# Test Report for
# EAC 2005 VVSG Certification Testing
# Performed on Election Systems & Software EVS 5.2.2.0

Issue Date: 02/21/2017

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# SIGNATURES

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## REVISIONS

| Revision | Reason for Revision | Date |
|---|---|---|
| NR | Initial Release | 1/13/2017 |
| 1 | EAC Comments | 2/13/2017 |
| 2 | EAC Comments | 2/17/2017 |
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# 1.0 INTRODUCTION

The purpose of this National Certification Test Report is to document the results of the certification testing performed on Election Systems & Software's (ES&S), herein referred to as manufacturer, Election Systems & Software Voting System 5.2.2.0 (EVS5220). EVS 5.2.2.0 was tested to the requirements set forth in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines Standards (2005 VVSG). EVS 5.2.2.0 is a modification to the previously 2005 VVSG certified EVS 5.2.1.0 voting system (Certification number: ESSEVS5210), and was tested by NTS Huntsville based on the "modified system" requirements set forth in section 4.6.2.3 of the EAC Testing and Certification Program Manual, Version 2.0, herein referred to as the Program Manual.

## 1.1 Description of EAC Certified System Being Modified

The following subsection describes the EAC Certified System that is baseline for the submitted modification. All information was derived from the previous Certification Test Report and/or EAC Certificate of Conformance.

### 1.1.1 Baseline Certified System

The baseline system for this modification is the EVS 5.2.1.0. Tables 1-1 and 1-2 describe both the baseline certified software versions and the hardware/firmware versions submitted for certification testing. For a complete description of the configuration and description of the EVS 5.2.1.0 product, refer to the EVS 5.2.1.0 Test Report located on the EAC's website at http://www.eac.gov.

**Table 1-1 Baseline Certified Software Versions**

| Software Component | Software/Firmware Version |
|---|---|
| ***Proprietary Software*** | |
| Electionware | 4.7.1.0 |
| Election Reporting Manager (ERM) | 8.12.1.0 |
| Removable Media Services (RMS) | 1.4.5.0 |
| Event Log Services (ELS) | 1.5.5.0 |
| AutoMARK VAT Previewer | 1.8.6.0 |
| ExpressVote Previewer | 1.4.1.0 |
| ***Proprietary Hardening Software*** | |
| CreateNewUser | 3.0.3.0 |
| NoNetwork | 3.0.3.0 |
| PreInstall | 3.0.5.1 |
| PostInstall | 3.0.3.0 |
| ServerShare | 3.0.3.0 |
| ***COTS Software*** | |
| Adobe Acrobat Standard | 11 |
| Cerberus FTP | 6.0.7.1 |
| Microsoft Server 2008 | R2 w/ SP1 |
| Microsoft Windows 7 | SP1 (64-bit) |
| Micro Focus RM/COBOL Runtime | 12.06 |
| Symantec Endpoint Protection | 12.1.4 (64-bit) |
| Symantec Endpoint Protection Intelligent Updater | 20151006-037-v5i64.exe |
| WSUS Microsoft Windows Update Utility | 8.8 |

### 1.1.1 Baseline Certified System (Continued)

**Table 1-2 Baseline Certified Hardware/Firmware Versions**

| Hardware Component | Hardware Version | Firmware Version |
|---|---|---|
| ***Proprietary Hardware*** | | |
| ExpressVote Universal Voting System | 1.0 | 1.4.1.0 |
| ExpressVote Rolling Kiosk | 1.0 | N/A |
| DS200 Precinct Count Tabulator | 1.2.1, 1.2.3, and 1.3 | 2.12.1.0 |
| DS850 Central Count Tabulator | 1.0 | 2.10.1.0 |
| AutoMARK A100 | 1.0 | 1.8.6.0 |
| AutoMARK A200 (SBC 2.0 & SBC 2.5) | 1.1 | 1.8.6.0 |
| AutoMARK A300 (SBC 2.0 & SBC 2.5) | 1.3 | 1.8.6.0 |
| Plastic Ballot Box | 1.2 & 1.3 | N/A |
| Metal Ballot Box | 1.0, 1.1, & 1.2 | N/A |
| ***COTS Hardware*** | | |
| EMS Server – Dell | PowerEdge T710 | N/A |
| EMS Reporting Workstation – Dell | OptiPlex 980 | N/A |
| EMS Reporting Laptop – Dell | E6410 | N/A |
| Motorola QR Code Scanner | DS9208 | N/A |
| Zebra QR Code Scanner | DS457-SR2009 | N/A |
| Delkin USB Flash Drives | 512 MB, 1, 2, 4, & 8 GB | N/A |
| Delkin Compact Flash | 1 GB | N/A |
| DS850 Report Printer | OKI B430dn & B431dn | N/A |
| DS850 Audit Printer | OKI Microline 420 | N/A |
| Avid Headphones | Avid FV 60 | N/A |
| SanDisk CF Card Reader | 018-6305 | N/A |
| Delkin CF Card Reader | 6381 | N/A |

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## 1.2 References

- United States Election Assistance Commission, 2005 Voluntary Voting System Guidelines, Volume I, Version 1.0, "Voting System Performance Guidelines," December 2005
- United States Election Assistance Commission, 2005 Voluntary Voting System Guidelines, Volume II, Version 1.0, "National Certification Testing Guidelines," December 2005
- United States Election Assistance Commission, Testing & Certification Program Manual, Version 2.0, Effective May 31, 2015
- United States Election Assistance Commission, Voting System Test Laboratory Program Manual, Version 2.0, Effective May 31, 2015
- National Voluntary Laboratory Accreditation Program, NIST Handbook 150, 2006 Edition, "Procedures and General Requirements," February 2006
- National Voluntary Laboratory Accreditation Program, NIST Handbook 150-22, 2008 Edition, "Voting System Testing," May 2008
- Public Law 107-252—OCT. 29, 2002, "Help America Vote Act of 2002," (HAVA)
- Test Guidelines Documents: EMI-001A, Test Guidelines for Performing Electromagnetic Interference (EMI) Testing," and EMI-002A, "Test Procedure for Testing and Documentation of Radiated and Conducted Emissions Performed on Commercial Products"
- National Technical Systems (NTS), Corporate Quality Policy Manual, Revision 8, April 22, 2016
- International Standard, ISO/IEC 17025:2005(E), "General requirements for the competence of testing and calibration laboratories", Second edition, 2005-05-15
- American National Standard for Calibration, ANSI/NCSL Z540.3-2006, "Requirements for the Calibration of Measuring and Test Equipment," August 3, 2006
- International Standard, ISO 10012:2003(E), "Measurement management systems—Requirements for measurement processes and measuring equipment," First edition, 2003-04-15
- EAC Requests for Interpretation (RFI) located at: http://www.eac.gov/testing_and_certification/request_for_interpretations1.aspx
- EAC Notices of Clarification (NOC) lactated at: http://www.eac.gov/testing_and_certification/notice_of_clarifications.aspx
- EAC Quality Monitoring Program located at: http://www.eac.gov/testing_and_certification/quality_monitoring_program.aspx
- NTS Test Report No. PR039745-01 Rev B – National Certification Test Report for Certification Testing of the Election Systems & Software 5.2.1.0 Voting System
- ES&S EVS 5.2.1.0 Technical Data Package
- ES&S EVS 5.2.2.0 Technical Data Package

## 1.3 Terms and Abbreviations

Table 1-3 defines all terms and abbreviations applicable to this Test Report.

**Table 1-3 Terms and Abbreviations**

| Term | Abbreviation | Definition |
|---|---|---|
| Anomaly | -- | Any non-repeatable testing event that is not the expected result or interrupts the test operations. |
| Americans with Disabilities Act 1990 | ADA | ADA is a wide-ranging civil rights law that prohibits, under certain circumstances, discrimination based on disability. |
| Configuration Management | CM | Systems engineering process for establishing and maintaining consistency of a product's performance, functional and physical attributes with its requirements, design and operational information throughout its life. |
| Commercial Off-the-Shelf | COTS | Commercial, readily available hardware or software. |
| Deficiency | -- | Any repeatable test result that was not the expected result or violates a requirement of the VVSG. |
| United States Election Assistance Commission | EAC | Commission created per the Help America Vote Act of 2002, assigned the responsibility for setting voting system standards and providing for the voluntary testing and certification of voting systems. |
| ES&S Event Log Service | ELS | ES&S Event Log Service is a Windows Service that runs in the background of any active ES&S Election Management software application to monitor the proper functioning of the Windows Event Viewer. |
| Election Management System | EMS | Within the voting system, the EMS is comprised of five components: ElectionWare, ERM, ES&S Event Log Service, VAT Previewer and ExpressVote Previewer. |
| Election Reporting Manager | ERM | EMS reporting component. |
| Election Systems and Software | ES&S | Identified manufacturer doting the equipment under test as part of this test plan. |
| Engineering Change Order | ECO | -- |
| Equipment Under Test | EUT | Refers to the individual system component or multiple piece of the same component. |
| ES&S Voting System | EVS | Proprietary software owned by ES&S. |
| Functional Configuration Audit | FCA | Verification of system functions and combination of functions cited in the manufacturer’s documentation. |
| Help America Vote Act | HAVA | Act created by United States Congress in 2002. |
| Institute of Electrical and Electronics Engineers | IEEE | -- |
| Intelligent Mark Recognition | IMR | Visible light scanning technology to detect completed ballot targets. |

**Table 1-3 Terms and Abbreviations (Continued)**

| Term | Abbreviation | Definition |
|---|---|---|
| National Institute of Standards and Technology | NIST | Government organization created to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhances economic security and improves our quality of life. |
| Notice of Clarification | NOC | Provides further guidance and explanation on the requirements and procedures of the EAC's Voting System Certification or Voting System Testing Laboratory programs. |
| Notice of Deviation | NOD | A NTS quality controlled document used to identify, access and describe any identified Anomaly or Deficiency witnessed by the VSTL during testing. |
| Physical Configuration Audit | PCA | Review by accredited test laboratory to compare voting system components submitted for certification testing to the manufacturer's technical documentation, and confirmation the documentation meets national certification requirements |
| Personal Computer | PC | Computer component of the voting system. |
| Quality Assurance | QA | Administrative and procedural activities implemented as a way of preventing mistakes or defects |
| Quantity | QTY | Number/Count of items |
| Quick Response Code | QR Code | Two-dimensional barcode |
| Request for Interpretation | RFI | A means by which a registered Manufacturer or Voting System Test Laboratory may seek clarification on a specific test requirement. |
| System Under Test | SUT | Refers to the system as a whole (all components). |
| Technical Data Package | TDP | Manufacturer documentation related to voting system required to be submitted as a precondition of testing. |
| Trusted Build | --- | Final build of source code performed by a trusted source and overseen by the manufacturer which is delivered to the EAC designated repository; also referred to as a "Witness Build". |
| Underwriters Laboratories Inc. | UL | Safety consulting and certification company |
| Uninterruptible Power Supply | UPS | Electrical apparatus providing emergency power when an input power source fails. |
| Voter Assist Terminal | VAT | Electronic ballot marking device component is the ES&S AutoMARK |

## 1.3 Terms and Abbreviations (Continued)

**Table 1-3 Terms and Abbreviations (Continued)**

| Term | Abbreviation | Definition |
|---|---|---|
| National Technical Systems, Inc. | NTS | Identified VSTL hosting the testing of the equipment listed in this test plan; facilities located in Huntsville, Alabama. |
| National Voluntary Laboratory Accreditation Program | NVLAP | Program which provides an unbiased third-party test and evaluation program to accredit laboratories in the respective fields to ISO 17025 standard. |
| NTS Operating Procedure | OP | NTS Test Method or Test Procedure |
| Virtual Review Tool | VRT | Test campaign management software used by the EAC. |
| Voting System Test Laboratory | VSTL | NTS |
| Voluntary Voting System Guidelines | VVSG | EAC Voluntary Voting System Guidelines Version 1.0. |

# 2.0 CERTIFICATION TEST BACKGROUND

NTS Huntsville, an independent testing laboratory, assesses systems and components under harsh environments to include dynamic and climatic extremes and test electronic voting systems. NTS Huntsville holds the following accreditations:

- ISO-9001:2008
- NVLAP Accredited ISO 17025:2005
- EAC Accredited VSTL, NIST 150,150-22
- A2LA Accredited (Certification No.'s 0214.40, 0214.41, and 0214.42)
- FCC Approved Contractor Test Site (Part 15, 18)

## 2.1 Revision History

Table 2-1 describes the version history of the submitted voting system.

**Table 2-1 Revision History**

| System Version | Certification | System | Certification | Certification Number |
|---|---|---|---|---|
| EVS 5.0.0.0 | New System | Original | 05/16/2013 | ESSEVS5000 |
| EVS 5.2.0.0 | Modification | EVS 5.0.0.0 | 07/02/2014 | ESSEVS5200 |
| EVS 5.2.1.0 | Modification | EVS 5.2.0.0 | 12/18/2015 | ESSEVS5210 |
| EVS 5.2.2.0 | Modification | EVS 5.2.1.0 | TBD | ESSEVS5220 |

## 2.2 Scope of Testing

The focus of the test campaign was to verify functionality of EVS 5.2.2.0 submitted by the manufacturer for EAC certification.

This report is valid only for the system identified in Section 2.2.1 Modification Overview. Any changes, revisions, or corrections not listed in this report or made to the system after this evaluation, are required to be submitted to the EAC for assessment.

### 2.2.1 Modification Overview

A description of submitted modifications to the baseline voting system includes changes to address functional upgrades, software fixes, and software updates to enhance usability, in general. This system implemented a new set of NIST-validated COTS cryptographic modules. The ExpressVote introduced an improved external power supply. ExpressVote now enables the display of candidates in either one or two columns, supports activation barcodes from third-party pollbook systems and can be configured to display Open Primary contests sorted by Party.

Within Electionware, the users.xml was updated to version 3.0 for compatibility with Cerberus version 8.0.8. This update also modified the method for SFTP server password creation so that they do not include leading zeros which the server cannot authenticate. Additionally, this release improved the refresh action in the Electionware navigator so that the data appears correctly. One new hardware component, the DS450 mid-range central count tabulator, was submitted for testing. As a result, product-specific labels were changed to “Central Count” across all voting system products. A full description of submitted modifications can be found in Appendix E – Details of Submitted Modifications.

EVS 5.2.2.0 Proprietary and COTS software submitted by the manufacturer for testing are listed in Table 2-2. Proprietary and COTS hardware are listed in Table 2-3.

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### 2.2.2 Test Materials

**Table 2-2 Proprietary and COTS Software**

| Software Component | Software/Firmware Version |
|---|---|
| ***Proprietary Software*** | |
| ElectionWare | 4.7.1.1 |
| Election Reporting Manager (ERM) | 8.12.1.1 |
| Removable Media Service (RMS) | 1.4.5.0 |
| Event Log Service (ELS) | 1.5.5.0 |
| AutoMARK VAT Previewer | 1.8.6.1 |
| ExpressVote Previewer | 1.4.1.2 |
| ***Proprietary Hardening Scripts*** | |
| CreateNewUsers | 3.0.3.0 |
| NoNetwork | 3.0.3.0 |
| PreInstall | 3.0.5.5 |
| PostInstall | 3.0.3.0 |
| ServerShare | 3.0.3.0 |
| ***COTS Software*** | |
| Adobe Acrobat Standard | 11 |
| Cerberus FTP | 8.0.6 (64-bit) |
| Microsoft Server 2008 | R2 w/ SP1 |
| Microsoft Windows 7 Professional | SP1 (64-bit) |
| WSUS Microsoft Windows Offline Update Utility | 10.7.4 |
| Micro Focus RM/COBOL Runtime | 12.06 |
| Symantec Endpoint Protection | 12.1.6 (64-bit) |
| Symantec Endpoint Protection Intelligent Updater | 20160829-002-v5i64.exe |

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### 2.2.2 Test Materials (Continued)

**Table 2-3 Proprietary and COTS Hardware**

| *Classification* | *System Component* | | *Hardware Version* | *Firmware Version* |
|---|---|---|---|---|
| ***Proprietary Hardware*** | | | | |
| ADA Compliant Ballot Marking Device | AutoMARK A100 | | 1.0 | 1.8.6.1 |
| | AutoMARK A200 (SBC 2.0) | | 1.1 | 1.8.6.1 |
| | AutoMARK A200 (SBC 2.5) | | | |
| | AutoMARK A300 (SBC 2.0) | | 1.3 | 1.8.6.1 |
| | AutoMARK A300 (SBC 2.5) | | | |
| Universal Voting System | ExpressVote | ExpressVote Carrying Case | 1.0 | 1.4.1.2 |
| | | ExpressVote Rolling Kiosk | | |
| | | ExpressVote Voting Booth | | |
| Precinct Tabulator | DS200 Precinct Count Tabulator | | 1.2.1, 1.2.3 and 1.3 | 2.12.2.0 |
| | DS200 Carrying Case | | N/A | N/A |
| | DS200 Plastic Ballot Box | | 1.2 and 1.3 | N/A |
| | DS200 Metal Ballot Box | | 1.0, 1.1 and 1.2 | N/A |
| Central Count | DS450 Central Count Tabulator | | 1.0 | 3.0.0.0 |
| | DS450 Central Count Tabulator (networked) | | | |
| | DS850 Central Count Tabulator | | 1.0 | 2.10.2.0 |
| | DS850 Central Count Tabulator (networked) | | | |
| ***COTS Hardware*** | | | | |
| Election Management System | EMS Server | | Dell PowerEdge T710 | N/A |
| | Client Workstation | | Dell OptiPlex 980 or 5040 | N/A |
| | Client Workstation | | Dell Latitude E6410 | N/A |
| | Standalone Workstation | | Dell Latitude E6410 | N/A |
| | Network Switch | | N/A | N/A |
| Storage Media | USB Flash Drive | | Delkin: 512 MB, 1 GB, 2GB, 4 GB and 8GB | N/A |
| | Validation USB Flash Drive | | Delkin: 16GB | N/A |
| | Compact Flash Card | | Delkin, Sandisk: 512 MB, 1 GB and 2GB | N/A |
| | SanDisk CF Card Reader | | 018-6305 | N/A |
| | Delkin CF Card Reader | | 6381 | N/A |
| Headphones | Avid | | 86002 | N/A |
| Scanner (Integrated) | Zebra QR Code Scanner (Integrated w/ Rolling Kiosk) | | DS457-SR20009 | N/A |

### 2.2.2 Test Materials (Continued)

**Table 2-3 Proprietary and COTS Hardware (Continued)**

| COTS Hardware | | | |
|---|---|---|---|
| Scanner (External) | (Previously Motorola) Symbol QR Code Scanner (External) | DS9208 | N/A |
| Report Printer | DS450 Report Printer | Dell S2810dn | N/A |
| | DS850 Report Printer | OKI B431dn and B431d | N/A |
| Audit Printer | DS450 Audit Printer | OKI Microline 420 | N/A |
| | DS850 Audit Printer | OKI Microline 420 | N/A |
| Power Management | DS450 UPS | APC Back-UPS Pro 1500 | N/A |
| | DS450 Surge Protector | Tripp Lite Spike Cube | N/A |
| | DS850 UPS | APC Back-UPS RS 1500 or APC Back-UPS Pro 1500 | N/A |

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### 2.2.3 Test Block Diagram

EVS 5.2.2.0 is an integrated suite of election management products, as depicted in Figure 2-1.

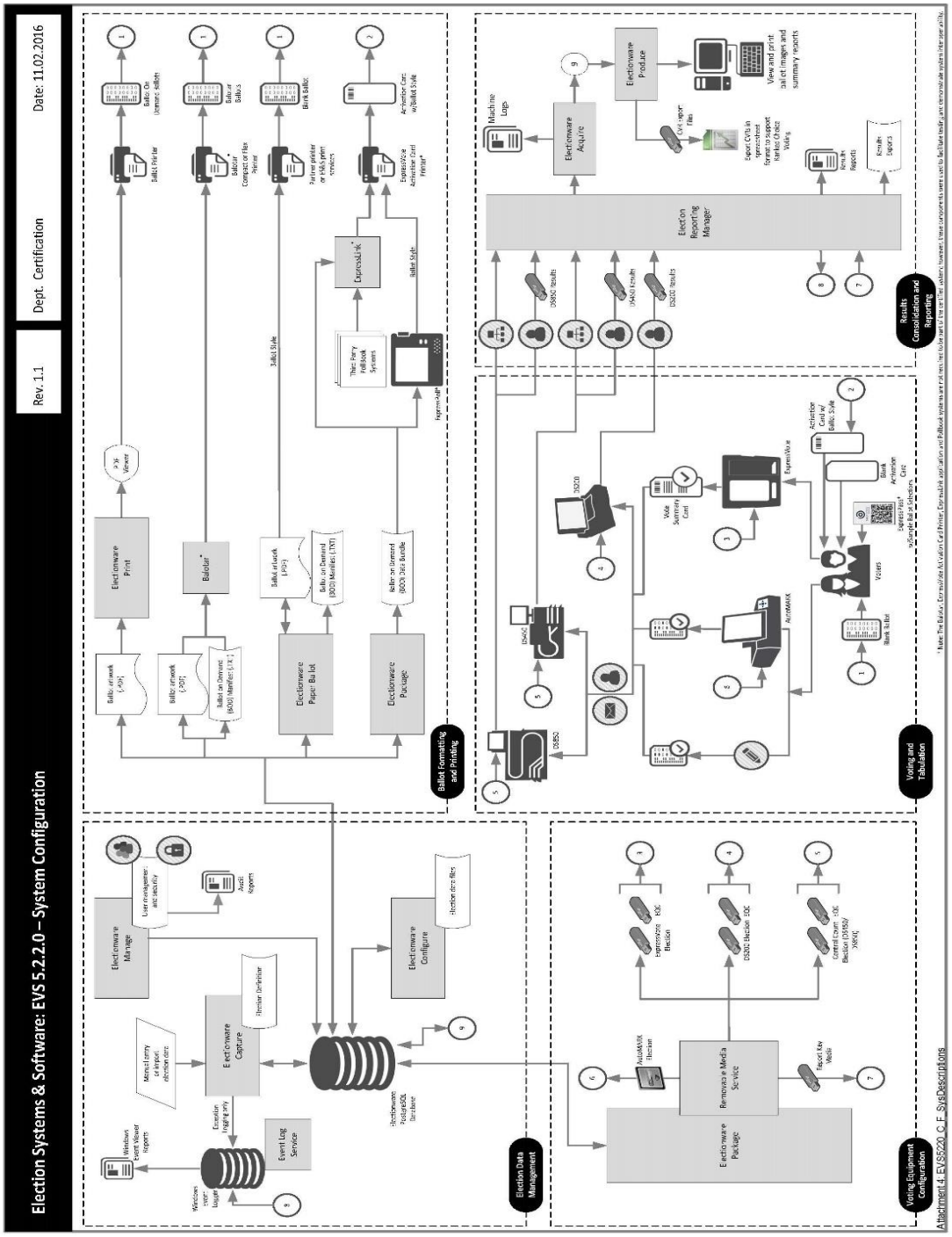


**Figure 2-1. Visual System Overview**

### 2.2.3 Test Block Diagram (continued)

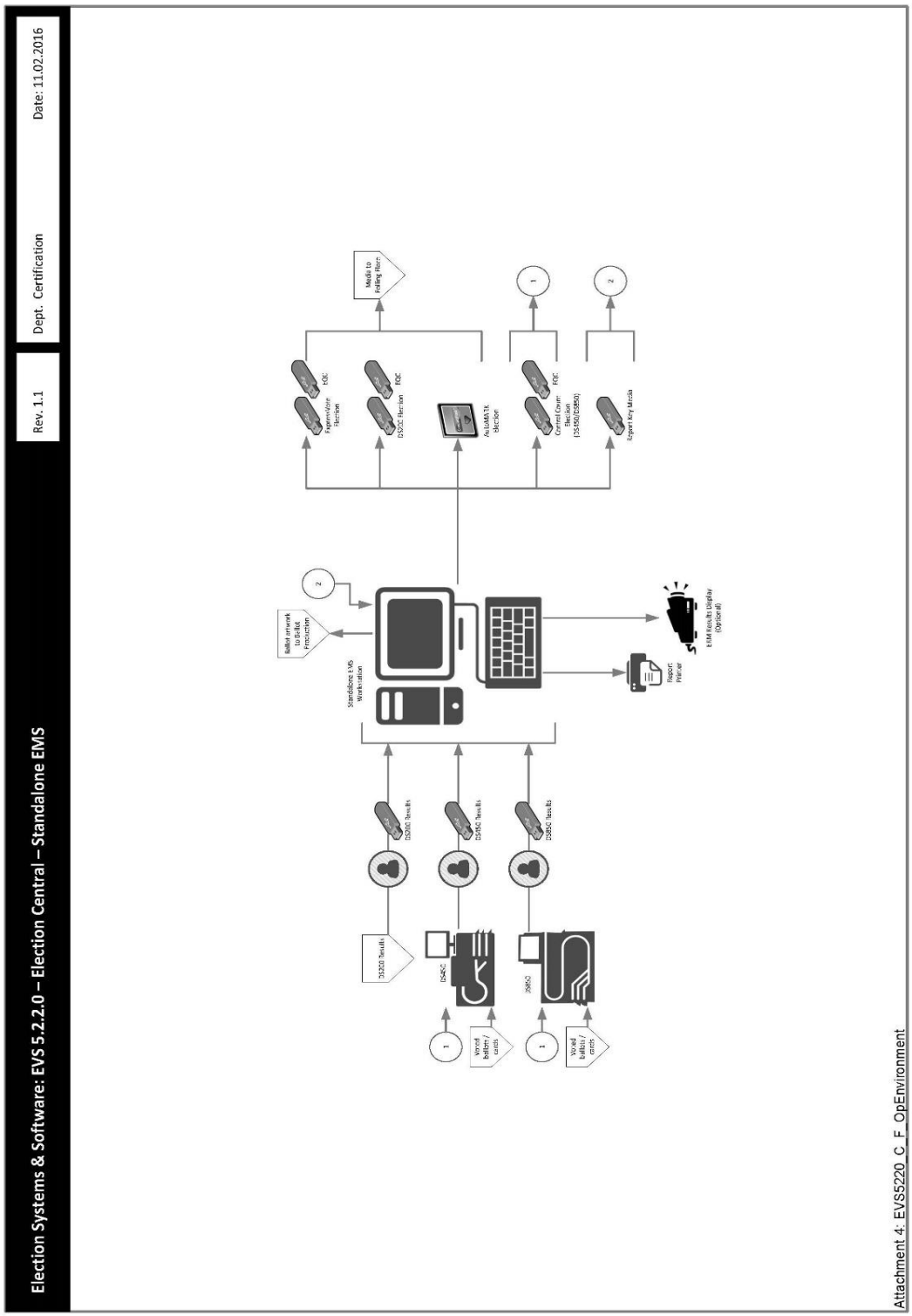


**Figure 2-2. Standalone EMS Workstation**

### 2.2.4 Supported Languages

The submitted voting system supports English, Spanish, Chinese (Cantonese) , Korean, Japanese, and Bengali languages.

### 2.2.5 RFIs

Table 2-4 lists the applicable RFIs the EAC has released as of the date of the report as it pertains to this test campaign.

**Table 2-4 Applicable RFIs**

| RFI ID | Name |
|---|---|
| 2007-01 | EAC Decision on Accessible Design |
| 2007-02 | EAC Decision on Variable Names |
| 2007-03 | EAC Decision on Summative Usability Testing |
| 2007-04 | EAC Decision on Presentation of Alternative Language |
| 2007-05 | EAC Decision on Testing Focus and Applicability |
| 2007-06 | EAC Decision on Recording and Reporting Undervotes |
| 2008-01 | EAC Decision on Temperature and Power Variation |
| 2008-02 | EAC Decision on Battery Backup for Optical Scan Voting Machines |
| 2008-03 | EAC Decision on OS Configuration |
| 2008-04 | EAC Decision on Supported Languages |
| 2008-05 | EAC Decision on Durability |
| 2008-06 | EAC Decision on Battery Backup for Central Count |
| 2008-07 | EAC Decision on “0” Count to Start Election |
| 2008-08 | EAC Decision on Automatic Bar Code Readers |
| 2008-09 | EAC Decision on Safety Testing |
| 2008-10 | EAC Decision on Electrical Fast Transient |
| 2008-12 | EAC Decision on Ballot Marking Device/Scope of Testing |
| 2009-01 | EAC Decision on VVPAT Accessibility |
| 2009-02 | EAC Decision on Alternate Languages |
| 2009-03 | EAC Decision on Battery Back Up for Central Count Systems |
| 2009-04 | EAC Decision on Audit Log Events |
| 2009-05 | EAC Decision on T-Coil Requirements |
| 2009-06 | EAC Decision on Temperature and Power Variation |
| 2010-01 | EAC Decision on Voltage Levels and ESD Test |
| 2010-02 | EAC Decision on Coding Conventions |
| 2010-03 | EAC Decision on Database Coding Conventions |
| 2010-04 | EAC Decision on Functional Requirements with Respect to Security |
| 2010-05 | EAC Decision on Testing of Modifications to a Certified System |
| 2010-06 | EAC Decision on DRE Accessibility Requirements and Other Accessible Voting Stations |
| 2010-07 | EAC Decision on Module Length |
| 2010-08 | EAC Decision on Calling Sequence |
| 2012-01 | EAC Decision on Ballot Handling - Multifeed |
| 2012-03 | EAC Decision on Configuration Management of COTS Products |
| 2012-04 | EAC Decision on Software Setup Validation |
| 2013-02 | EAC Decision on Audio Presentation Volume Levels |
| 2013-03 | EAC Decision on Timestamps |
| 2013-04 | EAC Decision on Usability Testing |

### 2.2.6 NOCs

Table 2-5 lists the applicable NOCs the EAC has released as of the date of the report as it pertains to this test campaign.

**Table 2-5 Applicable NOCs**

| NOC ID | Name |
|---|---|
| 2007-001 | Timely Submission of Certification Application |
| 2007-003 | State Testing Done in Conjunction with Federal Testing within the EAC Program |
| 2007-005 | Voting System Test Laboratory Responsibilities in the Management and Oversight of Third Party Testing |
| 2008-001 | Validity of Prior Non-core Hardware Environmental and EMC Testing |
| 2008-003 | EAC Conformance Testing Requirements |
| 2009-001 | Requirements for Test Lab Development and Submission of Test Plans |
| 2009-002 | Laboratory Independence Requirement |
| 2009-004 | Development and Submission of Test Reports |
| 2009-005 | Development and Submission of Test Plans for Modifications to EAC Certified Systems |
| 2013-01 | Discrepancy Listing in Test Report |
| 2013-02 | Detailed Description of Changes for Modifications |

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# 3.0 TEST FINDINGS

EVS 5.2.2.0, as identified in Section 2.2.1 of this report, was subjected to the tests as summarized in this section.

## 3.1 Deficiencies and Resolutions

NTS Huntsville defines a deficiency as any repeatable test result or event that is counter to the expected result or violates the specified requirements. Deficiencies are tracked using the NTS NOD process and are inserted into the EAC's Virtual Review Tool (VRT) for disposition and resolution.

Deficiencies are summarized in the summary findings of the respective test section of the test report and their resolutions are presented in their entirety in Appendix B – Deficiency Report.

## 3.2 Summary of Findings

Description of the testing performed and findings are summarized in this section.

### 3.2.1 Hardware Testing

Hardware requirements and environmental condition categories applicable to the design and operation of voting systems are detailed in Table 3-1. For applicable hardware versions, reference Table 2-3.

**Table 3-1 Voting Systems Hardware Requirements and Environmental Conditions**

| Hardware Requirements | Environmental Conditions (Applicable to Design and Operation) |
|---|---|
| Shelter | Natural environment: Including temperature, humidity, and atmospheric pressure |
| Space | Induced environment: Including proper and improper operation and handling of the system and its components during the election processes |
| Furnishings and fixtures | |
| Supplied energy | Transportation and storage |
| Environmental control | Electromagnetic signal environment: Including exposure to and generation of radio frequency energy |
| External telecommunications services | |

Procedural summaries and summary test results within this report verify that the Equipment Under Test (EUT) submitted for certification testing met the hardware requirements of the 2005 VVSG.

Receipt inspection and evaluation of voting system documentation was conducted prior to the start of the testing sequence. Operational tests/checks to verify system performance and function were performed throughout testing. Environmental tests were conducted to ensure that climatic and physical occurrences would not affect system performance or functionality. Electromagnetic Compatibility (EMC) tests were conducted to ensure continued system operation and reliability in the presence of abnormal electrical conditions.

#### 3.2.1.1 Electrical Supply

Electrical Supply testing was performed in accordance with Volume I Section 4.1.2.4 of the 2005 VVSG including considerations for RFI 2008-02 and RFI 2008-06.

The test was performed to ensure that the EUT would continue to operate a minimum of two hours when power is lost. It was required that the voting system perform a successful shutdown without loss or degradation of the voting and audit data and allow voters to resume voting once the voting system had reverted back to primary power.

The Electrical Supply test was conducted on one DS450 and the ExpressVote in the Rolling Kiosk configuration. The EUT was then operated as designed for fifteen minutes prior to the removal of the AC input power. Once AC power was interrupted, the EUT was continuously operated for a minimum period of two hours. At the conclusion of two hours, the EUT was powered down. The AC power was restored and the EUT was operated for an additional fifteen minutes.

**Summary Findings**

The ExpressVote in the Rolling Kiosk configuration and DS450 met the requirements of the Electrical Supply Test without any degradation to structure and/or performance capability.

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### 3.2.1.2 Electrical Power Disturbance

Electrical Power Disturbance testing was performed in accordance with Volume I Section 4.1.2.5 and Volume II Section 4.8 of the 2005 VVSG. This testing was performed to ensure that the EUT is able to withstand electrical power line disturbances (dips/surges) without disruption of normal operation or loss of data.

The Electrical Power Disturbance test was conducted on one DS450 and the ExpressVote in one of each of its configurations: Rolling Kiosk, Voting Booth, and Tabletop. For each test, the EUT was subjected to the voltage dips and surges detailed in Table 3-2. The power input line was subjected to voltage dips ranging from 30% to more than 95% for periods of 10 milliseconds up to 5 seconds and surges of ±15% for up to 8 hours. Table 3-2 lists power line disturbance dip and surge detail.

**Table 3-2 Power Line Disturbances**

| Type | Percentage | Duration |
|---|---|---|
| Dip | 30% | 10 ms |
| Dip | 60% | 100 ms and 1 sec |
| Dip | >95% | 5 sec |
| Surge | ± 15% | 8 Hours<br>(4 Each Polarity) |

**Summary Findings**

The ExpressVote in the Rolling Kiosk, Voting Booth and Tabletop configurations and DS450 met the requirements of the Electrical Power Disturbance test without any degradation to structure and/or performance capability.

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### 3.2.1.3 Electrical Fast Transient

Electrical Fast Transient (EFT) testing was performed in accordance with Volume I Section 4.1.2.6 and Volume II Section 4.8 of the 2005 VVSG and RFI 2008-10. This testing was performed to ensure that, should an electrical fast transient event occur on a power line, the EUT would continue to operate without disruption of normal operation or loss of data.

The EFT test was conducted on one DS450 and the ExpressVote in one of each of its configurations: Rolling Kiosk, Voting Booth, and Tabletop. For each test, electrical fast transients of ± 2 kV were applied to external AC power lines and the pulse characteristics are listed in Table 3-3.

**Table 3-3 EFT Pulse Characteristics**

| Pulse Description | Requirements | Units |
|---|---|---|
| Pulse Amplitude | +/-2.0 | kV peak to peak |
| Pulse Rise Time | 5 ±30% | nanoseconds |
| Pulse Width | 50 ±30% | nanoseconds |
| Pulse Repetition Rate | 100 | kHz |
| Pulse Shape | Double exponential | -- |
| Burst Duration | 15 | milliseconds |
| Burst Period | 300 | milliseconds |
| Test Duration | 60 | seconds |

**Summary Findings**

The ExpressVote in the Rolling Kiosk configuration successfully met the requirements of the Electrical Fast Transient Test without any degradation to function and/or performance capability.

Three deficiencies were discovered during the Electrical Fast Transient Test. One deficiency was found on each of the ExpressVote Voting Booth and Tabletop configurations. One deficiency was found with the DS450. The deficiencies were reported to and resolved by ES&S. The tests were then performed again and the EUT passed successfully. The details of the deficiencies and subsequent resolutions are described in Appendix B – Deficiency Report, NOD 2, 3 and 6 of this test report.

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### 3.2.1.4 Lightning Surge

Lightning Surge testing was performed in accordance with Volume I Section 4.1.2.7 and Volume II Section 4.8 of the 2005 VVSG. This testing was performed to ensure that, should a surge event occur on a power line due to a lightning strike, the EUT would continue to operate without disruption of normal operation or loss of data.

The Lightning Surge test was conducted on one DS450 and the ExpressVote in one of each of its configurations: Rolling Kiosk, Voting Booth, and Tabletop. For each test, the AC power input line was subjected to test levels, as indicated in Table 3-4.

**Table 3-4 Surge Characteristics**

| Pulse Description | Test Levels | | | Units |
|---|---|---|---|---|
| | A | B | C | |
| Pulse Amplitude | ±0.5 | ±1.0 | ±2.0 | kV |
| Pulse Rise Time | 1.2 ±30% | | | microseconds |
| Pulse Width | 50 ±20% | | | microseconds |
| Pulse Repetition Rate | 1 | | | Per minute |
| Phase Synchronization (Points) | AC Line at zero-crossing of (0°), (90°), (180°) and (270°). | | | Degrees |
| Total Pulse to be Injected | ± 5 | | | At each point |

**Summary Findings**

The ExpressVote in the Rolling Kiosk, Voting Booth and Tabletop configurations and DS450 met the requirements of the Lightning Surge Test without any degradation to structure and/or performance capability.

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### 3.2.1.5 Electrostatic Disruption

Electrostatic Disruption (ESD) testing was performed in accordance with Volume I Section 4.1.2.8 and Volume II Section 4.8 of the 2005 VVSG and RFI 2010-01. This testing was performed to ensure that should an electrostatic discharge event occur during equipment setup and/or ballot casting, the EUT would continue to operate normally. Momentary interruption is allowed so long as normal operation is resumed without human intervention or loss of data.

The Electrostatic Disruption test was conducted on one DS450 and the ExpressVote in one of each of its configurations: Rolling Kiosk, Voting Booth, and Tabletop. For each test, the EUT was subjected to electrostatic discharges, contact, and air as shown in Table 3-5.

**Table 3-5 Electrostatic Discharge Test Levels**

| Characteristic | Resistance | | | | Capacitance | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pulse Wave Shape (RC Network) | 330 | | | | 150 | | | | | | Ω / pf |
| Discharge Types | Air Gap | | | | Direct Contact | | | Indirect Coupling | | | |
| Test Levels | A | B | C | D | A | B | C | A | B | C | |
| | ±2 | ±4 | ±8 | ±15 | ±2 | ±4 | ±8 | ±2 | ±4 | ±8 | kV |
| Number of Discharges | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 10 Discharges each polarity |

The EUT was raised approximately 10 cm from the ground using isolated stand-offs. Signal/control test cables were positioned approximately 5 cm (2 in.) above the ground. Discharges were performed at areas typical of those that might be touched during normal operation, including the touch screen, user buttons, cables, connectors, and other points of contact used by the voter or poll worker.

**Summary Findings**

The Rolling Kiosk and Voting Booth configurations of the ExpressVote and the DS450 met the requirements of the Electrostatic Disruption Test without any degradation to function and/or performance capability.

A deficiency was discovered during the Electrostatic Disruption Test with an ExpressVote in the Tabletop configuration. The deficiency was reported to and resolved by ES&S. The test was then performed again and the EUT passed successfully. The details of the deficiency and subsequent resolution are described in Appendix B – Deficiency Report, NOD 5 of this test report.

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### 3.2.1.6 Electromagnetic Emissions: Radiated and Conducted

Electromagnetic Emissions testing was performed in accordance with Volume I Section 4.1.2.9 and Volume II Section 4.8 of the 2005 VVSG. The Electromagnetic Emissions test was conducted on one DS450 and the ExpressVote in one of each of its configurations: Rolling Kiosk, Voting Booth, and Tabletop. This testing was performed to ensure that emissions emanating from the EUT do not exceed the limits of 47 CFR Part 15, Subpart B, Class B Limits. Testing was performed at the NTS Longmont Open Air Test Site 2 (OATS-2) located in Longmont, CO. The OATS-2 is fully described in reports provided to the Federal Communication Commission (FCC) (FCC Reference 98597) and the site complies with the requirements of ANSI C63.4-2003.

For each test, the EUT was scanned during normal operation to determine the levels of radiated emissions the EUT emitted. Table 3-6 list the conducted and radiated emission limits of FCC Part 15, Class B emissions.

**Table 3-6 Conducted and Radiated Emissions Requirements**

| Conducted Emissions | | | Radiated Emissions | |
|---|---|---|---|---|
| Frequency Range (MHz) | Limits (dBµV) | | Frequency Range (MHz) | 3 Meter Test Limit (dBµV) |
| | Quasi-peak[1] | Average | | |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 | 30 to 88 | 40.0 |
| 0.50 to 5.0 | 56 | 46 | 88 to 216 | 43.5 |
| 5.0 to 30.0 | 60 | 50 | 216 to 960 | 46.0 |
| | | | 960 to 1000 | 54.0 |

**Summary Findings**

The Rolling Kiosk and Tabletop configurations of the ExpressVote met the requirements of the Conducted Emissions Test without any degradation to structure and/or performance capability.

A deficiency was discovered during the Conducted Emissions portion of the Electromagnetic Emissions Test with an ExpressVote in the Voting Booth configuration. A deficiency was discovered during the Radiated Emissions portion of the Electromagnetic Emissions Test with the DS450. The deficiencies

[1]Agencies governing the electromagnetic interference (EMI) from commercial products require quasi-peak detection to be used. Even if the emission from a device is over a test limit when measured with peak detection, the device is considered to pass if the quasi-peak level is below the test limit.

Quasi-peak detection is a form of detection where the result of a quasi-peak measurement depends on the repetition rate of the signal. Signals can be classified into two general categories based upon their repetition rate: narrowband or broadband. A narrowband signal is a signal that can be resolved by the spectrum analyzer. An example of a narrowband signal is a continuous wave (CW) signal. A CW signal is one signal at a fixed frequency. A broadband signal is a signal that cannot be resolved by the spectrum analyzer. An example of a broadband signal is a pulse signal. Peak, quasi-peak, and average detection will yield the same amplitude level for a narrowband signal. A broadband signal will yield a quasi-peak level lower than the peak level. The weighting (accounted for through specific charge and discharge time constants in the quasi-peak detector circuit), is a function of the repetition frequency of the signal being measured. The lower the repetition frequency, the lower the quasi-peak level.

were reported to and resolved by ES&S. The tests were then performed again and the EUT passed successfully. The details of the deficiencies and subsequent resolutions are described in Appendix B – Deficiency Report, NODs 1 and 4 of this test report.

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### 3.2.1.7 Electromagnetic Susceptibility

Electromagnetic Susceptibility testing was performed in accordance with Volume I Section 4.1.2.10 and Volume II Section 4.8 of the 2005 VVSG. This testing was performed to ensure that the EUT was able to withstand a moderate level of ambient electromagnetic fields without disruption of normal operation or loss of data.

The Electromagnetic Susceptibility test was conducted on one DS450 and the ExpressVote in one of each of its configurations: Rolling Kiosk, Voting Booth, and Tabletop. For each test, the EUT was subjected to ambient electromagnetic fields at 10 V/m with an 80% modulated 1 kHz sine wave over a range of 80 MHz to 1000 MHz, as shown in Table 3-7. Testing was conducted utilizing both horizontally and vertically polarized waves. The limits were measured with a maximum scan rate of 1% of the fundamental frequency and the dwell duration was three seconds.

**Table 3-7 Electromagnetic Susceptibility Test Levels**

| EN61000-4-3 Radiated Immunity | | | | |
|---|---|---|---|---|
| **Frequency (Hz)** | **Polarity** | | **Dwell Duration** | **Angle (Degree)** |
| 80 MHz – 1 GHz (80% modulated 1 kHz sine wave) | Vertical | Horizontal | 3 seconds | 0 |
| | | | | 90 |
| | | | | 180 |
| | | | | 270 |

**Summary Findings**

The ExpressVote in the Rolling Kiosk, Voting Booth and Tabletop configurations and DS450 met the requirements of the Electromagnetic Susceptibility Test without any degradation to structure and/or performance capability.

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### 3.2.1.8 Conducted RF Immunity

Conducted RF Immunity testing was performed in accordance with Volume I Section 4.1.2.11.a and Volume II Section 4.8 of the 2005 VVSG. This testing was performed to ensure that the EUT was able to withstand conducted RF energy onto its power lines without disruption of normal operation or loss of data.

The Conducted RF Immunity test was conducted on one DS450 and the ExpressVote in one of each of its configurations: Rolling Kiosk, Voting Booth, and Tabletop. For each test, the EUT was subjected to conducted RF energy of 10 $V_{RMS}$ applied to its power lines over a frequency range of 150 kHz to 80 MHz, 1% step, 80% AM, 1 kHz sine, 3 seconds dwell. Conducted RF Immunity was performed with 120 VAC, 60 Hz.

**Summary Findings**

The ExpressVote Rolling Kiosk, Voting Booth and Tabletop configurations and the DS450 met the requirements of the Conducted RF Immunity Test without any degradation to function and/or performance capability.

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### 3.2.1.9 Magnetic Fields Immunity

Magnetic Fields Immunity testing was performed in accordance with Volume I Section 4.1.2.12 and Volume II Section 4.8 of the 2005 VVSG. This testing was performed to ensure that the EUT was able to withstand AC Magnetic Fields of 30 A/m, at 60 Hz, without disruption of normal operation or loss of data.

The Magnetic Fields Immunity testing was conducted on one DS450 and the ExpressVote in one of each of its configurations: Rolling Kiosk, Voting Booth, and Tabletop. For each test, the EUT was subjected to an AC Magnetic Field of 30 A/m, at 60 Hz, in the three axis of the EUT.

**Summary Findings**

The ExpressVote in the Rolling Kiosk, Voting Booth and Tabletop configurations and DS450 met the requirements of the Magnetic Fields Immunity Test without any degradation to structure and/or performance capability.

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### 3.2.1.10 Temperature Power Variation

Temperature and Power Variation testing was performed in accordance with Volume I Section 4.1.2.13 and Volume II Section 4.7.1 of the 2005 VVSG, including considerations for RFI 2008-01 and RFI 2009-06. This test is similar to the procedure of MIL-STD-810D, Method 502.2 and 501.2.

The purpose of this test was to simulate stresses associated with operating the EUT at varying temperatures and voltages. EUT were placed inside a walk-in environmental test chamber and connected to a variable voltage power source. Operational functions were continuously exercised during the test by the casting of ballots.

The Temperature Power Variation test was conducted on three DS450 units. For each test, the EUT was utilized for a period of 64 hours, as described in EAC RFI 2008-01 to achieve the cumulative duration of at least 163 hours. The first 48 hours were conducted in the environmental test chamber where hardware was subjected to temperatures inside the chamber ranging from 50°F to 95°F and voltage varied from 105 VAC to 129 VAC. The remaining 16 hours were operated in ambient conditions.

**Summary Findings**

The DS450 met the requirements of the Temperature Power Variation Test without any degradation to function and/or performance capability.

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### 3.2.1.11 Data Accuracy

The Data Accuracy Test was conducted on one DS450. The Data Accuracy test was performed in accordance with the requirements of Section 4.7.1.1 of the Volume II of the VVSG. Per the 4.7.1.1, data accuracy is defined in terms of ballot position error rate. This rate applies to the voting functions and supporting equipment that capture, record, store, consolidate, and report the selections (or absence thereof) made by the voter for each ballot position. To meet the requirements of this test, the voting system must be subjected to the casting of a large number of ballots to verify vote recording accuracy, i.e. at least 1,549,703 ballot positions correctly read and recorded. Table 3-8 details the ballots cast and their total ballot positions.

**Table 3-8 Accuracy Test**

| Ballot/Session Type | No. of Ballots | No. Ballot Positions | No. of EUT | No. Times Voted per EUT | Total ballot Positions |
|---|---|---|---|---|---|
| 11 inch | 300 | 392 | 1 | 4 | 470,400 |
| 14 inch | 300 | 512 | 1 | 4 | 614,400 |
| 17 inch | 300 | 640 | 1 | 4 | 768,000 |
| 19 inch | 300 | 720 | 1 | 4 | 864,000 |
| | | | Total Ballot Positions | | 2,716,800 |

**Summary Findings**

The DS450 met the Accuracy requirements of the 2005 VVSG.

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### 3.2.2 System Level Testing

System-level testing examines the ability of proprietary software, hardware, and peripherals in addition to the COTS software, hardware, and peripherals to operate as a complete system. NTS Huntsville utilizes test cases designed to ensure that integrated components function as specified by the manufacturer's documentation and meet the requirements of the VVSG.

#### 3.2.2.1 Physical Configuration Audit (PCA)

A Physical Configuration Audit (PCA) of the DS450 was performed on five units as part of the testing activities in accordance with Volume II, Section 6.6 of the EAC 2005 VVSG. The PCA compares the voting system components submitted for certification with the vendor's technical documentation and confirms that the documentation submitted meets the requirements of the guidelines. The PCA included the following activities:

- Establishing a configuration baseline of software and hardware to be tested; confirm whether manufacturer's documentation is sufficient for the user to install, validate, operate, and maintain the voting system;
- Verifying software conforms to the manufacturer's specifications; inspect all records of manufacturer's release control system; if changes have been made to the baseline version, verify manufacturer's engineering and test data are for the software version submitted for certification;
- Reviewing drawings, specifications, technical data, and test data associated with system hardware, and to establish system baseline;
- Reviewing manufacturer's documents of user acceptance test procedures and data against system's functional specifications; resolve any discrepancy or inadequacy in manufacturer's plan or data prior to beginning system integration functional and performance tests;
- Subsequent changes to baseline software configuration made during testing, as well as system hardware changes that may produce a change in software operation are subject to re-examination.

**Summary Findings**

A PCA was performed to baseline the system's hardware and software components that were used during the test campaign. The EUT met the requirements of the PCA.

On DS450 (s/n# DS4516053020), an observation was made during PCA with the SATA and CF Reader cables as compared to the established baseline. There was epoxy resin present on the SATA cable leading to the CF Card Reader and no epoxy resin present on the SATA cable leading to the HDD. Upon examination of the acceptable test results from this EUT, the resin was determined to be without any negative impact to the system. The EUT met the requirements of the PCA, Temperature and Power Variation, and System Integration tests.

### 3.2.2.2 Functional Configuration Audit (FCA)

A Functional Configuration Audit of the EVS 5.2.2.0 was performed in accordance with Volume II, Section 6.7 of the EAC 2005 VVSG. The purpose of the FCA was to verify that the submitted modifications listed in section 2.2.1 performed as documented in the manufacturer supplied technical documentation and to validate that the modifications met the requirements of the EAC 2005 VVSG.

**Summary Findings**

The FCA testing demonstrated that the submitted FCA modifications performed as documented by the manufacturer and met the requirements 2005 VVSG Volume II Section 6.7.

The following deficiency was discovered in FCA and corrected by the manufacturer in a subsequent trusted build:

- In the Electionware Design Paper Ballot module, selecting Help Menu and Help Contents did not display anything.

Another deficiency was discovered during the FCA which the manufacturer addressed by making changes to the TDP.

- In the Electionware Design Module's Paper Ballot function, the Mouse-Over Tool Tip function does not display over the Help icon in the Toolbar. Manufacturer noted this in the TDP.

A functional fix will be submitted in a later version. The details of the deficiency are described in Appendix B - Deficiency Report, NOD 7.

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### 3.2.2.3 Volume and Stress Test

The DS450 was subjected to a Volume and Stress Test in accordance with the requirements of Section 6.2.3 of Volume II of the VVSG. The purpose of the test was to investigate the system's response to conditions that tend to overload the system's capacity to process, store, and report data. The Volume Test parameters were dependent upon the maximum number of active voting positions and the maximum number of ballot styles that the TDP claims the system can support. Testing was performed by exercising election definitions developed specifically to test for volume and stress (Election Definitions: Elections A, B, C, D, E and F contained in Table 3-9 of this document). All totals were verified within ERM against the expected results matrix to verify accuracy and the system's ability to handle the TDP stated limits.

**Table 3-9 Volume and Stress**

| | |
|---|---|
| Voting Pattern | **Election A**:<br>**Limits Tested:**<br>▪ Maximum Precincts in an election (9900)<br>▪ Maximum Ballot Styles in an Election (9900)<br><br>**Election B:**<br>**Limits Tested:**<br>▪ Maximum Precinct elements in a tabulator (65,500)<br>▪ Maximum Precinct elements in ERM (500,000).<br><br>**Election C:**<br>**Limits Tested:**<br>▪ Maximum candidate counters/election (21,000)<br>▪ Maximum candidates/contest (175)<br>▪ Maximum "Vote for"/contest (98)<br>▪ Maximum number of parties in a General Election (75)<br><br>**Election D:**<br>**Limits Tested:**<br>▪ Maximum number of parties in a Primary Election (20 including nonpartisan party)<br><br>**Election E:**<br>**Limits Tested:**<br>▪ Maximum district types (20)<br>▪ Maximum district names (40)<br><br>**Election F:**<br>**Limits Tested:**<br>▪ Maximum candidate\counters allowed per precinct (1,000)<br>▪ Maximum contests allowed per ballot style (200) |

**Summary Findings**

At the conclusion of the Volume and Stress Test, the DS450 unit successfully exercised the stated system limits. One DS450 was used for the duration of Volume and Stress performance testing. Nine-thousand, nine-hundred ballots were processed without issue upon the completion of the test.

#### 3.2.2.4 System Integration Test

System Integration Testing was performed to test the complete voting system, including all proprietary and COTS software, hardware, telecommunication and peripherals configured as described in the manufacturer-submitted TDP for the EVS 5.2.2.0. To perform the System Integration Testing, NTS developed specific procedures and test cases designed to test the system as a whole. These procedures demonstrated compliance to Sections 2, 3, 4, 5, and 6 of Volume I of the VVSG.

In order to verify compatibility with the system in scope, ballots were presented across the system and all results verified against the expected results matrix. The created test deck for system integration included hand marked ballots and ADA generated ballots.

The six election definitions exercised during the System Integration Testing are listed below:

- Gen-01 is a basic election held in four precincts, one of which is a split precinct, containing nineteen contests compiled into four ballot styles. Five of the contests are in all four ballot styles. The other fourteen contests are split between at least two of the precincts with a maximum of four different contests spread across the four precincts. This election was designed to functionally test the handling of multiple ballot styles, support for at least two languages, support for common voting variations, and audio support for at least two languages.
- Gen-02 is a basic election held in three precincts. This election contains fifteen contests compiled into three ballot styles. Ten of the contests are in all three ballot styles with the other five split across the three precincts. This election was designed to functionally test the handling of multiple ballot styles, support for ballot rotation, support for two languages, support for complex voting variations, and audio support for multiple languages.
- The Gen-03 is a basic election held in two precincts. This election contains eight contests compiled into two ballot styles. Four of the contests are in both ballot styles. The other four contests are split between the two precincts. This election was designed to functionally test the handling of multiple ballot styles, support for at least three languages including a character-based language, support for common voting variations, and audio support for at least three languages and an ADA binary input device.
- Prim-01 is a closed primary election in two precincts (one precinct is a split), containing thirty contests compiled into five ballot styles. Each ballot style contains six contests. This election was designed to functionally test an open primary with multiple ballot styles, support for two languages, and support for common voting variations.
- The Prim-02 is a basic election held in two precincts. This election contains thirteen contests compiled into three ballot styles. One contest is in all three ballot styles and all other contests are independent. This election was designed to functionally test the handling of multiple ballot styles, support for Primary presidential delegation nominations, support for two languages, support for complex voting variations, and audio support for multiple languages.
- The Prim-03 is a basic election held in two precincts. This election contains ten contests and is compiled into two ballot styles. Two of the contests are in both ballot styles. The other eight contests are split between the two party ballots. This election was designed to functionally test the handling of multiple ballot styles, support for at least three languages including an Ideographic based language, support for common voting variations, and audio support for at least three languages and an ADA binary input device.

### 3.2.2.4 System Integration Test (Continued)

In order to verify network/telecommunications, ballots were tabulated on the DS450 and results were sent directly to the EMS via a closed network. Both the Export Results and Export Files were performed and the data was verified as available to both ERM and Acquire as identified in the manufacturer-submitted TDP.

**Summary Findings**

Through System Integration Testing, it was demonstrated that the system performed as documented with all components performing their intended functions.

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### 3.2.2.5 Security Testing

The EVS 5.2.2.0 physical security tests was limited to the DS450. The physical security test was performed to verify that no tampering could be done to the EUT undetected.

EMS components were subjected to a Security Content Automation Protocol (SCAP), which consists of security review and vulnerability assessment. The review was conducted to verify that the operating environment (Windows Server 2008 R2 and Windows 7) was configured to match industry recognized security protocol and that no vulnerabilities were present. The ES&S TDP was utilized during this portion of testing to ensure the proper configuration of the operating environment. Testing was performed by a qualified contractor under the VSTL supervision onsite in the lab.

**Summary Findings**

One deficiency was determined in the physical security testing with the rear panel security label and seal of the DS450 EUT. The rear cover could be opened and the CF Card removed without breaking the security label or seal. ES&S updated the TDP to require security labels across all four of the rear edges of the panel to ensure the EUT could not be tampered with and go undetected.

One deficiency was discovered during the software penetration security testing. It was determined that the Windows patches were not current. ES&S corrected this and upon retest, the EMS components were found to be in compliance with the security requirements of the EAC 2005 VVSG.

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### 3.2.2.6 Technical Data Package Review

The EVS 5.2.2.0 TDP was reviewed to the 2005 VVSG. This review was performed as part of the testing activities. The TDP review only included the revised and new documents submitted for this testing campaign. The documents were reviewed for accuracy, completeness, and compliance to the 2005 VVSG.

The review results were recorded in a worksheet that provided the pass/fail compliance to each applicable VVSG requirement. The discovered deficiencies were reported to the manufacturer and internally tracked by NTS Huntsville as test exceptions until verified that the applicable documents had been corrected. The manufacturer corrected nonconformance observations and resubmitted the associated documents for review. This process continued until the TDP complied with the applicable TDP standards in the EAC 2005 VVSG.

**Summary Findings**

There were 65 TDP deficiencies discovered during this test campaign. A summary of the TDP issues encountered is provided below:

- Some descriptive information included was inconsistent with descriptions in other TDP documents.
- Some documents included functionality that was not supported in the voting system.
- Some of the individual user guides included information which conflicted with the actual information encountered when verified during the testing process.
- Some firmware versioning was inconsistent throughout the TDP, however all firmware versions have been updated to agree across TDP documentation. Furthermore, firmware versioning was found to be consistent with ESSSYS_CM_P_1000_CMProgram.pdf, Section 1.

All TDP deficiencies were resolved by ES&S prior to completion of testing.

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### 3.2.3 Source Code Review

Prior to submitting EVS 5.2.2.0, ES&S submitted EVS 5.0.0.0, 5.2.0.0, 5.2.1.0 for source code review. This source code review was performed in accordance with the 2005 VVSG and EAC Testing and Certification Program Manual, Version 1.0. All code modified or added subsequent to the EVS 5.0.0.0, 5.2.0.0, 5.2.1.0 source code reviews was reviewed as part of the 5.2.2.0 test campaign.

**Summary Findings**

A total of 149,489 lines of code were reviewed for the EVS 5.2.2.0 test campaign. There were 568 source code deficiencies discovered during testing. All identified source code deficiencies were resolved prior to the conclusion of the source code review process. The deficiencies are summarized is in Table 3-10.

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### 3.2.3 Source Code Review (Continued)

**Table 3-10 Source Code Review Deficiencies**

| System Name | Deficiency (Type) | Deficiency (QTY) |
|---|---|---|
| DS200 | Illegal Name | 1 |
| | Header Purpose | 1 |
| | Header Inputs or Outputs | 1 |
| | Object/Datatype/Variable Comments | 11 |
| | Header Return | 1 |
| | Units Called | 1 |
| DS450 | Code Deviates From Design | 4 |
| | Header File References | 87 |
| | Header Globals Missing | 5 |
| | Header Inputs or Outputs | 39 |
| | Header or File Name Missing | 11 |
| | Header Purpose | 24 |
| | Header Return | 43 |
| | Header Revision History | 50 |
| | Illegal Name | 2 |
| | In-Line Comments | 8 |
| | Line Too Long | 5 |
| | Multible Embeded Statements | 2 |
| | Multiple Statements On Line | 1 |
| | No Parameter Validation | 5 |
| | Non Enumerated Constant | 15 |
| | Non Initialized Variables | 10 |
| | Non Permissible Constructs | 3 |
| | Non Uniform Comment | 3 |
| | Object/Datatype/Variable Comments | 30 |
| | Over 6 Levels Of Indenting | 2 |
| | Pointer Values Not Protected | 119 |
| | Unit Size Too Large | 4 |
| | Units Called | 62 |
| Electionware | Header Revision History | 1 |
| | Line Too Long | 4 |
| | Non Enumerated Constant | 7 |
| RSACrypto | Header Inputs or Outputs | 1 |
| | Units Called | 1 |
| RSACryptoDLL | Header Revision History | 2 |
| | Header Inputs or Outputs | 1 |
| | Units Called | 1 |
| TOTAL | | 568 |

# 4.0 RECOMMENDATION FOR CERTIFICATION

NTS Huntsville performed conformance testing on the Election Systems & Software Voting System 5.2.2.0 to the EAC 2005 VVSG. Based on test findings, NTS Huntsville recommends the EAC grant the EVS 5.2.2.0 certification to the EAC 2005 VVSG. This report is valid only for the equipment identified in Section 2.2.2 in this report. Due to the varying requirements of individual jurisdictions, it is recommended, by the EAC 2005 VVSG, that local jurisdictions perform acceptance tests on all systems prior to implementation within their jurisdiction.

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