



FREEMAN, CRAFT, MCGREGOR GROUP

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

**Volume Testing of the
ES&S EVS 5.2.1.0 Voting System**

Prepared for the California Secretary
of State by:

Steven V. Freeman
Paul Craft
Kate McGregor

August 22, 2017

Revision history

| Version | Change date | Author(s) | Changes to previous version |
|---------|-------------|------------------|--|
| 1.0 | 2017-07-06 | Paul Craft | Initial draft |
| 1.1 | 2017-07-10 | Kate McGregor | Revision |
| 1.2 | 2017-07-19 | Paul Craft | Changes after client review |
| 1.2 | 2017-08-03 | Paul Craft | Status changed to Final. Printed to .PDF file. |
| 1.3 | 2017-08-18 | Craft & McGregor | Changes after additional client review |
| 1.3 | 2017-08-22 | Craft & McGregor | Format and punctuation changes after internal review |

Summary of System Components

The Election Systems & Software (ES&S) EVS 5.2.1.0 Voting System Elections voting system submitted for certification testing consisted of the following major components:

Software Modules:

- Election Management System (EMS), comprised of
 - Electionware, Version 4.7.1.0
 - Event Log Service, Version 1.5.5.0
 - Removable Media Service, Version 1.4.5.0
 - Election Reporting Manager, Version 8.12.1.0
 - Voter Assist Terminal (VAT) Previewer, Version 1.8.6.0
 - ExpressVote Previewer, Version 1.4.1.0

Hardware Components:

- DS200 Precinct Tabulator, Hardware Version 1.3, Software/Firmware 2.12.1.0
- DS850 Central Tabulator, Hardware Version 1.0, Software/Firmware 2.10.1.0
- AutoMARK VAT, Hardware Versions 1.0, 1.1, 1.3 and 1.31 Software/Firmware 1.8.6.0
- ExpressVote, Hardware Version 1.0, Software/Firmware 1.4.1.0

The equipment used in this test was:

- Twenty DS200 Scanners
- Ten AutoMARK VATs, Hardware Version 1.0
- Ten AutoMARK VATs, Hardware Version 1.1
- Ten AutoMARK VATs, Hardware Version 1.3
- Ten AutoMARK VATs, Hardware Version 1.31
- Twenty ExpressVotes, Hardware Version 1.0

Scope of Work and Reporting

This report covers work done to assist the California Secretary of State (SOS) with the Volume Tests for the AutoMARK ballot marking device, the ExpressVote vote capture device and the DS200 Precinct Tabulator.

We are not attorneys and do not offer legal advice. We assisted the SOS by collecting facts and evidence in order for them to make certification decisions. However, to advise the SOS on the determination as to whether the system complies with California's certification requirements

would require an interpretation of law. Accordingly we do not provide recommendations or any opinion as to whether the system can be certified.

The work we performed and our findings are strictly limited to the specific serial numbered hardware elements and specific software elements exercised during this test. An inventory of those items is included Attachment A. The results described in this report should be reliable and repeatable for those specific items. The decision to apply those results to decisions regarding other items is solely at the discretion and risk of the Secretary of State and election officials who purchase the system. Although the descriptions of the components can be used as part of a baseline to reach conclusions regarding the compliance of other items, anyone who wishes to determine the compliance of purchased systems or the compliance of a system already in use should conduct appropriate acceptance testing or system validation analysis to support those conclusions.

Description of System Submitted for Certification

ES&S EVS 5.2.1.0 is a voting system that utilizes paper ballots. Voters can mark their ballots manually using a pen or pencil. The system includes precinct scanner tabulators (DS200) and central count scanners (DS850). The system also includes two ballot-marking devices, the AutoMARK and the ExpressVote. Each of these devices has a touchscreen, keypad, audio ballot and headphones. The AutoMARK presents voters with the option to select candidates and propositions using a touch screen or through an audio ballot. After the voter makes their selections, it marks their choices on a paper ballot. The ExpressVote provides the same voting function, but it prints out the voter's selections in readable type and bar codes on a paper cast vote record. Both the marked ballots and the cast vote records can be scanned and tabulated on a DS200 or a DS850.

Approach to Testing

This portion of the certification test is intended to simulate conditions approximating the normal use by voters in a polling place on Election Day and verify that the equipment will operate reliably under those conditions. A number of temporary employees were hired as test voters. They cast four hundred eighteen two-sheet ballots on each DS200, marked fifty blank two-sheet ballots on each AutoMARK and marked fifty Activator Card/Cast Vote Records (ballots) on each ExpressVote. The testers observed the voting and documented any anomalies the voters encountered while operating the machines.

Detailed Reporting on the Phases of Testing

Test voters experienced fifty-one anomalous conditions that were documented in incident reports. The data obtained from these incident reports are presented in Attachment B. Nineteen of these reports were completed during testing of the DS200. Thirty-two of these reports were completed during testing of the AutoMARK.

DS200 Incident Reports

During the DS200 test, nineteen incident reports were completed. In this group there were:

- Eight paper jams that were not automatically managed by the operating system. In each case the ballot jammed after being scanned and was caught between the scanner and the ballot box. ES&S cleared these jams by pulling the scanner forward and reaching behind it to loosen the ballot and drop it into the ballot box. Five of these incidents occurred on a single machine. Three other machines had one occurrence each.
- Four episodes that required a machine be repaired or a part replaced. In each instance, a copper anti-static strip on the roof of the ballot feed mouth detached from the feed mouth, dropped down and blocked the mouth of the scanner. This occurred on three machines. The feed mouth was replaced on one machine, but the problem recurred. In each case, ES&S pressed the anti-static strip back onto the adhesive that attached it to the feed mouth and the problem did not recur.
- Three incidents were related to human error. A voter who was overly aggressive while they fed ballots into the machine caused two of them. The third occurred when, following the first scan of the test deck, a ballot was accidentally torn as it was removed from the ballot box. It was removed from the deck, duplicated and the duplicate was added to the deck before the second scan commenced.
- Four occasions were attributed to errors that occurred during set-up. In each case, the vendor failed to correctly set up a machine for the test. One of these errors resulted from a battery that was not charged prior to the beginning of the test. The other three were due to ballot boxes that were set up incorrectly.

AutoMARK Incident Reports

During the AutoMARK test, thirty-two incident reports were completed. Of these there were:

- One incident that required powering off the machine. The screen went white and the machine refused to accept ballots.
- Thirteen incidents that required the device be taken out of election mode.

- In twelve of these, the ballot did not eject so the system displayed an error message that simply said “Print Error.” These errors required the machine to be put into “Test Mode” and the “Eject Ballot” option be selected. Two of the ballots were visibly skewed when the AutoMARK printed them. The others were printed correctly.
- One was a calibration error, in which the calibration drifted approximately two inches down and one inch to the left. This caused the touch screen to stop responding to the voter. In order to recalibrate the machine, it had to be taken out of “Election Mode” and put in “Test Mode.”
- Eight paper jams occurred that the operating system did not automatically manage. Each of these required the machine to be put into “Test Mode” to eject the ballot. In some cases this did not work and the machine had to be opened in order to remove the ballot. In some instances these jams damaged the ballot.
- One incident resulted in the machine being taken out of service. A ballot jammed and ES&S could not resolve the issue. After several attempts ES&S took the device out of service. The machine marked only ten ballots before this happened.
- One machine had to be temporarily taken out of service and repaired because a ballot jammed and, when it was removed, there were marks where the feed roller had scuffed it. After ES&S replaced the upper clean out tray the error did not recur.
- Three incidents occurred when AutoMARKs operating on battery power experienced battery failure before the required 1 hour, 36 minutes elapsed.
- One incident occurred when a ballot printed by the AutoMARK was skewed and improperly marked to the point where it could not be accurately read by a DS200.
- Three incidents were attributed to human error.
 - Two of these errors occurred when voters were told to take a break and they walked away from their machines with a ballot still inside rather than waiting for the ballot to be ejected. The system is designed to hold a ballot for five minutes if there is no activity by the voter. Once five minutes have elapsed with no activity, a poll worker is required to remove the ballot.
 - In the third incident, the voter believed that they had marked a candidate in the state assembly race but the machine did not print any selection for that race. The condition did not occur on later ballots and there was no evidence to support the voter’s account of the incident. Since it could not be replicated and resolved, the incident was scored as human error.
- One episode was due to an error in the test setup. One of the machines tested on battery power failed due to a procedural error and could not complete the test. In this

instance, the voter did not begin to vote immediately after the machine was unplugged. Because of the inactivity, the machine went into power save mode, which is a new feature to the system. Both ES&S personnel and the testers misidentified this occurrence as a power failure and then plugged the machine back in. This allowed the voter to continue voting, but not on battery power. The battery test was compromised and deemed inconclusive for this unit.

To further test the efficacy of the power saving mode, four AutoMARKs were placed on battery power, turned on, allowed to go into their power save mode and occasionally brought out of power save mode without processing any ballots. All four stayed operational for in excess of 1 hour and 36 minutes.

For the ExpressVote, no incident reports were required. No errors occurred.

Findings

During this test, none of the DS200s exhibited the “Ballot counted but not saved” and “Ballot too long” errors reported in earlier versions of the DS200 although ballot jams between the scanner and the ballot box still occurred. Eight jams occurred during the time that eight thousand ballots were tabulated. Five of the eight jams occurred on one machine.

During this test, none of the AutoMARKs presented the “Ballot not recognized” or “Screen froze and required rebooting” messages experienced in earlier versions of the AutoMARK. However, the occurrence of “Ballot Jam”, “Printing Error” and “Loss of Screen Calibration” errors in this test are consistent with past performance.

The ExpressVote performed with no incidents.