

STATE OF NEW YORK
STATE BOARD OF ELECTIONS

NYSBOE Functional Test of DS 200 for ES&S Voting System (EVS) 5.0.0.4



Prepared by the Elections Operations Unit
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1. INTRODUCTION

1.1 Project Overview

This document is a report on the Functional Testing conducted on the upgrade of the previously certified voting system software and firmware, as submitted by Election Systems and Software (ES & S), for their DS200 voting system. The addition of this upgrade will increment the overall system version from ES&S Voting System (EVS) 5.0.0.2 to ES&S Voting System (EVS) 5.0.0.4. The corresponding trusted build version consists of the DS200 version 2.9.0.1:

Module	New Version	Current Version
DS200 Scanner	2.9.0.1	2.9.0.0
DS200 Scanner Board	3.1.0.0	2.24.2.0

The upgrades submitted are intended to address, inter alia, the ES&S system's change notes, which include the following:

System Enhancements

This upgrade includes the following updates and enhancements to the ES&S DS200:

- Allow removal of primary DS200 USB media before results are printed
- Alert when backup media not present
- Improved ballot handling
- Implement enhanced DS200 report printing
- Add additional messages to the DS200 configuration report to indicate that the voting machine is ready for deployment
- Integrate enhanced logging to reduce ballot processing time
- Enable Boards to implement a configurable font size on DS200 report printing

1.2 Source Code Review

In addition to the functional testing, a source code review was performed by SLI Global Solutions. The source code review is a key component of voting system certification testing. The source code review report of this upgrade's changes is provided with this report.

1.3 Purpose

The purpose of this functional testing was to verify that the upgrade to the software and firmware still perform the required functions of its certified predecessor and addresses change requests required by end users and also as a result of industry-standard software maintenance.

This document describes:

- The overall Test Plan and approach implemented to thoroughly test the upgraded software and firmware
- The overall results and findings from the functional testing performed

2. APPROACH AND PROCEDURES

2.1 Requirements

Testing verifies that the system changes and upgrades did not disrupt, disable or otherwise disaffect the required functions of the certified build and that the incorporation of the new features are operational. Multiple variations of elections were utilized to test the upgrade. The following ballot variations were used in the functional testing performed by SBOE staff. Both comprehensive and standard test decks were used as part of the logic and accuracy testing required by the test plan:

- **General Election of 14 inch ballots in length were restored from a previously-created election using the EVS 5.0.0.2 EMS. These elections were required so that testing would accommodate landscape and multiple page ballot layout.**
- **General Election of 17 inches in length was restored from a previously-created election using the EVS 5.0.0.2 EMS. This election was required so that testing would accommodate portrait grid layouts and the verification of the language requirements.**
- **General Election of 19 inches in length was restored from a previously created election using the EVS 5.0.0.2 EMS. This election was required so that testing would accommodate landscape layouts.**
- **Primary Election of 19 inch ballots in length will be restored from a previously created election using the EVS 5.0.0.2 EMS. These elections**

were required so that testing would accommodate portrait column layouts.

These requirements resulted in four separate test cases that would test each variation:

- **Test Case #1 – General 19 Inch (91 Timing Marks) Landscape 5.0.0.4 (G19L5004)**
- **Test Case #2 –General 14 inch (50 Timing Marks) Landscape Multi-Page 5.0.0.4 (G14MP5004)**
- **Test Case #3 – Primary 19 Inch (91 Timing Marks) Portrait (Column) 5.0.0.4 (P19C5004)**
- **Test Case #4 –General 17 Inch (62 Timing Marks) Portrait (Grid) Multi Language 5.0.0.4 (G17PML5004)**

Each Test Case requires a Test Deck marked in a predetermined fashion. Each Test Case utilized ballots created for a single ED. Some had smaller (7 ballot) Test Decks, while others had full Comprehensive Test Decks created based on SBOE standards. The general election comprehensive deck contained 151 ballots while the primary election comprehensive deck contained 90 ballots. Additional ballots were also utilized to validate and compare the improved 2.9.0.1 ballot handling against the handling in the previous 2.9.0.0 version. The following table lists the Test Decks built for the functional testing:

Test Case Title	Type of Election	Number of Ballots
General 19 Inch (91 Timing Marks) Landscape (G19L5004)	General	1 st Style = 151 1 st Style – 2.9.0.1 Speed Test = 3 1 st Style – 2.9.0.0 Speed Test = 3 1 st Style –Park Test= 1
Multi-Page General 14 Inch (50 Timing Marks) Landscape (G14MP5004)	General	1 st Style (Page 1) = 7
		2 nd Style (Page 2) = 7
Primary 19 Inch (70 Timing Marks) Portrait (Column) (P19C5004)	Primary	1 st Style = 51 1 st Style – 2.9.0.1 Speed Test = 1 1 st Style – 2.9.0.0 Speed Test = 1 1 st Style –Park Test= 1
		2 nd Style = 19 1 st Style – 2.9.0.1 Speed Test = 2 1 st Style – 2.9.0.0 Speed Test= 2
Multi Language General 17 Inch Inch (62 Timing Marks) Portrait (Grid) (G17MLP5004)	General	1 st Style = 7 1 st Style – 2.9.0.1 Speed Test = 3 1 st Style – 2.9.0.0 Speed Test = 3 1 st Style –Park Test = 1
		2 nd Style (Absentee) = 1

3. Test Plan

The Test Plan was designed to work in several phases:

Phase 1 – Planning and Test Case Development

- **Verify requirements and draft designs of the Test Cases**
- **Prepare Test Case Procedures**
- **Restore previously-generated test elections on EVS 5.0.0.2 EMS. Elections were restored from the back-up election files created in the last upgrade certification.**

Phase 2 – Implementation

- **Perform the Dry Run on each of the initial 4 test cases**
- **Correct and amend test cases to accommodate the upgrades**
- **Perform the official Run-for-Record of the final 4 test cases**
- **Archive the results and data from the Official Run for Record**
- **Perform a Trusted Build Run of the final Test Cases**
- **Archive the results and data from the Trusted Build Run**
- **Perform testing in a public forum**

Phase 3 –Finalizing Documentation and Records

- **Perform final formatting adjustments to test cases**
- **Collect test materials (marked ballots, results tapes) and records for final archive**
- **Prepare finalized reports on project**

3.1 Procedure

The procedures performed are detailed in the supplemental Test Case documents. Each test case required restoring an election from an existing election backup file. These backup files were created at the conclusion of the last upgrade certification testing project. The Trusted Build test cases were exactly the same as the official run-for-record cases.

Eleven (11) test decks were run in the 4 test cases to verify that the upgrade did not disaffect the logic and accuracy of the voting machines. The test decks were marked in a pre-determined pattern to verify the logic and accuracy of the system. The majority of the ballots were marked by hand while at least one ballot in each test deck was marked using the ballot marking device (BMD). Additional test decks were also utilized to validate and compare the improved 2.9.0.1 ballot handling against the previous version 2.9.0.0. The test decks consisted of the following elections:

Test Case Name	Test Deck	Election Type	# of Ballots	# of Contests	Contests Vote For
General 19 Inch (91 Timing Marks) Landscape (G19L5004)	Test Deck 1	General	151	9	5 vote for 1, 1 vote for 4, 3 Propositions
	Test Deck 2 (Speed and Park Tests)	General	7	9	5 vote for 1, 1 vote for 4, 3 Propositions
Multi-Page General 14 Inch (50 Timing Marks) Landscape (G14MP5004)	Test Deck 3	General	7	4	4 vote for 1
	Test Deck 4	General	7	5	1 vote for 1, 1 vote for 4, 3 Propositions
Primary 19 Inch (70 Timing Marks) Portrait (Column) (P19C5004)	Test Deck 5 (Republican)	Primary	19	3	3 vote for 1
	Test Deck 6 (Democratic)	Primary	51	2	1 vote for 1, 1 vote for 4
	Test Deck 7 (Speed and Park Tests, Republican)	Primary	4	3	3 vote for 1
	Test Deck 8 (Speed and Park Tests, Democratic)	Primary	3	2	1 vote for 1, 1 vote for 4
Multi Language General 17 Inch (62 Timing Marks) Portrait (Grid) (G17MLP5004)	Test Deck 9	General	8		2 vote for 1, 1 vote for 2, 3 Propositions (Election Day)
	Test Deck 10 (Speed and Park Tests)	General	7		2 vote for 1, 1 vote for 2, 3 Propositions (Election Day)
	Test Deck 11	General	1		2 vote for 1, 1 vote for 2, 3 Propositions (Absentee)

Once all of the test cases were completed and results were verified, backup files were made of the four test case elections. Along with the reports, these files were saved to a DVD. All of the test decks, results tapes, and associated materials were collected and organized for filing and archiving.

In addition, a public test of the **General 19-inch (91 Timing Marks) Landscape (G19L5004)** was successfully performed on April 18, 2014, at the offices of the New York State Board of Elections, during which each aspect of the changes constituting the upgrade was validated.

4. Results

4.1 Overall

The four base test cases performed as expected, as did the trusted build test cases and the public test. The elections were able to be restored and run without issue.

Test Case Name	Test Deck	Election Type	# of Ballots	# of Contests	Contests Vote For	Pass/Fail
General 19 Inch (91 Timing Marks) Landscape (G19L5004)	Test Deck 1	General	151	9	5 vote for 1, 1 vote for 4, 3 Propositions	PASS
	Test Deck 2 (Speed and Park Tests)	General	7	9	5 vote for 1, 1 vote for 4, 3 Propositions	
Multi-Page General 14 Inch (50 Timing Marks) Landscape (G14MP5004)	Test Deck 3	General	7	4	4 vote for 1	PASS
	Test Deck 4	General	7	5	1 vote for 1, 1 vote for 4, 3 Propositions	
Primary 19 Inch (70 Timing Marks) Portrait (Column) (P19C5004)	Test Deck 5 (Republican)	Primary	19	3	3 vote for 1	PASS
	Test Deck 6 (Democratic)	Primary	51	2	1 vote for 1, 1 vote for 4	
	Test Deck 7 (Speed and Park Tests, Republican)	Primary	4	3	3 vote for 1	
	Test Deck 8 (Speed and Park Tests, Democratic)	Primary	3	2	1 vote for 1, 1 vote for 4	
Multi Language General 17 Inch (62 Timing Marks) Portrait (Grid) (G17MLP5004)	Test Deck 9	General	8		2 vote for 1, 1 vote for 2, 3 Propositions (Election Day)	PASS
	Test Deck 10 (Speed and Park Tests)	General	7		2 vote for 1, 1 vote for 2, 3 Propositions (Election Day)	
	Test Deck 11	General	1		2 vote for 1, 1 vote for 2, 3 Propositions (Absentee)	

All changes presented in the ES&S System Change Notes were verified by test cases 1 through 4.

4.2 Findings/Workarounds

There were no findings or workarounds that became apparent in the conduct of any of the test cases.

5. Conclusion

During our functional testing we did not encounter any issues that would be considered show stoppers and otherwise jeopardize the voting integrity of the election process. The logic and accuracy of the DS200 scanner functioned as intended and the voting results obtained with all of the test decks used matched the pre-determined expected vote results. The testing confirmed that the enhancements and new features incorporated into the DS200 function as intended and do not compromise or impede any of the previously certified-functions.

A regression test was performed on the final witness build (**Trusted Build**) provided by SLI, utilizing the **General 19-inch (91 Timing Marks) Landscape (G19L5004)** and **Multi Language General 17- Inch Portrait (Grid) (G17MLP5004)** test cases.

Based on NYSBOE functional testing and all source code reviews of the ES and S submission of EVS 5.0.0.4 DS200 firmware upgrade, we recommend that the ES&S voting system upgrade described herein be certified for use in New York State.