



ELECTION PROTECTION **YOU HAVE THE RIGHT TO VOTE**

1-866-OUR-VOTE

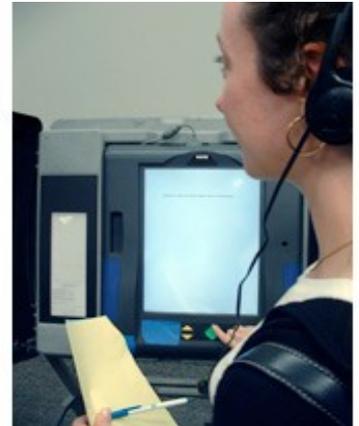
Electronic Voting Machine Information Sheet

Election Systems & Software – iVotronic

Name / Model: iVotronic₁

Vendor: Election Systems & Software, Inc. (ES&S)

Voter-Verifiable Paper Trail Capability: Yes



Brief Description: ES&S' iVotronic Touch Screen Voting System is a touch screen voting machine 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 touch screen, 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.

Checking the Voter-Verifiable Paper Trail: The iVotronic has an optional voter-verifiable paper trail printer, known as the Real-Time Audit Log (RTAL). States such as Ohio, West Virginia, and North Carolina require the RTAL by law, while iVotronics in South Carolina, Texas, and Pennsylvania do not have this option. The RTAL printer is a reel-to-reel cash-register type of printer under transparent plastic, and is located just to the left of the touch screen (pictured above right). The RTAL records all of the voter's actions, so if a voter changes her mind about a race on the ballot, the RTAL records both the initial choice and the final choice.

In Detail: 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



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party-specific ballot, 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.¹ After the PEB is used to close all the iVotronic machines, it contains all the summary data for the precinct. Depending on local regulations and procedures, poll workers can use a “printer kit” 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 or its contents sent over a computer network using a laptop running ES&S' Unity software.

Things to Look Out For

- The PEB slot on the face of the iVotronic is particularly sensitive. The EVEREST study showed that a voter with a magnet and a properly programmed PDA (with an infrared port) could gain privileged access to the sensitive functions of the machine. If you see anyone spending a long time in an iVotronic voting booth and engaging in activity that appears to be centered around the upper-left part of the iVotronic, they might be messing with the PEB slot. Of course, they might also just be voting, so don't cry wolf.
- The VVPAT printer (RTAL printer) is connected to the iVotronic via a cable that is connected to the top of the machine. This cable, unless the jurisdiction has purchased special cables or connectors, can be disconnected by a voter and various types of mischief could be performed (from printing extra VVPAT records to messing with the internals of the iVotronic). If you observe anyone

¹ 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.



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disconnecting this cable, alert the pollworkers immediately. If a pollworker is disconnecting this cable, it should only be to swap out a printer and you should be able to observe the whole process.

- The PEB device is particularly sensitive. An attacker who gains access to a PEB for a short or extended period of time can change votes on the PEB or attack the central Election Management System when the PEB is returned to election headquarters. PEB devices should only be handled by pollworkers and pollworkers should keep a vigilant watch over their use of the PEBs throughout the day (that is, they should not be leaving them around casually and the area in which the PEBs are kept should be secure and monitored at all times). If you see a voter or non-pollworker with a PEB, notify election protection immediately.

Past Problems

October 2008: West Virginia. Voters in two counties report that incorrect candidates are selected on the iVotronic display screen during early voting.²

October 2008: West Virginia. A ballot programming error by ES&S causes some straight-party votes to register incorrectly for a state Supreme Court race.³

May 2008: Arkansas. Votes for a local Constable race are tallied by iVotronics as part of a state legislative race.⁴

December 2007: Ohio. A review commissioned by the Ohio Secretary of State found “critical security vulnerabilities” in the iVotronic. The iVotronic can be accessed and manipulated by a person using only a magnet and a personal digital assistant.⁵

November 2006: Florida. An abnormally high undervote is reported by iVotronics in Sarasota County's Florida's 13th Congressional District race, as well as in other races in six Florida counties that used iVotronics.⁶

² “More W. Va. voters say machines are switching votes.” THE CHARLESTON GAZETTE, October 18, 2008. <http://www.sundaygazette.com/News/200810180251>

³ “Programming glitch affects ballots statewide.” THE CHARLESTON GAZETTE, October 14, 2008. <http://wvgazette.com/News/200810140330>

⁴ <http://blog.wired.com/27bstroke6/2008/05/arkansas-voting.html>

⁵ EVEREST Academic Review Team Findings, page 51 (page 69 of pdf), <http://www.sos.state.oh.us/sos/info/EVEREST/14-AcademicFinalEVERESTReport.pdf>

⁶ http://www.votetrustusa.org/index.php?option=com_content&task=view&id=2383&Itemid=113



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November 2006: *North Carolina.* Real-Time Audit Log printers fail on almost 10 per cent of machines in Guilford County.⁷

October-November 2006: Reports of vote-flipping⁸ in Texas, Indiana, Pennsylvania, Florida, and South Carolina: “*Douglas Jones, a computer scientist at the University of Iowa, says he's heard similar stories from voters in several states, including one computer scientist in South Carolina who said that his attempts to vote for one candidate on the iVotronic were repeatedly changed to an opposing candidate by the time he got to the voter verification screen.*”⁹

November 2004: *South Carolina.* Officials can't figure out how to retrieve 200 electronic votes from a malfunctioning iVotronic electronic voting machine.¹⁰

October 2004: *North Carolina & Texas.* Voters' choices register incorrectly on the touch screen.¹¹

August 2004: *Florida.* The iVotronic touch-screen machines -- the ones with the software bugs that caused an uproar last May -- showed evidence of the same problems in the August primary. Not only was the low battery problem (which ES&S claimed was repaired) still impacting the elections, problems also showed up with the features that are supposed to allow blind voters to vote independently. The county received 14,253 voter complaint forms about these and other election-day problems.¹²

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

⁷ “Printers failed on voting machines.” NEWS-RECORD, December 15, 2006, *archived at* <http://www.votersunite.org/article.asp?id=6948>

⁸ “E-voting Failures in the 2006 Mid-Term Elections.” Joint Report by VotersUnite, VoteTrustUSA, Pollworkers for Democracy, Voter Action. <http://www.votetrustusa.org/pdfs/E-VotingIn2006Mid-Term.pdf>

⁹ “All Four Major E-voting Machines Flip Votes in Early Voting.” By Warren Stewart. <http://www.votetrustusa.org/pdfs/E-VotingIn2006Mid-Term.pdf>

¹⁰ Id.

¹¹ Id.

¹² Id.



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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.¹³

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.¹⁴

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.¹⁵ 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.¹⁶

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.¹⁷

NASED Qualification Status:¹⁸

06/28/01: (hardware) iVotronic DRE Ver. 1

07/02/02: (firmware) Firmware Rel 7.4.1.0

02/19/04: iVotronic DRE Ver. 2.4.2, Firmware v. 8.0.0.0

08/27/04: iVotronic DRE Ver. 2.4.3, Firmware v. 8.0.1.0

¹³ “Electronic Vote Recount Stumps Broward Officials.” SUN-SENTINEL, January 10, 2004.

¹⁴ “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.

¹⁵ “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.

¹⁶ “Area Democrats say early votes miscounted,” THE DALLAS MORNING NEWS, Oct. 22, 2002.

¹⁷ “Leahy: Unskilled workers to blame,” MIAMI HERALD, Sept. 12, 2002.

¹⁸ *NASED Qualified Voting Systems (11/18/2005)*. National Association of State Election Directors. See: <http://www.nased.org/certification.htm>.



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01/09/05: iVotronic DRE Ver. 2.5, Firmware v. 9.0.0.0

10/14/05: iVotronic DRE Ver. 3.0, Firmware v. 9.1.2.0

03/08/06: iVotronic DRE Ver. 2.4.3.1, Firmware v. 8.0.1.0