces the final report for a given county or equivalent jurisdiction.

You should **choose whether you can observe at a polling place or observe at central tabulation**; you probably won't be able to do both, and you would want to be at the central count facility when ballot materials begin to arrive from the polling places. If absentee ballots are processed in the same general area, you may be able to observe that process before the central tabulating processes begin.

Some jurisdictions limit the number of observers. Get a comfortable seat and plan to stay until the wee hours. Interesting things happen at the end, when party observers are woozy and may be inattentive, so bring a thermos of coffee and stay alert

Bring ID

Remember to take identification; you may be asked to show it before entering the central tabulating area.

If early voting is allowed in your area, the tabulating process will include the reporting and accumulation of vote totals of (a) early votes, (b) absentee ballots, (c) polling place votes, and finally (d) provisional ballots. Early votes and polling place votes will probably happen first, unless the absentee counting is finished by election night. Provisional ballots are checked first to make sure the voter was eligible to cast the ballot and then counted and added in as part of the final canvass of the vote totals. The canvass might not be completed for as long as 28 days.

Guidelines for Observing Central Tabulation

Central Tabulation

Take notes on all your central tabulation observations and all responses to questions.

- If possible, observe the entire day of operations at the central election office. If the law in your state allows this, insist on it. Log anything out of the ordinary, and log the names of the relevant people.
- Ask questions about how absentee ballots and early voting ballots are handled.
- Find out who monitors the modem communications coming in from the precincts to the central tally computer. Does someone check the validity of the transmission before allowing it to be received?
- Ask if technicians have been required to take the same oath as poll workers to conduct a legal election. Monitor and log calls for assistance the election office receives from the precincts:
    1. Which precinct did the call come from?
    2. What is the problem?
    3. Was a technician dispatched?
    4. How is the technician dispatched?
    5. Did the technician take replacement machines to the precinct?
    6. How long did it take to resolve the problem?

- Log the names of all people operating the central tally computer. Observe what each one does, if possible.
- Log the names of the partisan observers.

Guidelines for Observing Central Tabulation

- As poll workers bring the reports and memory cards back to election center, notice and log:

    1. Do HQ Poll workers check the seals when they receive the envelopes containing the reports and the memory cards? What happens to the envelopes? Are they tracked?
    2. Do HQ Poll worker register the number of cards indicated in handwriting on the envelope?
    3. What happens to the Zero Total Reports and the End of Day Precinct Totals Report inside the envelopes? Are they removed, saved, logged? Are the totals tracked?
    4. What happens to the memory cards after the HQ Poll worker breaks the seal? What recording does the HQ Poll Worker do? Are the cards counted (there should be one for every DRE)? By whom? How many times? What happens to the accumulator card containing the precinct totals?
    5. Does the HQ poll worker check or verify the serial numbers or any other identifying information on the memory cards?
    6. What happens if none of the cards in an envelope contains the accumulated totals? Is the accumulation process performed on a machine at HQ? Are all the cards from the precinct kept together?
    7. Observe whether data from "accumulator" cards is uploaded to the central computer. Does someone track which precincts have been transmitted by modem and which are to be uploaded from the cards?

- Observe tabulator and room security. Take notes.
- Ask the name and employer of everyone who enters the tabulation room. Write it in your notebook. If you see vendor technicians or "contract workers" touch the tabulator at all, make a note of the time and the name of the person. In some states this is a violation of the law.
- Ask where the modems are. (Not all counties use them.)
- Use binoculars if needed, to observe the tabulator screen. Write any error messages down in your notebook, noting the time. If the program suddenly disappears (program crash) or the computer crashes, note the time and file a public records request for the audit log. Call incidents in to the Election Protection Hotline at +1 866 OUR-VOTE.
- Carefully observe disk management.

- If any pre-opened disk is put into the tabulator, ask first that the disk be brought out to demonstrate that it has nothing on it.

    1. Use a notebook to record the procedures for transferring interim vote totals to the county Web site. Do election officials recycle disks between the central tabulator and other computers? If so make a note of the time and the person doing so.
    2. Is the Web upload computer networked? If so, ask where the other networked computers are, observe who is sitting at them, write down names and employers.

- Write down the setup of the central tabulator. Where do the cables and wires lead? Ask about this. Are multiple tabulators networked together? If so, ask where the computer is that houses the final combined program. Make sure you can see it, and make a note of who touches every tabulator on the network.
- Watch to see if all polling places are uploaded into the central computer. Sometimes the trouble spots are held to the end, when observers are less vigilant. Sometimes they can't be uploaded at all.

[Thanks to Roxanne Jekot, Co-Founder of CountTheVote.org, Lillie Coney at the National Committee for Voting Integrity, the NAACP, and to the gang at BlackBoxVoting.org for contributions to this section.]

Danaher (Guardian Voting Systems) — ELECTronic 1242

Name / Model: ELECTronic / 1242 (a/k/a Shouptronic 1242)[1]
Vendor: Guardian Voting Systems, Inc. (division of Danaher Controls, Inc.)
Federally-Qualified Voter-Verified Paper Audit Trail Capability: None.

Brief Description: The Guardian Voting Systems ELECTronic 1242 is a poll worker-activated full-face direct recording electronic voting system. Voters press the front of a mounted ballot (see rightmost image above) underneath which a touch-sensitive matrix of switches records choices. Poll workers activate the machine using an operator panel on the back of the machine to choose the ballot style and voters make choices by touching a numbered box next to their choice. When cast, voting records are recorded internally to eight memory locations: three banks of battery-powered RAM,[2] three banks of EEPROM[3] memory, one bank of EPROM[4] memory and a removable memory cartridge, which contains both EPROM and EEPROM memory. When polls are closed, poll workers remove the memory cartridge that contains the vote records from each machine. These cartridges are then either physically transported to a tabulation facility or their contents transmitted over modem using a cartridge reading device.

Detailed Voting Process: When voters enter the precinct, poll workers confirm that they are properly registered to vote. The poll worker uses an operator's panel on the back of the machine to choose the ballot style appropriate for that voter.[5] The voter enters the curtains (see pictures at left above) and only the races for which they are permitted to vote are activated. The voter then votes by pressing a numbered box beside each choice in each race on the ballot. Flashing lights on the left-hand side of the ballot indicate races for which the voter has not yet voted. If the voter tries to choose more than one choice in a given race (over-voting), the machine will ignore the second choice. If the voter makes a mistake, they can press the numbered box again to deselect their choice; the indicator light will go out. The voter may then select the correct choice.

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[1] See: http://www.controls-online.com/gvs/vs.html
[2] This Random Access Memory (RAM) is similar to the memory that is used in a typical personal computer where a constant supply of power is necessary to keep data in memory. However, a 10-year life, lithium battery cell provides constant power to the ELECTronic 1242's RAM.
[3] EEPROM is electrically erasable, programmable read-only memory and retains data when un-powered.
[4] EPROM is erasable, programmable read-only memory and can only be erased with ultraviolet light.
[5] There may be different races for different precincts or political parties in one polling place.

When done voting, the voter presses a large green "Vote" button in the lower-right corner of the voting machine. It is very important that the voter does not push the vote-casting button until they are done voting; a vote inadvertently cast may not be redone. Once cast, the vote is recorded internally to eight internal memory locations: three banks of battery-powered RAM that reside on the machine's central processor, two internal banks of EEPROM memory, one bank of EPROM memory and a removable memory cartridge, which contains one bank of EPROM and one bank of EEPROM memory. The vote records are stored in "vote tables" as aggregate vote tallies and also as ballot images both internally and to the removable memory cartridge.

When the polls close, the machines print out paper copies of the results and poll workers remove their memory cartridges, which contain the vote records from each machine. At this point, the cartridges are physically transported to a tabulation facility. At the tabulation facility, election officials use a cartridge reader to read the data off of the cartridges and into vote tabulation databases. The results are then combined to produce an aggregate vote tally. The printed total tapes and memory cartridges can then become part of the official record of the election.[6]

Past Problems

November 2003: *Tennessee.* A poll worker in Rutherford County inadvertently cast a vote during a demonstration that may have resulted in a tie for a Town Council position.[7]

October 2001: *Tennessee.* In Knox County, a voting machine showed an error code that corresponded to a discrepancy between internally stored vote tables. Local officials could not retrieve the data or have the machine print out the results. A Danaher technician was able to crosscheck the internal memory tables and provide results.[8]

November 2000: *Tennessee.* About 7% of memory cartridges in Knox County were temporarily unreadable and three cartridges remained unreadable. There were also problems with transmitting precinct-by-precinct vote totals.[9]

November 2000: *Tennessee.* In Fayette County (Oakland, TN), problems, including double counting of some ballots, were resolved after borrowing a tabulation machine from a neighboring county.[10]

November 1998: *Ohio.* In Franklin County, "Votes for congressional candidates were incorrectly tabulated in 95 of the county's 735 voting precincts because memory cartridges did not match ballot faces for 371 voting machines."[11]

August 1998: *Tennessee.* In Memphis, memory problems with laptop computers and a central tabulation

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[6] Ballot images can be re-read off of the redundant memory inside the machine if a cartridge fails.
[7] "Mistaken vote may have led to Smyrna election tie." THE ASSOCIATED PRESS STATE & LOCAL WIRE, November 19, 2003.
[8] "City Council Primary Election Results Certified; Accurate Ballot Count Finally Obtained From Malfunctioning Machine." KNOXVILLE NEWS-SENTINEL (TENNESSEE), October 7, 2001.
[9] "Report on voting difficulties due within a week; Voters get chance to detail problems." KNOXVILLE NEWS-SENTINEL (TENNESSEE), November 14, 2000.
[10] "Mullins Repeats As Mayor After Voting Irregularities In Oakland." THE COMMERCIAL APPEAL (MEMPHIS, TN), November 11, 2000.
[11] "Miscount Could Have Been Avoided." COLUMBUS DISPATCH (OHIO), December 11, 1998.

computer used to read memory cartridges garbled vote results.[12]

June 1992: *Ohio.* 40 out of 758 machines used in Franklin County had problems that required service. Seven memory cartridges could not be read and were entered in by hand. Finally, there were problems combining DRE results with hand-entered lever machine results.[13]

NASED Qualification Status:[14]

07/09/96: ELECTronic 1242 DRE
11/01/01: Firmware 5T, 6T
12/05/02: Firmware 4T10, 5T2, 6T5

References:

The Philadelphia City Commissioners Office. "Risk Assessment of Danaher Controls DRE Electronic [1242] Voting System and Philadelphia Procedures." Prepared by: Bob Lee, Voter Registration Administrator (March 9, 2004). http://www.seventy.org/electioninfo/DREReceipts2004.html

The Department of Elections for New Castle County. "Report of the Committee to Review Physical and Operational Security of the Danaher Controls 1242 Electronic Voting Machine." (June 22, 2004). http://www.state.de.us/doe_ncc/Pubs/VM_Report.pdf

[12] "Simple 'Reboot' Might Have Averted Election Glitch." THE COMMERCIAL APPEAL (MEMPHIS, TN), August 29, 1998.
[13] "New Voting Machines Don't Satisfy County." COLUMBUS DISPATCH (OHIO), June 12, 1992.
[14] *NASED Qualified Voting Systems (06/30/2004)*. National Association of State Election Directors. See: http://www.nased.org/certification.htm.

Diebold AccuVote-TS

Name/Model: AccuVote-TS
Vendor: Diebold Election Systems

Brief Description:

The AccuVote-TS is likely the widest-deployed of all of Diebold's voting systems. It is a smart-card activated multilingual touchscreen system that records votes on internal flash memory. Voters insert a "smart-card" into the machine and then make their choices by touching an area on a computer screen, much in the same way that modern ATMs work. The votes are then recorded to internal electronic memory. When polls close, the votes for a particular machine are written to a “PCMCIA card” which is removed from the system and either physically transported to election headquarters or their contents transmitted via computer network.

Detailed Voting Process:

When the voter enters the precinct, he or she is given a "smart-card" by a poll worker after confirming the voter is registered. A "smart-card" is a card the size and shape of a credit-card which contains a computer chip, some memory and basic data such as the voter's voting language and political party. The voter then takes the smart-card to a voting machine and inserts the smart-card into the machine to allow voting. After using the touchscreen to vote, 1) the record of the vote is directly recorded electronically to multiple, internal flash memory cards and 2) the voter's smart-card is reset to ensure that it can only be used to vote once. The smart-card pops out of the machine with a loud "click" and the voter returns it to a poll worker.

When the polls close, a poll worker or election official inserts a different-type of smart-card, an administrator card, into each voting machine and puts the machine into a post-election mode where it will no longer record votes. At this point, the machine writes the votes from its internal memory to flash memory on a "PCMCIA card". The PCMCIA card is merely a removable form of flash memory. A printed tape of all votes cast or vote totals for the voting machine can also be printed out at this time depending on local procedure and regulations.

The PCMCIA cards are taken out of each machine and either taken to a central tabulation facility or to remote tabulation facilities. At the tabulation facility the votes are read out of the PCMCIA cards and into a central computer database where precincts are combined to result in an aggregate vote. For remote facilities, the votes are transmitted to the central tabulation facility via a closed "Intranet", the Internet or modem. The PCMCIA cards and any printouts from the voting machines can then become part of the official record of the election.

Past Problems:

March 2004: California. 55% of precincts in San Diego county experienced malfunctions due to battery problems that prevented polling places from opening on time. Voters were told to return later in the day but it is unknown how many were able to do so.15

March 2004: Maryland. At least one voter using Diebold election equipment was not presented with the entire ballot. Poll workers indicated that they knew of such errors when the ballot magnification feature was activated.16

November 2003: Georgia. Allegations of widespread complaints by citizens who voted "no" on a sales tax proposition but saw Diebold machines register "yes" caused county officials to take the machine out of service during the election.17

April 2002: Kansas. In Johnson County, an unexplained software error caused voting machines to miscount votes. Some modems used to transmit results from polling places to the central election office failed. After this latter incident, cartridges that record results are hand-delivered to the office. Also, results were misreported in six races. The system miscounted hundreds of votes, and a re-count was ordered.18

November 2002: Maryland. When voters voted for the Republican candidate for governor, an 'X' appeared beside the name of the Democratic candidate.19

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[15] *Report on March 2, 2004 Statewide Primary Election.* California Office of the Secretary of State. See: http://www.ss.ca.gov/elections/ks_dre_papers/march_2_report_final.pdf

[16] "Think You Voted in Md.? Think Again," THE WASHINGTON POST, March 7, 2004.

[17] "NAACP disputes sales tax results, DuBose files complaint in Muscogee Superior Court." LEDGER-ENQUIRER, November 13, 2003.

[18] "New voting technology is questioned: Computer systems can be tampered with, critics say." THE KANSAS CITY STAR, September 21, 2003.

[19] "Glitches cited at some polls." THE WASHINGTON TIMES, November 6, 2002

Diebold AccuVote-TSx

Name/Model: AccuVote-TSx
Vendor: Diebold Election Systems

Brief Description:

The AccuVote-TSx is a smart-card activated multilingual touchscreen system that records votes on internal flash memory. Voters insert a "smart-card" into the machine and then make their choices by touching an area on a computer screen, much in the same way that modern ATMs work. The votes are then recorded to internal electronic memory. When polls close, the votes for a particular machine are written to a “PCMCIA card” which is removed from the system and either physically transported to election headquarters or their contents transmitted via computer network.

Detailed Voting Process:

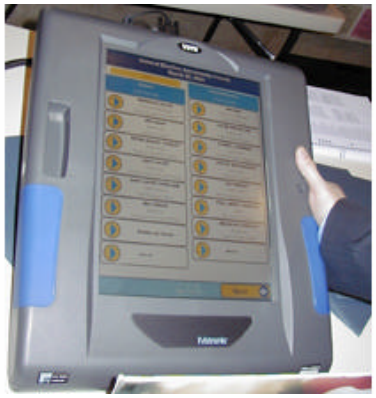
When the voter enters the precinct, he or she is given a "smart-card" by a poll worker after confirming the voter is registered. A "smart-card" is a card the size and shape of a credit-card which contains a computer chip, some memory and basic data such as the voter's voting language and political party. The voter then takes the smart-card to a voting machine and inserts the smart-card into the machine to allow voting. After using the touchscreen to vote, 1) the record of the vote is directly recorded electronically to multiple, internal flash memory cards and 2) the voter's smart-card is reset to ensure that it can only be used to vote once. The smart-card pops out of the machine with a loud "click" and the voter returns it to a poll worker.

When the polls close, a poll worker or election official inserts a different-type of smart-card, an administrator card, into each voting machine and puts the machine into a post-election mode where it will no longer record votes. At this point, the machine writes the votes from its internal memory to flash memory on a "PCMCIA card". The PCMCIA card is merely a removable form of flash memory. A printed tape of all votes cast or vote totals for the voting machine can also be printed out at this time depending on local procedure and regulations.

The PCMCIA cards are taken out of each machine to a central tabulation facility or to remote tabulation facilities. At the tabulation facility, the votes are read out of the PCMCIA cards and into a central computer database where precincts are combined into an aggregate vote. For remote facilities, the votes are transmitted to the central tabulation facility via a closed "Intranet", the Internet, or modem. The PCMCIA cards and any printouts from the voting machines become part of the official election record.

ES&S — iVotronic

Name/Model: iVotronic
Vendor: Election Systems & Software (ES&S)




Brief Description:

ES&S' iVotronic Touch Screen Voting System is a poll worker-activated, portable, multilingual touchscreen system that records votes on internal flash memory. A poll worker uses a device called a Personal Electronic Ballot (PEB; pictured above at left) to turn the machine on and enable voting. Voters choose their ballot language and then make their selections using a touchscreen, much in the same way that modern ATMs work. When the polls close, poll workers move summary data from each machine onto the PEB. The PEBs are then transported to election headquarters or their contents transmitted via a computer network.

Detailed Voting Process:

When the voter enters the polling place, a poll worker first confirms the voter is registered. Then the poll worker walks with the voter to an iVotronic and inserts the PEB in the PEB slot (visible as the rectangular slot in the upper left corner of the middle image above). The PEB communicates with the iVotronic using infrared signals, much like a TV remote control works, except that the PEB and iVotronic will not communicate unless the PEB is completely inserted. If the election requires a a specific ballot style, the poll worker chooses this for the voter. Activation by the PEB enables the iVotronic to vote once.

The voter then selects a ballot language and makes decisions using the touchscreen. When the voter is done, he or she presses a small "vote" button at the very top of the iVotronic to cast the vote. The vote is then recorded to three internal flash memories that reside inside the machine. A fourth memory is a removable card, called a "compact flash" (CF) card; note that CF is the same technology used in many digital cameras to store photos. During the election, the CF card holds audio files (for those with visual disabilities) and ballot definitions; vote data is written to the CF card when the machine is closed.

A poll worker closes the polls by using the PEB with a password to enter a supervisor menu on each iVotronic. After closing the election for a given machine, summary vote data are transmitted to the PEB via infrared signals.20 After the PEB is used to close all the iVotronic machines, it contains all the summary data for the precinct.

[20] Note that the vote data transmitted to the PEB at the closing of a machine is summary vote data instead of raw vote data; that is, it is a summary of the votes recorded rather than each individual electronic ballot as stored inside the iVotronic's internal memory. In order to do a proper recount or error analysis, one would need to remove the CF cards from the iVotronics and seal the CF cards for a precinct with the PEB and any printouts. This information is courtesy of Doug Jones of the University of Iowa.

Depending on local regulations and procedures, poll workers can use a "printer pack" at this point to print the result summary from the PEB on to paper. The PEB for that precinct, any printouts and the CF cards are then either physically transported to a central tabulation facility, and in addition, the data may be transmitted by telephone using the modem included in the printer pack.

All of the electronic ballot images and event log data remain in the iVotronic until it is cleared for the next election. Many jurisdictions use the serial port on the back of the iVotronic to extract this data for archival storage during normal post-election procedures. This data duplicates what is stored on the compact flash card, and some jurisdictions save only this data or only the data from the compact flash card.

Past Problems:

- January 2004: Florida. In a special election for the State House District 91 seat, with only one item on the ballot, ES&S electronic voting machines showed a total of 134 undervotes – that is, 134 ballots in which voters did not select a candidate even though it was a single-race election. The winner received 12 more votes than the runner-up. Florida law requires a manual recount of invalid votes when the winning margin is less than one-quarter of one percent. However, election officials determined that no recount was required because the 134 invalid votes were cast on electronic voting machines, and there is no record of the original votes.[21]
- May 2003: Florida. An internal review of election results by a Miami-Dade county election official found that a DRE system sold by ES&S and used in the May 20, 2003 North Miami Beach runoff election (as well as in earlier elections) was "unusable" for auditing, recounting or certifying an election due to a "serious bug" in the software.[22] As of August 2004, the newest software releases from ES&S fix this bug, which turns out to have been triggered by a low battery condition.[23]
- November 2002: North Carolina. At two early-voting locations in Wake County, North Carolina (Raleigh), iVotronics failed to record 436 ballots. This was due to a problem in the firmware of the machines.[24] Firmware is a kind of software loaded on read-only memory so that it cannot be easily changed.
- October 2002: Texas. Democrats said they received several dozen complaints from people who said that they selected a Democratic candidate but that their vote appeared beside the name of a Republican on the screen. Some votes cast for Republicans were counted for Democrats.[25]
- September 2002: Florida. A spot check of machines revealed two problems. First, several Miami-Dade precincts, each with hundreds of voters, are listed as showing one or even no votes cast on election day. Second, differences arose within the same precincts between vote totals produced by the main tabulation system and a backup system.[26]

[21] "Electronic Vote Recount Stumps Broward Officials." SUN-SENTINEL, January 10, 2004.
[22] "Count Crisis? Election Officials Warn of Glitches that May Scramble Vote Auditing." MIAMI DAILY BUSINESS REVIEW, May 16, 2004. "Glitch Forces Change in Vote Audits." THE MIAMI HERALD, May 15, 2004.
[23] Doug Jones, personal communication. Note that the software that fixes this bug has made it through ITA testing and state testing in at least Florida.
[24] "Electronic Ballots Fail To Win Over Wake Voters, Election Officials; Machines Provide Improper Vote Count At Two Locations," WRAL-TV RALEIGH-DURHAM, Nov. 2, 2002.
[25] "Area Democrats say early votes miscounted," THE DALLAS MORNING NEWS, Oct. 22, 2002.
[26] "Leahy: Unskilled workers to blame," MIAMI HERALD, Sept. 12, 2002.

Hart InterCivic eSlate 3000

Name/Model: eSlate 3000
Vendor: Hart InterCivic, Inc.

Brief Description:

Hart InterCivic's eSlate is a multilingual voter-activated electronic voting system where the voter turns a Select Wheel and pushes a button to indicate his/her preference. The eSlate is connected via cable to the Judge's Booth Controller (JBC; image above) which provides vote activation and vote storage for up to twelve eSlates. A poll worker issues a four digit, randomly generated Access Code to the voter using the JBC. The voter enters the Access Code on the eSlate and votes using the select Wheel and Buttons. Once the ballot is cast, the votes are stored in redundant and physically separate areas of the eSlate System, including the eSlate, JBC and flash memory. The votes are transmitted via a cable to the JBC, and are stored on the JBC and on a flash memory card (Mobile Ballot Box or MBB) inside the JBC. Then the MBB is physically transported to election headquarters for tabulation.

Detailed Voting Process:

When the voter enters the precinct, poll workers first confirm that the voter is properly registered. Then, a poll worker using the Judge's Booth Controller (JBC) prints out a piece of paper with a four digit, randomly generated Access Code. This number does not tie to the voter's identity but ties to the voter's precinct so that the proper ballot style for each voter will appear on the eSlate after a voter enters his/her Access Code. A voter is NOT assigned to any specific voting terminal. A voter can proceed to any open eSlate booth.

The voter takes the piece of paper with the Access Code to any open eSlate booth and enters the number into the eSlate device using the Select Wheel and Enter button. This Access Code number permits the voter to vote once; the Access Code will not work a second time. The voter makes his or her selections using the buttons and Select Wheel on the bottom of the eSlate. The Select Wheel allows the voter to navigate through the ballot. When the voter is finished, he or she presses the red "Cast Ballot" button at the lower left-hand corner of the eSlate to cast his/her ballot. Access Codes cannot be reissued by the JBC.

It is possible for a voter to ask a pollworker if his/her Access Code has registered a ballot on the JBC. If the voter has completed the voting process and cast a ballot, the pollworker can print off a piece of paper similar to

the Access Code that lists the voter's Access Code number and reads "Assigned and Cast." Again the Access Code is a randomly generated number and does not tie to the identity of the voter.

The ballot is then transmitted over the cable that connects the eSlate to the JBC on a closed, private network. This cable is a "serial" cable and carries both power and data. Up to twelve eSlates can be connected via this serial cable to the JBC. The JBC records and stores the ballot internally and on a flash memory card or Mobile Ballot Box (MBB). Additionally, each ballot is stored on the individual eSlate voting unit so that all ballots are stored redundantly in separate areas of the eSlate System. The MBB is a removable PCMCIA computer card that stores vote data as well as the ballot definitions. needed to open the polls for a given election. The PCMCIA card is a credit card-sized device containing flash memory that is sealed into a slot on the JBC.

Once the balloting is closed, the poll workers use the printer on the JBC to print summary results on to paper. Then the poll workers either remove the MBB and physically transport it with any printouts to a central tabulation facility or they can transport the JBC itself depending on local regulations and procedures.

Past Problems:

- March 2004: California. Hundreds of voters in Orange County were turned away when one eSlate machine broke down. It is not clear from reports if this was a JBC or eSlate.27
- March 2004: California. Approximately 7,000 voters were presented with the wrong ballots due to problems with poll workers' understanding the eSlate system. In 21 precincts where the problem was most acute, more ballots were cast than there were registered voters. Tallies at an additional 55 polling places with turnouts more than double the county average of 37% suggest at least 5,500 voters had their ballots tabulated for the wrong precincts.28
- February 2004. Virginia. Voters had to cast paper ballots when the JBC unit at one precinct "fried," rendering all the eSlate machines unusable.29
- November 2003: Texas. Poll workers in Harris County, confused by the eSlate system's complexity, could not get the machines to work properly. Subsequent investigation revealed they had been assigning the wrong ballots to voters using the JBC.30

[27] "Voters Decide Record Bond Issue; Edwards Quits." NBC4TV, March 2, 2004.
[28] "7,000 Orange County Voters Were Given Bad Ballots." LOS ANGELES TIMES, March 8, 2004.
[29] "Polling places report light turnout here," RICHMOND TIMES-DISPATCH, February 11, 2004.
[30] "ESlate voting proves smooth, not flawless." HOUSTON CHRONICLE, Nov. 5, 2003.

Sequoia AVC Advantage

Name/Model: AVC Advantage

Vendor: Sequoia Voting Systems, Inc.



Brief Description:

The AVC Advantage is a poll worker-activated full-face direct recording electronic voting system with a touch-sensitive matrix of switches that voters push to indicate their choices. Voting records are recorded internally to battery-powered RAM. Poll workers activate the machine using an operator panel on the side of the machine to choose the ballot style and voters make choices by touching a black arrow next to their choice. A record of the vote is then recorded internally to three sets of battery-powered RAM memory. When polls are closed, poll workers remove a cartridge of battery-powered RAM that contains the vote records from each machine. These cartridges are then either physically transported to a tabulation facility or their contents transmitted over modem.

Detailed Voting Process:

The voter enters the precinct and is given a voting ticket after confirming that the voter is registered. The voting ticket is a colored piece of paper with two identical and unique numbers.[31] The voter hands their ticket to a poll worker operating an Advantage voting machine and then tears the voting ticket in half and hands one half back to the voter. The poll worker uses an operator's panel on the side of the machine to choose the ballot style appropriate for that voter depending on the color of their voting ticket.[32] The voter enters the curtains (see picture above) and verifies that their ballot is the right one by comparing the color of their ticket to a LCD screen in the lower-right corner of the front of the voting machine. Then the voter votes by pressing a black arrow next to each choice in each race on the ballot. Blinking lights above each race indicate that no choice has been made in that race. If the voter tries to choose more than one choice in a given race (over-voting), the machine will ignore the second choice. If the voter makes a mistake, they can press the black arrow by the incorrect choice to deselect it, then they can select the correct choice.

When done voting, the voter presses a "Cast Vote" button in the lower-right corner of the voting machine. It is very important that the voter does not push the vote-casting button until they are done voting; a vote inadvertently

[31] The two numbers on the ticket are not tied in anyway to the voter other than ballot style.

[32] The color of the voting ticket is used to specify the precinct or party (in a partisan primary) for which the voter is permitted to cast votes. For a particular ballot style, voters cannot vote for a race or party in which they are not allowed to vote (the choices for those races are disabled and cannot be selected).

cast can likely not be redone.[33] The vote is recorded internally to three sets of battery-powered RAM, one of which is on a removable cartridge.[34] The vote records are stored in a manner similar to a ballot image.[35]

When the polls close, poll workers remove cartridges of battery-powered RAM containing the vote records from each machine. At this point, depending on local election procedure and regulations, the cartridges can either be physically transported to a tabulation facility or they can be sent over a modem. At the tabulation facility, the votes from all cartridges and precincts are read into vote tabulation databases and combined to result in an aggregate vote tally. In order to send vote records over a modem, a cartridge reader must read out each cartridge and then a modem in the cartridge reader can be used to transmit the votes over telephone lines. The cartridge reader can also print out a results tape of all votes cast in a precinct. The total tape and cartridges can then become part of the official record of the election.[36]

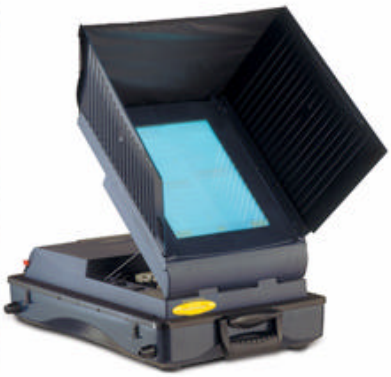
Past Problems

- June 2004: New Jersey. In Morris County, a glitch with the voting machines left the results of the election unknown. A back-up system also malfunctioned.[37]
- March 1997: Nevada. In Clark County (Las Vegas), numerous problems occurred from "poll workers miscalculating the number of names on voting rosters, voters who said they accidentally pushed the wrong buttons, and … unrecorded voters who huffed away from polls without casting ballots."[38]

[33] This can depend on local election law, procedures and regulations.
[34] This is Random Access Memory (RAM) and needs electricity – from a battery – to keep votes in storage. An event log, maintenance log and audit log is also stored on the memory pack.
[35] Specifically, the AVC Advantage's interface is a switch matrix. That is, the screen can be thought of as a grid with rows and columns and it is the grid position of each choice that is recorded for each race. The votes are stored as strings (ASCII characters; for example, "A9,B2,…").
[36] Vote records can be re-read off of the redundant memory in the Advantage if a cartridge fails.
[37] "Kinnelon results unknown as voting machine, computer fail." THE RECORD (BERGEN COUNTY, NJ). June 9, 2004.
[38] "Election glitches admitted." LAS VEGAS REVIEW-JOURNAL. March 5, 1997.

Sequoia AVC Edge

Name/Model: AVC Edge
Vendor: Sequoia Voting Systems, Inc.




Brief Description:

The Sequoia AVC Edge is a voter-activated multilingual touchscreen system that records votes on internal flash memory. Voters insert a "smart-card" into the machine and then make their choices by touching an area on a computer screen, much in the same way that modern ATMs work. The votes are then recorded to internal electronic flash memory. When polls close, the votes for a particular machine are written to a "PCMCIA card" which are removed from the system and either physically transported to election headquarters or their contents transmitted via computer network.

How To Vote On This Machine:

When the voter enters the precinct, he or she is given a "smart-card" by a poll worker after confirming the voter is registered. A "smart-card" – a card the size and shape of a credit-card – contains a computer chip, some memory and possibly basic data such as the voter's political party. The voter then takes the smart-card to a voting machine and inserts the smart-card into the yellow slot visible in the middle picture above. The first screen presented to the voter is one that allows him or her to choose the ballot language. After using the touchscreen to vote, 1) the record of the vote is directly recorded electronically to two flash memory cards and 2) the voter's smart card is reset to ensure that the voter can only vote once. The AVC Edge may also be equipped in some precincts to print a voter-verified paper audit trail using the VeriVote printer. In this case, the voter will inspect the printout which is displayed underneath glass. If the paper accurately reflects the vote, the voter indicates so using the touchscreen and casts the vote; the printed paper is withdrawn into the machine to protect privacy. If the paper is incorrect, the voter may mark it as spoiled and change his or her vote using the touchscreen interface. After the vote is cast, the smart-card pops out of the machine and the voter returns it to a poll worker.

When the polls close, a poll worker or election official inserts a different-type of smart card, an administrator card, into each voting machine and puts the machine into a postelection mode where it will no longer record votes. At this point, the machine writes the votes from its internal memory to flash memory on a "PCMCIA card." The PCMCIA card is merely a removable form of flash memory. A printed tape of all votes cast or vote totals for the voting machine can also be printed out at this time depending on local procedure and regulations.

The PCMCIA cards are removed from each machine and either taken to a central tabulation facility or to remote tabulation facilities. At the tabulation facility the votes are copied from the PCMCIA cards and into a central computer database where precincts are combined to result in an aggregate vote. The votes may also be transmitted to the central tabulation facility via a closed "Intranet", the Internet or modem. The PCMCIA cards and possible any printouts from the voting machines can then become part of the official record of the election.

Past Problems

- June 2004: New Jersey. In Morris County, the central tabulation system could not read the data from the PCMCIA cards. The system showed zeros.39
- November 2003: California. After a battery problem occurred during the election in Santa Clara County, Sequoia technicians worked on the machines without oversight from county officials. Following November's election in Santa Clara County, Sequoia sent over a group of technicians to make adjustments to voting machines that experienced battery problems.40
- November 2002: New Mexico. In Bernalillo County, 48,000 people voted early but no race showed more than 36,000 votes. The cause was a software bug.41
- April 2002: Florida. In Hillsborough County, one precinct could not transfer data on 24 out of 26 PCMCIA cards. Results summaries were faxed in and entered by hand.42 In March 2003, a similar problem plagued 2 out of 678 PCMCIA cards.43
- March 2002: Florida. In Palm Beach County much went wrong. When voters selected their language, the Edge froze up. Other reports indicate votes registering for wrong candidate.44 15 PCMCIA cards were temporarily lost and central system would not report result. In a race won by 4 votes, 78 were blank; voters reported erratic machine behavior.45
- November 2000: California. During the 2000 presidential election in Riverside County, a computer from Sequoia began dropping touch-screen ballots from the vote tally. A Sequoia salesman who was on hand intervened and fixed the problem.46

[39] "Montville and Chatham mayors ousted." NEW JERSEY STAR-LEDGER, June 9, 2004.
[40] "Electronic voting's hidden perils." SAN JOSE MERCURY NEWS. February 1, 2004.
[41] "Election results certified after software blamed." ALBUQUERQUE TRIBUNE, November 19, 2002.
[42] "Officials still searching for election glitch: The new system could not send the tabulations to the elections office." ST. PETERSBURG TIMES, April 6, 2002.
[43] "Elections Chief Sees Nearly Flawless Vote." ST. PETERSBURG TIMES, March 5, 2003.
[44] "Human goofs, not machines, drag vote tally into next day." PALM BEACH POST, 14 March 2002.
[45] "Out of Touch: You press the screen. The machine tells you that your vote has been counted. But how can you be sure?" NEW TIMES, April 24, 2003.
[46] *Id.*, note 14.

Unilect Patriot

Name/Model: Unilect Patriot
Vendor: Unilect Corporation

Brief Description:

The Unilect Patriot is a multilingual electronic voting system where the voter presses on-screen to indicate his/her preference. Election officials program ballot information at a central location, load election data into an "InfoPack" which is then inserted into a Precinct Control Unit (see photo). Individual terminals are connected together into the PCU to receive ballot data.

Voters make selections by pressing the box surrounding a candidate's name, navigating through ballot pages by means of navigation buttons, review their ballots by means of a summary screen, and can go back and change selections before casting their final votes. Vote data is stored in redundant memory inside each terminal. After polls close, vote data is loaded back into the PCU and can then be transmitted via modem to a tabulation center. Alternatively, the "InfoPack" (which store the vote data from all of the terminals at the polling place) can be removed from the PCU and taken to a tabulation center.

Detailed Machine and Voting Process Information:

Pre-election procedures

Ballot information is generally programmed by city or county election officials and later delivered to polling places. In order to create the ballots that will be used on the Patriot terminals, a menu-driven program is used to prompt the entry of all offices, candidates and propositions in order to "code" the election. Election officials have the option to print out the ballot on paper for proofreading purposes.

Ballot data is transferred to polling places in the form of an administrator interface loaded with precinct-specific data. By placing an "InfoPack" (a little larger than a pack of cigarettes) into the "InfoPacket" attached to the PC, the necessary ballot instructions are electronically transferred from the election supervisor PC to the InfoPack (about 5 seconds). It is then inserted into the Precinct Control Unit ("PCU" – see above photo) for the appropriate precinct. It is tested, sealed and sent to the precinct along with the prescribed number of Patriot Voting Devices.

In order to load the proper ballots into the Patriot terminals, the precinct workers place the PCU on the table and set up each booth. These are then connected from one to another by a cord similar in size to a lamp cord. The PCU is then turned on.

With the PCU in front of them, one of the precinct workers breaks the seal on the "Open Polls" latch, slides it open, and touches the red button underneath. This immediately causes the printer to print a report showing all the candidates with zero totals.

Voting on Election Day

The polls are now open and await the first voter. As each voter is checked in, the precinct worker determines which ballot style the voter is entitled to use (only if a split precinct, or a certain party in a primary), and assigns them to a particular open Voting Device booth. Only the offices on which the voter is entitled to vote should be displayed on the Voting Device. If a voter is judged to be a "Provisional" or "Challenged" or "Conditional" or "Affidavit" voter, a special button allows him/her to vote on the Patriot. Depending on local procedures, this ballot is not normally counted on election evening, but is added later if found to be valid.

Each voter should see the ballot electronically displayed on the screen. In localities where more than one language is required, the voter has the option of choosing which language he wishes to view. Usually the entire ballot will take more than one screen, so the voter may move forward or back by touching the appropriate box on the screen. The voter makes each candidate selection by touching anywhere in the box containing that name. As each is selected, that candidate's box becomes highly illuminated and a red “x” is placed next to the name. If a mistake is made, the selected candidate's box may be touched again (de-selecting him), and the new candidate selected. The entire ballot may be reviewed at any time to check who was previously selected.

Write-ins may be electronically entered by touching the "Write-In" box for a particular office. Upon selection of the write-in option, the screen changes to display an alphabet, and the write-in name may be spelled by touching the proper letters.

When completely finished voting, the "Review Choices" area is touched. This will automatically display on a single screen all choices made by that voter. It will also highlight those offices which were not completed by the voter. At that point, the voter may either "Make Ballot Changes" or "Record Ballot Now". At this point, the voter has completed his/her task and leaves.

Accessibility features

Unilect offers several accessibility features associated with the Patriot, although it is unclear if these features are readily available and installed on each terminal. These include the ability to disconnect and move terminals to enable “curb-side” voting, headphones and different shaped response buttons to facilitate voting by the sight-impaired, etc.

Preferential/Proportional voting

The Patriot Voting System also allows the use of "Preferential" or "Proportional" voting where permitted. This allows each voter to rank their candidates in order of desirability. Candidates are then elected by quota. (Such voting methods or used by some jurisdictions to eliminates the need for additional runoff elections.

Post-election procedures

At the end of the election day, a seal is broken on the "Close Polls" latch, opened and an exposed red button is touched. Several copies of the final precinct report are automatically printed, showing the candidates and their vote totals. Presumably, vote data is at this stage transferred back from the terminals to the PCU. Where a standard telephone line is available, the line is inserted into the phone jack of the Precinct Control Unit. All precinct totals are then transmitted directly to the Central Office PC. It is unclear whether this process is automated or whether poll workers must take affirmative action to initiate this upload. Another seal is then broken and the InfoPack is removed in order to be taken to a tabulation center.

At the tabulation center, each InfoPack (for precinct totals not sent by telephone) is inserted into a central PC equipped with the Patriot InfoPacket for a five (5) seconds to load the totals into the PC. Throughout election evening, summary reports can be printed showing all of the up-to-the-minute totals as they are received (including all write-ins).

Equipment – at the polling place

Patriot voting devices (5 to 8 lbs.), including a standard punch card type voting booth (13 lbs.) that folds up into an attache case. The Voter Unit may contain either a 10.4" (diagonal measurement) black and white screen or a 15" color screen with 256 available colors.

One precinct control unit (PCU) per precinct (30 lbs.), has an election worker control panel covering all aspects of running the activities in the precinct, a printer which allows the printing of precinct results as soon as the polls close, a battery to assure proper operation when "wall" electricity becomes unavailable, an InfoPack which contains the brains of the ballot as well as final vote totals, and an internal modem for direct transfer of totals from a standard telephone in the precinct to the Patriot Central Station, in the election office.

Equipment – at the election office

One Patriot Central Station (per jurisdiction), includes a PC or PC network powerful enough to code all ballots in the jurisdiction, accept all totals directly from the precincts via modem, and/or accept totals directly from InfoPacks and absentee ballots, instantly adds and tallies together including in-person or early voting ballots, and disseminates that information via summary reports throughout election evening (as well as individual precinct reports, canvass, logs and other miscellaneous reports). Other equipment included are InfoPackets, a printer (to match the jurisdiction's needs), modems, and an absentee ballot reader.

- Unilect Patriot (page 3 of 3)

Voting Technology Demos

A number of counties and voting machine vendors have published online demos and/or animations to assist voters in voting effectively. We present below a list of the demos we've discovered so far.

- Diebold AccuVote TS and Diebold AccuVote TS-X
  http://www.diebold.com/dieboldes/OnLine_Demo/screen1.html
- ES&S iVotronic
  http://www.essvote.com/HTML/products/ivotronic.html

  State/local guide (including video):
  http://www.srqelections.com/menu_touchscreen.htm

  http://elections.co.miami-dade.fl.us/how_to_vote.html

  http://www.uselections.com/fl/fl-ivotronic.htm
- Microvote MV464
  http://www.sos.state.mi.us/election/votesys/equipment/microvote/
- Sequoia AVC Advantage and Sequoia AVC Edge:
  http://www.sequoiavote.com/democenter.php
- Unilect Patriot
  http://www.unilect.com/demo_0.html

The latest list of online demos is available at:
http://verifiedvoting.org/article.php?list=type&type=63

Voting Technology Manuals

A number of counties and voting machine vendors have published online manuals to assist voters in voting effectively. We present below a list of the manuals we've discovered so far.

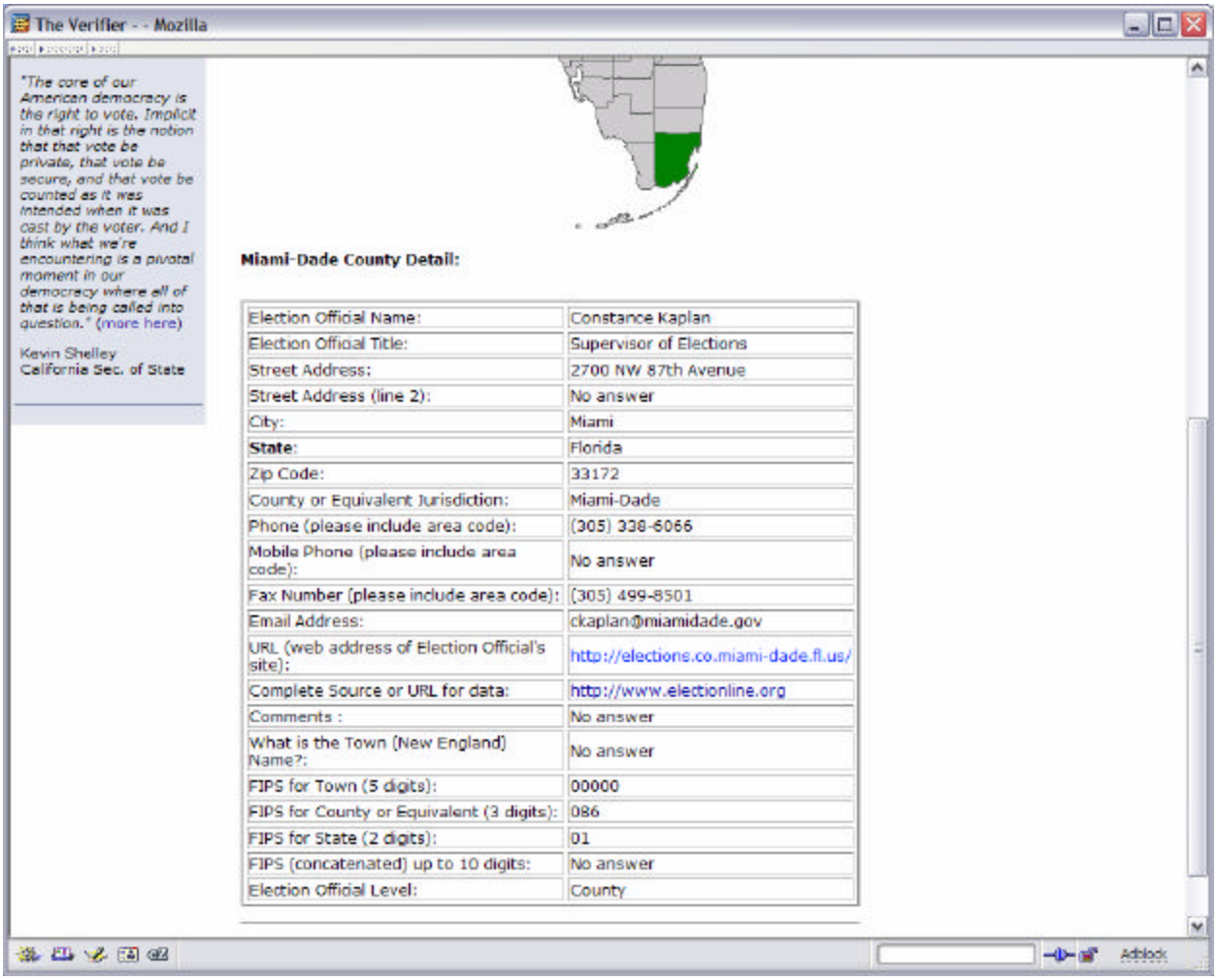
- Diebold Manuals
  http://verifiedvoting.org/article.php?id=5190
- ES&S Manuals
  http://verifiedvoting.org/article.php?id=5189
- Hart InterCivic Manuals
  http://verifiedvoting.org/article.php?id=5192
- Sequoia Manual
  http://verifiedvoting.org/article.php?id=5191

The latest list of voting machine manuals is available at:
http://verifiedvoting.org/article.php?list=type&type=63

Election Official Map

If you encounter a problem when trying to register or vote, you can try calling the toll-free Election Protection Hotline at 866-OUR-VOTE (866-687-8683).

Or, if you prefer, you can contact your local election official directly. Below is an example of the election official contact information available online at http://verifiedvoting.org/verifier/index.php?state=&topic_string=1019 .



Verified Voting Foundation Projects

The Verified Voting Foundation (VVF)'s projects before and during Election Day include the following:

- Election Incident Reporting System
- TechWatch
- Voter Education and Public Awareness Project

Motivation

The Verified Voting Foundation is a nonprofit organization championing reliable and publicly verifiable election systems, particularly the use of a voter-verified paper ballot (VVPB) which enables voters to check that their votes are recorded as intended and makes it possible for election officials to perform mandatory audits and meaningful recounts. The use of VVPBs is important because very few electronic voting systems have paper backups to permit recounts or audits and because of repeated failures and errors with existing e-voting technology in actual elections (see "Electronic Miscounts and Malfunctions in Recent Elections Summary" link on the front page of VerifiedVoting.org). Growing awareness of the problem nationwide will permit its resolution, which is critical to the integrity of the election process.

E-Voting Arrives

The landscape of voting is changing rapidly in the United States with concerns of disenfranchisement and reliability of election systems a major topic of public interest since the 2000 presidential election. With the passage of the Help America Vote Act (HAVA) in 2002, states are obtaining federal funds to improve their election systems. Many are purchasing new electronic voting systems even though up-to-date federal standards and guidelines for these systems not yet available. Voters are presented with new election equipment and procedures that can be bewildering. To the extent that it is possible, the Verified Voting Foundation seeks to inform voters about how to navigate through these new election systems to make sure their votes are recorded as intended.

Every Vote Counts

The right to have one's vote counted properly is a cornerstone of our democratic system. Making sure that our election systems are reliable and publicly verifiable enfranchises voters and increases public confidence and participation in our political process.

Verified Voting Foundation Projects

TechWatch

The objectives of the TechWatch project are the following:

- Recruit thousands of technology professionals as verified voting volunteers.
- Train the technology professionals to assist with elections.
- Assist partner organizations in preparing for voting technology issues, particularly electronic voting machine failures or fraud.
- Deploy technology professionals to observe, question, and attempt to improve voting equipment test observations (Logic & Accuracy testing) prior to Election Day.
- Immediate dispatch of technology professionals to polling places to respond to e-voting election incidents as they occur on Election Day in key states nationwide.

EIRS

The objectives of the Election Incident Reporting System project are the following:

- Obtain requirements for election monitor reporting activities from voter protection organizations.
- Harmonize election monitor reporting requirements among the organizations so that all organizations benefit from best practices.
- Develop election monitor reporting system prior to November 2004 in cooperation with Computer Professionals for Social Responsibility.
- Reports of meetings with state election officials, local election officials, and Logic & Accuracy testing prior to Election Day.
- Process reports from partner organizations and concerned individuals of incidents occurring at polling places and central vote tallying offices on Election Day.
- Enable immediate dispatch of attorneys and/or technology professionals to the scene of any election incident as appropriate so as to document thoroughly the incident and take any further action required, including potential litigation and/or follow-on policymaking activity.
- Make election incident reports available to media professionals covering the elections.

Verified Voting Foundation Projects

Voter Education & Public Awareness

The primary goal of the Voter Education and Public Awareness Program is to provide basic information to voters on how best to ensure their votes are counted as they intended in each election. Specific objectives include informing voters about VVPB laws and regulations, absentee and provisional ballot voting laws and regulations, voting equipment, voting procedures, and testimony about elections problems at polling places. VVF will work with coalition partners to obtain the voter information necessary for the voter education project.

The public awareness component of the program is to create and disseminate public education materials and organizers' kits to support local voter education efforts focused on ensuring that votes are counted as intended. These materials will include web-based documents, print materials, training videos, and informational videos for the general public.

Supporting technology for the above projects includes--

The Verifier

The Verified Voting Foundation provides a web-based tool called "The Verifier" that displays a wide variety of information related to verified voting and voter protection efforts. The election incident information is available by drilling down from a U.S. map to a specific state, and county.