

# Certification Test Report

Report Number *DVS-CPVS11DOMINI003-CTR-01*

## *Dominion Assure 1.3 EAC Modification Certification*

### Test Report Rev 1.3

May 18<sup>th</sup>, 2012

Prepared for:

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EAC Certification Report

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## Revision History

Release	Author	Revisions
Rev 1.0	M. Santos	Initial Release; submitted to EAC for approval
Rev 1.1	M. Santos	Wording updates
Rev 1.2	M. Santos	Updates in response to EAC comments, as well as for inclusion of MRAM memory card
Rev 1.3	M. Santos	Modified "VIBS" definition in section 2.5, removing "ergonomically designed", and 2.3.2 for additional information about NOC's and RFI's

### Disclaimer

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The tests referenced in this document were performed in a controlled environment using specific systems and data sets, and results are related to the specific items tested. Actual results in other environments may vary.



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## 1 Introduction

SLI Global Solutions is submitting this report as a summary of the Modification Certification testing efforts for the Dominion Assure 1.3 voting system, as detailed in the section System Identification. The Assure 1.3 voting system is a modification of the EAC certified Assure 1.2 system (EAC Certification Number: PES-Assure1.2, issued on August 6<sup>th</sup>, 2009). The purpose of this document is to provide an overview of the certification testing effort and the findings of the testing effort for Dominion Assure 1.3 voting system.

This effort included documentation review of modified documents within the Technical Data Package, source code review, Trusted Build, and testing of the Dominion Assure 1.3 voting system. Testing consisted of the development of a test plan, managing system configuration, system level tests as well as special test cases prepared by SLI for the verification of the modifications implemented, and analysis of results. The review and testing were performed at SLI's Denver, Colorado facility.

### 1.1 References

1. Election Assistance Commission Voluntary Voting System Guidelines (EAC VVSG), 2005 Version 1.0. Volumes I and II.
2. NIST NVLAP Handbook 150: 2006.
3. NIST NVLAP Handbook and 150-22: 2008.
4. EAC Testing and Certification Program Manual, United States Election Assistance Commission, 2007
5. SLI VSTL Quality System Manual, Revision v1.14, prepared by SLI, dated November 28<sup>th</sup>, 2011.

### 1.2 Document Overview

This document contains:

- The Introduction, which discusses the system tested/reviewed
- The Certification Test Background, which discusses the testing process
- The System Identification, which identifies hardware and software for the Dominion Assure 1.3 voting system



- The System Overview, which discusses the functionality of Dominion Assure 1.3 voting system software and firmware modifications
- The Certification Tests, which are a summary of the testing effort
- The Recommendations section, which contains the final analysis of the testing effort
- Voting System Configuration
- Attachments as follows:
  - Attachment A – Trusted Build Record
  - Attachment B – Documentation and Functional Discrepancy Report
  - Attachment C – Criterion NVLAP Accreditation
  - Attachment D – EMC Integrity NVLAP Accreditation
  - Attachment E – MRAM with models B and D (120418-1784)
  - Attachment F – MRAM with AV-OS model A (ERB11210 revA)
  - Attachment G – MRAM with AV-OS model B (ERB20419 revA)
  - Attachment H – MRAM with AV-OS model D (ERB20420 revA)
  - Attachment I – DVS ECO# AVOS-001
  - Attachment J –DVS ECO# AVOS-002



## **2 Certification Test Background**

### **2.1 PCA - Document Reviews**

The Physical Configuration Audit (PCA) review of the Dominion Assure 1.3 voting system modified documentation submitted in the Technical Data Package (TDP) was performed in order to verify conformance with the Election Assistance Commission's Voluntary Voting System Guidelines (EAC VVSG) 2005.

### **2.2 PCA - Source Code Reviews**

Source code that had been modified from the Assure 1.2 code base was reviewed for each software and firmware application declared within the Dominion Assure 1.3 voting system.

SLI conducted a source code review of all modified source code submitted in the delivery of the voting system TDP for compliance to the VVSG 2005, Volume 1 sections 5.0-5.27 and Volume 2 Section 6.6. The files listed were compared to the original files in the 1.2 code base, to see what had been changed. Those changes were reviewed.

### **2.3 FCA - Functional & System Testing**

The Functional Configuration Audit (FCA) review of the test documentation submitted by Dominion in the TDP was executed in order to verify testing of the voting system requirements defined in Volume 1 Sections 2, 6, 7, and 9 of the EAC VVSG 2005.

SLI's standard Test Suites were customized for the Dominion Assure 1.3 voting system and conducted in accordance with Volume 2 Section 6, in conjunction with the functional testing. Simulations of elections were conducted to demonstrate a beginning-to-end business use case process, where elections were imported into the system, all needed media was created, and voting system equipment was readied, and an election conducted for the Dominion Assure 1.3 voting system.

#### **2.3.1 Test Methods**

Test methods are formal documents that outline the testing strategy for a specific area of a voting system. These include general test cases (modules) designed to validate the requirements under review. All test methods that were employed for this project are within the scope of SLI's VSTL accreditation.



Applicable test cases from the following test methods were employed during this test campaign:

- TM\_Accessibility, v0.14
- TM\_Accumulating\_and\_Transmitting\_Results, v0.5
- TM\_Ballot\_Formatting\_and\_Production, v0.13
- TM\_Ballot\_and\_Program\_Installation\_and\_Control, v0.12
- TM\_Ballot\_Counter, v0.12
- TM\_Basic\_Election\_Components, v0.01
- TM\_Closing\_the\_Polls, v0.9
- TM\_Pre-Voting\_Capabilities, v0.18
- TM\_Readiness, v0.15
- TM\_Tally\_and\_Reporting, v0.16
- TM\_Voting\_Capabilities, v0.22
- TM\_Security – Access\_Control, v0.22

The above listed test methods are implemented in a complementary fashion: modules are employed from various methods to form suites. Suites include a logical sequence of functionality that is used to validate the requirement addressed by each module within the suite.

### **2.3.2 Relevant RFI's and NOC's**

All Requests for Information and Notices of Clarification that were finalized as of the time of this report, were reviewed for usage in this test campaign. RFI's through RFI 2012-01 and NOC's through NOC12-01 were considered.

The following Requests for Information were referenced in this test campaign:

- 2010-01 Voltage Levels and ESD Test
- 2010-05 Modification Testing

The following Notices of Clarification were referenced in this test campaign:

- 07-003 State and Federal Testing
- 09-001 Test Plan
- 09-002 Testing Independence
- 09-004 Test Report
- 09-005 Modification Test Plan





## 2.4 Hardware Testing

### MRAM Memory Card

The MRAM memory card was configured with AV-OS optical scanners (supporting equipment) in Test Election mode, scanning test ballots in recirculation mode and writing results to the AV-OS MRAM memory card production model.

- For ESD testing:  
The referenced requirement was VVSG 2005 Vol. 1, 4.1.2.8 Electrostatic Disruption
- For Radiated Electromagnetic Emissions testing:  
The referenced requirement was VVSG 2005 Vol. 1, 4.1.2.9 Electromagnetic Emissions
- For Electromagnetic Susceptibility testing:  
The referenced requirement was VVSG 2005 Vol. 1, 4.1.2.10 Electromagnetic Susceptibility

## 2.5 Terms and Abbreviations

The following terms and abbreviations will be used throughout this document:

**Table 1 – Terms and Abbreviations**

Term	Abbreviation	Description
AccuVote®-OS	AV-OS	Optical scanner utilized by the Assure 1.3 voting system
AccuVote®-OSX	AV-OSX	Optical scanner utilized by the Assure 1.3 voting system
AccuVote®-TS R6	AV-TS R6	Direct Recording Electronic (DRE) touch screen vote capture and tabulation device utilized by the Assure 1.2 voting system
AccuVote®-TSX	AV-TSX	Direct Recording Electronic (DRE) touch screen vote capture and tabulation device utilized by the Assure 1.2 voting system
Direct Recording Electronic	DRE	Electronic voting device that utilizes electronic components for the functions of ballot presentation, vote capture, vote recording and tabulation which are logically and physically integrated into a single unit.
Equipment Change Order	ECO	This signifies a minor update to the voting system's hardware inventory



Term	Abbreviation	Description
Optical Scan Accumulator Adapter	OSAA	Adapter utilized by the Assure 1.2 voting system for interfacing the AV-OS Memory Card into the PCMCIA connection on a DRE vote capture device for the purposes of accumulation and transmittal of vote data
Precinct Count Scanner	PCS	A precinct count optical scanner is a mark sense-based ballot and vote counting device located at a precinct and is typically operated by scanning one ballot at a time
Protective System Counter	PSC	Counts the total number of ballots ever cast on the machine, as opposed to the ballots cast for a specific election
Standard Lab Procedure	SLP	A SLI formally documented methodology for the conduct of testing
Test Method	TM	SLI formal documentation that outlines the testing strategy for a specific area of a voting system including general test cases designed to validate the requirements under review
Visually Impaired BallotStation	VIBS	A system of headphones and keypad that allows those with limited or no vision to listen as a recorded ballot is narrated, and then make selections on the keypad rather than the touch screen itself
Voting System Test Lab	VSTL	Test laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) and the US Election Assistance Commission to test voting systems
Voting Test Specialist	VTS	An SLI employee within the Compliance division who has been qualified to perform EAC voting system certification testing



### 3 System Identification

The Dominion Assure 1.3 voting system was submitted for modification certification testing with the documentation, hardware and software listed below. A complete listing of the 1.3 voting system, including components unchanged from the Assure 1.2 voting system, can be found in section 8. This section details the components utilized in the modification testing.

#### 3.1 Documentation

##### 3.1.1 Documentation Updates

The following documents were modified for Assure 1.3:

- ASSURE 1.3 Product Overview Guide
- ASSURE 1.3 Matrix
- GEMS Reference Guide 1.21.6 or later
- GEMS System Administrator’s Guide 1.21.3 or later
- ABasic 2.2.5 Reports Guide
- DRS PhotoScribe PS900 iM2/PS960 Hardware Guide
- ASSURE 1.3 System ID Guide

#### 3.2 Software and Firmware

Table 2 below details each application employed by the Dominion Assure 1.3 voting system, that is new or modified from the Assure 1.2 certified system.

**Table 2 – Manufacturer Software and Firmware**

Application	Version
GEMS	software version 1.21.6
AV-OS PC	firmware version 1.96.14
AV-OSX	firmware version 1.2.7
AV-TSX DRE	firmware version 4.7.10
AV-TS R6 DRE	firmware version 4.7.10
ABasic script for state of Vermont	in GEMS 1.21.6



### **3.3 Equipment (Hardware)**

#### **3.3.1 Manufacturer Equipment**

The following manufacturer equipment was used in testing:

- AV-OS optical scanner, Models A, B and D
- AV-OSX optical scanner, Model A
- AV-TSX DRE, Model D
- AV-TS R6 DRE, Model A

#### **3.3.2 COTS Equipment**

The following Commercial Off-the-Shelf equipment was used in testing:

- One COTS server, Dell Power Edge T110 (Windows Server 2003 SP2), used for implementing VCProgrammer, Key Card Tool, GEMS applications
- EPSON Work Force 610 Printer for printing reports
- One COTS 10/100 MB Network card

### **3.4 Test Materials**

The following test materials were required for the execution of testing including:

- Election definition
- Ballots
- Memory cards
- Printer paper rolls
- Poll worker access smart card
- Administrator smart card
- Polling place voter smart card



## 4 System Overview

### 4.1 Scope of the Dominion Assure 1.3 Voting System Modifications

This modification certification testing pertained to updates made by Dominion Voting Systems to their Assure voting system from version 1.2 to 1.3, specifically updates to the GEMS software application, OSX firmware, AV-TS (X and R6) Ballot Station firmware, AV-OS PC firmware and an ABasic script for the State of Vermont, as detailed in Table 2, in section 3.2 above.

#### 4.1.1 GEMS

GEMS was updated to account for the following:

- The Cards Cast report was updated to resolve an issue where the total number of registered voters was not accurately reported for split precincts.
- An occasional poster sharing violation was leaving the application in a state that did not accurately reflect the status of the memory card information being uploaded. The system accumulates the data in a two-step process in which the data is uploaded from the memory card and then posted to the database. If the upload was successful then the green arrow was displayed, even if the posting failed.
- An installation program was updated with a new splash screen and agreements page to reflect Dominion Voting Systems instead of Premier Election Solutions.
- A runtime error is addressed by a documentation update describing a configuration to prevent the runtime error from occurring. The error was caused by permissions for a folder not propagating inheritable rights to its sub-folders.

#### 4.1.2 AV-OSX

AV-OSX was updated to account for the following:

- The Protective System Counter (PSC), which counts the total number of ballots ever cast on the machine, as opposed to the ballots cast for a specific election, was archiving the PSC only during graceful shutdowns. A hardware reset was reverting the PSC to its previously saved count without the current count being archived.



- The date presented on the results tape could be incorrect, as it was using the system date (UTC) instead of the local date, which is adjusted to the local time zone.

#### **4.1.3 AV-TSX BallotStation**

AV-TSX BallotStation was updated to account for the following:

- A voter, or poll worker, is unable to cancel an in-process ballot when in VIBS mode, where the device is set up for a visually impaired voter and the screen is hidden. (This issue does not occur when not in VIBS mode.)

#### **4.1.4 AV-OS PC**

AV-OS PC was updated to account for the following:

- Incorrect “machine id” and “copy number” are printed on reports for multiple tabulators in a single precinct.

#### **4.1.5 ABasic Script for Vermont**

An ABasic reporting script customized for the state of Vermont was added to the GEMS installation. While the script was created for requirements specific to the State of Vermont, the script is available to all Assure 1.3 users.

#### **4.1.6 Documentation Updates**

The following documents were modified for Assure 1.3:

- ASSURE 1.3 Product Overview Guide  
To include the new software and documentation version numbers in the system
- ASSURE 1.3 Matrix  
To include the new software and documentation version numbers in the system
- GEMS Reference Guide 1.21.6 or later  
To include the description of the new operation of the AVServer Console
- GEMS System Administrator’s Guide 1.21.3 or later  
To include the description of the permissions settings to prevent the GEMS Runtime Error
- ABasic 2.2.5 Reports Guide  
To include the Vermont ABasic report script



- DRS PhotoScribe PS900 iM2/PS960 Hardware Guide  
To include the new PS960 Model B information – this configuration has already received a de minimis approval by the EAC through Dominion’s ECO PS960-001
- ASSURE 1.3 System ID Guide
  - To include updated hash values for the trusted build files and updated software version numbers
  - Also included in this document is the new PS960 Model B unit identification information – this configuration has already received a de minimis approval by the EAC through Dominion’s ECO PS960-001
- AccuVote-OS Ballot Specifications Guide, version 1.0.0:9  
To include modified specifications and added clarifications

#### **4.1.7 Hardware Testing**

##### **MRAM Memory Card**

The memory in the new card is Magnetoresistive Random-Access Memory (MRAM), a non-volatile computer memory that utilizes magnetic storage, whereas the memory in the old card was Static Random-Access Memory (SRAM). SRAM is considered a volatile type memory in that data is eventually lost when the memory is not powered. SRAM required a battery to retain the programming of the memory. MRAM does not require any power to retain its programming.

Both the new and old cards contain 128 kilobytes of memory storage. The architecture of the AV-OS unit and its CPU’s memory bank addressing capacity can only address eight (8) banks of 128Kb. The memory card is one of those eight banks.

- The card is utilized within the voting system for the purpose of:
  - Acting as the media for transporting information from GEMS to the AV-OS precinct voting devices
  - Configuring and programming the AV-OS optical scanners
  - Receiving/retaining results and audit log information from the AV-OS

##### **AV-OS**

The AV-OS has 4 production models: A, B, C and D.

- The model A was the original configuration, with a pressure molded case.
- The model B was updated to implement an injection molded case.



- The model C was updated with a new modem.
- The model D incorporated a number of field upgrades to the model C, into a production line implementation.

## **4.2 Testing Strategies Implemented**

Testing implemented two suites: Integration (see section 4.2.1) which tested to verify that the overall system integrity remained intact, and Modification Validation (see section 4.2.2) which validated the modifications implemented within Assure 1.3. Hardware testing was implemented for the MRAM memory card to verify conformance to the standards. (See section 4.2.4).

### **4.2.1 Integration Testing**

An Integration test was implemented to validate that the system's basic integrity remains intact for Assure 1.3. An election definition was imported, with election information disseminated to AV-OS, AV-OSX, AV-TSX and AV-TSR6 precinct devices. Polls were opened, ballots were then cast on each device, and polls were closed. The resulting vote data was transmitted via a local area network back to GEMS, where it was accumulated and tallied, with a final results report generated. VVSG 2005 requirement Vol. 2, 6.3 is the referenced requirement for verification of this activity.

### **4.2.2 Modification Validation Testing**

The Modification Validation test suite was created to replicate an election, from the importation of an election definition, through opening and closing of polls, to accumulation, tallying and reporting of election results. Testing modules were created and incorporated into the suite. These modules are specific to the validation of each modification being implemented in Assure 1.3, as listed in subsections 4.2.2.1 through 4.2.2.5 below.

The GEMS server was reset to a pristine condition, then GEMS was installed, during which ASR-88 was validated (specific ASRs are detailed below). After the installation completed, ASR-10 was validated by implementing documented changes and then launching GEMS. Within GEMS an election was imported, where a precinct was set up to be assigned 2 tabulators. The following activities were then conducted:

- Ballot definition was loaded via local area network to the AV-OS, which then opened polls, scanned voted ballots, closed polls and returned data back to GEMS via local area network. During this sequence, ASR-2 was validated.





- For the AV-TSX, Ballot definition was loaded via local area network to the device, which then opened polls, voted ballots, closed polls and returned data back to GEMS via local area network. During this sequence, a ballot was canceled in VIBS mode, where ASR-1 was validated.
- For the AV-OSX, Ballot definition was loaded via local area network to the device, which then opened polls, scanned voted ballots, closed polls and returned data back to GEMS via local area network. During this sequence, ASR-9 and ASR-18 were both validated.
- For the AV-TSR6, Ballot definition was loaded via local area network to the device, which then opened polls, voted ballots, closed polls and returned data back to GEMS via local area network. During this sequence, a ballot was canceled in VIBS mode, where ASR-1 was validated.
- The election data was sent back to GEMS via local area network and was then accumulated and tabulated, and reports generated. During this sequence ASR-17 and ASR-23 were validated.
- The validation of ASR-19 was conducted by replacing the GEMS database with a backup copy of the database prior to the above mentioned devices' uploads. Then the environment was set to reduce database connectivity. Next, all devices were set to resend election data simultaneously. ASR-19 was validated during this sequence of events.

#### **4.2.2.1 GEMS**

GEMS was updated to account for the following:

- ASR-17: For the Cards Cast report updated to resolve an issue where the total number of registered voters was not accurately reported for split precincts: This testing validated that the Cards Cast report now accurately reports the total number of registered voters in split precincts, as well as verifying that the totals for a non-split precinct continue to be reported correctly. VVSG 2005 requirement 2.2.4.b was the referenced requirement for verification of this modification.
- ASR-19: For the issue of interruptions in memory card uploads leaving the application in a state that did not accurately reflect the status of the memory card information being uploaded: This testing validated that the status for each phase is correctly reflected to the user such that when a data upload is successfully completed, the white up arrow is displayed, and when, and only when, the posting of the data is successfully completed, the green up arrow is displayed. VVSG 2005 requirement 2.2.4.a was the referenced requirement for verification of this modification.



- ASR-88: For the install program being updated with a new splash screen and agreements page to reflect Dominion Voting Systems instead of Premier Election Solutions: This testing validated that the install runs correctly, with the new splash screen displaying and the new software licensing agreement presented without impact on the installation itself. VVSG 2005 requirement 2.2.3.a was the referenced requirement for verification of this modification.
- ASR-10: For the runtime error during application startup addressed by a documentation update: The configuration of the application was implemented as per the updated documentation. VVSG 2005 requirement 2.2.4.a was the referenced requirement for verification of this modification.

#### 4.2.2.2 AV-OSX

AV-OSX was updated to account for the following:

- ASR-9: For the issue where the protective system counter will reset to zero: The testing for this modification verified that the archive occurs after each ballot cast, and that an unexpected power down does not cause the PSC to reset to zero. VVSG 2005 requirement 2.1.8.b was the referenced requirement for verification of this modification.
- ASR-18: For the date presented on the results tape potentially being incorrect due to the system date (UTC) being used instead of the local date: This testing verified that the results tape utilizes the local time/date information instead of the UTC time/date. VVSG 2005 requirements 2.2.4.b and 2.2.5.g were the referenced requirements for verification of this modification.

#### 4.2.2.3 AV-TSX BallotStation

AV-TSX BallotStation was updated to account for the following:

- ASR-1: For the issue of being unable to cancel ballot when in VIBS (ballot hidden) mode: The testing for this fix verified that the Cancel option works at all key points in the ballot casting process, both in VIBS mode and in non-VIBS mode. VVSG 2005 requirements 2.3.3.3.j and 4.1.4.3.c.i were the referenced requirements for verification of this modification.

#### 4.2.2.4 AV-OS PC

AV-OS PC was updated to account for the following:

- ASR-2: For the issue of when multiple devices are assigned to a single precinct, the label printed out for each device showed the precinct ID, but incorrect values for the machine specific identifying codes: This testing verified that when multiple devices are assigned to a single precinct that they



are each provided with a unique identifier. VVSG 2005 requirement 2.2.5.b was the referenced requirement for verification of this modification.

#### **4.2.2.5 ABasic Script for Vermont**

- ASR-23: For the ABasic reporting script customized for the state of Vermont added to Assure 1.3: This testing included downloading the report script to a precinct count voting device and printing test totals reports on that voting device. VVSG 2005 requirement 2.4.3.a was the referenced requirement for verification of this modification.

#### **4.2.3 Readiness Procedure**

The Readiness Procedure encompassed all activities executed to prepare the environment for a test suite run. This included:

- Preparation of devices for Assure software/firmware, Operational Status check if needed, setting environment to pristine condition, as applicable for each component
- Formatting of memory for each device
- Identification of network cards to be employed on each pertinent device resident in the local area network
- Clearing of accumulated totals (AV-TSX and AV-TSR6)
- Assignment and deployment of IP addresses to each pertinent device
- Notation of Audit Log status (note that the AV-TSX and AV-TSR6 contain audit logs on both the device and the memory card, whereas the AV-OS and AV-OSX contain audit logs only on the memory card)
- Preparation of accessory hardware (such as printers)
- Notation of state of hardware prior to initiation of test suite; this includes noting the software (and associated patch/service pack levels)
- Notation of Protected Counter values
- Loading of Test Election
- Preparation of testing artifacts, such as voted ballots



#### **4.2.4 Environmental Hardware Testing**

SLI's third-party certified hardware test laboratories, EMC Integrity and Criterion Technology, executed Environmental Hardware testing on the new AV-OS MRAM memory card production model. This testing utilized the relevant components of the Assure 1.3 voting system, namely the AV-OS optical scanning device models A, B and D, with which the new memory card is intended to interact within the voting system.

During execution of testing performed at EMC Integrity and Criterion Technology, an SLI representative was present to oversee the testing.

Hardware testing for the MRAM memory card with the AV-OS model A was leveraged from state testing that was done in December of 2011. That testing involved verification of the following requirements:

- VVSG 2005 Vol. 1, 4.1.2.8 Electrostatic Disruption
- VVSG 2005 Vol. 1, 4.1.2.9 Electromagnetic Emissions
- VVSG 2005 Vol. 1, 4.1.2.10 Electromagnetic Susceptibility

Hardware testing conducted specifically for this test campaign involved the MRAM memory card with the AV-OS models B and D. That testing involved verification of the following requirements:

- VVSG 2005 Vol. 1, 4.1.2.9 Electromagnetic Emissions
- VVSG 2005 Vol. 1, 4.1.2.10 Electromagnetic Susceptibility

## **5 Testing Performed**

### **5.1 Functional Configurations Tested**

The system implemented for Modification Testing and Integration Testing utilized the components listed below, in combination with the software/firmware versions listed in Table 2, in section 3.2:

- An EMS workstation with the GEMS software installed & configured
- One AV-OS optical scanner, Model A
- One AV-OSX optical scanner, Model A
- One AV-TSX DRE, Model D
- One AV-TS R6 DRE, Model A



## **5.2 Functional Test Execution**

The Test Execution phase represented the formal execution of the test of the Assure 1.3 voting system. All pertinent SLI Standard Lab Procedures were employed for the formal test execution.

### **5.2.1 Testing Flow**

Test execution was initiated in the following manner:

- 1 “Integration Test Suite – Readiness” was executed
- 2 “Integration Test Suite” was executed
- 3 “Modification Validation Test Suite – Readiness” was executed
- 4 “Modification Validation Test Suite” was executed

## **5.3 Hardware Testing**

The testing consisted of the AV-OS optical scanners (supporting equipment) being configured in Test Election mode, scanning test ballots in recirculation mode and writing results to the AV-OS MRAM memory card production model.

Please see the Assure 1.3 MRAM Memory Card Hardware Test Reports and other supporting documentation for additional information including test methodologies for environmental hardware tests.



## 6 Certification Test Results Summary

### 6.1 Source Code Review Summary

SLI conducted a source code review of all modified source code submitted in the delivery of the voting system TDP for compliance to the VVSG 2005, Vol. 1 Section 5.2, and Vol. 2, Sections 5.4 and 6.6. The modules listed below, which represent the modifications incorporated in the Assure 1.3 system, were reviewed with no discrepancies noted.

Source code for GEMS 1.21.6

- Files modified:
  - PosterDlg.h
  - PosterDlg.cpp
  - GEMSDoc.cpp
  - DownloadTCPConn.cpp
  - DownloadDlg.cpp
  - DownloadAVSPort.cpp
  - CBDetail.h
  - CardCastReport.cpp
  - CardCastReport.h

39 lines of executable code were modified and subjected to review.

Installation resources for GEMS

- Files modified:
  - Splash Screen (GEMS).bmp
  - premier\_sla.rtf
  - premier\_sla\_2.rtf

The “rtf” files are software licensing agreement, and the “bmp” is the new Dominion logo. No executable code.

Source code for ABasic

- List of the files associated:
  - 195usvt.abs
  - vt\_pnraces.abs

81 lines of executable code were included



#### Source code for AV- OSX 1.2.7

- Files modified:

- settings.cpp
- abasicreport.cpp

5 lines of executable code were modified and subjected to review.

#### Source code for AV-OS PC 1.96.14

- Files modified:

- abinterp.c
- ac2000.h

3 lines of executable code were modified and subjected to review.

#### Source code for BallotStation 4.7.10

- Files modified:

- BallotDlg.cpp
- VoteController.cpp

13 lines of executable code were modified and subjected to review.

## 6.2 Trusted Build

As Assure 1.3 is a Modification version of the Assure 1.2 voting system, only the applications listed in section 6.1 – Source Code Review Summary were included in the Trusted Build procedure for Assure 1.3. All other applications within the voting system are identical to Assure 1.2 applications.

Within the selection of modified applications, GEMS software, the ABasic script for Vermont and AV-OSX firmware were included in the SLI Trusted Build, which leveraged an iBeta Trusted Build image to create the environment. Note that iBeta was the VSTL responsible for testing and Trusted Builds for Assure 1.2, which was granted certification in August, 2009.

iBeta built post Assure 1.2 executables for:

- AV-OS PC version 1.96.14 on July 19<sup>th</sup>, 2010
- BallotStation version 4.7.10 on July 27<sup>th</sup> 2010

These executables are included in the Assure 1.3 voting system implementation.



### 6.3 Technical Data Package Review Summary

SLI reviewed the Dominion Assure 1.3 TDP documentation modifications for compliance with the EAC VVSG 2005 according to Vol. 2 Section 2. The specific documents are listed below. Bolded items represent the pertinent portion of a requirement if the whole requirement is not under review.

- ASSURE 1.3 Product Overview Guide
  - Vol. 2, requirement 2.1.1.2
    - 2.1.1.2- For systems seeking re-certification, vendors shall submit System Change Notes as described in Subsection 2.13, **as well as current versions of all documents that have been updated to reflect system changes.**
- ASSURE 1.3 Matrix
  - Vol. 2, requirement 2.1.1.2
    - 2.1.1.2- For systems seeking re-certification, vendors shall submit System Change Notes as described in Subsection 2.13, **as well as current versions of all documents that have been updated to reflect system changes.**
- GEMS Reference Guide 1.21.6 or later
  - Vol. 2, requirements 2.8.5.b&d and 2.5.6.2.a,b,c&f
    - 2.8.5 - The vendor shall provide documentation of system operating procedures that meets the following requirements:
      - b) Provides procedures that clearly enable the operator to assess the correct flow of system functions (as evidenced by system-generated status and information messages)
      - d) Defines and illustrates the procedures and system prompts for situations where operator intervention is required to load, initialize, and start the system
    - 2.5.6.2 - The vendor shall describe the software's capabilities or methods for detecting or handling:
      - a) Exception conditions
      - b) System failures
      - c) Data input/output errors
      - f) Data quality assessment
- GEMS System Administrator's Guide 1.21.3 or later
  - Vol. 2, requirement 2.8.5.a
    - 2.8.5 - The vendor shall provide documentation of system





operating procedures that meets the following requirements:

- a) Provides a detailed description of procedures required to initiate, control, and verify proper system operation
- A Basic 2.2.5 Reports Guide
  - Vol. 2, requirement 2.1.1.a&b
    - 2.1.1 - The content of the Technical Data Package (TDP) is intended to provide clear, complete descriptions of the following information about the system:
      - a) Overall system design, including subsystems, modules and the interfaces among them
      - b) Specific functional capabilities provided by the system
- DRS PhotoScribe PS900 iM2/PS960 Hardware Guide
  - Vol. 2, requirement 2.1.1.2
    - 2.1.1.2- For systems seeking re-certification, vendors shall submit System Change Notes as described in Subsection 2.13, **as well as current versions of all documents that have been updated to reflect system changes.**
- ASSURE 1.3 System ID Guide
  - Vol. 2, requirement 2.4.2
    - 2.4.2 - The vendor shall provide sufficient data, or references to data, to identify unequivocally the details of the system configuration submitted for testing. The vendor shall provide a list of materials and components used in the system and a description of their assembly into major system components and the system as a whole. Paragraphs and diagrams shall be provided that describe:
      - Materials, processes, and **parts used in the system**, their assembly, and the configuration control measures to ensure compliance with the system specification
- System Change Notes
  - Vol. 2, requirements 2.1.1.2 and 2.13
    - 2.1.1.2- For systems seeking re-certification, vendors shall submit System Change Notes as described in Subsection 2.13, **as well as current versions of all documents that have been updated to reflect system changes.**



- 2.13 - Vendors submitting modifications for a system that has been tested previously and received national certification shall submit system change notes. These will be used by the accredited test lab to assist in developing and executing the test plan for the modified system. The system change notes shall include the following information: **Summary description of the nature and scope of the changes, and reasons for each change**
- AccuVote-OS Ballot Specifications Guide, version 1.0.0:9
  - Vol. 2, requirement 2.1.1.2
    - 2.1.1.2- For systems seeking re-certification, vendors shall submit System Change Notes as described in Subsection 2.13, **as well as current versions of all documents that have been updated to reflect system changes.**

## Evaluation of TDP

The modified documentation within the Technical Data Package for the Dominion Assure 1.3 voting system was found to comply with the reviewed standards.

## 6.4 Functional Testing Summary

SLI performed tests on the system configuration identified in section 5.1, and as outlined in sections 4.2 and 5.2.

### 6.4.1 Evaluation of Testing

The tests were successfully conducted using the executables delivered as part of the Assure 1.3 voting system, in association with the appropriate hardware versions as declared in this Test Report for the Dominion Assure 1.3 voting system.

## 6.5 Environmental Hardware Test Summary

SLI examined the environmental hardware test data for the AV-OS MRAM memory card production model.



### 6.5.1 Evaluation of Environmental Hardware Testing

Based upon SLI's examination of all reporting data, SLI concludes the new AV-OS MRAM memory card production model retained all election results and the integrity of data was not compromised.

Attachments E, F, G and H contain the hardware environmental reports from SLI's approved Hardware Environmental Test Subcontractors, EMC Integrity and Criterion Technology. These reports detail specific information on the environmental hardware testing.

## 6.6 Anomalies

### 6.6.1 Hardware Anomalies

During hardware testing at EMC Integrity, ESD test anomalies were observed on the AV-OS model A during testing of the new Assure 1.2 MRAM memory card. No issues were determined to be caused by the MRAM memory card. The anomalies were isolated to the AV-OS unit, with the two sensitive areas including the key lock and rear panel near the serial port.

Contact Discharge Issue Points on AV-OS model A:

Voltage Levels:

- 6kv applied to the key lock scanner lockup; memory card was removed causing a system halted message. Operator reset was initiated by powering off, re-inserting memory card and powering on the unit. Following ESD protocol, 10 consecutive additional pulses were applied to the key lock (issue point) without error. Issue was not repeatable; the MRAM memory card retained all data.
  - Reference: AccuVote-OS Central Count 2.0 User's Guide Revision 5.0 Memory Card Removed Error:  
MEM CARD REMOVED SYSTEM HALTED. The memory card has been removed from the AccuVote-OS. Re-insert the memory card, and continue.
- ±8kV applied to the key lock causing scanner to lock up; error messages appeared: ISR7:0256 D666 call for service, ISR1:14e0:2f91 call for service. Operator reset was required by powering off / on the unit. Following ESD protocol, 10 consecutive additional pulses were applied to the key lock (issue

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point) without error. Issue was not repeatable; the MRAM memory card retained all data.

- Reference: AccuVote-OS Central Count 2.0 User's Guide Revision 5.0

Call for Service Error:

The AccuVote-OS has failed to complete the current activity. This message may display a number between 0 and 31 in 'nn', and each 'd' will be a digit between 0 and 9 or a character between A and F, the entirety representing an internal computer address. When one of these messages appears, record the message, taking special note of the number, and write a brief description of what was being done on the system at the time that the message appeared. As this message may be caused by static or power surges, turn the unit off and try again. If the same error recurs, have the unit serviced.

3. -8kV applied to back plate by serial connector; scanner stopped functioning. Operator reset was required by powering off / on the unit. Following ESD protocol, 10 consecutive additional pulses were applied to the back plate by serial connector (issue point) without error. Issue was not repeatable; the MRAM memory card retained all data.

Electrostatic discharge testing was performed around all the usual points that human fingers can touch around the system enclosure. The area around the memory card was tested satisfactorily. As noted in more detail above, when the ESD pulses were applied to the key lock or the metal panel adjacent to the serial port (rear panel), for the first time, anomalous behavior was observed, but was not able to be repeated on 10 subsequent tries in each instance. The new Assure 1.2 MRAM Memory retained all election results and the integrity of data was not compromised in any instance.

## 6.7 Discrepancies

One minor discrepancy was noted. When a precinct has multiple voting devices associated to it, when the election is closed and each device reports its results back to GEMS, the individual devices each correctly display a green up arrow, which indicates the device's data has been successfully uploaded and posted to the database. The vote center level up arrow, however, remains white. The data for all devices associated to that vote center are successfully posted to the GEMS database. As such, this discrepancy is considered minor and is resolved for the current release with a documentation entry indicating the behavior of the white up arrow in relation to a vote center with multiple voting devices assigned to it.



## 7 Recommendations

SLI has completed the testing of the Dominion Assure 1.3 voting system for the EAC modification certification program. It has been determined that the modifications implemented in the Dominion Assure 1.3 voting system meet the required acceptance criteria of the Election Assistance Commission Voluntary Voting System Guidelines 2005, as pertains to the modification certification criteria.

This recommendation reflects the opinion of SLI Global Solutions based on testing scope and results. It is SLI's recommendation based on this testing effort that the EAC grant a certification of the Dominion Assure 1.3 voting system.

A handwritten signature in blue ink, appearing to read 'Traci Mapps'.

Traci Mapps

Sr. Director of Operations

May 11<sup>th</sup>, 2012



## 8 Voting System Configuration

This report has been submitted to the Election Assistance Commission. Upon acceptance of this report by the EAC, a certification number will be issued.

This certification is for the system described as:

Voting System Name	Version
Dominion Assure	1.3

Equipment Name	Version	Description
AccuVote-OS Precinct Count		
AccuVote-OS Models A, B, C, and D	1.96.14	Precinct Count ballot counting firmware installed on an AccuVote-OS ballot scanner.
	Ballot Box	A secure box used to house voted ballots counted by the AccuVote-OS.
AccuVote-OS Central Count		
AccuVote-OS Models A, B, C, and D	2.0.15	Central Count ballot counting firmware installed on an AccuVote-OS ballot scanner
AccuFeed Model A, rev E	Not Applicable - no firmware	Device configured with the AccuVote-OS for the purpose of processing AccuVote-OS ballots in high-speed batch mode.
AccuVote-OSX		
AccuVote-OSX Model A	1.2.7	Optical-scan voting device application for paper ballots
	BootLoader 1.3.11	Application that boots the hardware for the AccuVote TS R6, AccuVote TSX, and AccuVote OSX
	Windows CE 500.4.1	Operating System for AccuVote OSX Model A
	Ballot Box	A secure box used to house voted ballots counted by the AccuVote-OSX
BallotStation		



Equipment Name	Version	Description
AccuVote-TS R6 Models A and B	BallotStation 4.7.10	Software application used in conjunction with the AccuVote-TS touch screen voting devices
	BootLoader 1.3.11	Application that boots the hardware for the AccuVote-TS R6, AccuVote -TSX, and AccuVote -OSX
	Windows CE 300.3.5	Operating System for AccuVote-TS R6 Models A and B
UAID Model A	n/a	Hardware Interface Device that offers voters with accessibility issues the opportunity to vote on an unassisted basis
AccuVote-TSX Models A, B, C, and D	Ballot Station 4.7.10	Software application used in conjunction with the AccuVote-TS touch screen voting devices
	BootLoader 1.3.11	Application that boots the hardware for the AccuVote-TS R6, AccuVote-TSX, and AccuVote-OSX
	Windows CE 410.3.10	Operating System for AccuVote-TSX Models A, B, C, and D
AVPM Model A	3.0.3	Premier VVPAT for the AccuVote-TSX
UAID Model A	n/a	Hardware Interface Device that offers voters with accessibility issues the opportunity to vote on an unassisted basis
<b>Ballot Marking Devices</b>		
AutoMARK VAT A100, A200, A300	1.3 PAVR (Build 1.3.3460)	Firmware for the AutoMARK VAT with optional AutoCAST that supports audio only
	1.3 PVR (Build 1.3.3460)	Firmware for the AutoMARK VAT with optional AutoCAST that supports audio and visual
WinCE	5.00.20	AutoMARK VAT Operating System
<b>Central Count Devices</b>		
DRS PhotoScribe PS960 Models A and B		Central Count image-based ballot scanner (COTS with Windows XP Pro SP3 and DRS Firmware 2.6.2)
DRS PhotoScribe PS900 iM2		Central Count image-based ballot scanner (COTS with Windows XP Pro SP3 and DRS Firmware 2.6.2)



Hardware/Equipment	Manufacturer	Version/Serial Number	Description
Dell Dimension 3100 Model DCSM	Dell		GEMS and ASM COTS Server (with Windows XP Pro SP3 and display adapter Intel® 82915G/GV/910 Express Chipset Family) and also includes Key Card Tool and VCProgrammer
Visually Impaired Ballot Station (VIBS)	Various	None	A voter assistance accessory that can be used with AccuVote-TS R6 and AccuVote-TSX (touch screen voting terminals)
Universal ADA Interface Device (UAID) with ADA switch kit or Sip & Puff	Various	None	A voter assistance accessory that can be used with AccuVote-TS R6 and AccuVote-TSX (touch screen voting terminals)
Privacy Filter	3M	None	Fits on top of the touch screen and restricts the side viewing of the display
ExpressPoll 4000	ADVANTECH	AD2K0576739C	Polling Place Voter Card Creation (COTS)
ExpressPoll 5000	ADVANTECH	EPS68Z0M001156	Polling Place Voter Card Creation (COTS)
Voter Card Encoder	SPYRUS	P300116131	Polling Place Voter Card Creation (COTS)
Smart-Card Terminal ST100	SecureTech	87003252	Smart Card Reader (COTS)
Smart-Card Terminal ST120	SecureTech	86000297	Smart Card Reader (COTS)
U.are.U 4500	digitalPersona	8Y00B007403	COTS fingerprint reader
Transport Printer	DRS	none	COTS Endorsement/Transport printer for the PhotoScribe
Digi PortServer II 16 Port	Digi International	W91223997	Port Servers (COTS)
Office Connect Dual Speed 160 Port Hub	3Com	0100/7T4F044698	Networking (COTS)
RICOH LP440C Printer	Ricoh	SPC811DN	Ballot Printer





Hardware/Equipment	Manufacturer	Version/Serial Number	Description
-Smart Cards -Ballot Box Keys -AccuVote Keys -128MB PCMCIA Memory Cards -128KB Memory Cards -PCMCIA To Compact Flash Adapter -Compact Flash Network Interface Cards	Various	None	Support equipment
-CAT5 Network Cable -CAT 5 Network Crossover Cable -AccuVote AC Power Cords -Blank Ballots -Rolls of Thermal Printer Paper -Ink Ribbons -Headphones -Telephone Cables -Sip n' Puff Saliva Traps	Various	None	Support equipment



Software	Version	Description
Ballot Preparation and Central Count		
GEMS	1.21.6	COTS platform is a PC with Windows 2003 or XP. GEMS provides DRE and AccuVote-SO ballot preparation, optical scanner and PCS workstation programming and AccuVote-OS central count ballot tallying.
ASSURE Security Manager	1.2.5	COTS platform is a PC with Windows XP. Software application that provides an interface to the ASSURE Security Service. The ASSURE Security Manager is used to define and dynamically control application users, users rights and other security features from a central location. Premier Central Scan requires the use of Security Manager/Security Service.
ABasic Report Files	2.2.5	ABasic report files are used to format the content of reports and memory card labels that can be printed on AccuVote-OSX, AccuVote-OS Precinct Count and BallotStation units.
AutoMARK AIMS	1.3 (MDE 1.3.572, Template 1.3.572)	COTS platform is a PC with Windows XP. Software that prepares the ballots and the election database to be used by the VAT
Key Card Tool	4.7.8	COTS platform is a PC with Windows 2003 or XP. This PC-based software application that allows the user to create a smart card encoded with user-defined security codes or keys.
Premier Central Scan	2.2.5	COTS platform is a PC or PhotoScribe PS900 iM2/PS960 with Windows XP, optional DRS Transport Printer (COTS), and optional DigitalPersona U.are.U 4000B, 4500 fingerprint readers (COTS). Software application that is designed for high-speed AccuVote-OS batch-ballot processing.
Polling Place		
VCProgrammer	4.7.8	COTS platform is a PC with Windows 2003 or XP. Software application is used to



Software	Version	Description
		encode voter access cards (with or without input from a voter registration system) for the purpose of activating ballots on the AccuVote-TSX and AccuVote-TS R6 in an election with ST-100 or ST-120 (COTS).
Voter Card Encoder	1.3.3	Software application is used to encode voter access cards for the purpose of activating ballots on the AccuVote-TSX and AccuVote-TS R6 in an election.
Card Writer	1.1.6	An application run on electronic Pollbook devices (such as the ExpressPoll 4000 or 5000) to encode voter access cards for the purpose of activating ballots on the AccuVote-TSX and AccuVote-TS R6 in an election.

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End of Certification Report

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