

Voting Equipment



"In an age of electronic banking and online college degrees, why hasn't the rest of the nation gone to voting on touchscreen computers? The reason is simple and resonates with the contentious debate that has yet to be resolved after at least 15 years of wrangling over the issue of electronic voting. No one has yet figured out a straightforward method of ensuring that one of the most revered democratic institutions—in this case, electing a U.S. president—can be double checked for fraud, particularly when paperless e-voting systems are used." - [Scientific American, Jan. 9, 2012](#)

Today's political climate is riven with discontent and mistrust of the institutions of government, yet apart from public discourse, the vote is still how we make our will known. Mistrust in lawmakers or institutions may be nearly endemic, but we still rely on the principle that they can be voted out. When our voting systems fail though, voters lose trust in the electoral process, and that is corrosive. Without that trust, our democracy could crumble. In such an environment, it is of critical importance that we safeguard that most fundamental part of who we are as Americans – our democracy – by ensuring voting systems work properly and that it is possible for those responsible for operating our elections to demonstrate to the public that their votes indeed are being captured and counted as they intended, and that the outcomes are correct.

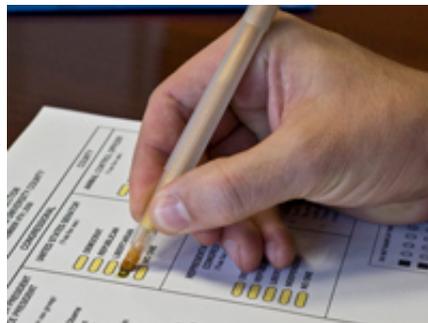
The U.S. election system faces unprecedented tests this November, and beyond. Among those tests are overt challenges to the full participation of all eligible voters. But there are also serious fault lines in the landscape of democracy, some of which are not visible but which threaten nonetheless. Many of these tests will become visible in the last yard of the voting process—the final step that occurs after other obstacles to voting are overcome, where the will of the voters must be captured and counted. That last yard is where the voter actually has the opportunity to mark and cast a ballot, and where the ballots are collected and counted, and ideally, where the systems that tally our votes are checked to make sure they work as they should. This is where the intersection of technology and democracy occurs. Challenges to voters' rights in that last yard derive from problems caused by the deployment and use of inadequate voting systems, and exacerbated by insufficient checks on the accuracy of the outcome.

Far too many states use unreliable and insecure electronic voting machines, and many states have made their situation worse by adding some forms of Internet voting for some voters,

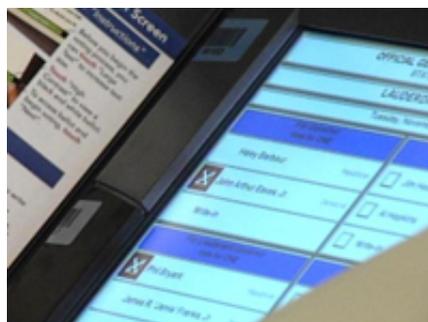
which cannot be checked for accuracy at all. Even in states where verifiable systems are used, too often the check on the voting system's function and accuracy is not done. In 2012, the voting systems now in use are aging; resources are severely impacted by the state of the economy over the past several years; shortages of both equipment and human resources are likely. After all the effort necessary to overcome the other hurdles to casting a ballot, it is patently unfair that once you get to the ballot box, that the ballot itself fails you. Taken together, these problems threaten to silently disenfranchise voters, potentially in sufficient numbers to alter outcomes.

Overview of Voting Equipment

Four basic types of voting equipment are used in US elections.



Optical Scan Paper Ballot Systems (including both marksense and digital image scanners), in which voters mark paper ballots that are subsequently tabulated by scanning devices. On most optical scan ballots voters indicate their selections by filling in an oval (on ES&S and Premier/Diebold ballots), completing an arrow (Sequoia ballots), or filling in a box (Hart Intercivic ballots.) Ballots may be either scanned on precinct-based optical scan systems in the polling place (Precinct Count) or collected in a ballot box to be scanned at a central location (Central Count.)



Direct Recording Electronic (DRE) Systems, in which using one of three basic interfaces (pushbutton, touchscreen or dial) voters record their votes directly into computer memory. The voter's choices are stored in DREs via a memory cartridge, diskette or smart card and added to

the choices of all other voters. An alphabetic keyboard is typically provided with the entry device to allow for the possibility of write-in votes, though with older models this is still done manually.

DRE systems can be distinguished generally by the interface through which the voter indicate her selections. The first generation of DREs used a push-button interface, while later systems use a touchscreen interface. The Hart Intercivic eSlate uses a dial interface. Some DREs can be equipped with Voter Verified Paper Audit Trail (VVPAT) printers that allow the voter to confirm their selections on an independent paper record before recording their votes into computer memory. This paper record is preserved and, depending on State election codes, made available in the event of an audit or recount.



Ballot Marking Devices and Systems provide an interface to assist voters with disabilities in marking a paper ballot, which is then scanned or counted manually. Most ballot marking devices provide a touchscreen interface together with audio and other accessibility features similar to those provided with DREs, but rather than recording the vote directly into computer memory, the voter's selections are indicated through a marking a paper ballot, which is then scanned or counted manually.



Punch Card Voting Systems Punchcard systems employ a card (or cards) and a small clipboard-sized device for recording votes. Voters punch holes in the cards (with a supplied punch device) opposite their candidate or ballot issue choice. After voting, the voter may place the ballot in a ballot box, or the ballot may be fed into a computer vote-tabulating device at the precinct. Four Idaho counties still use Votomatic Punch Card Voting System in the November 2012 election.



Mechanical Lever Voting Machines First introduced in the 1890s, mechanical lever machines were used in many States during the 20th Century. As recently as 1996, mechanical lever machines were used by 20.7% of registered voters in the United States. Since 2010, no mechanical lever voting machines are used in US elections.



Hand Counted Paper Ballots A significant number of jurisdictions manually count paper ballots cast in polling places by hand and even more count absentees and/or provisional ballots by hand. While not a type of "voting equipment", beyond the pen or pencil used by the voter to mark the ballot, many of the issues of ballot design and voter intent that effect all voting systems are relevant to hand counted paper ballots as well.

Voting Stages

Not all votes are cast in traditional polling places on Election Day - an increasing number of voters vote absentee by mail or at in-person early voting facilities. All jurisdictions now provide accessible equipment for voters with disabilities. Most jurisdictions use different voting systems

for these different voting stages.



Polling Place Voting In American elections, the majority of votes are cast in polling places. There are essentially two methods used to capture the voter's selections: a paper ballot marked by the voter, either physically or through the use of an assistive ballot-marking device, or a software interface in which votes are recorded directly into computer memory. Most paper ballots cast are tabulated by optical scanners, though there a significant number of jurisdictions that count paper ballots cast at polling places manually.



Accessible Voting The Help America Vote Act of 2002 (HAVA) required that every polling place provide voting equipment with assistive features for voters with disabilities. Jurisdictions have adopted different approaches to meeting this requirement. Some have opted the exclusive use of direct recording electronic (DRE) systems for all polling place voters. Others have chosen to have "Mixed" systems, with both an optical scan paper ballot system and a DRE system available in each polling place. Some such jurisdictions limit the use of the DRE primarily to voters with disabilities while others allow all voters to choose between the two systems available. A third approach to meeting the accessibility requirements of HAVA through the use of Ballot Marking Devices or Systems. These systems allow voters with disabilities to mark a paper ballot that is then counted along with the other paper ballots cast in the polling place.



Early Voting In recent years many, but not all, States provide for in-person Early Voting. For a period a days or weeks prior to the official Election Day (the period varies from State to State) voters have the option of visiting a central location (typically the county election officials office or, in larger jurisdictions, satellite vote centers) to cast their vote. Most jurisdictions use the same voting equipment for the early voting period that are used in polling places on election day but not all.



Absentee Voting Absentee Voting is available in every State. In some States there are restrictions on who can vote by mail and two States (Oregon and Washington) conduct elections using only mail ballots. Most jurisdictions tabulate absentee ballots with optical scanners - either high volume "Central Count" systems or smaller "Precinct Count" scanners. A small but significant number of jurisdictions count absentee ballots manually. Some jurisdictions transfer the votes cast by voters on absentee paper ballots onto DRE systems rather than tabulating the ballot by scanning or manual counting.



Provisional Ballots The [Help America Vote Act](#) of 2002 established that a voter could cast a provisional ballot if he or she believes that they are entitled to vote. A provisional ballot is cast when: the voter refuses to show a photo ID if required, the voter's name does not appear on the voter roll for the given precinct, the voter's registration contains inaccurate or out-dated information such as the wrong address or a misspelled name. or the voter's ballot has already been recorded. Whether a provisional ballot is counted is contingent upon the verification of that voter's eligibility. Many voters do not realize that the provisional ballot is not counted until 7–10 days after election so their vote does not affect the calling of the states to different candidates. Once the provisional ballot is determined to be valid it is counted with a scanner or manually.

A Brief History Voting Machines in the US



(From Douglas Jones, [Brief Illustrated History of Voting](#)) The conduct of elections has changed in many ways over the past 200 years. The extent of these changes is nicely illustrated by a comparison of today's voting practices with those illustrated in George Caleb Bingham's painting, *The County Election* (left - click to enlarge). In addition to being a noteworthy artist, Bingham was a successful politician; this painting shows a polling place on the steps of the courthouse in Saline County, Missouri, in 1846. In this painting, we see the judge (top center) administering an oath to a voter. The voter (in red) is swearing, with his hand on the bible, that he is entitled to vote and has not already done so. There was no system of voter registration, so this oath and the possibility that the judge or someone else in the vicinity of the polls might recognize him if he came back was all that prevented a voter from voting again and again.

There was no right to a secret ballot; having been sworn in, the voter simply called out his choices to the election clerks who sit on the porch behind the judge tallying the vote. Each clerk has a pollbook in which he writes the voter's name and records his votes; multiple pollbooks were a common defense against clerical error. There are several people in the painting holding paper tickets in their hands. We know that these were not paper ballots because Missouri continued to use voice voting until 1863. In a general election, however, many voters might have wanted to bring their own notes to the polling place. Campaigning at the polling place was

legal and common. The man in blue tipping his hat to the voter immediately behind the man taking the oath is one of the candidates in this election, E. D. Sappington, who lost to Bingham by one vote. He's handing out his calling cards so that people can easily read off his name to vote for him.

Voice votes offer modest protection against fraudulent vote counts: An observer can easily maintain an independent tally of the votes, and since there is no ballot box, it cannot be stuffed. On the other hand, the lack of privacy means that voters are open to bribery and intimidation; an employer can easily demand, for example, that his employees vote as required, and a crook can easily offer to pay a voter if he votes a certain way. [Continue Reading](#)