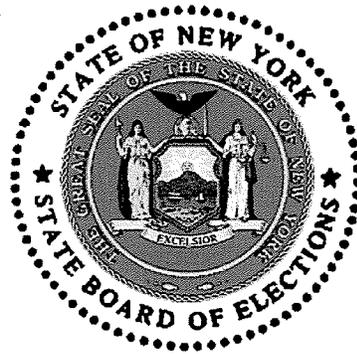


**STATE OF NEW YORK
STATE BOARD OF ELECTIONS**

Functional Test Report



Prepared by the Election Operations Unit
Presented at the July 15, 2009 Meeting of the
New York State Board of Elections

PURPOSE

As a component of the State Board's 2009 HAVA compliance plan, the Election Operations Unit conducted in-house functional testing of the ES&S DS-200 and Dominion ImageCast voting systems. This testing was crafted to validate the logic and accuracy of these two systems, thus increasing confidence in their use in the Pilot Project, and ultimately allowing for less restrictive post-election procedures to be implemented. This functional testing effort included logic and accuracy testing as well as volume and stress testing. The testing successfully proved that both the ES & S and Dominion optical scan voting systems tabulated ballots accurately.

The Citizens' Election Modernization Advisory Committee (CEMAC) was invited to participate in the testing, and we were fortunate to have three members of the Committee: Election Commissioners Peter Quinn of Monroe and Don Wart of Oswego, and Greg Jones of the Commission on Quality Care & Advocacy for Persons with Disabilities, assist in the marking, validating and casting of test ballots. Test decks prepared for the test were run on the software versions previously approved by the Board, (Board meeting of May 12, 2009), and the upgraded software versions provided to SysTest on June 8, 2009. Both software versions for each system operated correctly and passed the functional testing, therefore the Unit is recommending the Board authorize for use, the enhanced June 8 software versions for both systems.

DESCRIPTION OF TEST

The testing protocol used for this project is attached, and a summary of the software versions on which the test was conducted, appears below. In summary, four test decks with varying candidate contests and ballot proposals were used for the logic and accuracy testing of these machines. These decks were marked in pre-determined patterns, so that logic and accuracy could be validated when ballots were cast and tabulated. Included were two general elections and two primary elections. Ballots cast in the logic and accuracy tests were hand-marked, and included ballots marked using the BMDs for each system. The CEMAC members also 'free-marked' ballots, creating their own, original and unique patterns in test decks. These additional ballots were cast and tabulated. One pre-marked test deck was used for the volume and stress portion of the functional testing. The test decks consisted of the following:

General Elections

- 1) 193 Ballots, 7 Contests, 1 vote for 6, 5 vote for 1, 1 vote for 2,
2 Propositions
- 2) 130 Ballots, 6 Contests, 1 vote for 4, 3 vote for 1, 1 vote for 2, 1 vote for 3,
3 Propositions

Primary Elections

Democratic Primary

- 1) 68 Ballots, 4 Contests, 2 vote for 1, 2 vote for 2

Republican Primary

- 2) 74 Ballots, 4 Contests, 2 vote for 1, 2 vote for 2

Volume and Stress

4,215 General Election Ballots: 7 Contests, 1 vote for 6, 5 vote for 1, 1 vote for 2,
2 Propositions

TESTING EXPERIENCES

As one would expect with any all-paper technology, paper jams were experienced in the testing, though the majority of the paper jams encountered, when investigated further, were attributed to the manner in which ballots had been separated from their respective stubs. Once staff had been trained in a more efficient ballot separation technique, the number of paper jams dropped significantly. The State Board's inspector training materials and web-based training session will include helpful guidance on this issue. The training materials and web-based session already provide instructions for inspectors on how to resolve traditional paper jams.

Testing teams using the Dominion ImageCast system periodically encountered paper jams on ballots on which a write-in vote had been cast. In the ImageCast system, such ballots are diverted to a separate ballot box compartment so that they may be easily retrieved and canvassed for write-ins. This anomaly was reported to the vendor, and modifications are being made that will be part of the final, certified software version.

Testing teams using the ES & S DS-200 system's April software package periodically encountered a delay in ballots being deposited into the ballot box. When scanning ballots, a paper jam message appeared on the inspector panel. When the tester responded to the error message by selecting the "OK" key, the ballot was dropped into the ballot box without any other intervention. This issue was determined to be a timing issue and not truly a paper jam. When scanning ballots using the June 8 software package, the number of such instances was considerably less than in the April version.

CEMAC members, testing team members, and SBOE staff who assisted in marking ballots all commented on the precision and time it takes to mark test decks. Test team members responsible for validating those test decks confirmed the sentiment. The comments were not surprising to Election Operations staff who have had experience in

creating test decks for previous voting system certifications, and in their roles of assisting county boards who currently utilize central count absentee systems. County Boards will continue to be advised in the arena of test decks, and are encouraged to practice marking decks, identifying staff members who understand the logic and process involved. Test deck procedures are currently available on the county board procedures portal, and Election Operations staff will continue to assist boards in understanding the process, and in determining patterns for various ballot styles, as necessary. The Election Operations Unit will continue to advise boards of the need to develop experience in the conduct of this most important task, and to carefully consider the time it will take to mark and cast test ballots in the narrow, pre-election window. The Unit will support them in their efforts to do so, to every extent possible.

Results of each test are represented in the following table:

DS-200

ImageCast

Test Deck	April 30 th Build	June 8 th Build	April 30 th Build	June 8 th Build
193 Ballot	Passed	Passed	Passed	Passed
130 Ballot	Passed	Passed	Passed	Passed
Dem Primary	Passed	Passed	Passed	Passed
Rep Primary	Passed	Passed	Passed	Passed
Volume & Stress	Passed 2,953 Ballots (See Note 1)	Passed 4,215 Ballots	Passed 2,499 Ballots (See Note 2)	Passed 2,499 Ballots (See Note 2)

Note 1:

Running of the April 30th build of the DS-200 stopped at 2,953 ballots, due to a log file error. This was caused by staff shutting down the system each night and restarting the test each morning. The log file is archived each time the system is shut down.

Note 2:

The ImageCast has a firmware setting, limiting the number of ballots able to be processed at 2,500 ballots. This limit was set in the firmware by Dominion, in response to a request from SysTest, that each vendor must state their system's capacity for ballots processed. This limit is tied directly to the capacity of the memory card being used, however with a firmware change and the use of a card with more memory, the limit could be exceeded. The team does note, however, that the current 2,500 limit is consistent with this functional test's throughput findings, described below.

THROUGHPUT

While the State Board has provided guidance in NYCRR Part 6210.19, on the number of voting devices necessary for processing voters, based upon the number of registered voters in any given district, the actual use of systems will provide a better foundation upon which those decisions can be made. The Pilot Project will provide just such data,

however we would be remiss if we did not share our findings, as we moved through the various components of this functional testing.

Based upon the functional testing of these machines, Unit staff and CEMAC participants concluded that the Dominion ImageCast has the ability to scan approximately 125 ballots per hour and the ES&S DS-200 has the ability to scan approximately 200 ballots per hour. This information, though gathered in a controlled environment, should be helpful as County Boards of Elections continue to consider the number of scanners they will need to purchase and deploy in order to efficiently and promptly serve their voters. The same sort of data collected in a live voting environment such as the Pilot Project, will ensure that Commissioners make these purchase and usage decisions based upon their own experiences, as well as those of their colleagues.

Improvements of each system in the June 8, 2009 software versions

ES and S DS-200 and AutoMark

	Description of Change
Election Management Suite (EMS)	<p>Corrected a few instances where ED's were described as 'precincts.'</p> <ol style="list-style-type: none"> 1. Allow the customer to set a secret password for database superuser. This exclusive user would have access to database information for troubleshooting purposes. 2. The customer now has the ability to customize their DS200 security code length and strength. AutoMark data generated by ElectionWare was optimized to reduce poll opening times in some polling locations. This was accomplished primarily by eliminating foreign language information that wasn't required for the given poll. 3. AutoMark data generated by ElectionWare was optimized to reduce poll opening times in some polling locations. This was accomplished primarily by eliminating foreign language information that wasn't required for the given poll.
Scanner	<ol style="list-style-type: none"> 1. We added a selection in the Admin Menu that allows a user to copy the contents of the internal memory card to an external USB flash drive. This provides a convenient way to access the contents of the internal drive for validation without the need to take a cover off of the machine. 2. We added a menu item in the Qualification (Clear) process that allows users to store the access code on the internal memory card so that poll workers would then not need to enter the access code when they open the polls.
Ballot Marking Device (BMD)	<ol style="list-style-type: none"> 1. Resolved an issue when entering a Security Access Code that used the same character consecutively. 2. Corrected an issue where pressing the "Bypass" button to skip audio file checking would occasionally cause the VAT to lock up, requiring a re-boot of the machine. 3. Both versions contain solutions for the following issues highlighted by NYC: <ol style="list-style-type: none"> a. "Memory Leak" – Resolved b. Boot-up Time - Drastically improved c. Print Validation False Error – Resolved d. Ballot Not Recognized - Resolved

Dominion ImageCast

	Description of Change
Election Management Suite (EMS)	<ol style="list-style-type: none"> 1. Increased length of some fields in model/database. 2. Added validation to several entities, that some fields cannot be empty: Choice Group name, Tabulation center contact info etc ... 3. Tabulator Batch Creation dialog usability improved 4. Elector count grid on ED dialog: added column Elector group combination name. 5. Various set of permissions granted/forbidden to ensure data consistency. 6. Validation before ballot content generation extended to cover some complex scenarios: handling of contest/choice enabling/disabling combined with multiple party affiliations, choice rotations, handling of write-ins for delegate/alternate delegate contests etc... 7. Layout of some reports improved. 8. Added deleting of some not used data from NAS drive, depending on project status, to prevent theoretically possible errors. 9. Some system exceptions wrapped with more readable messages. 10. Fixed small problem with volume and balance settings in Audio Studio application. 11. Application setups usability improved. 12. On few popup messages used localization mechanism to format string more user friendly. 13. Some spelling errors fixed.
ICP (Scanner)	<ol style="list-style-type: none"> 1. Firmware update no longer delays at 95% for few minutes before reaching 100% 2. Thermal printer now consistently prints the complete Diagnostic report 3. ICP now accepts tabulator admin passcode in MODE 2 4. Able to see the standard "System Ready" message in all tabulators 5. When the ADA verification is failed/ not done, "ICP Status" is now updated 6. Wording when re-zeroing poll corrected for accuracy 7. Scanner Diagnostics no longer cast the ballot nor increases the ballot count
Ballot Marking Device (BMD)	<ol style="list-style-type: none"> 1. A new static screen and audio instruction when skipping the review has been ADDED 2. BMD no longer becomes non-responsive after running the complete diagnostics 3. Speed of BMD validation and verification of Election files has been increased 4. all audio files are in a consistent voice 5. Response to ATI button press has been increased

RECOMMENDATION

Based upon the successful completion of testing as described herein, and in consideration of the enhancements available in the June 8 version of each system's software, which will better serve voters and County Boards of Elections, the Election Operations Unit respectfully recommends that the Commissioners of the New York State Board of Elections authorize the use of the June 8th upgraded software for the Dominion ImageCast and the ES and E DS-200 and its companion A-200 series AutoMark Voter Assist Terminal, articulated as follows:

ES&S	June 8th Suite	Dominion ImageCast	June 8th Release
Election Data Manager	8.2.0.0k	EMS	3.0
Event Log	1.0.0.0e	EED	3.0.3455
Removable Media	1.0.0.0c	RTR	3.0.3455
ElectionWare	2.0.0.0zszs	Audio Studio	3.0.3455
Paper Ballot	1.0.0.0x	APPS	3.0.3455
Election Reporting Manager	8.1.0.0j	DCM	3.0.3455
DS200	2.1.0.0q	ICP LCD SW	102.0
PowerManagement_Msp430	1.2.2.0a	ICP Loader	1.12.1
Scanner_C8051	2.13.0.0a	ICP O/S	4.0.8
AutoMARK VAT	1.6.0.0k	ICP Firmware	1.30.5
VAT Previewer	1.6.0.0k	ICP ITX	2.22

Lot 1 Pilot - Functional Test Specifications

Lot 1 Pilot Voting Systems:

- Testing will be conducted using the same firmware/software/hardware of the voting systems being used in the county pilot
- SBOE will conduct logic and accuracy testing along with volume and stress testing
- Multiple test decks will be built pursuant to existing test deck procedures to conduct the functional test

Logic and Accuracy Testing:

Logic and accuracy testing will be performed by the SBOE Election Operations Unit. The logic and accuracy test will consist of:

- four unique ballot styles
- development of four comprehensive test decks (1 for each unique ballot style)
- casting of four comprehensive test decks
 - using perforated ballots
 - a portion of which will be marked using BMD's
- verifying results

Ballot Styles:

Ballot Style One: SBOE Acceptance Testing Ballot (Cicero Ballot)

Parties: 6 plus 1 write-in

Democratic	Republican	Conservative
Independence	Liberal	Right to Life
Write-In		

Contests: 7 plus 1 proposition and 1 proposal

Vote for any six	Vote for one	Vote for one
Vote for one	Vote for one	Vote for one
Vote for two	Proposition one	Proposal one

Ballot Style Two: General Election

Parties: 5 plus 1 write-in

Democratic	Republican	Conservative
Independence	Liberal	Write-In

Contests: 7 plus 3 propositions

Vote for any four	Vote for one	Vote for one
Vote for two	Vote for one	Vote for three
Vote for one	Proposition one	Proposition two
Proposition three		

Ballot Style Three: Primary Election

Parties: 1 plus 1 write-in

Democratic	Write-In	
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Contests: 4

Vote for one	Vote for two	Vote for one
Vote for two		

Ballot Style Four: Primary Election

Parties: 1 plus 1 write-in

Republican	Write-In	
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Contests: 4

Vote for one	Vote for two	Vote for one
Vote for two		

Volume and Stress Testing:

Volume and stress testing will be performed by the SBOE Election Operations Unit. The number of ballots used to conduct the volume and stress test was based on the New York State Voter System User Rate Assessment Study conducted by the American Institutes for Research which stated “The primary objective of this study was to calculate the maximum daily rate (MDR) of voting for each of the voting systems included in the study. As required by New York State law, the MDR indicates the maximum number of voters that each voting system could accommodate in a 15-hour voting period. As previously described, the calculation of the MDR was done without consideration to other factors that might affect the actual number of voters that can use a given voting machine in a 15 hour voting period, such as system breakdowns, volume of voters, and familiarity of voters with the voting machine.” The findings concluded that the MDR for the ES&S Optical Scanner was 2,571 ballots in a 15 hour period.

The volume and stress test will prove out the following:

- 2821 ballots were cast error free
 - casting 400 ballots for Democratic row
 - casting 401 ballots for Republican row
 - casting 402 ballots for Conservative row
 - casting 403 ballots for Independence row
 - casting 404 ballots for Right to Life row
 - casting 405 ballots for Working Families row
 - casting 406 ballots for Write-In row
- verification of results for additional logic and accuracy testing

Volume and Stress Ballot Style:

Parties: 6 plus 1 write-in

Democratic	Republican	Conservative
Independence	Right to Life	Working Families
Write-In		

Contests: 7

Vote for any six	Vote for one	Vote for one
Vote for one	Vote for one	Vote for one
Vote for two		

Software Versions

Dominion

May Release:
EMS
EMS 3.0
EED version 3.0.3413
RTR version 3.0.3413
Audio Studio version 3.0.3413
APPS version 3.0.3413
DCM version 3.0.3413
ICP
LCD SW Ver 101,0
Loader: 1.12.1
O/S: 4.0.6
Firmware: 1.30.2
ITX 2.19

June Release:
EMS
EMS 3.0
EED version 3.0.3455
RTR version 3.0.3455
Audio Studio version 3.0.3455
APPS version 3.0.3455
DCM version 3.0.3455
ICP
LCD SW Ver 102,0
Loader: 1.12.1
O/S: 4.0.8
Firmware: 1.30.5
ITX 2.22

ES&S

Product	May 4th Suite Regression Session 1 Tested by SysTest 5/4 thru 7/17	June 8th Suite Pilot Election Suite Pending
Election Data Manager	8.2.0.0h	8.2.0.0k
Event Log	1.0.0.0e	1.0.0.0e
Removable Media	1.0.0.0c	1.0.0.0c
ElectionWare	2.0.0.0zzk	2.0.0.0zzs
Paper Ballot	1.0.0.0v	1.0.0.0x
Election Reporting Manager	8.1.0.0j	8.1.0.0j
DS200	2.1.0.0k	2.1.0.0q
PowerManagement_Msp430	1.2.2.0a	1.2.2.0a
Scanner_C8051	2.13.0.0a	2.13.0.0a
AutoMARK VAT	1.6.0.0i	1.6.0.0k
VAT Previewer	1.6.0.0i	1.6.0.0k