



**FREEMAN, CRAFT, MCGREGOR GROUP**

**California Secretary of State  
Consultant's Report on:**

**Volume Testing of the ES&S Unity  
3.0.1.1 Voting System**

Prepared for the California Secretary of  
State by:

Paul W. Craft  
Senior Partner

Kathleen A. McGregor  
Senior Partner

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The Secretary of State staff and the State's technical consultants Freeman, Craft, McGregor Group (FCMG) conducted the volume test of the Election System and Software, Inc. (ES&S) AutoMARK Voter Assist Terminal (VAT) at the Sacramento County Elections Department at 7000 65<sup>th</sup> Street, Sacramento, California. The volume test was conducted in accordance with the Secretary of State's standard protocol for volume testing. (This protocol may be obtained from the Secretary of State website at: [http://www.sos.ca.gov/elections/voting\\_systems/volume\\_test\\_protocol\\_final.pdf](http://www.sos.ca.gov/elections/voting_systems/volume_test_protocol_final.pdf))

Approximately 50 temporary contract workers (test voters) were hired by the Secretary of State to simulate Election Day voting on the AutoMARK. The overall testing environment was recorded continuously on videotape and photographs were taken of error messages displayed on the AutoMARK for documentation. Each error was documented as to whether they were attributed to the equipment or to human performance.

A total of one hundred machines were tested. Fifty ES&S AutoMARK VAT, Model A100s were tested on December 6<sup>th</sup>. Fifty ES&S AutoMARK VAT, Model A200s were tested on December 7<sup>th</sup>. The testing included casting approximately 117 ballots on each machine. The actual number of ballots cast on individual machines ranged from 109 to 120. A total of 5,738 ballots were cast on the Model A100 machines. A total of 5,861 ballots were cast on the Model A200 machines. The total number of ballots cast over the two days of testing was 11,599.

Each day, ES&S was allowed to perform preventative maintenance on the test equipment during the lunch break. The Secretary of State's Office agreed to allow the maintenance with the understanding that the AutoMARK is not intended to be a high volume machine and that, if a high number of ballots were cast on a single machine during an election, periodic preventative maintenance must be performed during that election. Preventative maintenance included calibrating the scanners and printers, calibrating the touch screen displays, inspecting and cleaning the units, printing test ballots, replacing ink cartridges and rebooting the system. ES&S limited preventative maintenance to those machines that displayed a significant number of errors in the first half of each day. It is recommended that the California Use Procedures for the AutoMARK include prescriptions for preventative maintenance based upon the results of this test.

After test voters completed marking their ballot decks, they reviewed each of their ballots and identified those ballots that contained poor markings. The Secretary of State's Office of Voting Systems Technology Assessment (OVSTA) staff reviewed these ballots, looking for ballots with marks which were sufficiently poor, or outside the target area, that they might cause errors in tabulation. They selected thirteen ballots, which appeared most likely to generate tabulation errors. Each of these thirteen ballots was read into an ES&S Model 100 ballot scanner five times. Despite poor quality or placement of marks on these ballots, the scanner tabulated these ballots with zero errors.

A number of anomalous events occurred during the test. The events were recorded on incident reports as they occurred. The incident reports show the following:

**Ballot Not Recognized** – This occurred when the voter inserts the unmarked ballot into the machine and the machine fails to recognize the ballot. The ballot is ejected back to the voter. This was a common error during the test. There were no invalid ballots in the decks. In most instances, the ballot was recognized when the ballot was inserted a second time. This error occurred 804 times during the test. There were 440 of these occurrences over 5,738 ballots on the Model A100 units. There were 364 occurrences over 5,861 ballots on the Model A200 units. The ratio of occurrences to ballots was 7.67% for the Model A100 and 6.21% for the Model A200.

There were two instances where the message “Ballot Not Recognized” appeared, the unit froze and had to be rebooted in order to continue the test. This occurred once on the Model A100 and once on the Model A200.

There was one occurrence of the “Ballot Not Recognized” error in conjunction with a ballot jam. It was not determined whether the machine jammed while trying to handle the recognition error or whether the jam caused the ballot to not be recognized.

The “Ballot Not Recognized” message seems to occur less frequently when the ballot is inserted into the unit slowly. The California Secretary of State has determined that these errors will be considered human behavior errors rather than machine errors.

Although the situation is easily remedied, poll workers need to be trained to expect this situation and know how to handle it properly. The AutoMARK Poll Workers Guide states that the “Ballot Not Recognized” error occurs when the “System is unable to read election information programmed and/or stored on the compact flash memory card (FMC).” The guide instructs poll workers to take the following steps to resolve the condition:

1. Shutdown AutoMARK VAT.
2. Remove compact FMC.
3. Reprogram FMC with correct data.
4. Touch the key switch with one hand to discharge any static build-up
5. Insert FMC in AutoMARK VAT.
6. Startup AutoMARK VAT.

This description of the cause and remedy of the error do not match our experience during testing. In addition, the steps provided by the manual are not within the normal scope of poll workers’ duties. The AutoMARK Poll Workers Guide

should be revised to provide an accurate description of the cause(s) of the error and what steps need to be taken by the poll worker when it occurs.

**Ballot Misfeed** - When the voter inserts the unmarked ballot, the AutoMARK attempts to scan the ballot and then returns the ballot to the voter with the error message "Ballot Misfed." If the ballot is not damaged, it can be reinserted. This error results when the voter skews the ballot and the feed guides on the unit are unable to compensate for or correct the skewing. This is another common error that occurred during the test. It occurred 239 times during the test. With the Model A100 there were 142 occurrences on 5,738 ballots. With the Model A200 there were 97 occurrences on 5861 ballots. The ratio of occurrences to ballots was 2.47% for the Model A100 and 1.66% for the Model A200.

Poll workers need to be trained to expect this error and how to handle it properly. The AutoMARK Poll Worker Guide describes opening the machine and physically removing the ballot. Unless the ballot becomes jammed, this step is generally not necessary. The AutoMARK Poll Workers Guide should be revised to provide instructions for instances that do not require opening the machine in order to continue voting.

**Ballot Damaged on Eject** - The AutoMARK mangles, bends or tears the ballot when ejecting the ballot. There were seven occurrences of this error, two with the Model A100 and five with the Model A200. In each event, the unit failed to provide an error message. When this error was detected, the damaged ballots were removed from the test decks and kept by OVSTA staff. Because the unit does not generate an error message, it is incumbent on the voter to realize that the ballot was damaged, get a replacement ballot from a poll worker and revote the ballot. The damage to the ballot may be sufficient to prevent scanning on a tabulation device without the extent of the damage being noticed by the voter. Poll workers need to be trained to be alert to this possibility. A determination needs to be made as to whether or not this error will count as one of the spoiled ballots the voter is allowed, and include this information in the poll worker training.

**Ballot Jam** – In addition to the paper jams involved with the Ballots Damaged on Eject anomalies, there were five ballot jams that would require poll worker intervention to clear the jam. In one occurrence, the AutoMARK was switched over to test mode and the option to "eject the ballot" was selected. This caused the AutoMARK to freeze. ES&S's preferred method to clearing this error, is to always open up the machine and remove the ballot manually. Once the ballot is removed, the machine needs to be recycled by switching the machine to test mode and select the option to "eject ballot" and setting it back to voting mode. Poll workers must be trained to deal with these types of occurrences.

**Printer Error** - There were a total of 84 "Error While Printing" errors. These errors occurred after the voter had completed voting his or her ballot and selected "print ballot." While the ballot was being marked, the AutoMARK would stop while the ballot was inside the unit and the screen would display the message: "Error While Printing." This error requires intervention from the poll worker in order to resolve this issue. The poll worker is required to set the AutoMARK to test mode and select the option "Eject the Ballot." Once the ballot is ejected, the poll worker must then place the AutoMARK back in voting mode. After the AutoMARK is placed back in voting mode, the voter must start the entire voting process over with a new ballot.

There is no mention of "Error While Printing" in the AutoMARK Poll Worker Guide. The guide should be revised to include the error message and the steps required to handle the error when it occurs, including, but not limited to spoiling the voted ballot. Poll workers must be trained to deal with this error.

**Loss of Screen Calibration** - There were three instances where the touchscreen of an AutoMARK model A100 drifted out of calibration during the test. All three instances occurred on the same machine. Poll workers should be trained to check screen calibration and be alert to voters encountering calibration issues. The AutoMARK Poll Worker Guide should be revised to include processes for checking and setting screen calibration on AutoMARK devices.

**Machine froze and required rebooting** - There were eleven instances where a machine froze while attempting to read an unmarked ballot. These machines appeared to be stuck in read mode. The machine did not generate an error message, but the machine was rendered completely inoperable. In each instance, it required the poll worker to reboot the machine. Once the machine was rebooted, the poll worker had to go through the process of removing the ballot from inside the machine by either placing the machine in test mode then selecting the "Eject Ballot" option or by opening the machine and manually removing it.

The method for correcting this anomaly should be included in the AutoMARK's Poll Worker Guide.

**Low Memory – Reboot Required** - There were six instances where the machine displayed the error message "Alert Low Memory" and became completely inoperable. Five of the errors occurred on the Model A100 and one on the Model A200. The machine was required to be rebooted in order to clear the error message.

This condition is not described in the AutoMARK Poll Worker Guide. The manual should include this error message and the steps required to correct the error when it occurs.

**Machine pulled from the test** - ES&S staff determined that Machine 97 needed to have a full preventative maintenance done during lunch. After the preventative maintenance was completed ES&S staff could not get the machine to boot up. A visual check was done, per the preventative maintenance instructions, and everything appeared to be correct. The machine would still not boot up. At this point ES&S staff determined that the machine had to be taken out of service.

Findings from the volume test are:

During the course of this test, no ballot was lost and no conditions were experienced which would cause a ballot to be irretrievably lost. In each instance when an AutoMARK damaged a ballot or the print quality of a ballot marked by one of the AutoMARK units was so poor as to be unreadable by the tabulating scanners, either the ballot damage was obvious, an error message appeared, or some other condition existed that prompted the test voter to seek assistance and obtain a replacement ballot.

The number and nature of anomalies encountered during the test show that the AutoMARK requires a high level of maintenance and poll worker training. While properly trained poll workers can easily handle most of the anomalies discussed above, any one of these anomalies, if unaddressed, could bring use of the AutoMARK in a polling place to a halt. If poll workers are trained to deal with these anomalies without reliance on rovers or responses to service calls, then the disruption from these types of events can be minimized. The AutoMARK Poll Worker Guide should be amended to address the correct treatment of these devices and California Use Procedures need to be developed to ensure adequate poll worker training and system maintenance.