

Voting System Qualification Test Report

Dominion Voting Systems, Inc.

Democracy Suite, Release 4.14.37, Version 2

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Florida Department of State
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R. A. Gray Building, Room 316
500 S. Bronough Street
Tallahassee, FL 32399-0250



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Executive Summary

Dominion Voting Systems, Inc., (DVS) submitted an application requesting Florida voting system certification of *Democracy Suite Release 4.14.37, Version 2*. Previous releases of the Democracy Suite voting system have been certified in Florida, the latest being *Democracy Suite Release 4.14.37, Version 1* (certified February 15, 2016).

The Democracy Suite voting system is a paper-based voting system that complies with the Help America Vote Act (HAVA)¹ provisions for accessibility voting. The latest voting system version consists of an election management system (EMS); two types of optical scan precinct count tabulators—the ImageCast Precinct (ICP) and the ImageCast Evolution (ICE); and a digital scan central count tabulator, the ImageCast Central (ICC).

The ICC software controls various makes and models of scanners that function as central count tabulators. This certification effort adds an additional brand of scanner, the DRS PhotoScribe, to the *Democracy Suite Release 4.14.37, Version 2* ICC equipment list. The PhotoScribe brand tabulator is currently certified with earlier releases of Democracy Suite—specifically, the *Democracy Suite Release 4.14.17, Versions 1, 2, and 3*.

The Bureau of Voting Systems Certification (BVSC) conducted the certification qualification testing in two phases. Phase I consisted of a physical audit to verify the setup configuration of the EMS (which has not been modified since Release 4.14.37, Version 1), the restoration of elections, and a functional audit. In this phase, the bureau also conducted mock elections and all election cycle events for the tabulator under test, as well as other tests to verify continued compliance with the Florida Voting System Standards (FVSS)², Florida statutes and rules, and HAVA. In Phase II, BVSC conducted a mass ballot count test on the PhotoScribe brand of ICC central count tabulator.

The qualification test results affirm that *Democracy Suite Release 4.14.37, Version 2* met applicable requirements of the Florida Voting Systems Standards, the Florida Statutes and rules, and HAVA for usability and accessibility. BVSC, therefore, recommends certification of the referenced voting system. However, BVSC will not recommend the approval of any future release of this voting system unless the issues in the Continuous Improvements/Recommendations section of this report are addressed or are no longer an issue.

¹ 52 U.S.C. § 20901 – 52 U.S.C. § 21145.

² DS-DE 101 (Rule 1S-5.001, Florida Administrative Code)

Introduction

Dominion Voting Systems, Inc., (DVS) submitted an application requesting Florida voting system certification of *Democracy Suite Release 4.14.37, Version 2*. The new release for which DVS is seeking certification adds a DRS brand scanner, the DRS PhotoScribe, to the current lineup of central count tabulators available in this release.

The Democracy Suite voting system is a paper-based voting system that complies with HAVA provisions for accessibility voting. The voting system consists of an election management system (EMS); two types of optical scan precinct count tabulators—the ImageCast Precinct (ICP) and the ImageCast Evolution (ICE); and a digital scan central count tabulator, the ImageCast Central (ICC).

The ICC software controls various makes and models of scanners that function as central count tabulators. This certification campaign adds the DRS brand scanner, the PhotoScribe, to the list of Canon brand scanners already certified for use with the voting system.

BVSC conducted the certification qualification testing in two phases from October to December, 2019. Phase I consisted of a physical audit to verify the setup configuration of the EMS, the restoration of presidential preference primary, general and primary elections with their required media, and a functional audit. Phase I also comprised the conduct of mock elections and all election cycle events on the tabulator under test, including loading the tabulators with the requisite media, opening polls activities and reports, feeding ballots, closing polls activities and reports, and election night and post-election reporting. BVSC conducted regression tests to verify continued operability of the voting system. In Phase II, BVSC conducted a mass ballot count, a required test for the introduction of a tabulator to a Florida-certified voting system.

Background

The DRS PhotoScribe central count scanner is certified as part of the previous release of *Democracy Suite, Release 4.14.17* (first version certified August 14, 2013). With this application, the vendor seeks to add the PhotoScribe scanner to the existing *Democracy Suite, Release 4.14.37, Version 1* voting system (certified February 15, 2016). If approved, the voting system would become *Democracy Suite, Release 4.14.37, Version 2*. There are no changes to the hardware, firmware, or software on the PhotoScribe scanner with this application for certification.

Testing for *Democracy Suite Release 4.14.37, Version 2* occurred at the Leon County Supervisor of Elections office in Tallahassee, Florida.

System Overview

The DVS Democracy Suite voting system election management system consists of the following software applications:

- Application Server (APPS) – a server application for executing processes such as rendering ballots, generating audio files and election files, *etc.*
- Audio Studio (AS) – a client application used to record audio files.

- Data Center Manager (DCM) – a server application used in the back-end data center configuration.
- EMS Database Server – A server side repository of the election project database, which includes pre-voting and post-voting data.
- Election Data Translator (EDT) – an end-user application used to export election data from an election project and import election data into the election project.
- Election Event Designer (EED) – a client application that integrates definition functionality together with ballot styling capabilities and represents a main pre-voting phase end-user application.
- File System Service (FSS) – a Windows service application that helps read and write files on memory cards.
- Results Tally and Reporting (RTR) – a client application used for integrating election results acquisition, validation, tabulation, and reporting.

Democracy Suite uses the following scanning and tabulating devices and ADA voting device:

- ImageCast Precinct (ICP) tabulator is an optical scanner with ballot review. The ICP is attached on a ballot box (Figure 1, ICP only).



Figure 1. ImageCast Precinct tabulator (ICP)

- ImageCast Evolution (ICE) is a precinct-level optical scanner, with ballot marking capability, audio voting using the Audio Tactile Interface (ATI), and a tabulator connected to a ballot box.

Audio accessible voting may be accomplished on the ICE via the main monitor, as shown in Figure 2, or through an external, or “dual,” monitor attached to the main unit (Figure 3). The dual monitor setup (ICE-Dual) allows an accessible voting session to occur while the unit is in standard operating mode and scanning paper ballots.



Figure 2. ImageCast Evolution (ICE) with ballot box



Figure 3. ICE with external, "dual" monitor

- The central count scanners are the ImageCast Central (ICC) tabulators (Figures 4 and 5). These systems use commercial-off-the-shelf (COTS) hardware with Dominion software. The Canon brand scanners were certified with *Democracy Suite Release 4.14.37, Version 1*. This application for certification includes adding the DRS PhotoScribe brand scanners (Figure 5).



Figure 4. ImageCast Central tabulator (ICC) (model Canon DR-X10C shown)



Figure 5. ImageCast Central tabulator (ICC) (model DRS PhotoScribe shown).

Components Under Review

The test objective was to verify that the voting system meets the requirements of the applicable Florida statutes, standards, and federal laws.

Since this release is an upgraded version of a certified release of the Democracy Suite voting system, BVSC performed a limited FVSS qualification examination. In particular, BVSC reviewed the DRS PhotoScribe brand central count scanners of the that were added to this voting system.

Conduct of Tests / Findings

The FVSS qualification examination encompassed a physical and functional audit, as well as additional tests to verify continued compliance with standards for election cycle events with the introduction of a new tabulator. In addition, BVSC conducted a mass ballot count test on the DRS PhotoScribe brand central count tabulator.

Systems Setup & Configuration

BVSC set up the voting system and verified that the configurations of the system, as outlined in the submitted technical data package (TDP) documentation, corresponded with the actual system setup.

Findings:

After all materials were received, technical issues were resolved, and the vendor clarified its documentation. BVSC found no discrepancies with the setup of the Democracy Suite voting system configurations.

Physical Audit

BVSC conducted a physical audit to verify that the voting system matched the specifications described in the application and the TDP documentation.

Findings:

BVSC found no discrepancies between the voting system and the vendor's specifications in the certification application and TDP.

Functional System Audit

BVSC conducted a functional system audit on the unit under test (PhotoScribe scanner) to verify that all components of the unit operate as described in the TDP.

Import of Election Definitions

BVSC restored existing election definitions for a general election, a presidential preference primary (PPP) election, and a primary election.

Election Management System – Administrative Reports

Because there were no changes to the *Democracy Suite 4.14.37, Version 2* election management system software, BVSC generated only the reports needed to verify test activities. In doing so, staff was able to recreate a known issue with the Statement of Votes Cast report (a report that shows precinct-level results for each candidate).

Findings:

The Statement of Votes Cast (SOVC) report contains extraneous data fields that could be confusing to individuals seeking to interpret report data. Below is an excerpt of a SOVC report (Figure 6). Election results are reported accurately for candidates and precincts, as expected. However, the “cumulative” data rows highlighted in blue are meaningless and unnecessary and the “County – Total” row is redundant, containing data that is already displayed in another report line.

| United States Senator (REPUBLICAN) (Vote for 1) | | | | | | | | | |
|---|------------|---------------------------|-------------------------|------------------------|------------------------------|--------------------|------------------|---|---|
| REP | | | | | | | | | |
| Precinct | Times Cast | Precinct | LeRoy Collins Jr. (REP) | Katherine Harris (REP) | William "Will" McBride (REP) | Peter Monroe (REP) | John Smith (REP) | | |
| County | | County | | | | | | | |
| Miami-Dade County | | | | | | | | | |
| 01 | 6,040 | 01 | 400 | 800 | 1,200 | 1,600 | 2,000 | | |
| 02 | 3,020 | 02 | 200 | 400 | 600 | 800 | 1,000 | | |
| 03 | 6,020 | 03 | 200 | 400 | 600 | 800 | 1,000 | | |
| 04 | 3,020 | 04 | 200 | 400 | 600 | 800 | 1,000 | | |
| 05 | 6,040 | 05 | 400 | 800 | 1,200 | 1,600 | 2,000 | | |
| 06 | 3,020 | 06 | 200 | 400 | 600 | 800 | 1,000 | | |
| 07 | 3,020 | 07 | 200 | 400 | 600 | 800 | 1,000 | | |
| 08 | 3,020 | 08 | 200 | 400 | 600 | 800 | 1,000 | | |
| 09 | 3,020 | 09 | 200 | 400 | 600 | 800 | 1,000 | | |
| 10 | 3,020 | 10 | 200 | 400 | 600 | 800 | 1,000 | | |
| 11 | 3,020 | 11 | 200 | 400 | 600 | 800 | 1,000 | | |
| 12 | 3,020 | 12 | 200 | 400 | 600 | 800 | 1,000 | | |
| 13 | 3,020 | 13 | 200 | 400 | 600 | 800 | 1,000 | | |
| 14 | 3,020 | 14 | 200 | 400 | 600 | 800 | 1,000 | | |
| 15 | 3,020 | 15 | 200 | 400 | 600 | 800 | 1,000 | | |
| 16 | 3,020 | 16 | 200 | 400 | 600 | 800 | 1,000 | | |
| 17 | 3,020 | 17 | 200 | 400 | 600 | 800 | 1,000 | | |
| 49 | 3,020 | 49 | 200 | 400 | 600 | 800 | 1,000 | | |
| 50 | 3,020 | 50 | 200 | 400 | 600 | 800 | 1,000 | | |
| 51 | 3,020 | 51 | 200 | 400 | 600 | 800 | 1,000 | | |
| Miami-Dade County - Total | 69,440 | Miami-Dade County - Total | 4,400 | 8,800 | 13,200 | 17,600 | 22,000 | | |
| Cumulative | | Cumulative | | | | | | | |
| Cumulative | 0 | Cumulative | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cumulative - Total | 0 | Cumulative - Total | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| County - Total | 69,440 | County - Total | 4,400 | 8,800 | 13,200 | 17,600 | 22,000 | | |

Figure 6. Excerpt from the Statement of Votes Cast Report

Voting Equipment Menus – Administrative and Diagnostic Reports

BVSC performed a functional audit by testing all available menu options and administrative reports as well as systems functions in the course of testing.

Findings:

The system performed as indicated in the vendor’s TDP and in accordance with the FVSS, and applicable Florida statutes, and administrative rules.

Mock Elections Testing

BVSC conducted mock elections as regression testing on the voting system. The mock elections incorporated single- and multiple-card ballots of varying ballot lengths (11-inch to 18-inch) for three election types: a primary, a PPP, and a general. The tests included both hand marked and machine marked ballots, pre-printed and on-demand ballots. BVSC simulated elections using an ICE precinct tabulator and both types of central count scanners, including an ICC Canon and all models of the ICC PhotoScribes, from initial preparations (pre-election activities) through voting (election activities), election night and precinct level reporting (post-election and reporting activities). BVSC compared election results to pre-determined results.

Findings:

The system performed as indicated in the vendor’s TDP and in accordance with the FVSS, applicable Florida statutes, and administrative rules. BVSC did, however, observe an anomaly in the *Democracy Suite 4.14.37, Version 1 and 2* testing where contest titles on the precinct tabulator tapes for both the ICE and

ICP. The special character “-“ (hyphen) does not display correctly on the tapes (see Figure 5). This issue appears to be isolated only to the contest titles and only on the paper tapes (zero and results tapes). Furthermore, this issue does not affect the operation of the precinct tabulators or the scanning and tabulation of votes. BVSC determined that this issue is of low impact and severity; however, BVSC will require the vendor to correct this issue before any future releases of this voting system will be considered for certification.

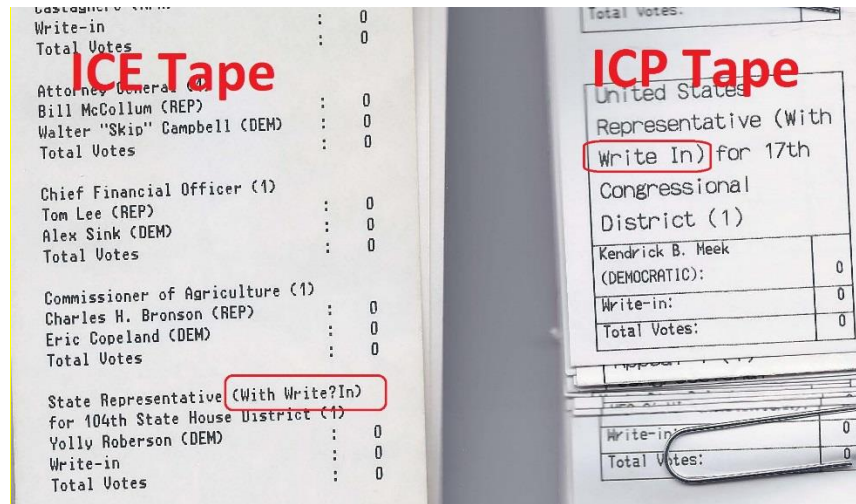


Figure 7. Special character display anomaly on precinct tapes

Pre-Election Activities

Pre-election activities included coding or verifying the coding of the election, preparing the election media, preparing the ballot test decks (unless already prepared by the vendor), preparing and validating the expected results (unless already prepared by the vendor), and preparing the voting equipment. The primary election definition included a universal primary contest (UPC).

Election Activities

Election activities included opening polls, casting ballots using test decks (including hand marked ballots and ballots marked using the ICE), and closing polls.

Election Reporting

Testing included uploading and verifying election results in the EMS by election group (vote-by-mail, early voting, Election Day, and provisional voting). BVSC uploaded results directly for the primary election and for the general election. Results were compared against expected results.

Post-Election Activities

Post-election activities included generating reports.

Mass Ballot Count

The re-introduction of the DRS brand central count tabulator to the certified voting system necessitated a mass ballot count.

Central Count Scanner (ICC) – DRS brand

BVSC conducted a mass ballot count on the DRS (PhotoScribe) brand of scanners. To reach the 192,000 minimum ballot requirement, BVSC used a test deck of pre-marked ballots supplied by the vendor. The pre-audited ballots, in varying lengths, were printed on 80-lb. conventional stock, as per the TDP. The test deck included easily verifiable vote patterns as well as overvotes and blank ballots. A set of predetermined results was also supplied and compared to the election results that were accumulated in the reporting application (RTR).

BVSC used three (3) models of the PhotoScribe for the mass ballot count: PS900, PS960-Model B, and two PS976 scanners.

Specific details follow:

Table 1. Mass Ballot Count Details for DRS PhotoScribe Central Count Scanners

| | |
|-------------------------------|---|
| Election definition used: | Miami-Dade County 2014 Primary Election |
| Ballot length: | Varies |
| Number of scanner units used: | 4 |
| Number of test decks: | 61 |
| Number of runs per test deck: | 10 |
| Number of ballots per deck: | Varies |
| Number of cards per ballot: | Varies |
| Total number of ballots cast: | 192,040 |
| Total number of vote targets: | 1,326,800 |

Findings:

The DRS PhotoScribe brand scanners under test met the acceptance criteria for the central count scanner mass ballot count as shown below:

Table 2. Acceptance Criteria for DRS PhotoScribe Brand Scanners

| DRS PhotoScribe Brand Scanners Mass Ballot Count – Acceptance Criteria | Expected | Accepted |
|---|---------------------|----------|
| Did the memory registers overflow? | No | ✓ |
| Did the public counters increment appropriately? | Yes | ✓ |
| Did the tabulated results agree with predetermined vote totals? | Yes | ✓ |
| Number of errors (must not exceed 1 in 1,000,000 vote targets). An error is defined as a target scan that produces a result other than the expected result. | ≤ 1/1M vote targets | ✓ |
| Number of multiple feeds (must not exceed 1 in 5,000 ballots). A multiple feed occurs when the machine pulls multiple ballots and does not “catch” the error. | ≤ 1/5K ballots | ✓ |
| Number of incorrect rejections of ballots (must not exceed 3%) | ≤ 3% total ballots | ✓ |

Additional Testing

In addition to mock elections and mass ballot counts, BVSC conducted tests to verify continued compliance with FVSS, applicable Florida statutes and administrative rules, and HAVA, as well as to observe specific features and functions of the voting system.

Contest Recounts

BVSC conducted recount testing to verify compliance with sections 102.141(7) and 102.166(2), F.S., and the FVSS. BVSC selected three countywide races and two district-wide races in the general election. The recount was conducted on the DRS PhotoScribe central count scanners. Per the TDP instructions, BVSC suppressed non-recount races in the EMS results software.

Findings:

BVSC found that the voting system complied with applicable statutes and standards. Democracy Suite allows the user to report results from only the affected races. Furthermore, the system permits a recount on more than one race at a time, as demonstrated by processing both the countywide race and district-wide race in one recount. The vendor’s initial documentation provided inadequate instructions necessary to complete all activities required. However, when modified, more detailed, instructions were presented, the system functioned as expected.

Folded Ballot

Although Florida law and FVSS do not require this test, BVSC conducted a folded-ballot test to simulate vote-by-mail ballot processing. The objective was to observe the behavior of the DRS brand of ICC central count scanners when they scan folded ballots.

BVSC used a test deck comprised of elections with several ballot lengths (11-inch, 14-inch, 17-inch, and 18-inch ballots)³. Each test deck included different fold types: Z-fold, C-fold, a fold through a vote target⁴, and a fold through a write-in, up to the maximum number of folds allowed per ballot length⁵.

BVSC cast ballots into the ICC scanners (DRS) and compared the results to expected results.

Findings:

The scanners accepted all ballots presented, and tabulated results matched expected results.

Simulated System Failure / Recovery

BVSC performed a catastrophic failure test on the PhotoScribe to observe how the scanner conducts a “graceful”⁶ shutdown due to power loss, and whether it would retain the counts and votes after a shutdown.

Findings:

BVSC found that the PhotoScribe scanner retained the public count and protective count, and ballots cast tallied correctly.

System Time & Date Changes

BVSC examined the PhotoScribe’s ability to automatically accommodate time and date changes such as the Daylight Saving Time observance and leap year calendar changes.

Daylight Saving Time

BVSC examined the PhotoScribe clock’s ability to automatically advance or turn back one hour with the Daylight Saving Time change. DVS advised in a previous certification that the PhotoScribe’s clock is designed to be manually adjusted by the election official; it does not automatically adjust for Daylight Saving Time changes.

Findings:

BVSC found that the PhotoScribes did not consistently retain the updated time as expected. To ensure that counties’ reports reflect the correct date and time, as the vendor indicated in a previous certification, counties should check the equipment date/time for accuracy before conducting any activities on the PhotoScribe scanners.

³ According to the vendor’s documentation, the DRS PhotoScribe brand scanners have a maximum ballot length of 18 inches. Other scanners in this voting system are able to handle longer ballots.

⁴ Folds through a vote target are outside the ballot printing specification as outlined in the vendor’s documentation. See Dominion Voting Systems ImageCast Printing Specification, Version 4.14.DS-FL::29 (July 7, 2015), p. 11.

⁵ Dominion Voting Systems ImageCast Printing Specification, Version 4.14.DS-FL::29 (July 7, 2015), p. 11.

⁶ A “graceful” shutdown is an industry term meaning the unit is turned off by software function and the operating system is allowed to perform its tasks of safely shutting down processes and closing connections.

Leap Year

BVSC examined whether the PhotoScribe correctly handled February 29 during leap years and non-leap years.

Findings:

BVSC found the ICP operated as expected.

Infrared (IR) Security Sensor

The infrared (IR) paper sensor is a security feature which, when enabled for an election on the ICE or ICP, allows only ballots printed on special IR-reactive ballot stock to be cast. The IR paper sensor contained in the ICE and ICP scanners detects paper infused with IR-reactive elements; when paper without the IR-reactive elements is inserted (as in the case of a fraudulent ballot), the tabulator rejects it. Counties have the option to enable this feature and print their ballots on the IR-reactive paper (IR security ballot stock), or use conventional ballot stock with the feature disabled.

According to the TDP⁷, the DRS-brand (PhotoScribe) scanners cannot accept ballot stock heavier than 80-lb text stock, which is lower than the weight of IR security ballot paper (100-lb). The IR security ballot paper, therefore, is incompatible with DRS-brand scanners.

Findings:

The vendor's ballot printing specifications indicate that IR security ballot stock (100-lb text stock) is incompatible with DRS-brand scanners. Any county who chooses to use the IR security ballot stock should plan to exclude DRS-brand scanners when conducting central count and recount activities. The IR security ballot stock, which has been certified in *Democracy Suite 4.14.37 Version 1*, may continue to be used with the ICE, ICP, and Canon-brand scanners.

User Security

BVSC observed the voting system's behavior regarding user management and access control. BVSC observed no security-based anomalies during the course of any of the certification test activities.

Source Code Review

The source code did not change between *Democracy Suite 4.14.37, Version 1* testing and *Democracy Suite 4.14.37, Version 2* testing. Therefore, a source code review was not required.

⁷ ImageCast Printing Specification (07 July 2015).

Continuous Improvement / Recommendations

There were no programmatic changes from the previously certified version of *Democracy Suite 4.14.37, Version 1*, which was certified in 2016. BVSC did not, therefore, add to the list of continuous improvement recommendations reported during that test effort. Since DVS has not yet addressed recommendations *Democracy Suite 4.14.37, Version 1* testing, they are again listed below in this *Democracy Suite 4.14.37, Version 2* test report.

1. The precinct tabulator tape anomaly observed during *Democracy Suite 4.14.37, Version 1* testing should be addressed in the next release of the voting system. This issue where the zero tapes and results tapes of the precinct scanners do not correctly display the special character “-“ (hyphen) affects only the paper tapes and not the operability or tabulating ability of the scanners; therefore, the anomaly does not preclude this version of the Democracy Suite voting system from recommendation for certification. However, any future certification for the Democracy Suite voting system, if granted, will be conditioned upon the vendor correcting this display issue.
2. The vendor’s remedy of the ICP’s unexpected shutdown issue during *Democracy Suite 4.14.37, Version 1 testing* was to disable the audit mark feature on the ICP. The audit mark feature is not required by the Florida Statutes, rules, or FVSS. If any future release of the Democracy Suite voting system continues to incorporate the audit mark, DVS will be required to leave the audit mark disabled or, if enabled, the certification of such a system will be conditioned upon DVS correcting the shutdown issue.
3. Statement of Votes Cast Report – This report contains extraneous data fields that could be confusing to individuals seeking to interpret report data. Details of the report’s deficiencies are documented in the body of this report (see page 8). The Statement of Votes Cast Report should be revised to include only data that is needed to convey the votes cast in a given election.

Conclusion

Qualification test results affirm that *Democracy Suite Release 4.14.37, Version 2* met applicable requirements of the Florida Voting Systems Standards, the Florida Statutes and rules, and the Help America Vote Act (HAVA) for usability and accessibility. The Florida Division of Elections, Bureau of Voting Systems Certification, therefore, recommends certification of the referenced voting system. However, BVSC does not recommend the approval of any future release of this voting system unless the issues in the Continuous Improvements/Recommendations section of this report are addressed or are no longer an issue.

Appendices

Acronyms

| | |
|------|--|
| ADA | Americans with Disabilities |
| AS | Audio Studio |
| ATI | Audio Tactile Interface |
| BVSC | Bureau of Voting Systems Certification |
| COTS | Commercial, off-the-shelf |
| DVS | Dominion Voting Systems, Inc. |
| EAC | U.S. Elections Assistance Commission |
| EED | Election Event Designer |
| EMS | Election Management System |
| FVSS | Florida Voting Systems Standards |
| HAVA | Help America Vote Act |
| ICC | ImageCast Central Count Tabulator |
| ICE | ImageCast Evolution Precinct Count / ADA Tabulator |
| ICP | ImageCast Precinct Count Tabulator |
| LAN | Local Area Network |
| PPP | Presidential Preference Primary |
| RTR | Results Tally and Reporting |
| TDP | Technical Data Package |
| UPC | Universal Primary Contest |
| UUT | Unit Under Test |
| VVSG | Voluntary Voting System Guidelines |

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Component Version List

The component version list describes in detail the components of the voting system.

[Redacted pursuant to section 282.318, Florida Statutes, and to the U.S. Department of Homeland Security's designation of elections as a critical infrastructure.]



Florida Department of State
Laurel M. Lee
Secretary of State