



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

**1-866-OUR-VOTE**

## Electronic Voting Machine Information Sheet

Sequoia Voting Systems — AVC Advantage

**Name / Model:** AVC / Advantage<sup>1</sup>

**Vendor:** Sequoia Voting Systems, Inc.

**Voter-Verifiable Paper Record Capability:** None.<sup>2</sup>



**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 polling place 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.<sup>3</sup> 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

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<sup>1</sup> <http://www.sequoiavote.com/productguide.php?product=AVC%20Advantage&type=Introduction>

<sup>2</sup> In 2005 NJ passed a law requiring voter-verifiable paper records which will take effect in 2009. Printers developed for NJ were tested in 2007 but failed initial tests. (Advocates have urged a switch to precinct-count optical scan.) CO's law takes effect 2010. LA, PA and VA have no such requirement.

<sup>3</sup> The two numbers on the ticket are not tied in any way to the voter other than ballot style.



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machine to choose the ballot style appropriate for that voter depending on the color of their voting ticket.<sup>4</sup> 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. To change a selection, voter can press the black arrow by the incorrect choice to deselect it, then 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 cast can likely not be redone.<sup>5</sup> The vote is recorded internally to three sets of battery-powered RAM, one of which is on a removable cartridge.<sup>6</sup> The vote records are stored in a manner similar to a ballot image.<sup>7</sup>

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 their data 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.<sup>8</sup> The total tape and cartridges can then become part of the official record of the election.<sup>9</sup>

### What to Look For

- Security Seals. Ideally, the Advantage’s exposed ports, memory card access areas and case seams would be covered with tamper-evident security seals. The

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<sup>4</sup> 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).

<sup>5</sup> This can depend on local election law, procedures and regulations.

<sup>6</sup> 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.

<sup>7</sup> 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,...”).

<sup>8</sup> Printing the results before connecting the modem is preferable.

<sup>9</sup> Vote records can be re-read off of the redundant memory in the Advantage if a cartridge fails.



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integrity of these seals should be maintained at all times, and only breached under controlled, explained circumstances. A voided seal looks like this:

<http://www.flickr.com/photos/joebeone/2247733620/> . Seals should be logged to maintain chain of custody of sensitive materials.

- Broken buttons, broken lights. As mentioned above the Advantage is a “button-matrix” DRE where the voter presses a button over which the machine’s paper ballot face is placed (under a plastic cover). A light lights up next to each selection by the voter. These buttons and lights, especially the frequently used ones in Federal races, can break or burn-out. If you see evidence of this – e.g., a light not lighting up after multiple button presses – you should request that the machine be pulled from service or that the button in question be serviced.
- Fleeing voters/premature voting. Some voters can be easily confused in that they press the vote button too early or not at all. If a voter complains that they only were able to vote on the first few races, they probably pressed the vote button before they were finished voting their ballot. Unfortunately, there’s not much to be done here other than emphasize that voters should make sure that they press the vote button *only after* they are certain they have voted as they want to in all races on the ballot. If a voter neglects to press the vote button and leaves a valid ballot on the machine, pollworkers will probably have procedures to deal with this problem. We recommend that a pollworker reach in between the curtains and simply cast this vote.
- Incorrect ballot style. The Advantage can accommodate a number of different ballots, for different precincts, by disallowing voters to vote in contests for which they are not eligible. If a voter complains that their party (in a primary) races are not activated or that local races specific to their precinct are not activated, the pollworker probably pushed the incorrect ballot style option. The pollworker should cancel that ballot and activate the correct one.
- Incorrect Totals Tapes. The Advantage has been shown to incorrectly add up the number of voters given a particular ballot style when compared to the number of votes cast.
- Sensitive Disability Access Panel. The disability access panel on the Advantage is particularly sensitive. Viruses and other malicious programs, including some that could change vote data, could easily be introduced through the ADA accessibility interface. The flash memory used for audio files to accommodate voters with visual impairment should be sealed with tamper-evident seals and monitored at all times.
- Misleading Activation. When the Advantage is not activated to vote a valid ballot, it will still go through the motions in a way that will confuse voters into



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thinking that they ballot was cast. It even goes as far as to say, “Vote recorded -- thank you!”, despite the fact that it couldn’t have recorded the ballot since it was not activated to do so.

### Past Problems

**October 2008:** *New Jersey.* Princeton University computer scientists publish a court-ordered review which questions the accuracy and security of the Advantage.<sup>10</sup> Even when not properly activated, the Advantage will still indicate to voters that they have voted.<sup>11</sup> Vote-switching software could be installed in a single unattended machine and spread throughout a county's stock of voting machines.<sup>12</sup> The Advantage is associated with a high undervote rate for public measures.<sup>13</sup> Since the publication of the report, Union County, NJ's election official has encouraged voters to vote absentee by paper ballot rather than use the Advantage.<sup>14</sup>

**February 2008:** *New Jersey.* Programming errors cause Advantage machines in 8 New Jersey counties to report inconsistent Presidential primary results in their internal memory and removable memory storage. Programming errors caused some voters to be disenfranchised.<sup>15</sup>

**May 2006:** *New Jersey.* Questions about how many voters participated in the May 2 elections caused several candidates to question results regarding runoffs and vote counts. The Trenton City Clerk said he had contacted the vendor, Sequoia some two months prior but had not heard back.<sup>16</sup>

**November 2004:** *Louisiana.* State election officials received about 200 complaints of problems with machines, including two confirmed reports of Sequoia AVC Advantage voting machines in New Orleans Parish that were not working, according to Scott Madere, press secretary for the Louisiana Secretary of State.<sup>17</sup>

**November 2004:** *New Mexico.* Presidential undervote rates (ballots without a vote for president) were greater for ballots cast on the Advantage than those cast on any other type of system used on Election Day. One in every 19 ballots cast on Advantage machines did not register a vote for president.<sup>18</sup>

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<sup>10</sup> “Insecurities and Inaccuracies of the Sequoia AVC Advantage 9.00H DRE Voting Machine,” Andrew W. Appel and colleagues, <http://cobnitz.codeen.org/citp.princeton.edu/voting/advantage/advantage-insecurities-redacted.pdf>

<sup>11</sup> Id., p.81

<sup>12</sup> Id., p. 64

<sup>13</sup> Id., p. 85

<sup>14</sup> “Union County clerk says voting machines are unreliable; encourages voting by mail,” NJPoliticker.com, October 21, 2008, <http://www.politickernj.com/matt-friedman/24666/union-county-clerk-says-voting-machines-are-unreliable-encourages-voting-mail>

<sup>15</sup> “Insecurities and Inaccuracies of the Sequoia AVC Advantage 9.00H DRE Voting Machine,” p. 117.

<sup>16</sup> Id.

<sup>17</sup> Id.

<sup>18</sup> Id.