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

EAC CERTIFICATION NUMBER: ESSEVS5220

Issue Date: 02/23/2017

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REVISIONS

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TABLE OF CONTENTS

PAGE NO.

1.0 INTRODUCTION 7
1.1 Description of EAC Certified System Being Modified 7
1.1.1 Baseline Certified System 7
1.2 References 9
1.3 Terms and Abbreviations 10

2.0 CERTIFICATION TEST BACKGROUND 12
2.1 Revision History 12
2.2 Scope of Testing 13
2.2.1 Modification Overview 13
2.2.2 Test Materials 14
2.2.3 Test Block Diagram 17
2.2.4 Supported Languages 19
2.2.5 RFIs 19
2.2.6 NOCs 20

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TABLE OF CONTENTS

PAGE NO.

3.0 TEST FINDINGS 21
3.1 Deficiencies and Resolutions 21
3.2 Summary of Findings 21
3.2.1 Hardware Testing 21
3.2.1.1 Electrical Supply 22
3.2.1.2 Electrical Power Disturbance 23
3.2.1.3 Electrical Fast Transient 24
3.2.1.4 Lightning Surge 25
3.2.1.5 Electrostatic Disruption 26
3.2.1.6 Electromagnetic Emissions: Radiated and Conducted 27
3.2.1.7 Electromagnetic Susceptibility 29
3.2.1.8 Conducted RF Immunity 30
3.2.1.9 Magnetic Fields Immunity 31
3.2.1.10 Temperature Power Variation 32
3.2.1.11 Data Accuracy 33
3.2.2 System Level Testing 34
3.2.2.1 Physical Configuration Audit (PCA) 34
3.2.2.2 Functional Configuration Audit (FCA) 35
3.2.2.3 Volume and Stress Test 36
3.2.2.4 System Integration Test 37
3.2.2.5 Security Testing 39
3.2.2.6 Technical Data Package Review 40
3.2.3 Source Code Review 41

4.0 RECOMMENDATION FOR CERTIFICATION 43

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TABLE OF CONTENTS

APPENDIX A. ADDITIONAL FINDINGS 44

APPENDIX B. DEFICIENCY REPORT 46

APPENDIX C. AS-RUN TEST PLAN 60

APPENDIX D. TECHNICAL DATA PACKAGE 118

APPENDIX E. DETAILS OF SUBMITTED MODIFICATIONS 123

APPENDIX F. PRODUCT SAFETY REPORT 126

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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.

1.3 Terms and Abbreviations (Continued)

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.

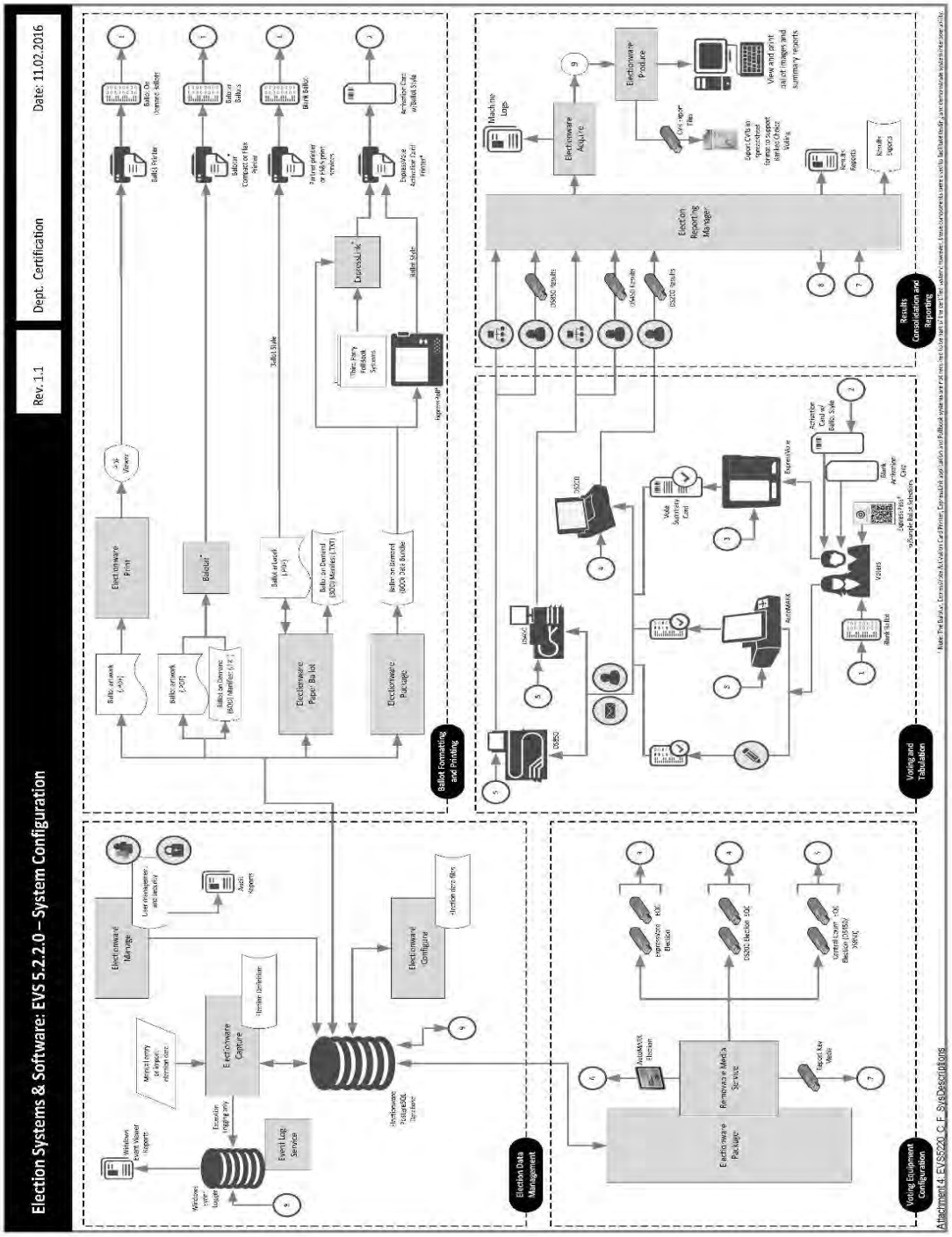

Figure 2-1. Visual System Overview

2.2.3 Test Block Diagram (continued)

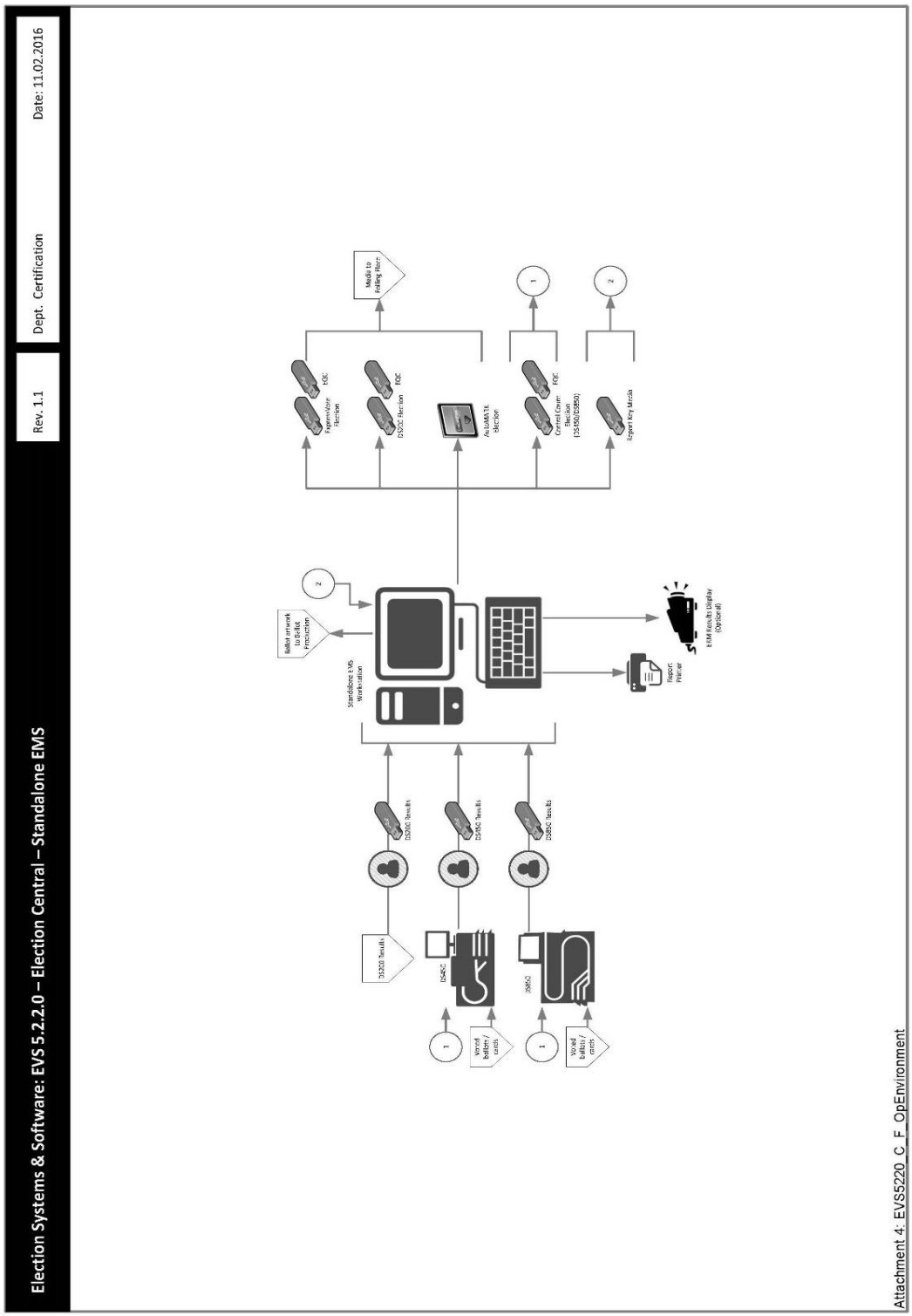

Figure 2-2. Standalone EMS Workstation

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

A1. ADDITIONAL FINDINGS REPORT

No additional findings were discovered during this campaign.

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APPENDIX B. DEFICIENCY REPORT

B.1 DEFICIENCY REPORT

Table B-1 describes the functional deficiency and resolution discovered during the EVS 5.2.2.0 test campaign.

Table B-1. Functional Deficiency Report

NTS NOD ID	EAC VRT ID[2]	Test/Requirement	Deficiency Summary	Resolutions
NOD 1	NA VRT DOWN	Electromagnetic Emissions: (Conducted Emissions) Vol. I Sec. 4.1.2.9	The ExpressVote, exceeded the Conducted Emissions Test Limit between 100 kHz & 200 kHz.	*ES&S determined that the power supply was faulty and replaced it with a new power supply.
NOD 2	NA VRT DOWN	Electrical Fast Transient Vol. I Sec 4.1.2.6	The ExpressVote QR Scanner's operation was interrupted on Line 1 at 2,000 volts and did not recover.	*The EUT that passed Electromagnetic Emissions (Conducted Emissions) in NOD 1 failed EFT. ES&S determined that the QR Code Scanner was faulty and replaced it with a new QR Code Scanner.
NOD 3	NA VRT DOWN	Electrical Fast Transient Vol. I Sec. 4.1.2.6	The ExpressVote QR Scanner's operation was interrupted on Line 1 at 2,000 volts and did not recover.	*ES&S determined that this second EUT had a faulty power supply cord, so it replaced the power supply cord with the one from the EUT that passed EFT after NOD 2.
NOD 4	NA VRT DOWN	Electromagnetic Emissions: (Radiated Emissions) Vol. I Sec. 4.1.2.9	The DS450 exceeded the Radiated Emissions Test Limit.	*ES&S replaced the monitor, replaced the power supply, and added 2 ferrites: 1 ferrite was added to the fan cable and 1 ferrite was added to the lid switch cable.
NOD 5	NA VRT DOWN	Electrostatic Disruption Vol. I Sec. 4.1.2.8	The ExpressVote QR Scanner's operation was interrupted at -15kV, air and did not recover.	*The EUT from NOD 3 failed ESD. ES&S determined that the QR Code Scanner was faulty, so it was replaced with the QR Code Scanner from the EUT that passed after NOD 2. Also, ES&S added a ferrite to the power supply cord.
NOD 6	NA VRT DOWN	Electrical Fast Transient Vol. I Sec 4.1.2.6	The DS450 Log Printer operation was interrupted on Line 1 at 2,000 volts and did not recover.	*The EUT that was used to pass NOD 4, already equipped with 2 ferrites, failed EFT, so ES&S added a 3rd ferrite to the EUT, on the Log Printer's USB Cable.
NOD 7	NA VRT DOWN	Functional Configuration Audit Vol. I Sec 9.7.2	The Electionware Help Icon does not display the icon function name as described in the TDP.	ES&S detailed this deviation in the TDP, Electionware Administrator Guide Ver. 1.4.

*Note: All replacement parts were of the same manufacturer and model number as the removed part.

[2] The EAC VRT ID numbers may not be sequential. The deficiency tracking system (VRT) that is utilized by the EAC creates unique ID numbers based on overall entries within the database and not within individual projects.

B.1 DEFICIENCY REPORT

The final ExpressVote configuration includes the addition of a ferrite on the scanner USB cable.

The final DS450 configuration includes the addition of three ferrites: one ferrite on the fan cable, one ferrite on the lid switch cable and one ferrite on the Log Printer's USB Cable.

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NTS

WE ENGINEER SUCCESS
SVILLE OPERATIONS

NOTICE OF DEVIATION		DATE:	1/10/2017
)TICE NO: 1	P.O. NUMBER: ES&S-MSA-TA072	CONTRACT NO:	CON044644
JSTOMER: ES&S		NTS JOB NO:	PR051024
)TIFICATION MADE TO: Sue McKay		NOTIFICATION DATE:	10/26/2016
)TIFICATION MADE BY: Lisa Johnson		VIA:	Verbal/Email

ATEGORY:	☑ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT	DATE OF DEVIATION:	10/26/2016
RT NAME:	ExpressVote 1.0 with stand/booth configuration	PART NO:	EV0115371483
ST:	Electromagnetic Emissions (Conducted Emissions)	I.D. NO:	HW 1.0
ECIFICATION:	2005 VVSG Vol. I (FCC Part 15, Class B)	PARA. NO:	§ 4.1.2.9

QUIREMENTS:

.2.9 Electromagnetic Emissions:

e scanning and counting equipment for paper-based systems, and all DRE equipment, shall comply with es and Regulations of the Federal Communications Commission, Part 15; Class B requirements for b iated and conducted emissions.

SCRIPTION OF DEVIATION:

EUT exceeded the Conducted Emissions Test Limit between 100 kHz to 200 kHz by as much as 8 dBµV.

SPOSITION • COMMENTS • RECOMMENDATIONS:

customer was notified of the failure.

FETY RELATED: ☐ YES ☑ NO POTENTIAL 10 CFR PART 21: ☐ YES ☐ NO ☑ N/A

PONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: ☑ CUSTOMER ☐ NTS HUNTSVILLE

PAR REQUIRED: ☐ YES ☑ NO CPAR NUMBER:

ERIFICATION:

LIENT TEST WITNESS:	Sue McKay (IF APPLICABLE)	PROJECT ENGINEER:	Charles R Morgan
OV. QAR:	N/A (IF APPLICABLE)	DEPT. MANAGER:	[signature] 01/10/
TS QUALITY REPRESENTATIVE:	Lisa C. Johnson	DATE:	01/10/2017

OR NTS QA USE	Tracking Code:	3

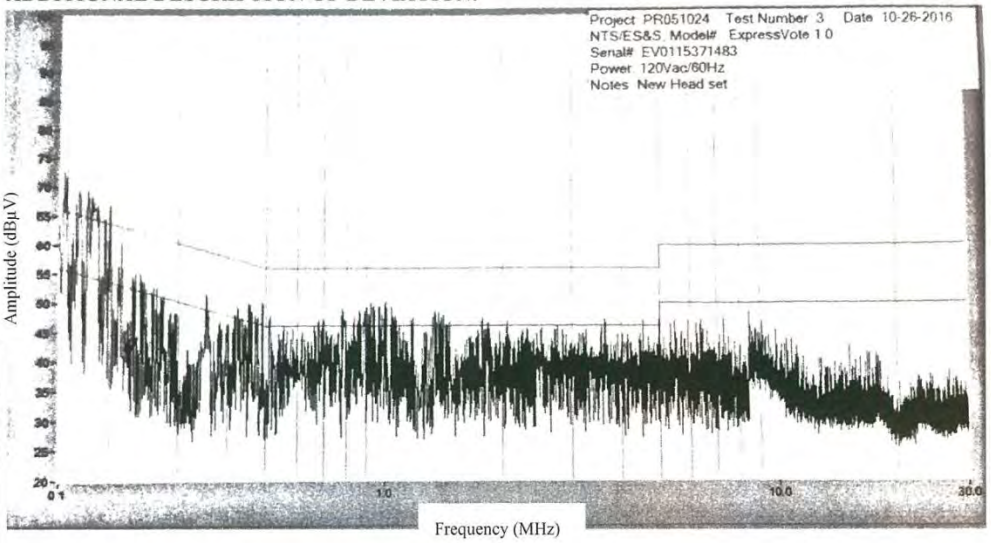
Employee Error	2. Test Equipment Problem	3. Customer Item Problem	4. Weather	5. Power Failure	6. Equipment Limitations	7

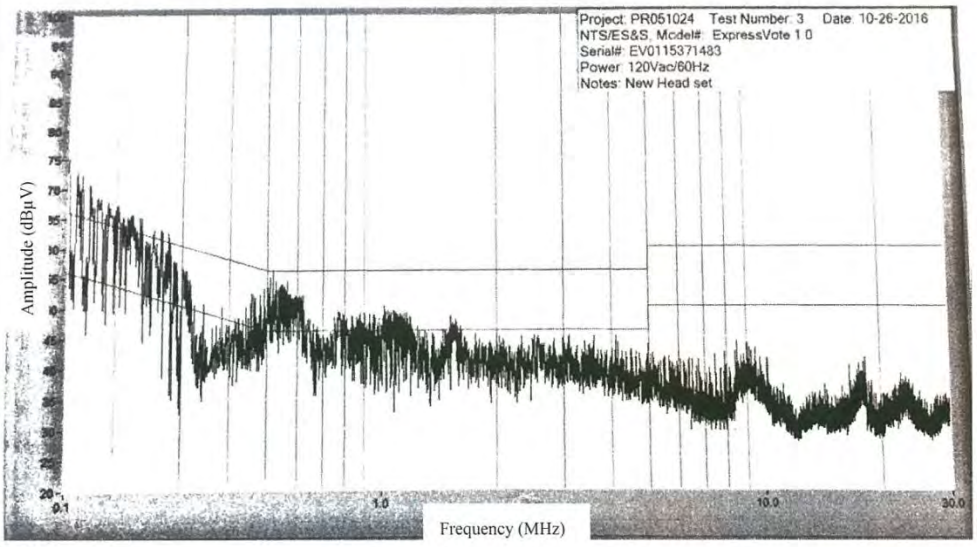
NTS
WE ENGINEER SUCCESS
HUNTSVILLE OPERATIONS

NOTICE OF DEVIATION (CONTINUED)

NOTICE NO: 1 **JOB NO:** PR051024 **DATE:** 10/26/2016

ADDITIONAL DESCRIPTION OF DEVIATION:





QP	0.175	50.7	-1.2	16	65.5	Line 1	*	-0.24
AV	0.155	29.8	-1.3	16	44.4	Neutral	11.4	*
QP	0.155	55.9	-1.3	16	70.6	Neutral	*	-4.71

NTS
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NOTICE OF DEVIATION

DATE: 1/10/2017

NOTICE NO: 2 **P.O. NUMBER:** ES&S-MSA-TA072 **CONTRACT NO:** CON044644

CUSTOMER: ES&S **NTS JOB NO:** PR051024

NOTIFICATION MADE TO: Sue McKay **NOTIFICATION DATE:** 10/31/2016

NOTIFICATION MADE BY: Lisa Johnson **VIA:** Verbal/Email

CATEGORY: ☑ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT **DATE OF DEVIATION:** 10/31/2016

PART NAME: ExpressVote 1.0 with stand/booth configuration **PART NO:** EV0115371483

TEST: Electrical Fast Transient (EFT) **I.D. NO:** H.W. 1.0

SPECIFICATION: 2005 VVSG Vol. 1 **PARA. NO:** 4.1.2.6

REQUIREMENTS:

4.1.2.6 Electrical Fast Transient:

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand, without disruption of normal operation or loss of data, electrical fast transients of:
a. + 2 kV and - 2 kV on External Power lines (both AC and DC)
b. + 1 kV and - 1 kV on Input/Output lines (signal, data, and control lines) longer than 3 meters
c. Repetition Rate for all transient pulses will be 100 kHz

DESCRIPTION OF DEVIATION:

The QR Scanner's operation was interrupted on Line 1 at 2000 volts and did not recover.

DISPOSITION • COMMENTS • RECOMMENDATIONS:

The customer was notified of the failure.

SAFETY RELATED: ☐ YES ☑ NO POTENTIAL 10 CFR PART 21: ☐ YES ☐ NO ☑ N/A

RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: ☑ CUSTOMER ☐ NTS HUNTSVILLE

CPAR REQUIRED: ☐ YES ☑ NO CPAR NUMBER:

VERIFICATION:

CLIENT TEST WITNESS: Sue McKay (IF APPLICABLE) **PROJECT ENGINEER:** Charles R Montgomery 1/10/17

GOV. QAR: N/A (IF APPLICABLE) **DEPT. MANAGER:** Lyn McCoy 01/10/2017

NTS QUALITY REPRESENTATIVE: Lisa C Johnson **DATE:** 01/10/2017

FOR NTS QA USE **Tracking Code:** 3

1. Employee Error	2. Test Equipment Problem	3. Customer Item Problem	4. Weather	5. Power Failure	6. Equipment Limitations	7. Other

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HUNTSVILLE OPERATIONS

NOTICE OF DEVIATION

DATE: 1/10/2017

NOTICE NO: 3 **P.O. NUMBER:** ES&S-MSA-TA072 **CONTRACT NO:** CON044644

CUSTOMER: ES&S **NTS JOB NO:** PR051024

NOTIFICATION MADE TO: Sue McKay **NOTIFICATION DATE:** 11/2/2016

NOTIFICATION MADE BY: Lisa Johnson **VIA:** Verbal/Email

CATEGORY:

DATE OF DEVIATION: 11/2/2016

PART NAME: ExpressVote 1.0 Tabletop **PART NO:** EV0115371779

TEST: Electrical Fast Transient (EFT) **I.D. NO:** H.W. 1.0

SPECIFICATION: 2005 VVSG Vol. 1 **PARA. NO:** 4.1.2.6

REQUIREMENTS:

4.1.2.6 Electrical Fast Transient:

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand, without disruption of normal operation or loss of data, electrical fast transients of:
a. + 2 kV and - 2 kV on External Power lines (both AC and DC)
b. + 1 kV and - 1 kV on Input/Output lines (signal, data, and control lines) longer than 3 meters
c. Repetition Rate for all transient pulses will be 100 kHz

DESCRIPTION OF DEVIATION:

The QR Scanner's operation was interrupted on Line 1 at 2000 volts and did not recover.

DISPOSITION • COMMENTS • RECOMMENDATIONS:

The customer was notified of the failure.

SAFETY RELATED: POTENTIAL 10 CFR PART 21:

ESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21:

CPAR REQUIRED: CPAR NUMBER:

VERIFICATION:

CLIENT TEST WITNESS: Sue McKay (IF APPLICABLE) **PROJECT ENGINEER:** Charlie R Montgomery 1/10/17

GOV. QAR: N/A (IF APPLICABLE) **DEPT. MANAGER:** 01/10/2017

NTS QUALITY REPRESENTATIVE: Lisa C. Johnson **DATE:** 01/10/2017

FOR NTS QA USE **Tracking Code:** 3

1. Employee Error	2. Test Equipment Problem	3. Customer Item Problem	4. Weather	5. Power Failure	6. Equipment Limitations	7. Other

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HUNTSVILLE OPERATIONS

NOTICE OF DEVIATION

DATE: 1/10/2017

NOTICE NO: 4 P.O. NUMBER: ES&S-MSA-TA072 CONTRACT NO: CON044644

CUSTOMER: ES&S NTS JOB NO: PR051024

NOTIFICATION MADE TO: Sue McKay NOTIFICATION DATE: 10/31/2016

NOTIFICATION MADE BY: Lisa Johnson VIA: Verbal/Email

CATEGORY: ☑ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT DATE OF DEVIATION: 10/31/2016

PART NAME: DS450 Central Count Scanner PART NO: DS4516053017

TEST: Electromagnetic Emissions (Radiated Emissions) I.D. NO: H.W. 1.0

SPECIFICATION: 2005 VVSG Vol. 1 PARA. NO: 4.1.2.9

REQUIREMENTS:

4.1.2.9 Electromagnetic Emissions:

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall comply with the Rules and Regulations of the Federal Communications Commission, Part 15; Class B requirements for both radiated and conducted emissions.

DESCRIPTION OF DEVIATION:

The EUT exceeded the Radiated Emissions test limit.

DISPOSITION • COMMENTS • RECOMMENDATIONS:

The customer was notified of the failure.

SAFETY RELATED: ☐ YES ☑ NO POTENTIAL 10 CFR PART 21: ☐ YES ☐ NO ☑ N/A

RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: ☐ CUSTOMER ☐ NTS HUNTSVILLE

CPAR REQUIRED: ☐ YES ☑ NO CPAR NUMBER:

VERIFICATION:

CLIENT TEST WITNESS: Sue McKay (IF APPLICABLE) PROJECT ENGINEER: Charles R Mundy 1/10/17

GOV. QAR: N/A (IF APPLICABLE) DEPT. MANAGER: Lyn A Clift 01/10/2017

NTS QUALITY REPRESENTATIVE: Lisa C. Johnson DATE: 01|10|2017

FOR NTS QA USE Tracking Code: 3

1. Employee Error	2. Test Equipment Problem	3. Customer Item Problem	4. Weather	5. Power Failure	6. Equipment Limitations	7. Other

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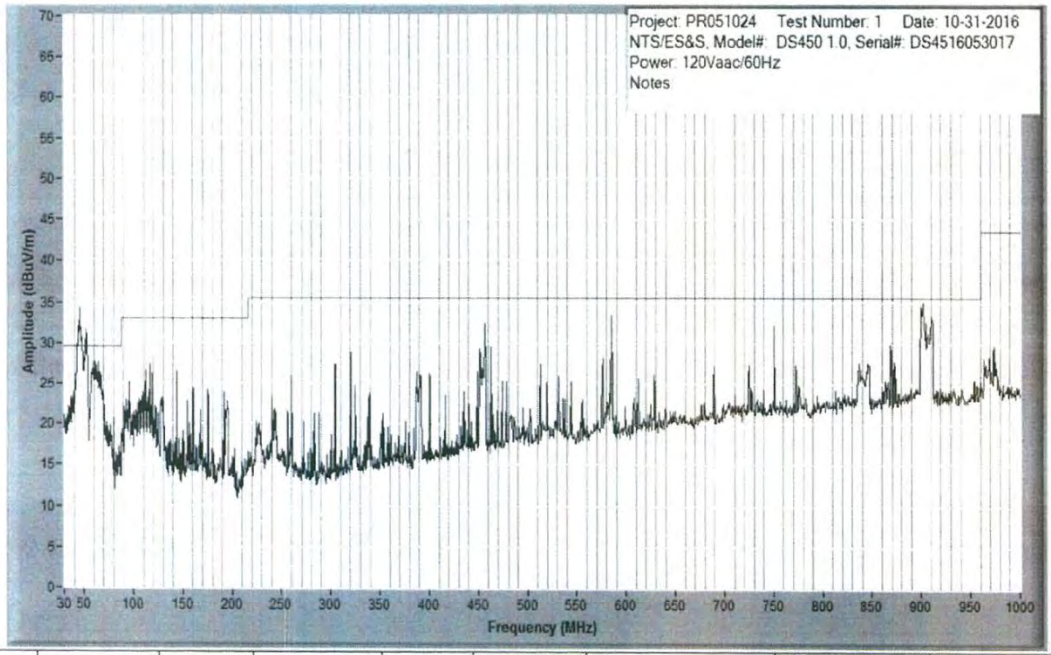
NOTICE OF DEVIATION (CONTINUED)

NOTICE NO: 4 **JOB NO:** PR051024 **DATE:** 10/31/2016



Type	Frequency (MHz)	Level (dBuV)	Transducer (dB/m)	Gain / Loss (dB)	Final (dBuV/m)	Azm(deg)/Pol/Hgt(m)	Margin: FCC Class B QP (dB)	Margin: FCC Class B AV (dB)
QP	46.131	50.6	9.5	-29.9	30.2	340/V-Pole/1.00	-0.71	-
QP	52.708	50.9	7.3	-30.0	28.1	288/V-Pole/1.00	1.41	-

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NOTICE OF DEVIATION

DATE: 1/10/2017

NOTICE NO: 5 **P.O. NUMBER:** ES&S-MSA-TA072 **CONTRACT NO:** CON044644

CUSTOMER: ES&S **NTS JOB NO:** PR051024

NOTIFICATION MADE TO: Sue McKay **NOTIFICATION DATE:** 11/4/2016

NOTIFICATION MADE BY: Lisa Johnson **VIA:** Verbal/Email

CATEGORY: ☑ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT **DATE OF DEVIATION:** 10/26/2016

PART NAME: ExpressVote 1.0 Tabletop **PART NO:** EV0115371779

TEST: Electrostatic Disruption (ESD) **I.D. NO:** HW 1.0

SPECIFICATION: 2005 VVSG Vol. I (FCC Part 15, Class B) **PARA. NO:** § 4.1.2.9

REQUIREMENTS:
4.1.2.8 Electrostatic Disruption

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withstand ±15 kV air discharge and ±8 kV contact discharge without damage or loss of data. The equipment may reset or have momentary interruption so long as normal operation is resumed without human intervention or loss of data. Loss of data means votes that have been completed and confirmed to the voter.

DESCRIPTION OF DEVIATION:

The QR Scanner's operation was interrupted at -15kV, air and did not recover.

DISPOSITION • COMMENTS • RECOMMENDATIONS:

The customer was notified of the failure. Run #1 failed 11/4/2016 and Run #2 11/7/2016.

SAFETY RELATED: ☐ YES ☑ NO POTENTIAL 10 CFR PART 21: ☐ YES ☐ NO ☑ N/A

RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: ☑ CUSTOMER ☐ NTS HUNTSVILLE

CPAR REQUIRED: ☐ YES ☑ NO CPAR NUMBER:

VERIFICATION:

CLIENT TEST WITNESS: Sue McKay (IF APPLICABLE) **PROJECT ENGINEER:** Charles R Mauffray 1/10/17

GOV. QAR: N/A (IF APPLICABLE) **DEPT. MANAGER:** Lyn J Clay 01/10/2017

NTS QUALITY REPRESENTATIVE: Lisa C. Johnson **DATE:** 01/10/2017

FOR NTS QA USE **Tracking Code:** 3

1. Employee Error	2. Test Equipment Problem	3. Customer Item Problem	4. Weather	5. Power Failure	6. Equipment Limitations	7. Other

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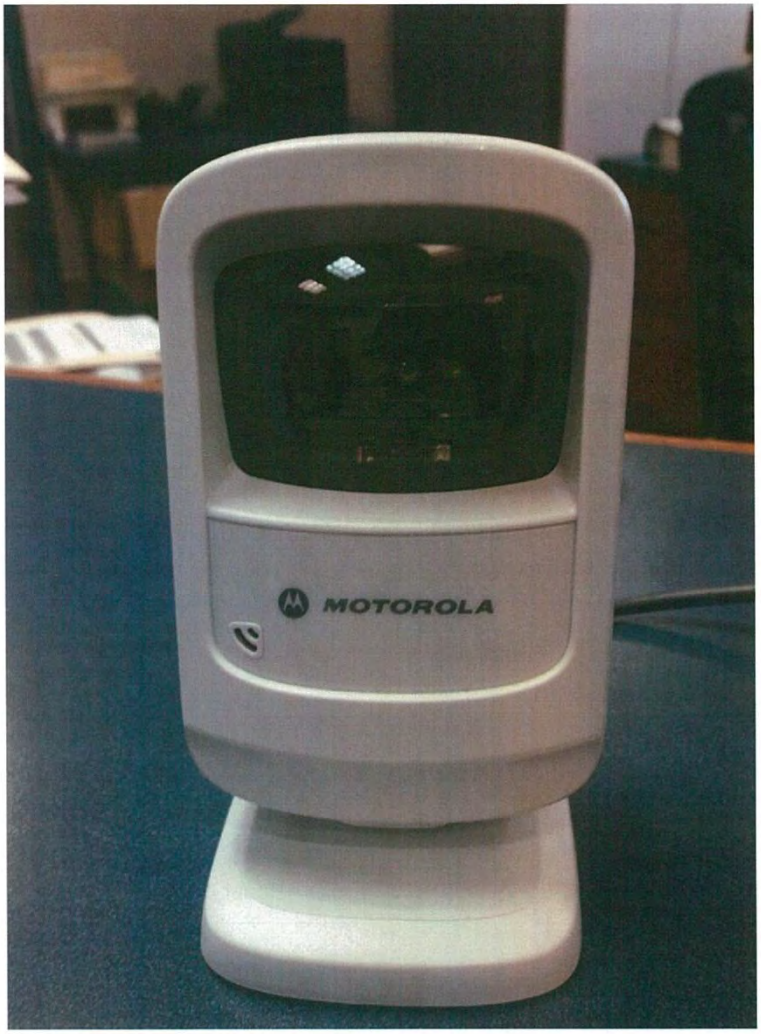
NOTICE OF DEVIATION (CONTINUED)

NOTICE NO: 5 JOB NO: PR051024 DATE: 11/7/2016

ADDITIONAL DESCRIPTION OF DEVIATION:



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NOTICE OF DEVIATION (CONTINUED)

NOTICE NO: 5 **JOB NO:** PR051024 **DATE:** 11/7/2016

ADDITIONAL DESCRIPTION OF DEVIATION:

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NOTICE OF DEVIATION

DATE: 1/10/2017

NOTICE NO: 6 **P.O. NUMBER:** ES&S-MSA-TA072 **CONTRACT NO:** CON044644

CUSTOMER: ES&S **NTS JOB NO:** PR051024

NOTIFICATION MADE TO: Sue McKay **NOTIFICATION DATE:** 11/8/2016

NOTIFICATION MADE BY: Lisa Johnson **VIA:** Verbal/Email

CATEGORY: ☑ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT **DATE OF DEVIATION:** 11/8/2016

PART NAME: DS450 **PART NO:** DS4516053017

TEST: Electrical Fast Transient (EFT) **I.D. NO:** H.W. 1.0

SPECIFICATION: 2005 VVSG Vol. 1 **PARA. NO:** 4.1.2.6

REQUIREMENTS:

4.1.2.6 Electrical Fast Transient:

Vote scanning and counting equipment for paper-based systems, and all DRE equipment, shall be able to withsta
without disruption of normal operation or loss of data, electrical fast transients of:
. + 2 kV and - 2 kV on External Power lines (both AC and DC)
. + 1 kV and - 1 kV on Input/Output lines (signal, data, and control lines) longer than 3 meters
. Repetition Rate for all transient pulses will be 100 kHz

DESCRIPTION OF DEVIATION:

The Log Printer's operation was interrupted on Line 1 at 2000 volts and did not recover.

DISPOSITION • COMMENTS • RECOMMENDATIONS:

The customer was notified of the failure.

SAFETY RELATED: ☐ YES ☑ NO POTENTIAL 10 CFR PART 21: ☐ YES ☐ NO ☑ N/A

RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: ☑ CUSTOMER ☐ NTS HUNTSVILLE

CPAR REQUIRED: ☐ YES ☑ NO CPAR NUMBER:

VERIFICATION:

CLIENT TEST WITNESS: Sue McKay (IF APPLICABLE) **PROJECT ENGINEER:** Charles R Montgomery

GOV. QAR: N/A (IF APPLICABLE) **DEPT. MANAGER:** Ryan J Ott 01/10/2

NTS QUALITY REPRESENTATIVE: Lisa C. Johnson **DATE:** 01/10/2017

FOR NTS QA USE **Tracking Code:** 3

1. Employee Error	2. Test Equipment Problem	3. Customer Item Problem	4. Weather	5. Power Failure	6. Equipment Limitations	7. C

NTS
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NOTICE OF DEVIATION

DATE: 2/9/2017

NOTICE NO: 7 **P.O. NUMBER:** ES&S-MSA-TA072 **CONTRACT NO:** CON044644

CUSTOMER: ES&S **NTS JOB NO:** PR051024

NOTIFICATION MADE TO: Sue McKay **NOTIFICATION DATE:** 1/9/2017

NOTIFICATION MADE BY: Lisa Towers **VIA:** Email

CATEGORY: ☑ SPECIMEN ☐ PROCEDURE ☐ TEST EQUIPMENT **DATE OF DEVIATION:** 1/9/2017

PART NAME: Electionware **PART NO:** N/A

TEST: FCA **I.D. NO:** Version 4.7.1.1

SPECIFICATION: 2005 VVSG Vol. II Sec 6.7 FCA **PARA. NO:** 1-4

REQUIREMENTS:

6.7 Functional Configuration Audit

The Functional Configuration Audit encompasses an examination of vendor tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the vendor's documentation submitted for the TDP.

DESCRIPTION OF DEVIATION:

When mousing over the Help icon in Paper Ballot in Electionware, the icon function name does not display as described in the TDP, Electionware Administrator Guide.

DISPOSITION • COMMENTS • RECOMMENDATIONS:

The customer was notified of the failure. Per the EAC in phone call on 1/10/17, ES&S addressed the issue by describing the deviaton in a TDP update to the Electionware Administrator Guide Ver. 1.4, but did not include the updated TDP in a new trusted build. ES&S is to address the issue per the EAC in Electionware in a future project.

SAFETY RELATED: ☐ YES ☑ NO POTENTIAL 10 CFR PART 21: ☐ YES ☐ NO ☑ N/A

RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: ☑ CUSTOMER ☐ NTS HUNTSVILLE

CPAR REQUIRED: ☐ YES ☑ NO CPAR NUMBER:

VERIFICATION:

CLIENT TEST WITNESS: N/A (IF APPLICABLE) **PROJECT ENGINEER:** Lisa Towers 2/9/17

GOV. QAR: N/A (IF APPLICABLE) **DEPT. MANAGER:** 02/09/2017

NTS QUALITY REPRESENTATIVE: Lisa Johnson **DATE:** 02/09/2017

FOR NTS QA USE **Tracking Code:** 3

1. Employee Error	2. Test Equipment Problem	3. Customer Item Problem	4. Weather	5. Power Failure	6. Equipment Limitations	7. Other

APPENDIX C. AS-RUN TEST PLAN

As-Run Test Plan for EAC 2005 VVSG Certification Testing Performed on Election Systems & Software Voting System 5.2.2.0

Issue Date: 2/22/2017

Prepared for: **Election Systems & Software, Inc.**
11208 John Galt Blvd
Omaha, NE 68137

Prepared by: **National Technical Systems Huntsville**
7800 Hwy 20 West
Huntsville, AL 35806

VSTL
EAC Lab Code 0704

SIGNATURES

Reviewed by: Lisa C. Johnson Date: 02/22/2017
Lisa Johnson, VSTL Quality Manager

Approved by: Ryan A Chambers Date: 02/22/2017
Ryan Chambers, Program Manager

Reviewed by: Rick Davis Date: 2/23/2017
Rick Davis, QA Manager

REVISIONS

Revision	Reason for Revision	Date
NR	Initial Release	10/4/2016
1	EAC Comment updates	11/20/2016
2	EAC and ES&S Comment updates	11/30/2016
3	Made EAC Comment adjustments	12/6/2016
4	Removed state specific BUG35850 from sections section 1.1.3 & 4.1.1	12/7/2016
5	Added BUG35683, BUG35850 & BUG35480 to sections 1.1.3 & 4.1.1	12/9/2016
6	AS-Run Test Plan	2/17/2017
7	EAC Comments	2/22/2017

TABLE OF CONTENTS

PAGE NO.

1.0 Introduction 6

1.1 Description and Overview of EAC Certified System Being Modified 6
1.1.1 Baseline Certified System 6
1.1.2 Revision History 7
1.1.3 Description of Submitted Modifications 8
1.1.4 Initial Assessment 9
1.2 References 11
1.3 Terms and Abbreviations 12
1.4 Project Schedule 14
1.5 Scope of Test 14
1.5.1 Block Diagram 14
1.5.2 System Limits 17
1.5.3 Supported Languages 17
1.5.4 Supported Functionality 17

2.0 Pre-Certification Testing and Issues 18

2.1 Evaluation of Prior VSTL Testing 18
2.2 Evaluation of Prior Non-VSTL Testing 18
2.3 Known Field Issues 18

3.0 Material Required for Testing 19

3.1 Software 19
3.2 Hardware 20
3.3 Test Materials 21
3.4 Deliverables 21
3.5 Proprietary Data 22

4.0 Test Design and Specifications 23

4.1 Requirements 23
4.1.1 Requirements Mapping 23
4.1.2 Rationale for Excluded Requirements 25
4.1.3 NOCs 26
4.1.4 RFIs 26
4.1.5 Hardware Configuration and Design 27
4.2 Software System Functions 27
4.3 Test Case Design 27
4.3.1 Software Module Test Case Design and Data 28
4.3.2 Software Functional Test Case Design and Data 29
4.3.3 System-level Test Case Design 29
4.4 Test Specifications 29
4.4.1 Hardware Test Specifications 29
4.4.2 Physical Configuration Audit Specifications 32
4.4.3 Functional Configuration Audit Specifications 32
4.4.4 Accuracy Test Specifications 33
4.4.5 Volume and Stress Test Specifications 33

4.4.6 System Integration Test Specifications 33
4.4.7 Security Testing Specifications 33
4.4.8 TDP Evaluation Specifications 33
4.4.9 Source Code Review Specifications 34
4.5 Source Code Build Process 34
4.6 System Identification Tools Review 34
4.7 QA & CM System Review 35

5.0 Test Data 35

5.1 Test Data Recording 35
5.2 Test Data Criteria 35

6.0 Test Procedures and Conditions 35

6.1 Test Facilities 36
6.2 Test Set-up 37
6.3 Test Sequence and Description 37
6.3.1 Hardware Testing 37
6.3.2 Physical Configuration Audit 38
6.3.3 Functional Configuration Audit 38
6.3.4 Accuracy 38
6.3.5 Volume and Stress 38
6.3.6 System Integration 40
6.3.7 Security 46
6.3.8 TDP Review 46
6.3.9 System Identification Tools Review 46
6.3.10 Source Code Review 46
6.4 Test Operations Procedure 46
6.4.1 Pass/Fail Criteria 47
6.4.2 Anomalies 47
6.4.3 Deficiencies and Resolutions 47
6.4.4 Test Results and Assessment 47
6.4.5 Terms of NTS Huntsville Recommendation for Certification 48

Appendix A – Additional Testing 49

Appendix B – Technical Data Package 51

Appendix C – Project Schedule 56

1.0 INTRODUCTION

Election Systems & Software (ES&S), herein referred to as manufacturer, submitted the Election Systems & Software Voting System 5.2.2.0 (EVS 5.2.2.0) to the Election Assistance Commission (EAC), for certification testing to the 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 as such, will be tested by National Technical Systems Huntsville (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. This National Certification Test Plan, hereafter referred to as the Test Plan, documents the process and test methods that will be used to validate 2005 VVSG compliance of EVS 5.2.2.0.

1.1 Description and Overview of EAC Certified System Being Modified

The following subsections describe the EAC Certified System that is the baseline for the submitted modification. All information was derived from the previous EVS 5.2.1.0 Certification Test Report(s) and EAC Certificate of Conformance.

1.1.1 Baseline Certified System

Tables 1-1 and 1-2 describe the hardware and software/firmware versions that were previously certified by the EAC. For a complete description of the configuration and description of the previously certified 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. Previously Certified Software

Software	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 Scripts	
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	2008 w/ SP1
Microsoft Windows 7	7 w/ SP1
WSUS Microsoft Windows Offline Update Utility	8.8
Symantec Endpoint Protection	12.1.4
Symantec Endpoint Protection Intelligent Updater	20151006-037-v5i64.exe
Micro Focus RM/COBOL Runtime	12.06

1.1.1 Baseline Certified System (Continued)

Table 1-2. Previously Certified Voting System Equipment

Component	Hardware Version	Firmware Version
Proprietary Hardware		
ExpressVote Accessible Voting Station	1.0	1.4.1.0
ExpressVote Rolling Kiosk	1.0	N/A
DS200 Precinct Count Scanner	1.2.1, 1.2.3, & 1.3	2.12.1.0
DS850 Central Count Scanner	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-SR20009	N/A
Delkin USB Flash Drives	512 MB, 1, 2, 4, & 8 GB	N/A
Delkin Compact Flash	1GB	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

1.1.2 Revision History

Table 1-3 describes the version history of the submitted voting system.

Table 1-3. Voting System Revision History

System Version	Certification Type	System Modified	Certification Date	Certification Number
EVS 5.0.0.0	New System	N/A	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

1.1.3 Description of Submitted Modifications

The changes submitted for this modification are presented in this section.

Electionware

- Corrected spelling of 'change' in AutoMARK system prompt Excel file
- Corrected enable save button after changes in text box in the Language Additional text area
- Corrected message display when ballot style ID is longer than 8 characters
- Corrected contest order display for ExpressVote in an open primary election to sort by party
- Added the election wide option to enable/disable multi column view on the ExpressVote
- Added the ExpressVote Multi Column Setting to the ExpressVote Settings Report
- Corrected erroneous data fit error message when no nonpartisan contests existed in a closed primary
- Updated copyright to 2016
- Updated user guide help file
- Corrected error displayed when triple clicking Bengali text editor
- Updated the users xml to version 3.0 for compatibility with Cerberus 8.0.6
- Updated to WSUS Microsoft Windows Offline Update Utility 10.7.4
- Updated to Symantec Endpoint Protection 12.1.6 (64-bit)
- Updated to Symantec Endpoint Protection Intelligent Updater 20160829-002-v5i64.exe
- Improved refresh action in the navigator so the data appears correctly
- Updated creation of passwords for the SFTP server so that they do not include leading zeros which the server cannot authenticate
- Corrected an invalid party ID in Illinois Export party records
- Added export results from Produce when the last contest is a text only contest

Cross Product (Electionware, ERM)

- Renamed "DS850" labels to "Central Count"

Cross Product (DS200, DS850, Electionware, ERM, AutoMARK, ExpressVote)

- Updated encryption suites used for security purposes to meet VVSG 1.0, Sections 2.1.4 and 7.5.1

1.1.3 Description of Submitted Modifications (Continued)

Hardware

- Added a new central count scanner the DS450.
- Power Supply for ExpressVote 1.0 is upgraded to be in compliance with Level Efficiency 6. Because this is not a de minimis change, it will undergo all EMI testing along with the ExpressVote 1.0.

1.1.4 Initial Assessment

An initial assessment was performed to determine the scope of testing for the submitted modification. The results of this assessment are presented in the following five categories as specified in the 2005 VVSG Vol. 2 Section 1.3.1: functionality tests, hardware evaluation, software evaluation, system integration tests and technical data package (TDP). Additionally a section of regression testing is included.

Functional Assessment:

Based on the assessment of submitted changes, NTS determined that for the modifications to the previously certified components, a limited Functional Configuration Audit will be required to verify that the voting system meets 2005 VVSG requirements. "Limited" in this instance refers to only functional changes made in this modification (new features, changes to functions, etc.) or functions that have not changed but may be impacted by the modification or changes. The DS450 will require a full functional review to determine compliance with the 2005 VVSG.

In addition, the voting system will be subjected to a system integration test, defined in section 4.4.6 of this plan, to ensure all components interact properly and to verify that the changes to the voting system do not introduce any nonconformities or instabilities.

Hardware Assessment:

There are two hardware changes submitted for 5.2.2.0; the power supply for ExpressVote 1.0 was upgraded to be in compliance with Level Efficiency 6, and a new central count scanner, the DS450, was added to the available configuration.

The modification to the ExpressVote power supply will require the following hardware tests to ensure that the submitted hardware meets the requirements of the 2005 VVSG:

- Electrical Power Disturbance
- Electrical Fast Transient
- Lightning Surge
- Electromagnetic Emissions
- Electromagnetic Susceptibility
- Conducted RF Immunity
- Electrical Supply

The DS450 will require all non-operational and operational hardware tests to ensure that the submitted hardware meets the requirements of the 2005 VVSG.

1.1.4 Initial Assessment (Continued)

Software Assessment:

All added or modified Lines of Code (LOC) will require a source code review to ensure the 2005 VVSG requirements are met and that changes to the software do not introduce any new functions or features. In determining the extent of the required source code review, the submitted source code for EVS 5.2.2.0 was compared to the EAC certified EVS 5.2.1.0 source code. Table 1-4 provides the software comparison results. Only the products listed in Table 1-4 were modified.

Table 1-4. Software Comparison Results

Product	Baseline	New Version	Lines of Code Changed	
			Files	Lines
Electionware	4.7.1.0	4.7.1.1	159	5122
ERM	8.12.1.0	8.12.1.1	16	2089
DS200	2.12.1.0	2.12.2.0	53	2568
DS850	2.10.1.0	2.10.2.0	6	223
DS450	DS850 2.10.1.0[1]	3.0.0.0	722	133267
ExpressVote	1.4.1.1	1.4.1.2	79	4672
AutoMARK	1.8.6.0	1.8.6.1	25	1548
Totals			1060	149489

System Integration Assessment:

System Integration is defined as per 2005 VVSG 1.0 Section 1.3.1.4. System level testing will be conducted to evaluate the functional, hardware, and software aspects jointly, throughout the full range of system operations. The tests will include the fully integrated system components, internal and external system interfaces, usability and accessibility, and security. During this process election management functions, ballot-counting logic, and system capacity will be exercised. The process will also include the Physical Configuration Audit (PCA) and the Functional Configuration Audit (FCA).

Security Assessment:

A security assessment will be required to verify that the configuration scripts submitted correctly configure Windows Server 2008 R2 and Windows 7 per the provided documented security checklists (or benchmarks), that the new encryption packages have been implemented correctly, and that the overall security framework matches that of the documentation.

In addition, a windows security patch level assessment will be performed to ensure that any critical security patch that is exploitable locally, meaning without the requirement of external public communications, has been applied.

[1] The DS450 is a derivative product of the DS850 and thus shares most of the same code base. For this code review the DS450 source code package was compared against the previously certified EVS 5.2.1.0 DS850 source code.

1.1.4 Initial Assessment (Continued)

TDP Assessment:

The submitted TDP is constructed with the certified EVS 5.2.1.0 TDP and the EVS 5.2.2.0 changes to the certified documents. NTS Huntsville personnel determined that most documents in the submitted TDP will require some level of review. These documents will ensure that all EVS 5.2.2.0 changes are properly documented and compliant with 2005 VVSG.

Regression Test

Regression testing shall be conducted on EVS 5.2.2.0 components to establish assurance that the modifications have no adverse impact on the compliance, integrity, or performance of the system as outlined in the 2005 VVSG.

1.2 References

- Election Assistance Commission 2005 Voluntary Voting System Guidelines, Volume I, Version 1.0, "Voting System Performance Guidelines," and Volume II, Version 1.0, "National Certification Testing Guidelines," dated December 2005
- Election Assistance Commission Testing and Certification Program Manual, Version 2.0, expiration date June 30, 2018
- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 2.0, expiration date June 30, 2018
- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2006 Edition, "NVLAP Procedures and General Requirements (NIST Handbook 150)," dated February 2006
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, "Voting System Testing (NIST Handbook 150-22)," dated May 2008
- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- NTS Quality Assurance Program Manual, Revision 8
- ANSI/ISO/IEC 17025:2005 and ANSI/NCSL Z540.3, "Calibration Laboratories and Measuring and Test Equipment, General Requirements"
- ISO 10012:2003, "Quality Assurance Requirements for Measuring Equipment"
- 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 1-5 defines all terms and abbreviations applicable to this Test Plan.

Table 1-5. 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.

1.3 Terms and Abbreviations (Continued)

Table 1-5. 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
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

1.3 Terms and Abbreviations (Continued)

Table 1-5. Terms and Abbreviations (Continued)

Term	Abbreviation	Definition
Virtual Review Tool	VRT	Test campaign management software used by the EAC.
Voting System Test Laboratory	VSTL	---
Voluntary Voting System Guidelines	VVSG	---

1.4 Project Schedule

The project schedule for the test campaign is in Appendix C – Project Schedule.

1.5 Scope of Test

The scope of testing is limited to the modifications to the previously certified EVS 5.2.1.0 voting system as described in Section 1.1.3.

1.5.1 Block Diagram

Figure 1-1 and Figure 1-2 provide a visual overview of the submitted voting system configurations.

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1.5.1 Block Diagram (Continued)

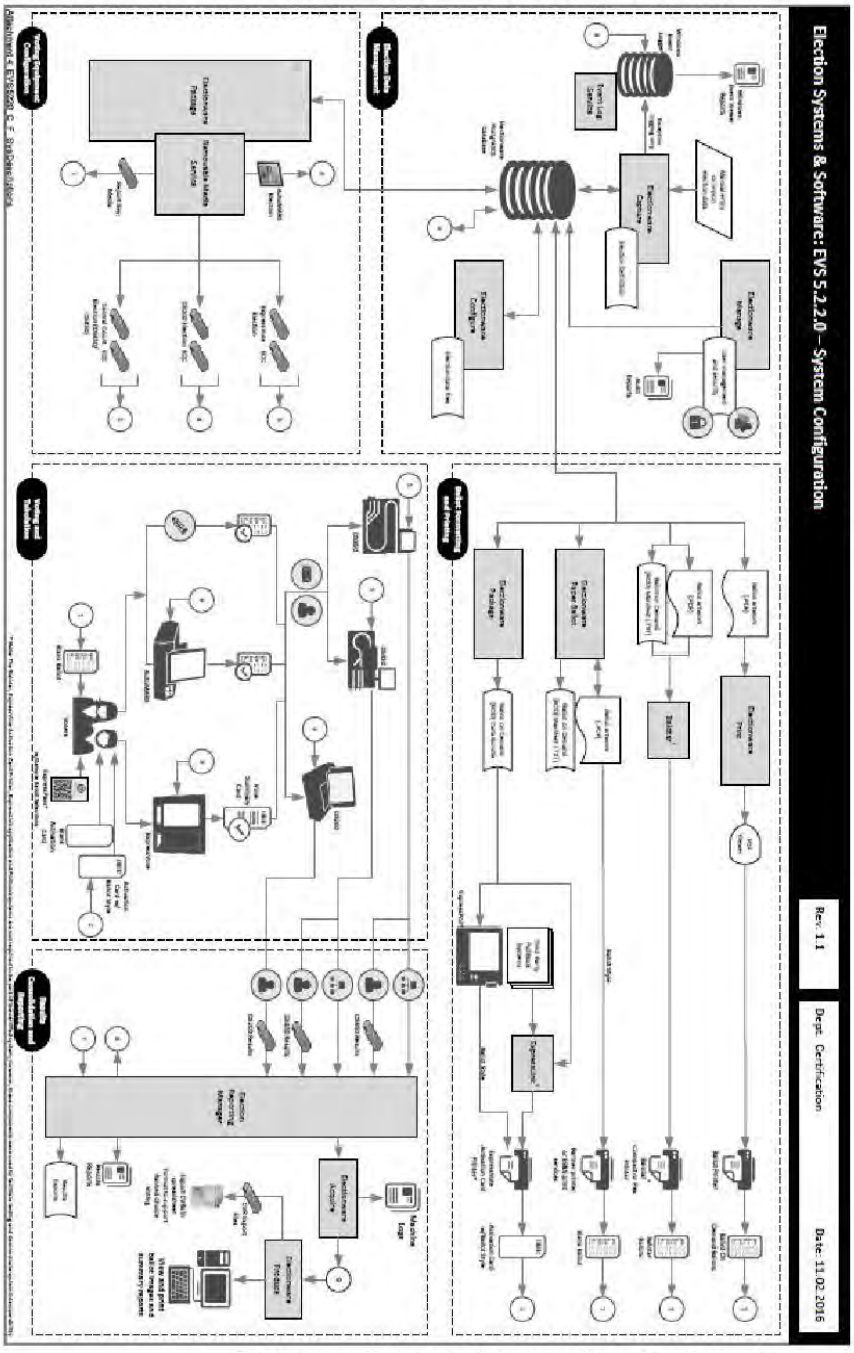

Figure 1-1. Networked System Overview Diagram

1.5.1 Block Diagram (Continued)

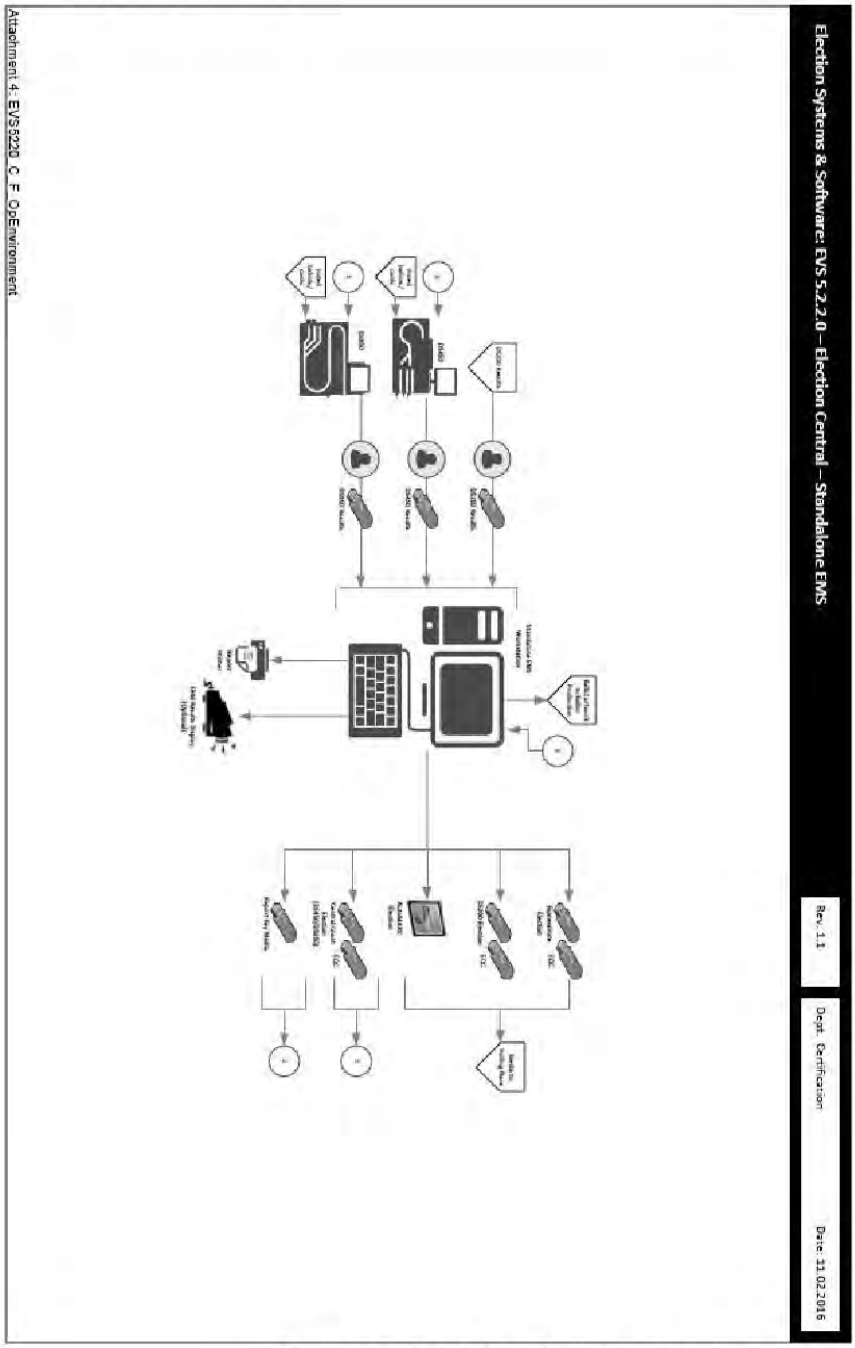

Figure 1-2. Standalone Overview Diagram

1.5.2 System Limits

System limitations remain unchanged for all previously certified components of the EVS 5.2.1.0 voting system. See Attachment 1 of the System Overview TDP document for detailed information on the system limitations for EVS 5.2.2.0 "EVS 5.2.2.0 Voting System Overview.pdf".

1.5.3 Supported Languages

The submitted voting system supports English, Spanish, Chinese, Korean, Japanese, and Bengali.

1.5.4 Supported Functionality

Table 1-7 lists the functionality supported by the submitted voting system.

Table 1-7. Supported Functionality

Functionality	Description
Election Data Management	Managing election data supports all tasks related to the creation of the election database, precinct, office, and candidate information required to configure a jurisdiction's elections
Ballot Formatting and Printing	Ballot formatting and printing includes activities required for defining the image of a paper ballot, populating that ballot with information imported from the election database, and printing the ballot with ballot style code.
Voting Equipment Configuration	Configuring voting equipment converts election database information into ballot definition parameters for voting equipment. Within this functional subsystem, software users transfer the election rules specific to an election to the memory devices used to program voting equipment.
Voting and Tabulation	Voting and tabulation includes the following: • Accessible ballot marking includes all tasks related to preparing, testing and implementing assistive voting devices for use in a polling place environment. • All tasks related to preparing, testing and implementing universal voting devices for use in a polling place environment with the option of precinct vote summary card tabulation. • Precinct ballot tabulation covers the activities required to prepare, test and scan official ballots and/or vote summary cards at a precinct location. • Central ballot tabulation includes all tasks required to prepare, test and scan official ballots and/or vote summary cards at a central count location.
Results Consolidation and Reporting	Results consolidation and reporting encompasses the functions necessary to gather and combine results from ballot scanners and use that data to generate paper and electronic reports for election workers, candidates and the media.

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2.0 PRE-CERTIFICATION TESTING AND ISSUES

This section describes testing performed by either VSTL or the manufacturer prior to submitting the voting system to the EAC.

2.1 Evaluation of Prior VSTL Testing

For the DS450 source code that is deemed identical to that of the DS850, the previous source code review assessments will be reused, as if the DS450 was a modification from the previous certification test campaigns. All new or modified source code will be fully reviewed.

2.2 Evaluation of Prior Non-VSTL Testing

No Non-VSTL testing was submitted for re-use consideration.

2.3 Known Field Issues

The EVS 5.2.0.0 voting system family has three identified field issues.

- The RSA Crypto suite used by Electionware to generate RSA keys will sometimes create a key that is too short. This causes a key mismatch issue when loading the keys into ExpressVote. The issue was corrected in EVS 5.2.0.3 and the change was incorporated in this release.
- In Electionware, intermittently the tree view indicator is not visible. In addition, sometimes list items, such as created media, do not appear or update in the list. These issues were corrected in EVS 5.2.1.1 and the change was incorporated in the release.
- The RSA Crypto suite used by the voting system has been expired by NIST whereby the voting system did not meet the requirements of VVSG Sections 2.1.4 and 7.5.1. The correction to this issue was submitted in this release.

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3.0 MATERIAL REQUIRED FOR TESTING

The following sections list the materials required to be delivered to facilitate testing of the submitted system.

3.1 Software

Proprietary software and COTS identified in Table 3-1 will be provided by the manufacturer as part of this test campaign.

Table 3-1. Required Voting System Software

Software	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
ES&S 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
Microsoft Server 2008	R2 w/ SP1
Microsoft Windows 7	7 w/ SP1
Symantec Endpoint Protection	12.1.6
Symantec Endpoint Protection Intelligent Updater	20160829-002-v5i64.exe
WSUS Microsoft Windows Offline Update Utility	10.7.4
Micro Focus RM/COBOL Runtime	12.06

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3.2 Hardware

Proprietary equipment and COTS identified in Table 3-2 will be provided by the manufacturer as part of this test campaign.

Table 3-2. Required Voting System Equipment

Component	Hardware Version	Firmware Version
Proprietary Hardware		
ExpressVote Accessible Voting Station	1.0	1.4.1.2
ExpressVote Rolling Kiosk	1.0	N/A
DS200 Precinct Count Scanner	1.2.1, 1.2.3, & 1.3	2.12.2.0
DS850 Central Count Scanner	1.0	2.10.2.0
DS450 Central Count Scanner	1.0	3.0.0.0
AutoMARK A100	1.0	1.8.6.1
AutoMARK A200 (SBC 2.0 & SBC 2.5)	1.1	1.8.6.1
AutoMARK A300 (SBC 2.0 & SBC 2.5)	1.3	1.8.6.1
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 Client Workstation	Dell Optiplex 980 or 5040	N/A
EMS Client Laptop	Dell E6410	N/A
(Previously Motorola) Symbol QR Code Scanner (External)	DS9208	N/A
Zebra QR Code Scanner (Integrated with Rolling Kiosk)	DS457-SR20009	N/A
Delkin USB Flash Drives	512 MB, 1, 2, 4, & 8 GB	N/A
Delkin USB Flash Drive for Validation	16GB	N/A
Delkin Compact Flash	512MB, 1GB, 2 GB	N/A
DS850 Report Printer	OKI B431dn, and B431d	N/A
DS850 Audit Printer	OKI Microline 420	N/A
DS850 UPS	APC Back-UPS RS 1500 or APC Back-UPS Pro 1500	N/A
DS450 Report Printer	Dell S2810dn	N/A
DS450 Audit Printer	OKI Microline 420	N/A
DS450 UPS	APC Back-UPS Pro 1500	N/A
Avid Headphones	Avid 86002	N/A
SanDisk CF Card Reader	018-6305	N/A
Delkin CF Card Reader	6381	N/A
Ethernet Switch	N/A	N/A
Surge Protector	Tripp Lite Spike Cube	N/A

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3.3 Test Materials

Test Materials Table 3-3 describes the test materials required to execute the required testing. Test materials may not be fully tested during the campaign, but are used to support the tests conducted during the campaign. The following items listed may not be included in the baseline system or Scope of Certification document.

Table 3-3. Required Test Materials

Test Material	Quantity	Make	Model
Ballot Printer	1	OKI Data	C9650

3.4 Deliverables

The materials listed in Table 3-4 are identified by the manufacturer as materials deliverable to the end users.

Table 3-4. Voting System Deliverables

Deliverable Material	Version	Description
Electionware	4.7.1.1	EMS
ERM	8.12.1.1	EMS
ES&S Event Log Service	1.5.5.0	EMS
Removable Media Services	1.4.5.0	EMS
ExpressVote	Firmware 1.4.1.2; Hardware 1.0	Accessible Voting Station
ExpressVote Rolling Kiosk	Hardware 1.0	Stand
DS200	Firmware 2.12.2.0; Hardware 1.2.1 or 1.2.3 or 1.3	Precinct Ballot Scanner
AutoMARK A100 or A200 or A300	Firmware 1.8.6.1; Hardware 1.0 or 1.1 or 1.3	Voter Assist Terminal
DS850	Firmware 2.10.2.0; Hardware 1.0	Central Ballot Scanner
DS450	Firmware 3.0.0.0; Hardware 1.0	Central Ballot Scanner
OKI Printer	B431dn or B431d	Laser Report Printer
OKI Printer	Microline 420	Dot Matrix Printer
DELL Printer	2810n	Laser Report Printer
Headphones	Avid FV 60	Stereo Headphones
ES&S Pens	N/A	BIC Grip Roller
EVS 5.2.2.0 Voting System Overview	1.7	TDP Document
EVS 5.2.2.0 System Functionality Description	1.3	TDP Document
ES&S Electionware Volume I: Administrator's Guide	1.1	TDP Document
ES&S Electionware Volume II: Define User's Guide	1.1	TDP Document
ES&S Electionware Volume III: Design User's Guide	1.1	TDP Document

3.4 Deliverables (Continued)

Table 3-4. Voting System Deliverables (Continued)

Deliverable Material	Version	Description
ES&S Electionware Volume IV: Deliver User's Guide	1.1	TDP Document
ES&S Electionware Volume V: Results User's Guide	1.0	TDP Document
Election Reporting Manager User's Guide	1.1	TDP Document
ExpressVote Operator's Guide	1.1	TDP Document
DS200 Operator's Guide	1.2	TDP Document
DS850 Operator's Guide	1.1	TDP Document
DS450 Operator's Guide	1.4	TDP Document
AutoMARK System Operator's Guide	1.0	TDP Document
Voting System Security Specification	1.2	TDP Document
Security Script Description	1.1	TDP Document
EMS Client Workstation Secure Setup & Configuration Guide	1.2	TDP Document
EMS Server Secure Setup & Configuration Guide	1.3	TDP Document
Standalone EMS Workstation Secure Setup & Configuration Guide	1.2	TDP Document
AutoMARK System Security Specification	7	TDP Document

3.5 Proprietary Data

All data considered by the manufacturer to be proprietary is marked as such.

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4.0 TEST DESIGN AND SPECIFICATIONS

NTS Huntsville personnel shall ensure that all certification testing conducted on the manufacturer's voting system follows NTS Huntsville's procedures for testing, the requirements of the EAC 2005 VVSG, and the Program Manual.

4.1 Requirements

To evaluate the modification test requirements, each section of the EAC 2005 VVSG was analyzed to determine the applicable tests required. The following subsections detail the results of this analysis.

4.1.1 Requirements Mapping

The requirements mapping is provided in conjunction with submitted modifications. NTS Huntsville will verify and validate that the manufacturer is in compliance with stated QA and CM plans.

Table 4-1. Modification Requirements Mapping

Change ID	Changed Component	Change Description	Impacted 2005 VVSG Requirement
BUG35826 ENH35226 ENH35227 ENH35228 ENH35229 ENH35230 ENH35260 ENH35369 ENH35617	Electionware and ERM	Renamed "DS850" labels to "Central Count".	Volume II, Section 6.7
ENH35852 ENH35855 ENH35856 ENH35876 ENH35879 ENH35884 ENH35858 ENH35859	DS200 DS850 AutoMARK ExpressVote Electionware ERM	The random number generator, used for security functions to meet VVSG 1.0, Sections 2.1.4 and 7.5.1, has been updated to meet new NIST standards.	Volume I, Section 2.1.4 & Section 7.5.1
BUG35743	Electionware	Corrected spelling of the word 'change' in the AutoMARK system prompt Excel file.	Volume II, Section 6.7
BUG35663	Electionware	Correction to enable the save button after making changes in the text box (...) in the Language Additional text area.	Volume II, Section 6.7
BUG35751	Electionware	Corrected message display from an internal processing error to the 'Import of ballot style alternate ID' error message when the continuous ballot style ID is longer than 8 characters.	Volume II, Section 6.7
ENH35344	Electionware	Correct the contest order display for the ExpressVote in an open primary election to sort by party.	Volume II, Section 6.7

4.1.1 Requirements Mapping (Continued)

Table 4-1. Modification Requirements Mapping (Continued)

Change ID	Changed Component	Change Description	Impacted 2005 VVSG Requirement
ENH35533	Electionware	Added the election wide option to enable/disable multi column view on the ExpressVote.	Volume I Section 3.2.2.2 Volume II, Section 6.7
ENH35534	Electionware	Added the ExpressVote Multi Column setting to the ExpressVote Settings Report.	Volume I Section 3.2.2.2 Volume II, Section 6.7
BUG35685	Electionware	Corrected erroneous data fit error message that occurred when no nonpartisan contests existed in a closed primary.	Volume II, Section 6.7
ENH35254	Electionware	Update copyright to 2016.	Volume II, Section 6.7
ENH35255	Electionware	Update user guide help file.	Volume II, Section 6.7
BUG35647	Electionware	Corrected the situation where an error displayed erroneously when triple clicking in the Bengali language text editor.	Volume II, Section 6.7
BUG35480	Electionware	Updated creation of passwords for the SFTP server so that they do not include leading zeros which the server cannot authenticate.	Volume II, Section 6.7
BUG35633	Electionware	Updated the users.xml to version 3.0 for compatibility with Cerberus version 8.0.0.9 and newer.	Volume II, Section 6.7
ENH35606	Electionware	Improved the refresh action in the navigator so that the data appears correctly.	Volume II, Section 6.7
BUG35683	Electionware	Corrected an Invalid party ID in Illinois Export party records.	Volume II, Section 6.7
BUG35850	Electionware	Can now export results from Produce when the last contest is a text only contest.	Volume II, Section 6.7
N/A	DS450	Added the DS450 as a new central count component.	All applicable requirements
ENH35374	ExpressVote	Display candidates in either 1 or 2 columns in a particular contest screen based on a configuration flag from Electionware.	Volume II, Section 6.7
ENH35495	ExpressVote	Support the ability for a poll worker to scan a 128c barcode on the external barcode scanner instead of manually selecting the ballot style on the touch screen.	Volume II, Section 6.7
ENH35612	ExpressVote	Update copyright date (code and splash screen).	Volume II, Section 6.7
N/A	ExpressVote	Power Supply Level Efficiency 6	All applicable requirements

4.1.2 Rationale for Excluded Requirements

EVS 5.2.2.0 is a paper-based system that supports a closed network. All 2005 VVSG requirements will be evaluated as part of this test campaign apart from the following:

- Volume I, Section 2.3.1.3, 2.3.2, and 2.3.3.3 (Functional Requirements for DRE Systems)
- Volume I, Section 3 (Usability and Accessibility Requirements for DRE System)
- Volume I, Section 4.1.4.3 and 4.1.6.2 (Hardware Requirements for DRE Systems)
- Volume I, Section 6.2.6 (Telecommunications Requirements)
- Volume I, Section 7.52-7.54 (Telecommunications and Data Transmission)
- Volume I, Section 7.6 (Use of Public Networks)
- Volume I, Section 7.7 (Wireless Communications)
- Volume I, Section 7.9 (Voter Verifiable Paper Audit Trail Requirements)
- Volume II, Section 4.2.1 (Testing Focus and Applicability)
- Section 4.1.2.11.b of Volume I was not applicable because the EUT did not have signal control lines greater than three meters

Table 4-2. Rationale for Excluded Requirements

EAC 2005 VVSG Version 1 Volume I, Section	Rationale for Not Applicability
2.3.1.3, 2.3.2, 2.3.3.3	These requirements relate to DRE Systems; the EVS 5.2.2.0 is a paper-based system.
3	These requirements relate to DRE Systems; the EVS 5.2.2.0 is a paper-based system.
4.1.2.11.b	The EUT did not have signal control lines greater than three meters.
4.1.4.3, 4.1.6.2	These requirements relate to DRE Systems; the EVS 5.2.2.0 is a paper-based system
6.2.6	These requirements are written for use of public networks. The EVS 5.2.2.0 does not use public networks.
7.5.2, 7.5.3, 7.5.4	These requirements are written for use of public networks. The EVS 5.2.2.0 does not use public networks.
7.6	EVS 5.2.2.0 does not support transmission over public networks.
7.7	No wireless technology is used in this system.
7.9	This system does not contain a Voter Verifiable Paper Audit Trail (VVPAT).
EAC 2005 VVSG Version 1 Volume II, Section	**Rationale for Not Applicability**
4.2.1	These requirements relate to elements of the system that are intended for use at poll site voting locations, such as voting machines and precinct counters. The DS450 is a Central Count machine and not located at poll site voting locations.

4.1.3 NOCs

Applicable NOCs released by the EAC as of the date of the Test Plan are listed in Table 4-3.

Table 4-3. Applicable NOCs

NOC ID	Name
2016-01	Test Readiness Review
2016-02	Trusted Build
2016-03	Test Case Upload

4.1.4 RFIs

Applicable RFIs released by the EAC as of the date of the Test Plan are listed in Table 4-4.

Table 4-4. Applicable RFIs

RFI ID	Name
2007-02	EAC Decision on Variable Names
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
2008-03	EAC Decision on OS Configuration
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
2008-09	EAC Decision on Safety Testing
2008-10	EAC Decision on Electrical Fast Transient
2009-03	EAC Decision on Battery Back Up for Central Count Systems
2009-04	EAC Decision on Audit Log Events
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
2010-07	EAC Decision on Module Length Comments and responses
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
2013-03	EAC Decision on Timestamps
2013-04	EAC Decision on Usability Testing
2015-05	EAC Decision on Touchscreen Technology

4.1.5 Hardware Configuration and Design

EVS 5.2.2.0 is an electronic voting system consisting of one precinct paper-based voting system, two central count voting systems, and a voting system application software package. The precinct paper-based voting system is comprised of four voter assistance terminals (AutoMark A100, AutoMark A200, AutoMark A300 and ExpressVote 1.0) and one precinct count scanner (DS200).

The AutoMark is a ballot marking device that prints the voter's choices onto a ballot that is then digitally scanned for tabulation by a precinct count scanner (DS200), or by one of the central count scanners (DS850 or DS450). The ExpressVote produces an independent voter-verifiable paper record that is then digitally scanned for tabulation by the DS200, DS850 or DS450. The Voting System Application Software Package, Election Management System (EMS), is an application suite consisting of Electionware, Election Reporting Manager (ERM), Removable Media Service (RMS), ES&S Event Log Service (ELS), ExpressVote Previewer, and VAT Previewer.

4.2 Software System Functions

The software system functions as described in the manufacturer submitted TDP are unchanged for all previously certified components of the EVS 5.2.2.0 voting system.

4.3 Test Case Design

Test cases are designed around what the voting system is supposed to do (per the manufacturers design specifications) and what the voting system is required to do (per the guiding standards document). The tests cases used are primarily functional in nature; however, in certain cases, NTS may use non-functional tests. The test designer selects both valid and invalid inputs and determines the correct output without any knowledge of the test object's internal structure. The acceptable range for system performance and the expected results for each test case are derived from the manufacturer's documentation and the 2005 VVSG. All test cases are validated and approved by the project lead or other qualified VSTL personnel, (i.e., VSTL QA Representative). Test cases will be uploaded to the VRT as they are completed for EAC review per the guidance in NOC 2016-03.

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4.3.1 Software Module Test Case Design and Data

NTS Huntsville personnel implements component level testing during the Functional Configuration Audit (FCA) for each component and subcomponent exercising the functionality of each as designed and documented. NTS Huntsville will utilize limited structural-based techniques (white-box testing) mainly in the area of Source Code Review and Security Testing. NTS Huntsville will depend heavily on specification-based techniques (black-box testing) for the individual software components. The most common specification-based techniques applied to the voting system during software testing will be "equivalence partitioning", "boundary value", and "pairwise" testing.

- "Equivalence Partitioning" will be used to evaluate specific software functions and data entry points of the voting system for valid and invalid data during the FCA. For software functions and data entry points, an entry will be made for a valid data requirement and at least one invalid data requirement to test for normal and abnormal conditions.
- "Boundary Value" testing will be used to evaluate specific software functions and data entry points for minimums and maximums during the FCA. For software functions and data entry points, an entry will be made for all minimum and all maximum documented requirements to test for normal and abnormal conditions. This technique will be used for numeric ranges as well as non-numeric ranges.
- "Pairwise" testing is a combinatorial method of software testing that, for each pair of input parameters to a system, tests all possible discrete combinations of those parameters. NTS Huntsville uses combinatorial test design to identify the minimum number of tests needed to get the coverage required to exercise the functionality. Combinatorial test design enables testers to get greater test coverage with fewer tests. Note that "coverage", as used here, is referring to functional combinatorial coverage, not requirements coverage.

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4.3.2 Software Functional Test Case Design and Data

NTS Huntsville personnel shall perform the specification-based technique used at the functional test case level entitled "Use Case." The identified actors and their responsibilities are listed in Table 4-5.

Table 4-5. "Use Case" Identified Roles and Responsibilities

Role/Actor	Responsibility
Election Administrator	Enters the election definition with translation and audio Maintains EMS users and the election database
Warehouse Technician	Loads the election definition onto the voting equipment Runs diagnostic test and maintains the units
Poll Worker	Sets up and closes down the voting equipment on election-day at the precinct location
Voter	Physically casts the ballot on election-day
ADA Voter	Votes unassisted on election-day with special needs
Election Official	Reports and audits the election result post-election day

"Use Case" is utilized during the FCA with a single pass through each component using only valid data. This pass is considered the "Master Copy" of data to be passed between interfacing points of applications during integration level testing. If a component downstream in the test process needs data from previous processes, the "Master Copy" of data can be used or altered to accelerate the test process. Known tests utilizing the "Master Copy" of data at the integration level are Security and Usability.

4.3.3 System-level Test Case Design

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 2005 VVSG.

4.4 Test Specifications

The following subsections provide a brief description of the testing to be performed.

4.4.1 Hardware Test Specifications

Hardware tests are divided into two categories: non-operating and operating. The non-operating tests are intended to simulate the storage and transport of equipment between the storage facility and the polling location. The operating tests are intended to simulate conditions that the EUT may encounter during operation. Prior to and immediately following non-operating and operating tests, the EUT shall be subjected to an operational status check.

The non-operating tests include the following:

Low Temperature – This requirement addresses a range of tests for voting machines and precinct counters, as such devices are stored between elections and are transported between the storage facility and polling place, to meet specific minimum performance standards for low temperatures.

4.4.1 Hardware Test Specifications (Continued)

High Temperature – This test addresses a range of tests for voting machines and precinct counters, as such devices are stored between elections and are transported between the storage facility and polling place, to meet specific minimum performance standards for high temperature.

Humidity Test – This requirement addresses a range of tests for voting machines and precinct counters, as such devices are stored between elections and are transported between the storage facility and polling place, to meet specific minimum performance standards.

Vibration – This requirement addresses a range of tests for voting machines and precinct counters, as such devices are stored between elections and are transported between the storage facility and polling place, to meet specific minimum performance standards for vibration.

Bench Handling – The bench handling test simulates stresses faced during maintenance and repair of voting machines and ballot counters.

The operating tests include the following:

Electromagnetic Radiation – This test verifies that radiated and conducted emissions from the voting system hardware do not exceed the allowable limits of Title 47CFR, Part 15, Class B. The test for electromagnetic radiation shall be conducted in compliance with the FCC Part 15 Class B requirements by testing per ANSI C63.4 (Volume II, Section 4.8.b).

Lightning Surge – This test demonstrates the voting system's hardware to withstand power line lightning surges during normal operation. This test is equivalent to the procedure of IEC 61000-4-5:1995-02. The test for lightning surge protection shall be conducted in compliance with the test specified in IEC 61000-4-5: 1995-02 (Volume II, Section 4.8.f).

Electrical Fast Transient – This test demonstrates the voting system's hardware to withstand electrical fast transients during normal operation. This test is equivalent to the procedure of IEC 61000-4-4:1995-01. The test for electrical fast transient protection shall be conducted in compliance with the test specified in IEC 61000-4-4:1995-01 (Volume II, Section 4.8.e, RFI 2008-10).

Electrostatic Disruption – This test demonstrates the voting system's hardware to withstand electrostatic discharges during normal operation. This test is equivalent to the procedure of IEC 61000-4-2. The test for electrostatic disruption shall be conducted in compliance with the test specified in IEC 61000-4-2 (Volume II, Section 4.8.c, RFI 2010-01).

Electromagnetic Susceptibility – This test demonstrates the voting system's hardware to withstand radiated electromagnetic fields during normal operation. This test is equivalent to the procedure of IEC 61000-4-3:1996. The test for electromagnetic susceptibility shall be conducted in compliance with the test specified in IEC 61000-4-3:1996 (Volume II, Section 4.8.d.).

Conducted RF Immunity – This test demonstrates the voting system's hardware ability to withstand conducted RF energy on power and I/O lines during normal operation. This test is equivalent to the procedure of IEC 61000-4-6:1996-04. The test for conducted RF immunity shall be conducted in compliance with the test specified in IEC 61000-4-6:1996-04 (Volume II, Section 4.8.g).

4.4.1 Hardware Test Specifications (Continued)

Electrical Power Disturbance – This test demonstrates the voting system's hardware to withstand power disturbances during normal operation. This test is equivalent to the procedure of IEC 61000-4-11:1994-06 (Volume I, Section 4.1.2.5). The test for power disturbance disruption shall be conducted in compliance with the test specified in IEC61000-4-11:1994-06 (Volume II, Section 4.8.a).

Magnetic Fields Immunity – This test demonstrates the voting system's hardware ability to withstand Magnetic Fields during normal operation. This test is equivalent to the procedure of IEC 61000-4-8. The test for AC magnetic fields RF immunity shall be conducted in compliance with the test specified in IEC 61000-4-8 (Volume II, Section 4.8.h).

Temperature Power Variation – The Environmental Test, Operating, subjects the system hardware to varying temperatures (50°F to 95°F) and voltages (105vac to 129vac), demonstrating hardware/data recording accuracy reliability Mean-Time-Between-Failure (MTBF) of 163 hours.

Maintainability – Maintainability represents the ease with which preventive and corrective maintenance actions can be performed based on the design characteristics of equipment and software and the processes the manufacturer and election officials have in place for preventing failures and for reacting to failures.

Electrical Supply – This requirement addresses the battery power source for providing electrical supply during a power failure (Volume II, Section 4.1.2.4, RFI 2008-02, RFI 2008-06, RFI 2009-03).

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4.4.2 Physical Configuration Audit Specifications

The Physical Configuration Audit compares the voting system components submitted for qualification to the manufacturer's technical documentation, and shall include the following activities:

- Establish 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.
- Verify 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.
- If the hardware is non-COTS, NTS Huntsville will review drawings, specifications, technical data, and test data associated with system hardware to establish system hardware baseline associated with software baseline.
- Review 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.

4.4.3 Functional Configuration Audit Specifications

The functional configuration audit encompasses an examination of manufacturer's tests and the conduct of additional VSTL tests to verify the system performs all the functions as described in the manufacturer's documentation. In addition to functioning according to the manufacturer's documentation, tests will be conducted to ensure that requirements of Volume II section 6.7 and all other applicable EAC 2005 VVSG requirements are met. This testing is accomplished through a process called sequencing.

Sequencing is the act of navigating through the user interface to verify that the system performs as described by the manufacturer and does not violate any of the 2005 VVSG requirements. The path that the tester navigates follows the logical flow of accomplishing task required to conduct an election. For example, a task in conducting an election is to add a candidate. The tester will follow the flow of the user interface to add the candidate to a contest. If there are multiple ways to achieve this, then each method will be tested. This process will continue until all tasks for conducting an election are completed. Any paths, or combination of paths, that have revealed failures will be further tested to determine the scope of the failure. These will be handled on an individual basis.

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4.4.4 Accuracy Test Specifications

The accuracy test ensures that each component of the voting system can each process 1,549,703 consecutive ballot positions correctly within the allowable target error rate. The accuracy test is designed to test the ability of the system to "capture, record, store, consolidate, and report" specific selections and absences of a selection. The required accuracy is defined as an error rate. This rate is the maximum number of errors allowed while processing a specified volume of data. For paper-based voting systems, the ballot positions on a paper ballot must be scanned to detect selections for individual candidates and contests and the conversion of those selections detected on the paper ballot converted into digital data.

4.4.5 Volume and Stress Test Specifications

The volume and stress test investigates the system's response to conditions that tend to overload the system's capacity to process, store, and report data. The test parameters will focus on the system's stated limits and the ballot logic for areas such as the maximum number of active voting positions, maximum number of ballot styles, maximum candidates, maximum contests, and stated limits within the EMS. This test will be utilized to ensure the system can achieve the manufacturer's TDP claims of what the system can support. Testing will be performed by exercising an election definition and test cases developed specifically to test for volume and stress conditions of the system being tested.

4.4.6 System Integration Test Specifications

The system integration test addresses the integration of both hardware and software, along with any telecommunication capabilities. This includes connecting all supporting equipment and peripherals including ballot boxes, voting booths (regular and accessible), and any physical security equipment such as locks and ties. The testing process utilizes functional testing to execute the operations required to design an election, facilitate voting, and tabulate results.

4.4.7 Security Testing Specifications

The purpose of security testing is to evaluate the effectiveness of the voting system in detecting, preventing, logging, reporting, and recovering from any security risks identified by simulating attacks on the system. NTS Huntsville personnel have developed internal operating procedures to evaluate the voting system against the security requirements set forth in the 2005 VVSG.

4.4.8 TDP Evaluation Specifications

NTS Huntsville qualified personnel utilize a TDP Review Matrix which lists every EAC 2005 VVSG requirement pertaining to TDP review. NTS Huntsville will review the modified documents listed in Section 1.1.3 and other documents required to execute testing. NTS Huntsville will record the results of the review of each document to the applicable requirements listed in the TDP Review Matrix.

During the TDP review process, each document will be reviewed for completeness, clarity, correctness, and continuity. The review results will be formally reported to manufacturer. If a revised document is received, it will be re-reviewed as discussed in this section. The TDP will be continued to be reviewed during the entire testing process as these documents will be utilized to set up the systems, verify correct operational results and in other tests as needed. At the end of the TDP review process, a Deficiency Report will be issued listing the non-compliant items on a document-by-document basis, if applicable.

4.4.9 Source Code Review Specifications

Upon receipt of the source code, a SHA256 hash value will be created for each file. NTS Huntsville will verify that every line of modified source code is compliant to the 2005 VVSG coding requirements. In circumstances where the coding language facilitates the use of automated tools, NTS will develop a process for conducting the source code review with an automated tool. In addition, NTS Huntsville personnel will perform a manual 10% review of all automated source code review to verify that the automated tool was configured properly.

A technical report of all identified violations will be sent to the manufacturer for resolution per review / re-review basis. All revised source code will be checked for compliance until all issues are resolved. All iterative review results shall be included in the final test report.

Unmodified non-voting COTS software (e.g., operating systems, programming language compilers, database management systems, and web browsers) is not subject to the detailed review process specified in this section. However, NTS Huntsville personnel will use one of the following methods to verify that the COTS software has not been modified; independently download an original copy of the COTS software from a 3rd party site, obtain an original OEM disc(s), or receive an original COTS software package sent from the 3rd party manufacturer directly to NTS. Utilizing binary comparison or sha256 hash values the COTS software shall be verified as unmodified.

COTS software that has been modified by the manufacturer in any manner is subject to review. Source code generated by a COTS package and embedded in software modules for compilation or interpretation will be provided in human readable form to NTS Huntsville personnel to enable review.

4.5 Source Code Build Process

NTS Huntsville utilizes two build processes, a compliance build and a trusted build. Compliance builds for all software builds that are not required to be witnessed by the manufacturer. This build process follows the documented procedures of a "Trusted Build" in the Program Manual, with two exceptions: The image products will not be submitted to the EAC, and no manufacturer representative shall be required to be present or on-site for these builds. The "Trusted Build" process is described in section 5.6 of the EAC Program Manual and further clarified in NOC 16-02: Trusted Build.

4.6 System Identification Tools Review

System Identification tools are defined by the Program Manual as "Tools created by a Manufacturer of voting systems which allow elections officials to verify that the hardware and software of systems purchased are identical to the systems certified by the EAC." Section 2.14 of the Voting System Test Laboratory Manual requires that VSTLs test system identification tools during the test campaign to make sure they function properly and as intended. The manufacturer submitted system identification tools will be review for compliance with the 2005 VVSG Volume I Section 7.4.6 and RFI 2012-04.

4.7 QA & CM System Review

The manufacturer submitted QA Plan and CM Plan will be reviewed. The review will be limited to the changes within this modification to determine compliance with EAC 2005 VVSG Volume II Sections 2.11 and 2.12, and Volume I Sections 8 and 9, EAC stated requirements, and with the requirements of the internal manufacturer documentation. In addition, the manufacturer TDP documentation package will be reviewed to determine if the manufacturer's QA Plan and the CM Plan are being followed. The results of the TDP review shall be entered on a spreadsheet as previously described in Section 4.6 of this test plan. The results of the TDP review, including the QA and CM compliance results of the Technical Data Package Review, will be included in the final test report.

5.0 TEST DATA

5.1 Test Data Recording

All equipment utilized for test data recording shall be identified in the test data package. For hardware environmental and operational testing, the equipment shall be listed on the Instrumentation Equipment Sheet for each test. The output test data shall be recorded in an appropriate manner as to allow for data analysis. For source code and TDP reviews, results shall be compiled in output reports and submitted to the manufacturer for resolution.

Additionally, all test results, including functional test data, will be recorded on the relevant NTS Huntsville Operating Procedures and Test Cases. Results will also be recorded real-time in engineering log books. Incremental reports will be submitted to the manufacturer and the EAC at the completion of major test areas to communicate progress and results as deemed necessary by the stakeholders.

5.2 Test Data Criteria

NTS Huntsville will evaluate all test data against the manufacturer provided TDP and the requirements set forth in the EAC 2005 VVSG. Per the EAC 2005 VVSG, these parameters shall encompass the test tolerances and samples to define the minimum number of combinations or alternatives of input and output conditions that can be exercised to constitute an acceptable test of the parameters involved. The parameters will also include events with criteria defining the maximum number of interrupts, halts, or other system breaks that may occur due to non-test conditions. The maximum number shall not include events from which recovery occurs automatically or where a relevant status message is displayed.

6.0 TEST PROCEDURES AND CONDITIONS

NTS Huntsville is an independent testing laboratory for systems and components under harsh environments, including dynamic and climatic extremes as well as the testing of 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)

6.1 Test Facilities

All testing will be conducted at the NTS Huntsville, AL facility unless otherwise noted. Environmental non-operating (storage) and operating hardware testing will be conducted utilizing an adequately sized environmental test chamber or dynamic vibration (shaker) system equipped with the required data gathering support equipment. All remaining operating hardware tests will be conducted at the appropriate test site with the required support equipment. All instrumentation, measuring, and test equipment used in the performance of this test program will be listed on the Instrumentation Equipment Sheet for each test and shall be calibrated in accordance with NTS Quality Assurance Program, which complies with the requirements of ANSI/ISO/IEC 17025:2005 and ANSI/NCSL Z540.3 and ISO 10012:2003.

Standards used in performing all calibrations are traceable to the National Institute of Standards and Technology (NIST) by report number and date. When no national standards exist, the standards are traceable to international standards or the basis for calibration is otherwise documented.

Unless otherwise specified herein, all remaining tests, including system level functional testing, shall be performed at standard ambient conditions outlined in Table 6-1.

Table 6-1. Standard Ambient Conditions

Event	Ambient Range
Temperature	68 to 75 degrees (°) Fahrenheit (F)
Relative Humidity	Local Site Humidity
Atmospheric Pressure	Local Site Pressure

The following tolerances listed in Table 6-2 shall be used unless otherwise specified herein.

Table 6-2. Test Tolerances

Phenomena	Tolerance Allowance
Temperature	± 3.6°F (2°C)
Vibration Amplitude	± 10%
Vibration Frequency	± 2%
Random Vibration Acceleration	20 to 500 Hertz ± 1.5 dB
	500 to 2000 Hertz ± 3.0 dB
Random Overall grms	± 1.5 dB
Acoustic Overall Sound Pressure Level	+4/-2 dB

Deviations to the above tolerances may be submitted by the responsible test laboratory with sufficient engineering information to substantiate the deviation request, but only when best effort technique and system limitations indicate the need for a deviation.

6.2 Test Set-up

All voting system components (hardware and software), will be received and documented utilizing NTS Huntsville Receiving Ticket (QP HSV-150, 05/04/15) and proper QA procedures. When voting system hardware is received, each test article will be unpacked and inspected for obvious signs of degradation and/or damage that may have occurred during transit. Noticeable degradation and/or damage, if present, will be recorded, photographed, and the manufacturer shall be notified. NTS Huntsville VSTL personnel will notify NTS Huntsville QA personnel that the equipment is ready for receipt inspection. QA personnel shall record the serial numbers and part numbers. Comparison shall be made between those numbers recorded and those listed on the shipper's manifest. Any discrepancies noted will be brought to the attention of the manufacturer representative for resolution. All TDP and source code modules received will be inventoried and maintained by the Project Lead assigned to testing.

For test setup, the system will be configured as it would for normal field use. This includes connecting all supporting equipment and peripherals. NTS Huntsville will properly configure and initialize the system, and verify that it is ready to be tested by following the procedures detailed in the voting system TDP.

6.3 Test Sequence and Description

The components of the voting system will undergo testing to verify that the modification performs as described by the manufacturer and meets the requirements of the 2005 VVSG. The required hardware and functional tests are outlined in the subsections below. The sequence will follow the schedule in Appendix C – Project Schedule.

6.3.1 Hardware Testing

All hardware testing will be performed as described by the 2005 VVSG and RFIs issued at the time of this test campaign. Descriptions of these tests are located in section 4.5.1. As part of the test campaign, the DS450 and ExpressVote 1.0 shall be subjected to the hardware tests outlined in Table 6-3. No hardware testing is required for the DS200, DS850 or AutoMARK.

Table 6-3. Hardware Tests

Test	Equipment	
	DS450	ExpressVote 1.0[2]
Conducted RF Immunity	X	X
Electrical Fast Transient	X	X
Electrical Power Disturbance	X	X
Electrical Supply	X	X
Electromagnetic Radiation	X	X
Electromagnetic Susceptibility	X	X
Electrostatic Disruption	X	X
Lightning Surge	X	X
Magnetic Fields Immunity	X	
Product Safety	X	
Temperature Power	X	

[2] Hardware testing will be performed on the three configurations of ExpressVote 1.0; tabletop, booth, and rolling kiosk. Testing is being conducted to verify that the new power supply, that is required to meet the US Department of Energy Level VI Efficiency Standard, meets the requirements of the 2005 VVSG.

6.3.2 Physical Configuration Audit

NTS Huntsville will perform a physical configuration audit on the submitted hardware to verify that it is unmodified from the certified EVS 5.2.2.0 hardware.

6.3.3 Functional Configuration Audit

The FCA for the EVS 5.2.2.0 campaign will include review of: DS450, DS850, DS200, ExpressVote 1.0, AutoMARK and modified elements of the EMS. The FCA tests will be designed per the specifications in Section 4.4.3 of this plan. Test cases will be created to verify that the modifications detailed in section 1.1.3 and 4.1.1 of this test plan meet the requirements of the 2005 VVSG and the manufacturer stated operations:

During the FCA, both normal and abnormal data will be input into the system to attempt to introduce errors and test for error recovery.

6.3.4 Accuracy

The accuracy requirements for the DS450 will be met by the execution of the standard accuracy test. The D450 will be tested by utilizing a combination of hand marked (70%) and pre-marked (30%) ballots to achieve accuracy rate greater than 1,549,703 correct ballot positions.

6.3.5 Volume and Stress

The volume and stress test investigates the system's response to conditions that tend to overload the system's capacity to process, store, and report data. The test parameters will focus on the system's stated limits and the ballot logic for areas such as the maximum number of active voting positions, maximum number of ballot styles, maximum candidates, maximum contests, and stated limits within the EMS. This test will be utilized to ensure the system can achieve the manufacturer's TDP claims of what the system can support. Testing will be performed by exercising an election definition and test cases developed specifically to test for volume and stress conditions of the system being tested.

V&S A:

Election A tests the maximum precincts (9900) and maximum ballot styles (9900) in an election.

V&S B:

Election B tests the maximum precinct elements in a tabulator (65,500) and the maximum precinct elements in ERM (500,000).

V&S C:

Election C tests the maximum candidate counters per election (21,000), the maximum contests allowed in an election (21,000), maximum candidates per contest (175), maximum "vote for" per contest (98) and the maximum number of parties in a general election (75).

V&S D:

Election D tests the maximum number of parties in a primary election (20 including nonpartisan party).

V&S E:

Election E tests the maximum district types (20) and the maximum district names (40) in an election.

V&S F:

Election F tests the maximum candidate\counters allowed per precinct (1,000) and maximum contests allowed per ballot style (200)

6.3.5 Volume and Stress (Continued)

V&S F:

Election F tests the maximum candidate\counters allowed per precinct (1,000) and maximum contests allowed per ballot style (200)

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6.3.6 System Integration

All submitted hardware and software components will be included in the system integration test. Six elections will be created to test the voting systems ability to function as an integrated system. The design parameters of each election are included in this section.

General Election: GEN-01

The 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.

The parameters of this election are listed below:

- Closed Primary: No
- Open Primary: No
- Partisan offices: Yes
- Non-Partisan offices: Yes
- Write-in voting: Yes
- Primary presidential delegation nominations: No
- Ballot Rotation: Yes
- Straight Party voting: Yes
- Cross-party endorsement: No
- Split Precincts: Yes
- Vote for N of M: Yes
- Recall issues, with options: No
- Cumulative voting: No
- Ranked order voting: No
- Provisional or challenged ballots: Yes
- Early Voting: No

In addition to the parameters listed above, the following will also be tested:

- Audio input in an alternative language for basic voting pattern using an ADA device
- Audio input for write-in voting using an ADA device
- Spanish language input for a basic voting pattern
- Input for write-in voting using Spanish language

6.3.6 System Integration (Continued)

General Election: GEN-02

The 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 parameters of this election are listed below:

- Closed Primary: No
- Open Primary: No
- Partisan offices: Yes
- Non-Partisan offices: Yes
- Write-in voting: Yes
- Primary presidential delegation nominations: No
- Ballot Rotation: Yes
- Straight Party voting: No
- Cross-party endorsement: No
- Split Precincts: No
- Vote for N of M: Yes
- Recall issues, with options: Yes
- Cumulative voting: No
- Ranked order voting: No
- Provisional or challenged ballots: No
- Early Voting: Yes

In addition to the parameters listed above, the following will also be tested:

- Early voting election with at least one unit in all precincts
- Voting options for over-voting
- Voting options for under-voting
- Spanish language ballots
- Audio ballots utilizing ADA capabilities

6.3.6 System Integration (Continued)

General Election: GEN-03

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.

The parameters of this election are listed below:

- Closed Primary: No
- Open Primary: No
- Partisan offices: Yes
- Non-Partisan offices: Yes
- Write-in voting: Yes
- Primary presidential delegation nominations: No
- Ballot Rotation: No
- Straight Party voting: No
- Cross-party endorsement: No
- Split Precincts: No
- Vote for N of M: Yes
- Recall issues, with options: No
- Cumulative voting: No
- Ranked order voting: No
- Provisional or challenged ballots: Yes
- Early Voting: No

In addition to the parameters listed above, the following will also be tested:

- Spanish language ballot with a basic voting pattern and write-in candidates
- Spanish audio input to simulate ADA device with write-in option
- Character based language with basic voting pattern
- Character based language utilizing an ADA option
- Binary input to support ADA option
- Binary input to support ADA audio device

6.3.6 System Integration (Continued)

Primary Election: PRIM-01

The 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 parameters of this election are listed below:

- Closed Primary: Yes
- Open Primary: No
- Partisan offices: Yes
- Non-Partisan offices: Yes
- Write-in voting: Yes
- Primary presidential delegation nominations: No
- Ballot Rotation: No
- Straight Party voting: No
- Cross-party endorsement: No
- Split Precincts: Yes
- Vote for N of M: Yes
- Recall issues, with options: No
- Cumulative voting: No
- Ranked order voting: No
- Provisional or challenged ballots: Yes
- Early Voting: No

In addition to the parameters listed above, the following will also be tested:

- ADA audio device utilized with a write-in option

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6.3.6 System Integration (Continued)

Primary Election: PRIM-02

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 parameters of this election are listed below:

- Closed Primary: No
- Open Primary: Yes
- Partisan offices: Yes
- Non-Partisan offices: Yes
- Write-in voting: Yes
- Primary presidential delegation nominations: No
- Ballot Rotation: No
- Straight Party voting: No
- Cross-party endorsement: Yes
- Split Precincts: No
- Vote for N of M: Yes
- Recall issues, with options: No
- Cumulative voting: No
- Ranked order voting: No
- Provisional or challenged ballots: No
- Early Voting: No

In addition to the parameters listed above, the following will also be tested:

- Open primary election with at least one machine in each precinct
- Voting options for over-voting
- Voting options for under-voting
- Voting option for write-ins
- Spanish language ballot
- Voting option utilizing ADA audio device

6.3.6 System Integration (Continued)

Primary Election: PRIM-03

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.

The parameters of this election are listed below:

- Closed Primary: Yes
- Open Primary: No
- Partisan offices: Yes
- Non-Partisan offices: Yes
- Write-in voting: Yes
- Primary presidential delegation nominations: No
- Ballot Rotation: No
- Straight Party voting: No
- Cross-party endorsement: No
- Split Precincts: No
- Vote for N of M: Yes
- Recall issues, with options: No
- Cumulative voting: No
- Ranked order voting: No
- Provisional or challenged ballots: Yes
- Early Voting: No

In addition to the parameters listed above, the following will also be tested:

- Spanish ballot with basic voting pattern and write-in option
- Spanish language ballot using ADA audio device with write-n option
- Character based language ballot with basic voting pattern
- Character based language utilizing ADA device
- Binary input to support ADA option
- Binary input to support ADA audio device

6.3.7 Security

The security test is designed and performed to verify compliance with the requirements defined in 2005 VVSG Volume I, Section 7. The range of risks tested is determined by the design of the system and potential exposure to risk. For EVS 5.2.2.0, the security testing will be limited to the following:

- Review of hardening Scripts for the following:
  - Compliance to the submitted security checklists (or benchmarks) for the Windows Server 2008 R2 (Microsoft Secure Configuration Manger v 3.0 – Member Server) and Window 7 (USGCB v. 1.2).
- Basic vulnerability scans on the EMS components to verify that the Operating System and Anti-Virus software are up-to-date as of the test execution date and that no locally exploitable vulnerabilities are detected.
- Analysis of the system's use of the RSA encryption library. This will be performed using a combination of:
  - Source code which will be reviewed to ensure that the source code contains comments and calls to enforce the use of FIPS140 functionality.
  - Dynamic analysis will be performed to see if the application utilizes the target libraries during execution.
  - Observations will be made to determine if the results data transferring between the client and voting machines is encrypted and contained in an encrypted file using the Windows File Share.

6.3.8 TDP Review

NTS Huntsville will ensure that all submitted modifications are accurately documented and that the documents adhere to the requirements of the 2005 VVSG. A complete listing of the EVS 5.2.2.0 TDP is located in Appendix B – Technical Data Package.

6.3.9 System Identification Tools Review

NTS Huntsville will use the results of the trusted build process and the EVS 5.2.2.0 system identification tools to verify that the tools provided function as described by ES&S and meet the requirements of the Program Manual and Volume I Section 7.4.6 of the 2005 VVSG.

6.3.10 Source Code Review

All lines of source code that are new or were modified from EVS 5.2.1.0 to EVS 5.2.2.0 will be reviewed. This encompasses code for the DS450, which is a new component to EVS 5.2.2.0. A portion of the DS450 code was re-used from the previously certified DS850 code base as they are both central count scanners and share a significant amount of identical capabilities and functionality. The DS450 code that was newly developed or modified will be reviewed using VSTL source code review procedures and standards.

6.4 Test Operations Procedure

These subsections address the procedures that NTS will follow during this modification testing campaign.

6.4.1 Pass/Fail Criteria

The PASS/FAIL criteria at the Component Level will be based on the expected result. If the Equipment Under Test (EUT) performs as expected, the test is considered as passed. If the EUT does not perform as expected, the test will be evaluated for tester, test procedure, or test equipment errors. If it is determined there were no tester, test procedure, or test equipment errors, the test will be repeated in an attempt to reproduce the results. If the results cannot be reproduced, the anomaly will be logged and monitored throughout the test campaign and subsequent testing efforts. If the results can be reproduced and the expected results are not met, the EUT will have failed the test. NTS Huntsville personnel will document the error and track the error through resolution.

The PASS/FAIL criteria at the System Level will be based on the expected result. If the System Under Test (SUT) performs as expected, the test is considered as passed if either 1) no errors are found, or 2) an error is encountered but the system continues to operate and engineering analysis determines that the root cause does not affect system level testing. The system level test is considered failed when an error is encountered and the system is too unstable to continue or engineering analysis determines the root cause could affect further testing. If an error occurs during system level testing, the error shall be documented. If the voting system is able to recover and continue, the test will continue. If the error causes the system to become unstable, the test shall be halted. All errors documented during System Level Testing shall be tracked through resolution.

6.4.2 Anomalies

NTS Huntsville defines an anomaly as any unexpected result and/or event that deviates from what is standard, normal, or expected in which no root cause has been determined. All anomalies are logged in the NTS issue tracking system (JIRA) and monitored throughout the test campaign and subsequent testing efforts. Anomalies may become deficiencies when a root cause is established.

6.4.3 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 placed into JIRA and the EAC's Virtual Review Tool (VRT) for disposition and resolution. The manufacturer will be required to submit a root cause analysis and correct any deficiency before testing can be resumed. Engineering analysis will be performed to determine what effect the resolution has on the component. A determination will be made whether Regression Testing will be sufficient or a complete re-test is necessary. All deficiencies and their resolutions will be documented on the NTS Huntsville Deficiency tracking system and the EAC Virtual Review Tool.

6.4.4 Test Results and Assessment

NTS Huntsville personnel will test every EAC 2005 VVSG requirement impacted by the submitted modification. NTS Huntsville personnel will report all deficiencies discovered during this test campaign to the manufacturer and the EAC. If NTS Huntsville determines there is not enough data to ensure a requirement was met, the test plan will be altered and further testing will be done.

6.4.5 Terms of NTS Huntsville Recommendation for Certification

The EAC has the final decision as to whether the system meets all the requirements for an EAC-certified system. NTS Huntsville will recommend approval, if the modifications meet all applicable sections of the 2005 VVSG. If the modifications do not meet all applicable sections of the 2005 VVSG, NTS will report the non-conformities to EAC.

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APPENDIX A – ADDITIONAL TESTING

A.1 Manufacturer Requested Additional Testing

The following tests will be performed by NTS Huntsville at the request of the manufacturer. These modifications or additions represent functionality or tools that are outside the scope of the certification.

A.1.2 Election Support Software and Hardware

The following software and hardware components are used to support the operations of the EMS and ExpressVote:

- ExpressLink – ExpressLink is a Windows PC application that can run in either a standalone mode, or in a monitor mode, where the application monitors requests from a voter registration (VR) system over a shared network folder. The application imports an election definition from Electionware, accepts requests to print a voter's ExpressVote activation card, determines the voter's ballot style and then prints the activation card on the ExpressVote Activation Card Printer.
- ExpressVote Activation Card Printer – The ExpressVote Activation Card Printer is a small, thermal, on demand printer used to print the ballot activation code on the ExpressVote activation card.
- Electionware Toolbox – Electionware Toolbox is a set of utilities that can be integrated into the Electionware EMS to enhance the software usability experience and streamline various processes. These add-on utilities are called Test Deck and Text to Speech.
- Ballot Online ExpressPass – Ballot Online is an optional system that allows a user to access their ballot online and make sample ballot selections on any device connected to the Internet. When finished, the output from this system is the ExpressPass – a selection summary with scannable QR code that the user can either print or save in an electronic format on their mobile device. If submitting the vote selections for official tabulation, the user is required to go to the polling place to submit the vote selections on their ExpressPass, following standard voter authentication at the polling place. The voter operates the ExpressVote to scan, review and validate vote selections. The vote summary card may then be submitted for tabulation on an ES&S tabulator: DS200, DS850, or DS450.

NTS Huntsville will perform limited testing as requested by the manufacturer. Table A-1 outlines the requested testing.

Table A-1. Manufacturer Requested Testing Outside of Certification

Component	Version	Requested Testing
ExpressLink	1.3.0.0	2005 VVSG Source code Compliance, Functional Integration Test
ExpressVote Activation Card Printer	N/A	Functional Integration Test
Electionware Toolbox	3.1.0.0	Functional Integration Test
Ballot Online ExpressPass	N/A	Functional Integration Test

APPENDIX B – TECHNICAL DATA PACKAGE

B.1 Technical Data Package

The documents listed in Table B-1 comprise the EVS 5.2.2.0 TDP.

Table B-1. EVS 5.2.2.0 TDP

EVS 5.2.2.0 TDP Documents	Version	Doc No.	Document Code
System Overview			
System Overview	1.13	01-01	EVS5220_C_D_0100_SysOvr
System Functionality Description			
System Functionality Description	1.5	02-01	EVS5220_C_D_0200_SFD
System Hardware Specification			
AutoMARK System Hardware Specification	6	03-06-01	AutoMARK_System Hardware Specification_AQS-18-5000-001-F
AutoMARK System Hardware Overview	9	03-06-02	AutoMARK_System_Hardware_Overview_AQS-18-5002-000-S
DS200 Hardware Specification	3.4	03-01	DS200HW_M_SPC_0312_HWSpec
DS200 Hardware Specification	4.5	03-02	DS200HW_M_SPC_0313_HWSpec
DS450 Hardware Specification	1.6	03-03	DS450HW_M_SPC_0310_HWSpec
DS850 Hardware Specification	1.6	03-04	DS850HW_M_SPC_0310_HWSpec
ExpressVote Hardware Specification	3.5	03-05	EXPRESSVOTEHW_M_SPC_0310_HWSPEC
Approved Parts List	--	03-07	Approved Parts List (folder)
AutoMark A100 Approved Parts List	2.0	03-07-06	AutoMARKHW_M_SPC_A100_BOM
AutoMark A200 Approved Parts List	2.0	03-07-07	AutoMARKHW_M_SPC_A200_BOM
AutoMARK A300 Approved Parts List	2.0	03-07-08	AutoMARKHW_M_SPC_A300_BOM
Approved Parts List: DS200 HW Rev 1.2	1.2	03-07-01	DS200HW_M_SPC_0312_APL
Approved Parts List: DS200 HW Rev 1.3	1.1	03-07-02	DS200HW_M_SPC_0313_APL
Approved Parts List: DS450 HW Rev 1.0	1.1	03-07-03	DS450HW_M_SPC_0310_APL
Approved Parts List: DS850 HW Rev 1.0	1.1	03-07-04	DS850HW_M_SPC_0310_APL
Approved Parts List: ExpressVote HW Rev 1.0	1.1	03-07-05	ExpressVoteHW_M_SPC_0310_APL
Software Design and Specification			
Coding Standards	1.2	04-10	ESSSYS_D_P_0400_CodingStandards
System Development Program	1.2	04-09	ESSSYS_SG_P_0400_SystemDevProgram
DS200- Software Design Specification	1.3	04-06	EVS5220_D_SDS00_DS200
DS450- Software Design Specification	1.2	04-04	EVS5220_D_SDS00_DS450
DS850- Software Design Specification	1.2	04-05	EVS5220_D_SDS00_DS850
Electionware - Software and Design Specification	1.3	04-02	EVS5220_D_SDS00_Electionware
Software Design Specifications Event Log Service	1.0	04-01	EVS5220_D_SDS00_ELS
Software Design Specifications ERM	1.4	04-03	EVS5220_D_SDS00_ERM
Software Design Specifications ERM Appendices	1.1	04-03-01	EVS5220_D_SDS00_ERM01_Appendices
ExpressVote- Software Design and Specification	1.3	04-07	EVS5220_D_SDS00_ExpressVote
AutoMARK Software Design Specifications	--	04-08	AutoMARK SDS (folder)
AutoMARK Ballot Image Processing Specification	6	04-08-08	AutoMARK ESS Ballot Image Processing Specification AQS-18-5002-003-S

B.1 Technical Data Package (Continued)

Table B-1. EVS 5.2.2.0 TDP (Continued)

Software and Design Specification (continued)			
AutoMARK Ballot Scanning and Printing Specification	5	04-08-08	AutoMARK ESS Ballot Scanning and Printing Specification AQS-18-5002-007-S
AutoMARK Driver Application Programming Interface (API) Specification	5	04-08-09	AutoMARK ESS Driver API Specification AQS-18-5000-002-F
AutoMARK Embedded Database Interface Specification	6	04-08-06	AutoMARK ESS Embedded Database Interface Specifications AQS-18-5002-005-S
AutoMARK Graphical User Interface (GUI) Design Specification	6	04-08-04	AutoMARK ESS GUI Design Specifications AQS-18-5001-005-R
AutoMARK Operating Software Design Specifications	5	04-08-01	AutoMARK ESS Operating Software Design Specifications AQS-18-5001-002-R
AutoMARK Operations and Diagnostics Log	5	04-08-12	AutoMARK ESS Operations and Diagnostic Log Specs AQS-18-5002-004-S
AutoMARK Programming Specifications Details	6	04-08-10	AutoMARK ESS Programming Specifications Details AQS-18-5001-011-R
AutoMARK Software Design Specification	7	04-08-02	AutoMARK ESS Software Design Spec AQS-18-5001-004-S
Software Design and Specifications Overview AutoMARK Voter Assist Terminal (VAT) Firmware Version Number 1.8	--	04-08-13	AutoMARK ESS Software Design Spec Overview
AutoMARK Software Development Environment Specification	5	04-08-03	AutoMARK ESS Software Development Environment AQS-18-5001-006-R
AutoMARK Software Diagnostic Specifications	5	04-08-05	AutoMARK ESS Software Diagnostics Specifications AQS-18-5000-004-F
AutoMARK Software Standards Specification	5	04-08-11	AutoMARK ESS Software Standards Specification AQS-18-4000-000-S
Electionware04_PostgreSQL Table and Field Descriptions	--	04-02-01	EVS5220_D_SDS00_Electionware04_PostgreSQL Table and Field Descriptions (folder)
Electionware	--	--	election_ware_4_7_1_1
Electionware Admin	--	--	election_ware_admin_4_7_1_1
System Test/Verification Specification			
System Test Plan	1.0	05-01	EVS5220_QA_D_0500_SysTestPlan
Usability Test Reports	--	--	UsabilityTestReports (folder)
Common Industry Format Usability Test Report – ExpressVote 1.0	N/A	05-02-01	EVOTE_1'0_D_CIFRpt
Common Industry Format Usability Test Report – AutoMARK 1.8.7.0	1.x	05-02-02	AMVAT_1'X_D_CIFRpt
Common Industry Format Usability Test Report – DS200 1.2.1	1.2.1	05-02-03	DS200_1'2'1_D_CIFRpt

B.1 Technical Data Package (Continued)

Table B-1. EVS 5.2.2.0 TDP (Continued)

System Security Specification			
Voting System Security Specification	1.3	06-01	EVS5220_CM_SPC00_SysSecuritySpec
Security Script Description	1.1	06-05	EVS5220_CM_SPC02_SecScriptDesc
EMS Client Workstation Secure Setup & Configuration Guide	1.3	06-02	EVS5220_CM_SPC_ClientWorkstationSetupConfigGuide
EMS Server Secure Setup & Configuration Guide	1.3	06-03	EVS5220_CM_SPC_EMSServerSetupConfigGuide
Standalone EMS Workstation Secure Setup & Configuration Guide	1.3	06-04	EVS5220_CM_SPC_StandaloneWorkstationSetupConfigGuide
AutoMARK System Security Specifications	7	06-06	AutoMARK ESS System Security Specification AQS-18-5002-001-S
Validation Procedures and Scripts	--	06-07	01_ValidationProcedures&Scripts (folder)
Verification Procedure: Election Management System	1.1	06-07-01	EVS5220_CM_D_2010_EMSVerificationProcedure
Verification Procedure: AutoMARK Ballot Marking Device	1.1	06-07-02	EVS5220_CM_D_2021_AutoMARKVerificationProcedure
Verification Procedure: DS850 Central Scanner & Tabulator	1.1	06-07-03	EVS5220_CM_D_2050_DS850VerificationProcedure
Verification Procedure: DS450 Central Scanner & Tabulator	1.1	06-07-04	EVS5220_CM_D_2060_DS450VerificationProcedure
Verification Procedure: DS200 Precinct Scanner & Tabulator	1.1	06-07-05	EVS5220_CM_D_2070_DS200VerificationProcedure
Verification Procedure: ExpressVote Universal Voting System	1.1	06-07-06	EVS5220_CM_D_2081_ExpressVoteVerificationProcedure
			EVS 5.2.2.0 - Verification Pack (folder)
Validation File Lists	--	06-08	02_ValidationFileLists (folder)
Validation File List: Electionware	1.1	06-08-01	EVS5220_D_L01_StaticDynamicFileList_Electionware
Validation File List: ExpressVote	1.1	06-08-02	EVS5220_D_L02_StaticDynamicFileList_ExpressVote
Validation File List: DS450	1.1	06-08-03	EVS5220_D_L03_StaticDynamicFileList_DS450
Validation File List: DS200	1.0	06-08-04	EVS5220_D_L04_StaticDynamicFileList_DS200
Validation File List: DS850	1.0	06-08-05	EVS5220_D_L05_StaticDynamicFileList_DS850
Validation File List: AutoMARK	1.1	06-08-06	EVS5220_D_L06_StaticDynamicFileList_AutoMARK
Validation File List: ERM	1.1	06-08-07	EVS5220_D_L08_StaticDynamicFileList_ERM
Validation File List: ExpressVote Previewer	1.0	06-08-08	EVS5220_D_L11_StaticDynamicFileList_ExpressVotePreviewer
Validation File List: ELS	1.0	06-08-09	EVS5220_D_L15_StaticDynamicFileList_ELS
Validation File List: RMS	1.0	06-08-10	EVS5220_D_L16_StaticDynamicFileList_RMS
Validation File List: VATPreviewer	1.1	06-08-11	EVS5220_D_L19_StaticDynamicFileList_VATPreviewer

B.1 Technical Data Package (Continued)

Table B-1. EVS 5.2.2.0 TDP (Continued)

System Operations Procedure			
AutoMARK System Operator's Guide	1.0	07-01	EVS5220_DOC_SOP_AMVAT
DS200 Operator's Guide	1.3	07-02	EVS5220_DOC_SOP_DS200
DS200 Operator's Guide Appendices	1.0	07-02-03	EVS5220_DOC_SOP_DS200_APPX
DS450 Operator's Guide	1.7	07-03	EVS5220_DOC_SOP_DS450
DS450 Operator's Guide Appendices	1.0	07-03-01	EVS5220_DOC_SOP_DS450_APPX
DS850 Operator's Guide	1.3	07-04	EVS5220_DOC_SOP_DS850
DS850 Operator's Guide Appendices	1.0	07-04-01	EVS5220_DOC_SOP_DS850_APPX
EVS Event Logging Service User's Guide	1.0	07-05	EVS5220_DOC_SOP_ELS
Election Reporting Manager User's Guide	1.1	07-06	EVS5220_DOC_SOP_ERM
Election Reporting Manager User's Guide Appendices	1.0	07-06-01	EVS5220_DOC_SOP_ERM_APPX
ElectionWare Vol. I: Administrators Guide	1.4	07-07	EVS5220_DOC_SOP_EW01Admin
ElectionWare Vol. II: Define User Guide	1.1	07-08	EVS5220_DOC_SOP_EW02Define
ElectionWare Vol. III: Design User Guide	1.3	07-09	EVS5220_DOC_SOP_EW03Design
ElectionWare Vol. IV: Deliver User Guide	1.1	07-10	EVS5220_DOC_SOP_EW04Deliver
ElectionWare Vol. V: Results User Guide	1.0	07-11	EVS5220_DOC_SOP_EW05Results
ElectionWare Vol. VI: Appendices	1.0	07-11-01	EVS5220_DOC_SOP_EW06Appendix
ExpressVote Operator's Guide	1.2	07-12	EVS5220_DOC_SOP_ExpressVote
ExpressVote Operator's Guide Appendices	1.0	07-12-01	EVS5220_DOC_SOP_ExpressVote_APPX
System Maintenance Manuals			
AutoMARK System Maintenance Manual	1.0	08-01	EVS5220_DOC_SMM_AMVAT
DS200 Maintenance Manual	1.1	08-02	EVS5220_DOC_SMM_DS200
DS450 Maintenance Manual	1.4	08-03	EVS5220_DOC_SMM_DS450
DS850 Maintenance Manual	1.2	08-04	EVS5220_DOC_SMM_DS850
ExpressVote Maintenance Manual	1.1	08-05	EVS5220_DOC_SMM_ExpressVote
Personnel Deployment and Training			
Personnel Deployment and Training Program	1.1	09-01	ESSSYS_T_D_0900_TrainingProgram
Configuration Management Plan			
Configuration Management Program	2.1	10-01	ESSSYS_CM_P_1000_CMProgram
Technical Documentation Program	1.0	10-02	EVS5220_DOC_P_1000_TDProgram
QA Program			
Manufacturing Quality Assurance Program	1.2	11-01	ESSSYS_M_P_1100_MNFQualityAssurancePlan
Software Quality Assurance Program	1.2	11-02	ESSSYS_QA_P_1100_SWQAProgram
System Change Notes			
System Change Notes	1.8	12-01	EVS5220_DOC_D_1200_ChangeNotes
System Change Notes with QA Test Notes	1.6	12-02	EVS5220_DOC_D_1200_ChangeNotes_QA
Attachments			
Ballot Production Guide for EVS	2.6	13-01	ESSSYS_DOC_SOP_BPG

APPENDIX C – PROJECT SCHEDULE

C.1 Project Schedule

Table C-1 provides the project schedule as run.

Table C-1. Project Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	'16 T	M
1	✓	Receipt Inspection (8/26/16 - Soft; 8/31/16 - Hwd. DS450) (5220)	1 day	Tue 9/6/16	Tue 9/6/16			
2	✓	ES&S Application Submission	7 days	Tue 9/6/16	Wed 9/14/16			
3	✓	Test Readiness Review	3 days	Tue 9/6/16	Thu 9/8/16			
4	✓	Technical Data Package Review (TDP)	32 days	Fri 9/9/16	Mon 10/24/16	3		
5	✓	Test Plan	44 days	Thu 9/15/16	Tue 11/15/16			
12	✓	Source Code Reviews	68 days	Mon 9/5/16	Mon 12/12/16			
115	✓	Compliance Builds	45 days	Mon 9/5/16	Mon 11/7/16			
116	✓	EMS (CB1)	1 day	Fri 10/14/16	Fri 10/14/16			
117	✓	AutoMark (CB1) (ES&S to provide 11/01/16)(COMPLETED 11/04)	1 day	Mon 11/7/16	Mon 11/7/16	57FS+5 day		
118	✓	ExpressVote 1.0 (CB1)	1 day	Tue 10/18/16	Tue 10/18/16	58,65,76,83		
119	✓	DS200 (CB1)	1 day	Tue 10/25/16	Wed 10/26/16	59,77,95		
120	✓	DS450 (CB1)	1 day	Fri 10/21/16	Fri 10/21/16	60,66,78,84		
121	✓	DS850 (CB1)	1 day	Fri 10/14/16	Fri 10/14/16	61FS+10 da		
122		Compliance Build Set 2	45 days	Mon 9/5/16	Mon 11/7/16			
129	✓	EMS System Setup	30 days	Tue 9/6/16	Mon 10/17/16			
133	✓	Security (EMS and DS450) *Physical Security finished 11/30	3 days	Tue 10/18/16	Thu 10/20/16	129		
134	✓	Physical Configuration Audit (5 - DS450 - DS45160530:16,17,18,19,20)	2 days	Tue 9/20/16	Wed 9/21/16	2		
135	✓	Functional Configuration Audit	17 days	Tue 11/8/16	Fri 12/2/16			
136	✓	Hardware Testing	21 days	Mon 10/24/1	Mon 11/21/16			
164	✓	Temperature Power Variation	2 days	Fri 11/18/16	Mon 11/21/16	159FS-2 da		
168	✓	Product Safety (completed 10/7 pending receipt of report)	3 days	Wed 10/5/16	Fri 10/7/16			
169	✓	Maintainability	1 day	Tue 10/25/16	Tue 10/25/16	129FS+5 da		
170	✓	Volume and Stress Testing	5 days	Fri 11/18/16	Tue 11/29/16	164FS-2 da		
171	✓	Accuracy Testing	1 day	Fri 11/18/16	Mon 11/21/16	164FS-2 da		
172	✓	System Integration Testing	4 days	Mon 11/21/1	Tue 11/29/16	171		
173	✓	Final Source Code Review	1 day	Tue 11/29/16	Wed 11/30/16	172		
174	✓	Trusted Build - Build Review	24.3 days	Tue 11/29/16	Thu 1/5/17			
181	✓	Trusted Build Set 1	5 days	Mon 12/5/16	Fri 12/9/16			
191		Test Report	62.88 days	Tue 11/29/16	Tue 2/28/17			

END OF TEST PLAN

APPENDIX D. TECHNICAL DATA PACKAGE

D.1 EVS 5.2.2.0 TECHNICAL DATA PACKAGE

The documents listed in Table D-1 comprise the EVS 5.2.2.0 TDP.

Table D-1. EVS 5.2.2.0 TDP

EVS 5.2.2.0 TDP Documents	Version	Doc No.	Document Code
System Overview			
System Overview	1.13	01-01	EVS5220_C_D_0100_SysOvr
System Functionality Description			
System Functionality Description	1.5	02-01	EVS5220_C_D_0200_SFD
System Hardware Specification			
AutoMARK System Hardware Specification	6	03-06-01	AutoMARK_System Hardware Specification_AQS-18-5000-001-F
AutoMARK System Hardware Overview	9	03-06-02	AutoMARK_System_Hardware_Overview_AQS-18-5002-000-S
DS200 Hardware Specification	3.4	03-01	DS200HW_M_SPC_0312_HWSpec
DS200 Hardware Specification	4.5	03-02	DS200HW_M_SPC_0313_HWSpec
DS450 Hardware Specification	1.6	03-03	DS450HW_M_SPC_0310_HWSpec
DS850 Hardware Specification	1.6	03-04	DS850HW_M_SPC_0310_HWSpec
ExpressVote Hardware Specification	3.5	03-05	EXPRESSVOTEHW_M_SPC_0310_HWSPEC
Approved Parts List	--	03-07	Approved Parts List (folder)
AutoMark A100 Approved Parts List	2.0	03-07-06	AutoMARKHW_M_SPC_A100_BOM
AutoMark A200 Approved Parts List	2.0	03-07-07	AutoMARKHW_M_SPC_A200_BOM
AutoMARK A300 Approved Parts List	2.0	03-07-08	AutoMARKHW_M_SPC_A300_BOM
Approved Parts List: DS200 HW Rev 1.2	1.2	03-07-01	DS200HW_M_SPC_0312_APL
Approved Parts List: DS200 HW Rev 1.3	1.1	03-07-02	DS200HW_M_SPC_0313_APL
Approved Parts List: DS450 HW Rev 1.0	1.1	03-07-03	DS450HW_M_SPC_0310_APL
Approved Parts List: DS850 HW Rev 1.0	1.1	03-07-04	DS850HW_M_SPC_0310_APL
Approved Parts List: ExpressVote HW Rev 1.0	1.1	03-07-05	ExpressVoteHW_M_SPC_0310_APL
Software Design and Specification			
Coding Standards	1.2	04-10	ESSSYS_D_P_0400_CodingStandards
System Development Program	1.2	04-09	ESSSYS_SG_P_0400_SystemDevProgram
DS200- Software Design Specification	1.3	04-06	EVS5220_D_SDS00_DS200
DS450- Software Design Specification	1.2	04-04	EVS5220_D_SDS00_DS450
DS850- Software Design Specification	1.2	04-05	EVS5220_D_SDS00_DS850
Electionware - Software and Design Specification	1.3	04-02	EVS5220_D_SDS00_Electionware
Software Design Specifications Event Log Service	1.0	04-01	EVS5220_D_SDS00_ELS
Software Design Specifications ERM	1.4	04-03	EVS5220_D_SDS00_ERM
Software Design Specifications ERM Appendices	1.1	04-03-01	EVS5220_D_SDS00_ERM01_Appendices
ExpressVote- Software Design and Specification	1.3	04-07	EVS5220_D_SDS00_ExpressVote
AutoMARK Software Design Specifications	--	04-08	AutoMARK SDS (folder)
AutoMARK Ballot Image Processing Specification	6	04-08-08	AutoMARK ESS Ballot Image Processing Specification AQS-18-5002-003-S

D.1 EVS 5.2.2.0 TECHNICAL DATA PACKAGE (Continued)

Table D-1. EVS 5.2.2.0 TDP (Continued)

Software and Design Specification (continued)			
AutoMARK Ballot Scanning and Printing Specification	5	04-08-08	AutoMARK ESS Ballot Scanning and Printing Specification AQS-18-5002-007-S
AutoMARK Driver Application Programming Interface (API) Specification	5	04-08-09	AutoMARK ESS Driver API Specification AQS-18-5000-002-F
AutoMARK Embedded Database Interface Specification	6	04-08-06	AutoMARK ESS Embedded Database Interface Specifications AQS-18-5002-005-S
AutoMARK Graphical User Interface (GUI) Design Specification	6	04-08-04	AutoMARK ESS GUI Design Specifications AQS-18-5001-005-R
AutoMARK Operating Software Design Specifications	5	04-08-01	AutoMARK ESS Operating Software Design Specifications AQS-18-5001-002-R
AutoMARK Operations and Diagnostics Log	5	04-08-12	AutoMARK ESS Operations and Diagnostic Log Specs AQS-18-5002-004-S
AutoMARK Programming Specifications Details	6	04-08-10	AutoMARK ESS Programming Specifications Details AQS-18-5001-011-R
AutoMARK Software Design Specification	7	04-08-02	AutoMARK ESS Software Design Spec AQS-18-5001-004-S
Software Design and Specifications Overview AutoMARK Voter Assist Terminal (VAT) Firmware Version Number 1.8	--	04-08-13	AutoMARK ESS Software Design Spec Overview
AutoMARK Software Development Environment Specification	5	04-08-03	AutoMARK ESS Software Development Environment AQS-18-5001-006-R
AutoMARK Software Diagnostic Specifications	5	04-08-05	AutoMARK ESS Software Diagnostics Specifications AQS-18-5000-004-F
AutoMARK Software Standards Specification	5	04-08-11	AutoMARK ESS Software Standards Specification AQS-18-4000-000-S
Electionware04_PostgreSQL Table and Field Descriptions	--	04-02-01	EVS5220_D_SDS00_Electionware04_PostgreSQL Table and Field Descriptions (folder)
Electionware	--	--	election_ware_4_7_1_1
Electionware Admin	--	--	election_ware_admin_4_7_1_1
System Test/Verification Specification			
System Test Plan	1.0	05-01	EVS5220_QA_D_0500_SysTestPlan
Usability Test Reports	--	--	UsabilityTestReports (folder)
Common Industry Format Usability Test Report – ExpressVote 1.0	N/A	05-02-01	EVOTE_1'0_D_CIFRpt
Common Industry Format Usability Test Report – AutoMARK 1.8.7.0	1.x	05-02-02	AMVAT_1'X_D_CIFRpt
Common Industry Format Usability Test Report – DS200 1.2.1	1.2.1	05-02-03	DS200_1'2'1_D_CIFRpt

D.1 EVS 5.2.2.0 TECHNICAL DATA PACKAGE (Continued)

Table D-1. EVS 5.2.2.0 TDP (Continued)

System Security Specification			
Voting System Security Specification	1.3	06-01	EVS5220_CM_SPC00_SysSecuritySpec
Security Script Description	1.1	06-05	EVS5220_CM_SPC02_SecScriptDesc
EMS Client Workstation Secure Setup & Configuration Guide	1.3	06-02	EVS5220_CM_SPC_ClientWorkstationSetupConfigGuide
EMS Server Secure Setup & Configuration Guide	1.3	06-03	EVS5220_CM_SPC_EMSServerSetupConfigGuide
Standalone EMS Workstation Secure Setup & Configuration Guide	1.3	06-04	EVS5220_CM_SPC_StandaloneWorkstationSetupConfigGuide
AutoMARK System Security Specifications	7	06-06	AutoMARK ESS System Security Specification AQS-18-5002-001-S
Validation Procedures and Scripts	--	06-07	01_ValidationProcedures&Scripts (folder)
Verification Procedure: Election Management System	1.1	06-07-01	EVS5220_CM_D_2010_EMSVerificationProcedure
Verification Procedure: AutoMARK Ballot Marking Device	1.1	06-07-02	EVS5220_CM_D_2021_AutoMARKVerificationProcedure
Verification Procedure: DS850 Central Scanner & Tabulator	1.1	06-07-03	EVS5220_CM_D_2050_DS850VerificationProcedure
Verification Procedure: DS450 Central Scanner & Tabulator	1.1	06-07-04	EVS5220_CM_D_2060_DS450VerificationProcedure
Verification Procedure: DS200 Precinct Scanner & Tabulator	1.1	06-07-05	EVS5220_CM_D_2070_DS200VerificationProcedure
Verification Procedure: ExpressVote Universal Voting System	1.1	06-07-06	EVS5220_CM_D_2081_ExpressVoteVerificationProcedure
			EVS 5.2.2.0 - Verification Pack (folder)
Validation File Lists	--	06-08	02_ValidationFileLists (folder)
Validation File List: Electionware	1.1	06-08-01	EVS5220_D_L01_StaticDynamicFileList_Electionware
Validation File List: ExpressVote	1.1	06-08-02	EVS5220_D_L02_StaticDynamicFileList_ExpressVote
Validation File List: DS450	1.1	06-08-03	EVS5220_D_L03_StaticDynamicFileList_DS450
Validation File List: DS200	1.0	06-08-04	EVS5220_D_L04_StaticDynamicFileList_DS200
Validation File List: DS850	1.0	06-08-05	EVS5220_D_L05_StaticDynamicFileList_DS850
Validation File List: AutoMARK	1.1	06-08-06	EVS5220_D_L06_StaticDynamicFileList_AutoMARK
Validation File List: ERM	1.1	06-08-07	EVS5220_D_L08_StaticDynamicFileList_ERM
Validation File List: ExpressVote Previewer	1.0	06-08-08	EVS5220_D_L11_StaticDynamicFileList_ExpressVotePreviewer
Validation File List: ELS	1.0	06-08-09	EVS5220_D_L15_StaticDynamicFileList_ELS
Validation File List: RMS	1.0	06-08-10	EVS5220_D_L16_StaticDynamicFileList_RMS
Validation File List: VATPreviewer	1.1	06-08-11	EVS5220_D_L19_StaticDynamicFileList_VATPreviewer

D.1 EVS 5.2.2.0 TECHNICAL DATA PACKAGE (Continued)

Table D-1. EVS 5.2.2.0 TDP (Continued)

System Operations Procedure			
AutoMARK System Operator's Guide	1.0	07-01	EVS5220_DOC_SOP_AMVAT
DS200 Operator's Guide	1.3	07-02	EVS5220_DOC_SOP_DS200
DS200 Operator's Guide Appendices	1.0	07-02-03	EVS5220_DOC_SOP_DS200_APPX
DS450 Operator's Guide	1.7	07-03	EVS5220_DOC_SOP_DS450
DS450 Operator's Guide Appendices	1.0	07-03-01	EVS5220_DOC_SOP_DS450_APPX
DS850 Operator's Guide	1.3	07-04	EVS5220_DOC_SOP_DS850
DS850 Operator's Guide Appendices	1.0	07-04-01	EVS5220_DOC_SOP_DS850_APPX
EVS Event Logging Service User's Guide	1.0	07-05	EVS5220_DOC_SOP_ELS
Election Reporting Manager User's Guide	1.1	07-06	EVS5220_DOC_SOP_ERM
Election Reporting Manager User's Guide Appendices	1.0	07-06-01	EVS5220_DOC_SOP_ERM_APPX
ElectionWare Vol. I: Administrators Guide	1.4	07-07	EVS5220_DOC_SOP_EW01Admin
ElectionWare Vol. II: Define User Guide	1.1	07-08	EVS5220_DOC_SOP_EW02Define
ElectionWare Vol. III: Design User Guide	1.3	07-09	EVS5220_DOC_SOP_EW03Design
ElectionWare Vol. IV: Deliver User Guide	1.1	07-10	EVS5220_DOC_SOP_EW04Deliver
ElectionWare Vol. V: Results User Guide	1.0	07-11	EVS5220_DOC_SOP_EW05Results
ElectionWare Vol. VI: Appendices	1.0	07-11-01	EVS5220_DOC_SOP_EW06Appendix
ExpressVote Operator's Guide	1.2	07-12	EVS5220_DOC_SOP_ExpressVote
ExpressVote Operator's Guide Appendices	1.0	07-12-01	EVS5220_DOC_SOP_ExpressVote_APPX
System Maintenance Manuals			
AutoMARK System Maintenance Manual	1.0	08-01	EVS5220_DOC_SMM_AMVAT
DS200 Maintenance Manual	1.1	08-02	EVS5220_DOC_SMM_DS200
DS450 Maintenance Manual	1.4	08-03	EVS5220_DOC_SMM_DS450
DS850 Maintenance Manual	1.2	08-04	EVS5220_DOC_SMM_DS850
ExpressVote Maintenance Manual	1.1	08-05	EVS5220_DOC_SMM_ExpressVote
Personnel Deployment and Training			
Personnel Deployment and Training Program	1.1	09-01	ESSSYS_T_D_0900_TrainingProgram
Configuration Management Plan			
Configuration Management Program	2.1	10-01	ESSSYS_CM_P_1000_CMProgram
Technical Documentation Program	1.0	10-02	EVS5220_DOC_P_1000_TDProgram
QA Program			
Manufacturing Quality Assurance Program	1.2	11-01	ESSSYS_M_P_1100_MNFQualityAssurancePlan
Software Quality Assurance Program	1.2	11-02	ESSSYS_QA_P_1100_SWQAProgram
System Change Notes			
System Change Notes	1.8	12-01	EVS5220_DOC_D_1200_ChangeNotes
System Change Notes with QA Test Notes	1.6	12-02	EVS5220_DOC_D_1200_ChangeNotes_QA
Attachments			
Ballot Production Guide for EVS	2.6	13-01	ESSSYS_DOC_SOP_BPG

APPENDIX E. DETAILS OF SUBMITTED MODIFICATIONS

E.1 SUBMITTED MODIFICATIONS

Table E.1. Submitted Modification

Change ID	Changed Component	Change Description	Impacted 2005 VVSG Requirement
BUG35826 ENH35226 ENH35227 ENH35228 ENH35229 ENH35230 ENH35260 ENH35369 ENH35617	Electionware and ERM	Renamed “DS850” labels to “Central Count”.	Volume II, Section 6.7
ENH35852 ENH35855 ENH35856 ENH35876 ENH35879 ENH35884 ENH35858 ENH35859	DS200 DS850 AutoMARK ExpressVote Electionware ERM	The random number generator, used for security functions to meet VVSG 1.0, Sections 2.1.4 and 7.5.1, has been updated to meet new NIST standards.	Volume I, Section 2.1.4 & Section 7.5.1
BUG35743	Electionware	Corrected spelling of the word 'change' in the AutoMARK system prompt Excel file.	Volume II, Section 6.7
BUG35663	Electionware	Correction to enable the save button after making changes in the text box (…) in the Language Additional text area.	Volume II, Section 6.7
BUG35751	Electionware	Corrected message display from an internal processing error to the 'Import of ballot style alternate ID' error message when the continuous ballot style ID is longer than 8 characters.	Volume II, Section 6.7
ENH35344	Electionware	Correct the contest order display for the ExpressVote in an open primary election to sort by party.	Volume II, Section 6.7
ENH35533	Electionware	Added the election wide option to enable/disable multi column view on the ExpressVote.	Volume I Section 3.2.2.2 Volume II, Section 6.7
ENH35534	Electionware	Added the ExpressVote Multi Column setting to the ExpressVote Settings Report.	Volume I Section 3.2.2.2 Volume II, Section 6.7
BUG35685	Electionware	Corrected erroneous data fit error message that occurred when no nonpartisan contests existed in a closed primary.	Volume II, Section 6.7

E.1 SUBMITTED MODIFICATIONS (Continued)

Table E-1. Modification Requirements Mapping (Continued)

Change ID	Changed Component	Change Description	Impacted 2005 VVSG Requirement
ENH35254	Electionware	Update copyright to 2016.	Volume II, Section 6.7
ENH35255	Electionware	Update user guide help file.	Volume II, Section 6.7
BUG35647	Electionware	Corrected the situation where an error displayed erroneously when triple clicking in the Bengali language text editor.	Volume II, Section 6.7
BUG35480	Electionware	Updated creation of passwords for the SFTP server so that they do not include leading zeros which the server cannot authenticate.	Volume II, Section 6.7
BUG35633	Electionware	Updated the users.xml to version 3.0 for compatibility with Cerberus version 8.0.0.9 and newer.	Volume II, Section 6.7
ENH35606	Electionware	Improved the refresh action in the navigator so that the data appears correctly.	Volume II, Section 6.7
BUG35683	Electionware	Corrected an Invalid party ID in Illinois Export party records.	Volume II, Section 6.7
BUG35850	Electionware	Can now export results from Produce when the last contest is a text only contest.	Volume II, Section 6.7
N/A	DS450	Added the DS450 as a new central count component.	All applicable requirements
ENH35374	ExpressVote	Display candidates in either 1 or 2 columns in a particular contest screen based on a configuration flag from Electionware.	Volume II, Section 6.7
ENH35495	ExpressVote	Support the ability for a poll worker to scan a 128c barcode on the external barcode scanner instead of manually selecting the ballot style on the touch screen.	Volume II, Section 6.7
ENH35612	ExpressVote	Update copyright date (code and splash screen).	Volume II, Section 6.7
N/A	ExpressVote	*Power Supply Level Efficiency 6	All applicable requirements

*No de minimis determinations were included as part of this system.

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APPENDIX F. PRODUCT SAFETY REPORT

America

Technical Report No. 72120951-000
Rev. -
Dated: 2016-10-18

Client:	Election Systems & Software LLC 11208 John Galt Blvd. Omaha, NE 68137 USA
Manufacturing place:	Election Systems & Software LLC 11208 John Galt Blvd. Omaha, NE 68137 USA
Test subject:	Product: Central Count Scanner and Tabulator Type: DS450
Test specification:	UL 60950-1:2007/R:2014-10
Purpose of examination:	• Test according to the test specification.
Test result:	*The test results show that the presented product is in compliance with the specified requirements.*

This technical report may only be quoted in full. Any use for advertising purposes must be granted in writing. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production.

America

1 Description of the test subject

1.1 Function

Manufacturer's specification for intended use:

The model DS450 central count scanner and tabulator is mounted on a cart with supporting separately certified equipment that consists of a certified laser scanner, certified dot matrix printer and a certified UPS. Both printers along with the central count scanner and tabulator plugs into the UPS outlets. The ballots cannot be scanned and laser printer printing at the same time. The system process is that the ballots are scanned, then results are download electronically via the UPS connector or printed via the laser printer. The dot matrix printer is for system command reporting.

The central count scanner and tabulator power is supplied to the appliance inlet via a detachable power supply cord which has not been evaluated.

Manufacturer's specification for predictive misuse:

No restrictions provided.

1.2 Consideration of the foreseeable misuse

☐ *Not applicable*
☒ *Covered through the applied standard*
☐ *Covered by the following comment*
☐ *Covered by attached risk analysis*

1.3 Technical Data

120VAC, 50/60HZ, 12A, Class I equipment

2.0 Order

2.1 Date of Purchase Order, Customer's Reference

NTS PO #PRPO054733-2 Issued on: 2016-09-30
TUV Reference No: 72120951

America

2.2 Receipt of Test Sample, Location
2016-10-05

2.3 Date of Testing
2016-10-05 and 2016-10-06

2.4 Location of Testing
TÜV SÜD America Inc.
5610 West Sligh Ave., Suite 100
Tampa, FL 33634 USA

2.5 Points of Non-compliance or Exceptions of the Test Procedure
None.

3. Test Results

3.1 Positive Test Results

- *Electrical safety*
  UL 60950-1:2007/R:2014-10

- *Mechanical safety*
  UL 60950-1:2007/R:2014-10

"The test specifications are met."

3.2 Points of non-compliance according to the test specification
None.

4. Remark
The user manual has been examined according to the minimum requirements described in the product standard. The manufacturer is responsible for the accuracy of further particulars as well as of the composition and layout.

5. Summary
Positive
"The test specifications are met."

TÜV SÜD Product Service GmbH

Engineer: Karl Wagner — Technical Report checked: David B. Dorfner

Karl Wagner — David Dorfner

TEST REPORT

IEC 60950-1
Information technology equipment – Safety –
Part 1: General requirements

Report Number. ..... :	72120951-000
Date of issue..... :	2016-10-18
Total number of pages	45
CB Testing Laboratory..... :	TÜV SÜD America Inc.
Address ..... :	5610 West Sligh Ave., Suite 100, Tampa, FL 33634 USA
Applicant's name..... :	Election Systems & Software LLC
Address ..... :	11208 John Galt Blvd., Omaha, NE 68137 USA
Manufacturer's name..... :	Election Systems & Software LLC
Address ..... :	11208 John Galt Blvd., Omaha, NE 68137 USA
Test specification:	
Standard ..... :	UL 60950-1:2007/R:2014-10
Test procedure ..... :	Report Only
Non-standard test method..... :	N/A
Test Report Form No..... :	IEC60950_1E
Test Report Form(s) Originator ..... :	SGS Fimko Ltd
Master TRF..... :	Dated 2013-07

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If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

Test item description ..... :	Central Count Scanner and Tabulator
Trade Mark ..... :	ES&S
Manufacturer..... :	Election Systems & Software LLC 11208 John Galt Blvd., Omaha, NE 68137 USA
Model/Type reference..... :	DS450
Ratings ..... :	120VAC, 50/60HZ, 12A, Class I equipment

Testing procedure and testing location:		
☒ **Testing Laboratory:**		
Testing location/ address .....:	TÜV SÜD America Inc. 5610 West Sligh Ave., Suite 100, Tampa, FL 33634 USA	
Tested by (name + signature) .....:	Karl Wagner	Karl Wagner
Approved by (name + signature) .....:	David Dorfner	David B Dorfner

List of Attachments (including a total number of pages in each attachment):

Attachment 1: US National Differences (15 pages)

Attachment 2: Photos (5 pages)

Summary of testing:

The product fulfils the requirements of UL 60950-1:2007/R:2014-10.

MNL: Unit cannot scan ballots and print from the laser printer at the same time. The laser printer and the scan equipment are plugged into the UPS outlets. Max input current draw on the UPS input is with the laser printer printing. The UPS current rating is 12A. Scanning ballots is the worst case load for the DS450 central count scanner and tabulator.

Tests performed (name of test and test clause):	**Testing location:**
All required for this investigation.	TÜV SÜD America Inc. 5610 West Sligh Ave., Suite 100 Tampa, FL 33634 USA

Summary of compliance with National Differences

List of countries addressed:

This report is includes US National Differences.

Copy of marking plate

Input 120VAC, 50/60Hz, 12A

Test item particulars.....:	
Equipment mobility.....:	[] movable [] hand-held [] transportable [X] stationary [] for building-in [] direct plug-in
Connection to the mains.....:	[] pluggable equipment [X] type A [] type B [] permanent connection [] detachable power supply cord [] non-detachable power supply cord [] not directly connected to the mains
Operating condition.....:	[X] continuous [] rated operating / resting time:
Access location .....:	[X] operator accessible [] restricted access location
Over voltage category (OVC) .....:	[] OVC I [X] OVC II [] OVC III [] OVC IV [] other:
Mains supply tolerance (%) or absolute mains supply values .....:	-10%, +6%
Tested for IT power systems .....:	[] Yes [X] No
IT testing, phase-phase voltage (V) .....:	N/A
Class of equipment .....:	[X] Class I [] Class II [] Class III [] Not classified
Considered current rating of protective device as part of the building installation (A) .....:	20A
Pollution degree (PD) .....:	[] PD 1 [X] PD 2 [] PD 3
IP protection class .....:	IPX0
Altitude during operation (m) .....:	2000 m max
Altitude of test laboratory (m) .....:	0 m
Mass of equipment (kg) .....:	147kg (Complete Unit (scanner and cart) 58.5kg (Scanner only)
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement.....:	F (Fail)
Testing.....:	
Date of receipt of test item.....:	2016-10-05
Date(s) of performance of tests .....:	2016-10-05 and 2016-10-06

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....:

☐ **Yes**

☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies) ..... : Election Systems & Software LLC
11208 John Galt Blvd., Omaha, NE 68137 USA

General product information:

The model DS450 central count scanner and tabulator is mounted on a cart with supporting separately certified equipment that consists of a certified laser scanner, certified dot matrix printer and a certified UPS. Both printers along with the central count scanner and tabulator plugs into the UPS outlets. The ballots cannot be scanned and laser printer printing at the same time. The system process is that the ballots are scanned, then results are download electronically via the UPS connector or printed via the laser printer. The dot matrix printer is for system command reporting.

The central count scanner and tabulator power is supplied to the appliance inlet via a detachable power supply cord which has not been evaluated.

Abbreviations used in the report:

- normal conditions	**N.C.**	- single fault conditions	**S.F.C**
- functional insulation	**OP**	- basic insulation	**BI**
- double insulation	**DI**	- supplementary insulation	**SI**
- between parts of opposite polarity	**BOP**	- reinforced insulation	**RI**

Indicate used abbreviations (if any)

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1	**GENERAL**		—
1.5	**Components**		P
1.5.1	General		P
	Comply with IEC 60950-1 or relevant component standard	(see appended tables 1.5.1)	P
1.5.2	Evaluation and testing of components	Certified components are used in accordance with their ratings, certifications and they comply with applicable parts of this standard. Components not certified are used in accordance with their ratings and they comply with applicable parts of UL 60950-1 and the relevant component standard. Components, for which no relevant UL-standard exists, have been tested under the conditions occurring in the equipment, using applicable parts of UL 60950-1.	P
1.5.3	Thermal controls	None unless part of certified power supply.	N/A
1.5.4	Transformers	None unless part of certified power supply.	N/A
1.5.5	Interconnecting cables	No interconnecting cables provided with device.	N/A
1.5.6	Capacitors bridging insulation	None unless part of certified power supply.	N/A
1.5.7	Resistors bridging insulation	None unless part of certified power supply.	N/A
1.5.7.1	Resistors bridging functional, basic or supplementary insulation		N/A
1.5.7.2	Resistors bridging double or reinforced insulation between a.c. mains and other circuits		N/A
1.5.7.3	Resistors bridging double or reinforced insulation between a.c. mains and antenna or coaxial cable		N/A
1.5.8	Components in equipment for IT power systems	Not evaluated for IT power systems.	N/A
1.5.9	Surge suppressors	None provided.	N/A
1.5.9.1	General		N/A
1.5.9.2	Protection of VDRs		N/A
1.5.9.3	Bridging of functional insulation by a VDR		N/A
1.5.9.4	Bridging of basic insulation by a VDR		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.5.9.5	Bridging of supplementary, double or reinforced insulation by a VDR		N/A
1.6	**Power interface**		P
1.6.1	AC power distribution systems	TN	P
1.6.2	Input current	(see appended table 1.6.2)	P
1.6.3	Voltage limit of hand-held equipment	Not hand-held	N/A
1.6.4	Neutral conductor	Neutral is insulated from earth with basic insulation throughout the equipment.	P
1.7	**Marking and instructions**		P
1.7.1	Power rating and identification markings	The required marking is located on the outside surface of the equipment.	P
1.7.1.1	Power rating marking	The required marking is located on the outside surface of the equipment.	P
	Multiple mains supply connections.....:	The equipment does not have multiple mains connections.	N/A
	Rated voltage(s) or voltage range(s) (V) .....:	120VAC	P
	Symbol for nature of supply, for d.c. only.....:	The equipment is for a.c. supply.	N/A
	Rated frequency or rated frequency range (Hz) ....:	50/60Hz	P
	Rated current (mA or A) .....:	Refer to marking plate, page 4.	P
1.7.1.2	Identification markings		P
	Manufacturer's name or trade-mark or identification mark .....:		P
	Model identification or type reference .....:	DS450	P
	Symbol for Class II equipment only .....:	The equipment is not Class II.	N/A
	Other markings and symbols .....:	None.	N/A
1.7.1.3	Use of graphical symbols	None.	N/A
1.7.2	Safety instructions and marking	Sufficient instructions for installation and use provided.	P
1.7.2.1	General	The equipment is not Class II.	N/A
1.7.2.2	Disconnect devices	Statement not required.	N/A
1.7.2.3	Overcurrent protective device	Not Pluggable Type B or permanently connected.	N/A
1.7.2.4	IT power distribution systems	Not evaluated for IT power systems.	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.2.5	Operator access with a tool	Tool required to access any circuits. User not directed to use a tool to gain access.	N/A
1.7.2.6	Ozone	The equipment does not produce ozone.	N/A
1.7.3	Short duty cycles	The equipment is intended for continuous operation.	N/A
1.7.4	Supply voltage adjustment .....:	No supply adjustment on the equipment.	N/A
	Methods and means of adjustment; reference to installation instructions .....:		N/A
1.7.5	Power outlets on the equipment .....:	None.	N/A
1.7.6	Fuse identification (marking, special fusing characteristics, cross-reference) .....:	No operator replaceable fuses.	N/A
1.7.7	Wiring terminals	No wiring terminals.	N/A
1.7.7.1	Protective earthing and bonding terminals .....:	Marked appliance inlet.	P
1.7.7.2	Terminals for a.c. mains supply conductors	The equipment is not permanently connected or provided with a non-detachable power supply cord.	N/A
1.7.7.3	Terminals for d.c. mains supply conductors	Not for connection to a d.c. mains.	N/A
1.7.8	Controls and indicators	None provided.	N/A
1.7.8.1	Identification, location and marking .....:		N/A
1.7.8.2	Colours .....:		N/A
1.7.8.3	Symbols according to IEC 60417.....:		N/A
1.7.8.4	Markings using figures .....:		N/A
1.7.9	Isolation of multiple power sources .....:	Single input.	N/A
1.7.10	Thermostats and other regulating devices .....:	No thermostats or other regulating devices.	N/A
1.7.11	Durability	The marking withstands required tests.	P
1.7.12	Removable parts	No marking on removable parts.	N/A
1.7.13	Replaceable batteries .....:	No batteries.	N/A
	Language(s) .....:		—
1.7.14	Equipment for restricted access locations.....:	Not intended for resticted access.	N/A

2	**PROTECTION FROM HAZARDS**		P
2.1	**Protection from electric shock and energy hazards**		P
2.1.1	Protection in operator access areas	Refer below:	P

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.1.1.1	Access to energized parts	All covers / guards preventing access to energized parts require a tool for removal. Checked by test finger and test pin.	P
	Test by inspection .....:		P
	Test with test finger (Figure 2A) .....:	No parts accessible with test finger.	P
	Test with test pin (Figure 2B) .....:	No parts accessible with test pin.	P
	Test with test probe (Figure 2C) .....:	No TNV circuits.	N/A
2.1.1.2	Battery compartments	No battery compartments, no TNV circuits.	N/A
2.1.1.3	Access to ELV wiring	No accessible wiring.	N/A
	Working voltage (Vpeak or Vrms); minimum distance through insulation (mm)		—
2.1.1.4	Access to hazardous voltage circuit wiring	No accessible to hazardous voltage wiring.	P
2.1.1.5	Energy hazards .....:	No accessible to energy hazards.	P
2.1.1.6	Manual controls	No manual controls.	N/A
2.1.1.7	Discharge of capacitors in equipment	Complies.	P
	Measured voltage (V); time-constant (s) .....:	Initial value: 180Vp 37% value: 54Vp 1 second value: 0Vp	—
2.1.1.8	Energy hazards – d.c. mains supply	The equipment is not intended to connect to a d.c. mains.	N/A
	a) Capacitor connected to the d.c. mains supply ..:		N/A
	b) Internal battery connected to the d.c. mains supply .....:		N/A
2.1.1.9	Audio amplifiers .....:	No audio amplifiers.	N/A
2.1.2	Protection in service access areas	No service areas.	N/A
2.1.3	Protection in restricted access locations	Not for use in restricted access locations.	N/A

2.2	**SELV circuits**		P
2.2.1	General requirements	SELV circuits provided by the certified PSU output.	P
2.2.2	Voltages under normal conditions (V) .....:	Refer to 2.2.1.	P
2.2.3	Voltages under fault conditions (V) .....:	Refer to 2.2.1.	P
2.2.4	Connection of SELV circuits to other circuits .....:	SELV circuits are only connected to other SELV circuits.	P

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.3	**TNV circuits**		N/A
2.3.1	Limits	No TNV circuits	N/A
	Type of TNV circuits..... :		—
2.3.2	Separation from other circuits and from accessible parts		N/A
2.3.2.1	General requirements		N/A
2.3.2.2	Protection by basic insulation		N/A
2.3.2.3	Protection by earthing		N/A
2.3.2.4	Protection by other constructions ..... :		N/A
2.3.3	Separation from hazardous voltages		N/A
	Insulation employed ..... :		—
2.3.4	Connection of TNV circuits to other circuits		N/A
	Insulation employed ..... :		—
2.3.5	Test for operating voltages generated externally		N/A
2.4	**Limited current circuits**		N/A
2.4.1	General requirements	No limited current circuits.	N/A
2.4.2	Limit values		N/A
	Frequency (Hz)..... :		—
	Measured current (mA) ..... :		—
	Measured voltage (V)..... :		—
	Measured circuit capacitance (nF or µF) ..... :		—
2.4.3	Connection of limited current circuits to other circuits		N/A
2.5	**Limited power sources**	No output ports.	N/A
	a) Inherently limited output		N/A
	b) Impedance limited output		N/A
	c) Regulating network limited output under normal operating and single fault condition		N/A
	d) Overcurrent protective device limited output		N/A
	Max. output voltage (V), max. output current (A), max. apparent power (VA) ..... :		—
	Current rating of overcurrent protective device (A) .:		—
	Use of integrated circuit (IC) current limiters		
2.6	**Provisions for earthing and bonding**		P

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.6.1	Protective earthing	No accessible metal that can be energized by a single fault. Appliance inlet has a PE terminal.	N/A
2.6.2	Functional earthing	No functional earthing terminals provided.	N/A
	Use of symbol for functional earthing .....:		N/A
2.6.3	Protective earthing and protective bonding conductors	Refer below.	P
2.6.3.1	General	Refer below.	P
2.6.3.2	Size of protective earthing conductors	Earth terminal of certified appliance inlet serves as PE conductor.	P
	Rated current (A), cross-sectional area (mm^2), AWG .....:		—
2.6.3.3	Size of protective bonding conductors	Refer below.	P
	Rated current (A), cross-sectional area (mm^2), AWG .....:	Min.18AWG wire used	—
	Protective current rating (A), cross-sectional area (mm^2), AWG.....:	20A.	
2.6.3.4	Resistance of earthing conductors and their terminations; resistance (Ω), voltage drop (V), test current (A), duration (min).....:	40A applied for 2 minutes from AC inlet to AC outlet earthing terminals. The measured resistance was 59mΩ.	P
2.6.3.5	Colour of insulation .....:	Green/yellow.	N/A
2.6.4	Terminals	No terminals provided.	N/A
2.6.4.1	General		N/A
2.6.4.2	Protective earthing and bonding terminals	Earth terminal of certified appliance inlet serves as PE conductor.	N/A
	Rated current (A), type, nominal thread diameter (mm).....:		—
2.6.4.3	Separation of the protective earthing conductor from protective bonding conductors		N/A
2.6.5	Integrity of protective earthing		N/A
2.6.5.1	Interconnection of equipment	Not a system of interconnected equipment or marked as a Class II device.	N/A
2.6.5.2	Components in protective earthing conductors and protective bonding conductors	No such components.	N/A
2.6.5.3	Disconnection of protective earth	Disconnection of PE removes all hazards.	P
2.6.5.4	Parts that can be removed by an operator	Detachable power supply cord and appliance inlet meet make/break criteria.	P

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.6.5.5	Parts removed during servicing	Disconnection of PE removes all hazards.	P
2.6.5.6	Corrosion resistance	Evaluated.	P
2.6.5.7	Screws for protective bonding	No protective bonding screws provided.	N/A
2.6.5.8	Reliance on telecommunication network or cable distribution system	No TNV or CDS circuits.	N/A
2.7	**Overcurrent and earth fault protection in primary circuits**		P
2.7.1	Basic requirements	Provided by the building installation.	P
	Instructions when protection relies on building installation	Pluggable type A equipment.	N/A
2.7.2	Faults not simulated in 5.3.7	Considered.	N/A
2.7.3	Short-circuit backup protection	Provided by the building installation.	N/A
2.7.4	Number and location of protective devices .....:	Provided by the building installation	N/A
2.7.5	Protection by several devices	Provided by the building installation	N/A
2.7.6	Warning to service personnel .....:	Provided by the building installation	N/A
2.8	**Safety interlocks**		N/A
2.8.1	General principles	No safety interlocks provided or required.	N/A
2.8.2	Protection requirements		N/A
2.8.3	Inadvertent reactivation		N/A
2.8.4	Fail-safe operation		N/A
	Protection against extreme hazard		N/A
2.8.5	Moving parts		N/A
2.8.6	Overriding		N/A
2.8.7	Switches, relays and their related circuits		N/A
2.8.7.1	Separation distances for contact gaps and their related circuits (mm) .....:		N/A
2.8.7.2	Overload test		N/A
2.8.7.3	Endurance test		N/A
2.8.7.4	Electric strength test	(see appended table 5.2)	N/A
2.8.8	Mechanical actuators		N/A
2.9	**Electrical insulation**		P

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.9.1	Properties of insulating materials	Neither natural rubber, materials containing asbestos nor hygroscopic materials are used as insulation.	P
2.9.2	Humidity conditioning	Certified power supplies used.	N/A
	Relative humidity (%), temperature (°C) .....:		—
2.9.3	Grade of insulation	Only BI evaluated.	P
2.9.4	Separation from hazardous voltages	Reinforced insulation provided by certified power supply.	N/A
	Method(s) used .....:		—
2.10	**Clearances, creepage distances and distances through insulation**		P
2.10.1	General	All distances within the PSU evaluated as part of separately certified power supply. Only BI evaluated from Mains to PE in terminal block.	P
2.10.1.1	Frequency .....:	50/60Hz	N/A
2.10.1.2	Pollution degrees .....:	2	N/A
2.10.1.3	Reduced values for functional insulation	No reduced values for functional insulation.	N/A
2.10.1.4	Intervening unconnected conductive parts	No such parts.	N/A
2.10.1.5	Insulation with varying dimensions	None used.	N/A
2.10.1.6	Special separation requirements		N/A
2.10.1.7	Insulation in circuits generating starting pulses	None used.	N/A
2.10.2	Determination of working voltage	Part of certified power supply.	N/A
2.10.2.1	General		—
2.10.2.2	RMS working voltage	Used input rating 120V.	—
2.10.2.3	Peak working voltage	Used input rating 170V.	—
2.10.3	Clearances	All distances within the PSU evaluated as part of separately certified power supply. Only BI evaluated from Mains to PE in terminal block.	—
2.10.3.1	General		—
2.10.3.2	Mains transient voltages	Not measured.	N/A
	a) AC mains supply .....:	Used input rating 120VAC.	—
	b) Earthed d.c. mains supplies .....:	No dc mains.	N/A
	c) Unearthed d.c. mains supplies .....:	No dc mains.	N/A
	d) Battery operation .....:	No batteries.	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.10.3.3	Clearances in primary circuits	All distances within the PSU evaluated as part of separately certified power supply. Only BI evaluated from Mains to PE in terminal block. (see appended table 2.10.3 and 2.10.4)	N/A
2.10.3.4	Clearances in secondary circuits	Only functional insulation in secondary circuits, ref. 5.3.4.	N/A
2.10.3.5	Clearances in circuits having starting pulses	(see appended table 2.10.3 and 2.10.4)	N/A
2.10.3.6	Transients from a.c. mains supply ..... :	Use 1500Vp.	—
2.10.3.7	Transients from d.c. mains supply ..... :	No dc mains.	N/A
2.10.3.8	Transients from telecommunication networks and cable distribution systems ..... :	No TNV or CDS circuits.	N/A
2.10.3.9	Measurement of transient voltage levels	Measurement not relevant.	N/A
	a) Transients from a mains supply		N/A
	For an a.c. mains supply ..... :		N/A
	For a d.c. mains supply ..... :		N/A
	b) Transients from a telecommunication network :		N/A
2.10.4	Creepage distances	All distances within the PSU evaluated as part of separately certified power supply. Only BI evaluated from Mains to PE in terminal block.	—
2.10.4.1	General		—
2.10.4.2	Material group and comparative tracking index		N/A
	CTI tests..... :		—
2.10.4.3	Minimum creepage distances	All distances within the PSU evaluated as part of separately certified power supply. Only BI evaluated from Mains to PE in terminal block. (see appended table 2.10.3 and 2.10.4)	N/A
2.10.5	Solid insulation	Part of power supply certifications.	N/A
2.10.5.1	General		—
2.10.5.2	Distances through insulation		N/A
2.10.5.3	Insulating compound as solid insulation		N/A
2.10.5.4	Semiconductor devices		N/A
2.10.5.5.	Cemented joints		N/A
2.10.5.6	Thin sheet material – General		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.10.5.7	Separable thin sheet material		N/A
	Number of layers (pcs)..... :		—
2.10.5.8	Non-separable thin sheet material		N/A
2.10.5.9	Thin sheet material – standard test procedure		N/A
	Electric strength test		—
2.10.5.10	Thin sheet material – alternative test procedure		N/A
	Electric strength test		—
2.10.5.11	Insulation in wound components		N/A
2.10.5.12	Wire in wound components		N/A
	Working voltage ..... :		N/A
	a) Basic insulation not under stress ..... :		N/A
	b) Basic, supplementary, reinforced insulation ..... :		N/A
	c) Compliance with Annex U ..... :		N/A
	Two wires in contact inside wound component; angle between 45° and 90° ..... :		N/A
2.10.5.13	Wire with solvent-based enamel in wound components		N/A
	Electric strength test		—
	Routine test		N/A
2.10.5.14	Additional insulation in wound components		N/A
	Working voltage ..... :		N/A
	- Basic insulation not under stress ..... :		N/A
	- Supplementary, reinforced insulation ..... :		N/A
2.10.6	Construction of printed boards	Part of certified power supply.	N/A
2.10.6.1	Uncoated printed boards		N/A
2.10.6.2	Coated printed boards		N/A
2.10.6.3	Insulation between conductors on the same inner surface of a printed board		N/A
2.10.6.4	Insulation between conductors on different layers of a printed board		N/A
	Distance through insulation		N/A
	Number of insulation layers (pcs)..... :		N/A
2.10.7	Component external terminations	Part of certified power supply.	N/A
2.10.8	Tests on coated printed boards and coated components	Part of certified power supply.	N/A
2.10.8.1	Sample preparation and preliminary inspection		N/A
2.10.8.2	Thermal conditioning		N/A
2.10.8.3	Electric strength test		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.10.8.4	Abrasion resistance test		N/A
2.10.9	Thermal cycling		N/A
2.10.10	Test for Pollution Degree 1 environment and insulating compound		N/A
2.10.11	Tests for semiconductor devices and cemented joints		N/A
2.10.12	Enclosed and sealed parts		N/A
3	**WIRING, CONNECTIONS AND SUPPLY**		P
3.1	**General**		P
3.1.1	Current rating and overcurrent protection	Adequate for loads.	P
3.1.2	Protection against mechanical damage	All internal wires are properly routed and away from sharp edges.	P
3.1.3	Securing of internal wiring	Internal wires are properly secured.	P
3.1.4	Insulation of conductors	Wiring insulation appropriate based on voltages. (see appended table 5.2)	P
3.1.5	Beads and ceramic insulators	None used.	N/A
3.1.6	Screws for electrical contact pressure	None used.	N/A
3.1.7	Insulating materials in electrical connections	None used.	N/A
3.1.8	Self-tapping and spaced thread screws	Thread-cutting or space thread screws are not used for electrical connections.	N/A
3.1.9	Termination of conductors	Wiring properly secured based on voltages.	P
	10 N pull test	Reliable connectors/terminals used.	N/A
3.1.10	Sleeving on wiring	None used.	N/A
3.2	**Connection to a mains supply**		P
3.2.1	Means of connection	Refer below:	P
3.2.1.1	Connection to an a.c. mains supply	Provided with appliance inlet.	P
3.2.1.2	Connection to a d.c. mains supply	The equipment is not for connection to a d.c. mains supply.	N/A
3.2.2	Multiple supply connections	Only one supply connection.	N/A
3.2.3	Permanently connected equipment	The equipment is not intended for permanent connection to the mains.	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Number of conductors, diameter of cable and conduits (mm) ..... :		—
3.2.4	Appliance inlets	The appliance inlet complies with IEC 60320.	P
3.2.5	Power supply cords	Refer below:	N/A
3.2.5.1	AC power supply cords	Power supply cord is not evaluated with the equipment.	N/A
	Type ..... :		—
	Rated current (A), cross-sectional area (mm^2), AWG ..... :		—
3.2.5.2	DC power supply cords	The equipment is not for connection to a d.c. mains supply.	N/A
3.2.6	Cord anchorages and strain relief	Equipment provided with an appliance inlet.	N/A
	Mass of equipment (kg), pull (N) ..... :		—
	Longitudinal displacement (mm) ..... :		—
3.2.7	Protection against mechanical damage	Equipment provided with an appliance inlet.	N/A
3.2.8	Cord guards	The equipment is neither hand-held nor intended to be moved during operation.	N/A
	Diameter or minor dimension D (mm); test mass (g) ..... :		—
	Radius of curvature of cord (mm) ..... :		—
3.2.9	Supply wiring space	Equipment provided with an appliance inlet.	N/A

3.3	**Wiring terminals for connection of external conductors**		N/A
3.3.1	Wiring terminals	Equipment provided with an appliance inlet.	N/A
3.3.2	Connection of non-detachable power supply cords		N/A
3.3.3	Screw terminals		N/A
3.3.4	Conductor sizes to be connected		N/A
	Rated current (A), cord/cable type, cross-sectional area (mm^2) ..... :		—
3.3.5	Wiring terminal sizes		N/A
	Rated current (A), type, nominal thread diameter (mm) ..... :		—
3.3.6	Wiring terminal design		N/A
3.3.7	Grouping of wiring terminals		N/A
3.3.8	Stranded wire		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
3.4	**Disconnection from the mains supply**		N/A
3.4.1	General requirement	Equipment provided with an appliance inlet.	N/A
3.4.2	Disconnect devices	Refer below:	N/A
3.4.3	Permanently connected equipment	The appliance inlet is considered the disconnect device.	N/A
3.4.4	Parts which remain energized	Not permanently connected equipment.	N/A
3.4.5	Switches in flexible cords	No switches in flexible cords.	N/A
3.4.6	Number of poles - single-phase and d.c. equipment	Power supply cord is not evaluated with the equipment.	P
3.4.7	Number of poles - three-phase equipment	The disconnect device disconnects both poles simultaneously.	N/A
3.4.8	Switches as disconnect devices	Single-phase equipment.	N/A
3.4.9	Plugs as disconnect devices	Operator's Guide provided.	P
3.4.10	Interconnected equipment	Only one supply source.	N/A
3.4.11	Multiple power sources	Only one supply source.	N/A
3.5	**Interconnection of equipment**		P
3.5.1	General requirements		—
3.5.2	Types of interconnection circuits .....:	SELV to SELV.	P
3.5.3	ELV circuits as interconnection circuits	None.	N/A
3.5.4	Data ports for additional equipment	No data ports for additional equipment.	N/A
4	**PHYSICAL REQUIREMENTS**		P
4.1	**Stability**		P
	Angle of 10°	Complies (scanning unit and cart).	P
	Test force (N) .....:	Used 250N and 800N applied downward on side foldout work surface. No hazards.	P
4.2	**Mechanical strength**		P
4.2.1	General		P
	Rack-mounted equipment.	Not rack-mount equipment. (see Annex DD)	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.2.2	Steady force test, 10 N	Certified PSU used.	N/A
4.2.3	Steady force test, 30 N	No internal enclosure barriers.	N/A
4.2.4	Steady force test, 250 N	Complies.	P
4.2.5	Impact test	Complet metal enclosure mm thickness.	N/A
	Fall test		N/A
	Swing test		N/A
4.2.6	Drop test; height (mm) .....:	Drop test not applicable.	N/A
4.2.7	Stress relief test	Metal Enclosure.	N/A
4.2.8	Cathode ray tubes	No CRT.	N/A
	Picture tube separately certified .....:	(see separate test report or attached certificate)	N/A
4.2.9	High pressure lamps	No high pressure lamps.	N/A
4.2.10	Wall or ceiling mounted equipment; force (N) .....:	Not wall of ceiling mount.	N/A
4.3	**Design and construction**		P
4.3.1	Edges and corners	All edges and corners are rounded and/or smoothed.	P
4.3.2	Handles and manual controls; force (N) .....:	None.	N/A
4.3.3	Adjustable controls	No hazardous adjustable controls.	N/A
4.3.4	Securing of parts	Properly secured.	P
4.3.5	Connection by plugs and sockets	SELV connector does not comply with IEC 60320 or IEC 60083.	N/A
4.3.6	Direct plug-in equipment	Not direct plug-in equipment.	N/A
	Torque .....:		—
	Compliance with the relevant mains plug standard .....:		N/A
4.3.7	Heating elements in earthed equipment	No heating elements provided.	N/A
4.3.8	Batteries	No batteries. (see appended tables 4.3.8)	N/A
	- Overcharging of a rechargeable battery		N/A
	- Unintentional charging of a non-rechargeable battery		N/A
	- Reverse charging of a rechargeable battery		N/A
	- Excessive discharging rate for any battery		N/A
4.3.9	Oil and grease	Insulation is not exposed to oil, grease etc.	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.3.10	Dust, powders, liquids and gases	The equipment does not generate ionizing radiation or use a laser, and does not contain flammable liquids or gases. Only a certified laser printer used.	N/A
4.3.11	Containers for liquids or gases	No containers for liquids or gases in the equipment.	N/A
4.3.12	Flammable liquids ..... :	The equipment does not contain flammable liquid.	N/A
	Quantity of liquid (l) ..... :		N/A
	Flash point (°C) ..... :		N/A
4.3.13	Radiation	No radiation.	N/A
4.3.13.1	General		N/A
4.3.13.2	Ionizing radiation	The equipment does not generate ionizing radiation.	N/A
	Measured radiation (pA/kg) ..... :		—
	Measured high-voltage (kV) ..... :		—
	Measured focus voltage (kV) ..... :		—
	CRT markings ..... :		—
4.3.13.3	Effect of ultraviolet (UV) radiation on materials	The equipment does not produce UV radiation.	N/A
	Part, property, retention after test, flammability classification ..... :		N/A
4.3.13.4	Human exposure to ultraviolet (UV) radiation ..... :	The equipment does not produce UV radiation.	N/A
4.3.13.5	Lasers (including laser diodes) and LEDs	No lasers, LED's provided are diffused. Only a certified laser printer used.	N/A
4.3.13.5.1	Lasers (including laser diodes)	None.	N/A
	Laser class ..... :		—
4.3.13.5.2	Light emitting diodes (LEDs)	LED's provided are diffused indicating types only.	
4.3.13.6	Other types ..... :	The equipment does not generate other types of radiation.	N/A

4.4	**Protection against hazardous moving parts**		P
4.4.1	General	Adequate protection against risk of personnel injury.	P
4.4.2	Protection in operator access areas ..... :	No hazardous moving parts accessible to the operator other than guarded fans.	P

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Household and home/office document/media shredders	(see Annex EE)	N/A
4.4.3	Protection in restricted access locations .....:	Not intended for restricted access location	N/A
4.4.4	Protection in service access areas	Adequate protection.	N/A
4.4.5	Protection against moving fan blades	Guarded fans	P
4.4.5.1	General		N/A
	Not considered to cause pain or injury. a).....:		N/A
	Is considered to cause pain, not injury. b) .....:		N/A
	Considered to cause injury. c) .....:		N/A
4.4.5.2	Protection for users		N/A
	Use of symbol or warning .....:		N/A
4.4.5.3	Protection for service persons		N/A
	Use of symbol or warning .....:		N/A

4.5	**Thermal requirements**		P
4.5.1	General		P
4.5.2	Temperature tests		P
	Normal load condition per Annex L .....:	Refer to Annex L.	—
4.5.3	Temperature limits for materials	Complies. (see appended table 4.5)	P
4.5.4	Touch temperature limits	Complies. (see appended table 4.5)	P
4.5.5	Resistance to abnormal heat .....:	Certified components, no testing performed.	N/A

4.6	**Openings in enclosures**		P
4.6.1	Top and side openings	No openings in the enclosure.	N/A
	Dimensions (mm) .....:		—
4.6.2	Bottoms of fire enclosures	No bottom openings	N/A
	Construction of the bottomm, dimensions (mm) ..:		—
4.6.3	Doors or covers in fire enclosures		N/A
4.6.4	Openings in transportable equipment	No openings in the enclosure.	N/A
4.6.4.1	Constructional design measures		N/A
	Dimensions (mm) .....:		—
4.6.4.2	Evaluation measures for larger openings		N/A
4.6.4.3	Use of metallized parts		N/A
4.6.5	Adhesives for constructional purposes		N/A
	Conditioning temperature (°C), time (weeks).....:		—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.7	**Resistance to fire**		P
4.7.1	Reducing the risk of ignition and spread of flame	Method 1 used.	P
	Method 1, selection and application of components wiring and materials	Suitable materials used, refer to appended table 1.5.1. (see appended table 4.7)	P
	Method 2, application of all of simulated fault condition tests	Method 1 used.	N/A
4.7.2	Conditions for a fire enclosure	Refer below.	—
4.7.2.1	Parts requiring a fire enclosure	The fire enclosure is required to cover all parts.	P
4.7.2.2	Parts not requiring a fire enclosure		N/A
4.7.3	Materials		—
4.7.3.1	General	Components and materials have adequate flammability classification. (see appended Table 4.7)	—
4.7.3.2	Materials for fire enclosures	Refer to enclosure in Table 1.5.1.	P
4.7.3.3	Materials for components and other parts outside fire enclosures		N/A
4.7.3.4	Materials for components and other parts inside fire enclosures	PWB flame rated 94V-0.	P
4.7.3.5	Materials for air filter assemblies	No air filters.	N/A
4.7.3.6	Materials used in high-voltage components	No high voltage components.	N/A
5	**ELECTRICAL REQUIREMENTS AND SIMULATED ABNORMAL CONDITIONS**		P
5.1	**Touch current and protective conductor current**		P
5.1.1	General		P
5.1.2	Configuration of equipment under test (EUT)	Only single connection.	P
5.1.2.1	Single connection to an a.c. mains supply	Only single connection.	P
5.1.2.2	Redundant multiple connections to an a.c. mains supply	Only single connection.	N/A
5.1.2.3	Simultaneous multiple connections to an a.c. mains supply		N/A
5.1.3	Test circuit	Single phase type TN system.	P
5.1.4	Application of measuring instrument	Measuring circuit D1 used.	P
5.1.5	Test procedure	Switch "e" opened and closed.	P
5.1.6	Test measurements	(see appended table 5.1)	P
	Supply voltage (V) ..... :	127.2VAC/60Hz	—
	Measured touch current (mA) ..... :	0.050	—
	Max. allowed touch current (mA) ..... :	3.5	—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Measured protective conductor current (mA) .....:	N/A	—
	Max. allowed protective conductor current (mA)...:	N/A	—
5.1.7	Equipment with touch current exceeding 3,5 mA		N/A
5.1.7.1	General .....:		N/A
5.1.7.2	Simultaneous multiple connections to the supply		N/A
5.1.8	Touch currents to telecommunication networks and cable distribution systems and from telecommunication networks	No TNV circuits.	N/A
5.1.8.1	Limitation of the touch current to a telecommunication network or to a cable distribution system		N/A
	Supply voltage (V) .....:		—
	Measured touch current (mA) .....:		—
	Max. allowed touch current (mA) .....:		—
5.1.8.2	Summation of touch currents from telecommunication networks	No TNV circuits.	N/A
	a) EUT with earthed telecommunication ports .....:		N/A
	b) EUT whose telecommunication ports have no reference to protective earth		N/A

5.2	**Electric strength**		P
5.2.1	General	Complies. (see appended table 5.2)	P
5.2.2	Test procedure		P

5.3	**Abnormal operating and fault conditions**		P
5.3.1	Protection against overload and abnormal operation	Locked rotor all fans. (see appended table 5.3)	P
5.3.2	Motors	Only dc stepper motor and certified fans.	N/A
5.3.3	Transformers	No transformers. (see appended Annex C)	N/A
5.3.4	Functional insulation.....:	No functional insulation relied upon for safety.	N/A
5.3.5	Electromechanical components	No such components.	N/A
5.3.6	Audio amplifiers in ITE .....:	No audio amplifiers.	N/A
5.3.7	Simulation of faults		N/A
5.3.8	Unattended equipment		N/A
5.3.9	Compliance criteria for abnormal operating and fault conditions		N/A
5.3.9.1	During the tests		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.3.9.2	After the tests		N/A
6	**CONNECTION TO TELECOMMUNICATION NETWORKS**		N/A
6.1	**Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment**		N/A
6.1.1	Protection from hazardous voltages		N/A
6.1.2	Separation of the telecommunication network from earth		N/A
6.1.2.1	Requirements	No TNV Circuits.	N/A
	Supply voltage (V) ..... :		—
	Current in the test circuit (mA) ..... :		—
6.1.2.2	Exclusions ..... :		N/A
6.2	**Protection of equipment users from overvoltages on telecommunication networks**		N/A
6.2.1	Separation requirements	No TNV Circuits.	N/A
6.2.2	Electric strength test procedure		N/A
6.2.2.1	Impulse test	(see appended table 5.2)	N/A
6.2.2.2	Steady-state test	(see appended table 5.2)	N/A
6.2.2.3	Compliance criteria		N/A
6.3	**Protection of the telecommunication wiring system from overheating**		N/A
	Max. output current (A) ..... :		—
	Current limiting method ..... :		—
7	**CONNECTION TO CABLE DISTRIBUTION SYSTEMS**		N/A
7.1	**General**	No CDS	N/A
7.2	Protection of cable distribution system service persons, and users of other equipment connected to the system, from hazardous voltages in the equipment		N/A
7.3	Protection of equipment users from overvoltages on the cable distribution system		N/A
7.4	Insulation between primary circuits and cable distribution systems		N/A
7.4.1	General		N/A
7.4.2	Voltage surge test	(see appended table 5.2)	N/A
7.4.3	Impulse test	(see appended table 5.2)	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
A	**ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE**		N/A
A.1	**Flammability test for fire enclosures of movable equipment having a total mass exceeding 18 kg, and of stationary equipment (see 4.7.3.2)**	All materials have suitable flame class, no additional testing required.	N/A
A.1.1	Samples ..... :		—
	Wall thickness (mm) ..... :		—
A.1.2	Conditioning of samples; temperature (°C) ..... :		N/A
A.1.3	Mounting of samples ..... :		N/A
A.1.4	Test flame (see IEC 60695-11-3)		N/A
	Flame A, B, C or D ..... :		—
A.1.5	Test procedure		N/A
A.1.6	Compliance criteria		N/A
	Sample 1 burning time (s) ..... :		—
	Sample 2 burning time (s) ..... :		—
	Sample 3 burning time (s) ..... :		—
A.2	**Flammability test for fire enclosures of movable equipment having a total mass not exceeding 18 kg, and for material and components located inside fire enclosures (see 4.7.3.2 and 4.7.3.4)**		N/A
A.2.1	Samples, material ..... :		—
	Wall thickness (mm) ..... :		—
A.2.2	Conditioning of samples; temperature (°C) ..... :		N/A
A.2.3	Mounting of samples ..... :		N/A
A.2.4	Test flame (see IEC 60695-11-4)		N/A
	Flame A, B or C ..... :		—
A.2.5	Test procedure		N/A
A.2.6	Compliance criteria		N/A
	Sample 1 burning time (s) ..... :		—
	Sample 2 burning time (s) ..... :		—
	Sample 3 burning time (s) ..... :		—
A.2.7	Alternative test acc. to IEC 60695-11-5, cl. 5 and 9		N/A
	Sample 1 burning time (s) ..... :		—
	Sample 2 burning time (s) ..... :		—
	Sample 3 burning time (s) ..... :		—
A.3	**Hot flaming oil test (see 4.6.2)**		N/A
A.3.1	Mounting of samples		N/A
A.3.2	Test procedure		N/A
A.3.3	Compliance criterion		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
B	**ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS (see 4.7.2.2 and 5.3.2)**		N/A
B.1	**General requirements**	Only dc stepper motor and certified fans.	N/A
	Position ..... :		—
	Manufacturer ..... :		—
	Type ..... :		—
	Rated values ..... :		—
B.2	**Test conditions**		N/A
B.3	**Maximum temperatures**	(see appended table 5.3)	N/A
B.4	**Running overload test**	(see appended table 5.3)	N/A
B.5	**Locked-rotor overload test**		N/A
	Test duration (days) ..... :		—
	Electric strength test: test voltage (V) ..... :		—
B.6	**Running overload test for d.c. motors in secondary circuits**		N/A
B.6.1	General		N/A
B.6.2	Test procedure		N/A
B.6.3	Alternative test procedure		N/A
B.6.4	Electric strength test; test voltage (V) ..... :		N/A
B.7	**Locked-rotor overload test for d.c. motors in secondary circuits**	DC stepper motor only in printer.	N/A
B.7.1	General		N/A
B.7.2	Test procedure		N/A
B.7.3	Alternative test procedure		N/A
B.7.4	Electric strength test; test voltage (V) ..... :		N/A
B.8	**Test for motors with capacitors**	(see appended table 5.3)	N/A
B.9	**Test for three-phase motors**	(see appended table 5.3)	N/A
B.10	**Test for series motors**		N/A
	Operating voltage (V) ..... :		—
C	**ANNEX C, TRANSFORMERS (see 1.5.4 and 5.3.3)**		N/A
	Position ..... :	No transformers.	—
	Manufacturer ..... :		—
	Type ..... :		—
	Rated values ..... :		—
	Method of protection ..... :		—
C.1	**Overload test**	(see appended table 5.3)	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
C.2	**Insulation**	(see appended tables 5.2 and C2)	N/A
	Protection from displacement of windings .....:		N/A
D	**ANNEX D, MEASURING INSTRUMENTS FOR TOUCH-CURRENT TESTS (see 5.1.4)**		P
D.1	**Measuring instrument**	Measuring circuit D1 used.	P
D.2	**Alternative measuring instrument**		N/A
E	**ANNEX E, TEMPERATURE RISE OF A WINDING (see 1.4.13)**		N/A
F	**ANNEX F, MEASUREMENT OF CLEARANCES AND CREEPAGE DISTANCES (see 2.10 and Annex G)**		N/A
G	**ANNEX G, ALTERNATIVE METHOD FOR DETERMINING MINIMUM CLEARANCES**		N/A
G.1	**Clearances**	Annex G not relied upon.	N/A
G.1.1	General		N/A
G.1.2	Summary of the procedure for determining minimum clearances		N/A
G.2	**Determination of mains transient voltage (V)**		N/A
G.2.1	AC mains supply .....:		N/A
G.2.2	Earthed d.c. mains supplies .....:		N/A
G.2.3	Unearthed d.c. mains supplies .....:		N/A
G.2.4	Battery operation .....:		N/A
G.3	**Determination of telecommunication network transient voltage (V) .....:**		N/A
G.4	**Determination of required withstand voltage (V)**		N/A
G.4.1	Mains transients and internal repetitive peaks .....:		N/A
G.4.2	Transients from telecommunication networks .....:		N/A
G.4.3	Combination of transients		N/A
G.4.4	Transients from cable distribution systems		N/A
G.5	**Measurement of transient voltages (V)**		N/A
	a) Transients from a mains supply		N/A
	For an a.c. mains supply		N/A
	For a d.c. mains supply		N/A
	b) Transients from a telecommunication network		N/A
G.6	**Determination of minimum clearances .....:**		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
H	**ANNEX H, IONIZING RADIATION (see 4.3.13)**		N/A
J	**ANNEX J, TABLE OF ELECTROCHEMICAL POTENTIALS (see 2.6.5.6)**		N/A
	Metal(s) used ..... :	Corrosion not critical.	—
K	**ANNEX K, THERMAL CONTROLS (see 1.5.3 and 5.3.8)**		N/A
K.1	Making and breaking capacity	No thermal controls relied upon for safety unless part of certified components.	N/A
K.2	Thermostat reliability; operating voltage (V) ..... :		N/A
K.3	Thermostat endurance test; operating voltage (V) ..... :		N/A
K.4	Temperature limiter endurance; operating voltage (V) ..... :		N/A
K.5	Thermal cut-out reliability		N/A
K.6	Stability of operation	(see appended table 5.3)	N/A
L	**ANNEX L, NORMAL LOAD CONDITIONS FOR SOME TYPES OF ELECTRICAL BUSINESS EQUIPMENT (see 1.2.2.1 and 4.5.2)**		P
L.1	Typewriters		N/A
L.2	Adding machines and cash registers		N/A
L.3	Erasers		N/A
L.4	Pencil sharpeners		N/A
L.5	Duplicators and copy machines		N/A
L.6	Motor-operated files		N/A
L.7	Other business equipment	(MNL): Unit cannot scan ballots and print from the laser printer at the same time. The laser printer and the scan equipment are plugged into the UPS outlets. Max input current draw on the UPS input is with the laser printer printing. The UPS current rating is 12A. Scanning ballots is the worst case load for the DS450 central count scanner and tabulator.	P
M	**ANNEX M, CRITERIA FOR TELEPHONE RINGING SIGNALS (see 2.3.1)**		N/A
M.1	Introduction	No TNV circuits.	N/A
M.2	Method A		N/A
M.3	Method B		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
M.3.1	Ringing signal		N/A
M.3.1.1	Frequency (Hz) ..... :		—
M.3.1.2	Voltage (V) ..... :		—
M.3.1.3	Cadence; time (s), voltage (V) ..... :		—
M.3.1.4	Single fault current (mA) ..... :		—
M.3.2	Tripping device and monitoring voltage ..... :		N/A
M.3.2.1	Conditions for use of a tripping device or a monitoring voltage		N/A
M.3.2.2	Tripping device		N/A
M.3.2.3	Monitoring voltage (V) ..... :		N/A
N	**ANNEX N, IMPULSE TEST GENERATORS (see 1.5.7.2, 1.5.7.3, 2.10.3.9, 6.2.2.1, 7.3.2, 7.4.3 and Clause G.5)**		N/A
N.1	ITU-T impulse test generators	Impulse Test not relied upon.	N/A
N.2	IEC 60065 impulse test generator		N/A
P	**ANNEX P, NORMATIVE REFERENCES**		—
Q	**ANNEX Q, Voltage dependent resistors (VDRs) (see 1.5.9.1)**		N/A
	- Preferred climatic categories ..... :	No VDR's.	N/A
	- Maximum continuous voltage ..... :		N/A
	- Combination pulse current ..... :		N/A
	Body of the VDR Test according to IEC60695-11-5..... :		N/A
	Body of the VDR. Flammability class of material (min V-1)..... :		N/A
R	**ANNEX R, EXAMPLES OF REQUIREMENTS FOR QUALITY CONTROL PROGRAMMES**		N/A
R.1	Minimum separation distances for unpopulated coated printed boards (see 2.10.6.2)	Coated PWB not relied upon for safety.	N/A
R.2	Reduced clearances (see 2.10.3)		N/A
S	**ANNEX S, PROCEDURE FOR IMPULSE TESTING (see 6.2.2.3)**		N/A
S.1	Test equipment	Impulse not relied upon.	N/A
S.2	Test procedure		N/A
S.3	Examples of waveforms during impulse testing		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
T	**ANNEX T, GUIDANCE ON PROTECTION AGAINST INGRESS OF WATER (see 1.1.2)**		N/A
		No ingress protection claimed.	—
U	**ANNEX U, INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION (see 2.10.5.4)**		N/A
		Annex U not relied upon.	—
V	**ANNEX V, AC POWER DISTRIBUTION SYSTEMS (see 1.6.1)**		P
V.1	Introduction		P
V.2	TN power distribution systems	TN.	P
W	**ANNEX W, SUMMATION OF TOUCH CURRENTS**		N/A
W.1	Touch current from electronic circuits	No TNV circuits.	N/A
W.1.1	Floating circuits		N/A
W.1.2	Earthed circuits		N/A
W.2	Interconnection of several equipments		N/A
W.2.1	Isolation		N/A
W.2.2	Common return, isolated from earth		N/A
W.2.3	Common return, connected to protective earth		N/A
X	**ANNEX X, MAXIMUM HEATING EFFECT IN TRANSFORMER TESTS (see clause C.1)**		N/A
X.1	Determination of maximum input current	No transformers.	N/A
X.2	Overload test procedure		N/A
Y	**ANNEX Y, ULTRAVIOLET LIGHT CONDITIONING TEST (see 4.3.13.3)**		N/A
Y.1	Test apparatus .....:	No UV.	N/A
Y.2	Mounting of test samples .....:		N/A
Y.3	Carbon-arc light-exposure apparatus .....:		N/A
Y.4	Xenon-arc light exposure apparatus .....:		N/A
Z	**ANNEX Z, OVERVOLTAGE CATEGORIES (see 2.10.3.2 and Clause G.2)**		N/A
AA	**ANNEX AA, MANDREL TEST (see 2.10.5.8)**		N/A
BB	**ANNEX BB, CHANGES IN THE SECOND EDITION**		—

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
CC	**ANNEX CC, Evaluation of integrated circuit (IC) current limiters**		N/A
CC.1	General	No IC current limiters.	N/A
CC.2	Test program 1.....:		N/A
CC.3	Test program 2.....:		N/A
CC.4	Test program 3.....:		N/A
CC.5	Compliance.....:		N/A
DD	**ANNEX DD, Requirements for the mounting means of rack-mounted equipment**		N/A
DD.1	General	Not rack mounted equipment.	N/A
DD.2	Mechanical strength test, variable N.....:		N/A
DD.3	Mechanical strength test, 250N, including end stops.....:		N/A
DD.4	Compliance.....:		N/A
EE	**ANNEX EE, Household and home/office document/media shredders**		N/A
EE.1	General	Not a shredder.	N/A
EE.2	Markings and instructions		N/A
	Use of markings or symbols.....:		N/A
	Information of user instructions, maintenance and/or servicing instructions.....:		N/A
EE.3	Inadvertent reactivation test.....:		N/A
EE.4	Disconnection of power to hazardous moving parts:		N/A
	Use of markings or symbols.....:		N/A
EE.5	Protection against hazardous moving parts		N/A
	Test with test finger (Figure 2A) .....:		N/A
	Test with wedge probe (Figure EE1 and EE2) .....:		N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

1.5.1	TABLE: List of critical components				P
Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
Enclosure	Various	Various	Metal, min. 2.0 mm thickness,	UL 60950-1	Evaluated in Equipment
Cart	Various	Various	Metal, 2.0mm thickness overall provided with 4 locking casters	UL 60950-1	Evaluated in Equipment
UPS	APC	BR1500G	120VAC, 50/60Hz, 12A	UL 1778	cTUVRHus
Laser Printer	Dell	S2810dn	110-127V, 50/60Hz, 11A	UL 60950-1	cTUVRHus
Dot Matrix Printer	Oki Data Corp.	D22900A	100-127VAC, 50/60Hz, 1.0A	UL 60950-1	UL E135780
AC Inlet/Filter/ Switch/Fuseholder	Schurter	Type FKSP (CD34.1101.15)1	Rated 125/250V, 50/60Hz, 4A	UL 1283	UL E72928
Fuses (each pole)	Cooper Bussman	Type MDA	Rated 250V, 4A	UL 248-1	UL E19180
Terminal Block	Phoenix Contact	TYP ST 2.5	Rated 600V, 20A, 26-2 AWG., 2.0A	UL 508	UL E60425
ATX Power Supply	Systium Electronics (FSP Group)	FSP220-60LE	Rated 100-240V, 4-2A, 60-50Hz Max. output 250W	UL 60950-1	UL E190414
Main Power Supply	Astec	LPQ252	100-250V, 50/60Hz, 4.5A	UL 60950-1	UL
Monitor	TRU-Vu (Vita Electronics)	VT-150XAR1	Rated 12VDC, 2.0A	UL 60950-1	UL E147601
Stepper Motor	Sanyo Denki	103H7123-0440	3.2VDC, rated 2A	UL 60950-1	Evaluated in Equipment
Side Fan	Traco	D09T12HWS GN	Rated 12VDC, 0.23A	UL 507	UL
Top Internal Fan	Traco	D04T12MWS GN	Rated 12VDC, 0.07A	UL 507	UL
Scanner Module (Contact Type Image Sensor)	Canon	HW12H-W02	LED, 1200dpi, 3.3V, 310mA	UL 60950-1	Evaluated in Equipment
Mother Board	Kontron	KTQM87/mitx	Rated 12VDC	UL 60950-1	UI E147705
Hard Drive	Seagate	ST 1000NM0033	Rated 5VDC, 0.75A;12VDC, 0.99A	UL 60950-1	UL E106814)
PWB	Various	Various	Rated 94V-0, 105°C.	UL94	UL
Wiring	Various	Various	AWM, rated min 125V, VW-1, 80°C, min. 18AWG.	UL 758	UL

Supplementary information:

[1]) Provided evidence ensures the agreed level of compliance. See OD-CB2039.

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

1.5.1	TABLE: Opto Electronic Devices	N/A
Manufacturer ..... : Type..... : Separately tested..... : Bridging insulation ..... : External creepage distance..... : Internal creepage distance ..... : Distance through insulation ..... : Tested under the following conditions ..... :		
Input..... : Output..... :		
supplementary information: : No opto electronic devices used.		

1.6.2	TABLE: Electrical data (in normal conditions)					P
U (V)	I (A)	Irated (A)	P (W)	Fuse #	Ifuse (A)	Condition/status
108/50HZ	9.50	12	—	—	—	Laser Printer Printing
108/50HZ	1.64	12	—	—	—	Scanning Ballots
120/50HZ	10.00	12	—	—	—	Laser Printer Printing
120/50HZ	1.50	12	—	—	—	Scanning Ballots
127.2/50HZ	9.80	12	—	—	—	Laser Printer Printing
127.2/50HZ	1.45	12	—	—	—	Scanning Ballots
108/60HZ	8.70	12	—	—	—	Laser Printer Printing
108/60HZ	1.69	12	—	—	—	Scanning Ballots
120/60HZ	9.10	12	—	—	—	Laser Printer Printing
120/60HZ	1.50	12	—	—	—	Scanning Ballots
127.2/60HZ	9.30	12	—	—	—	Laser Printer Printing
127.2/60HZ	1.44	12	—	—	—	Scanning Ballots
Supplementary information: MNL: Unit cannot scan ballots and print from the laser printer at the same time. The laser printer and the scan equipment are plugged into the UPS outlets. Max input current draw on the UPS input is with the laser printer printing. The UPS current rating is 12A. Scanning ballots is the worst case load for the DS450 central count scanner and tabulator.						

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

2.1.1.5 c) 1)	**TABLE: max. V, A, VA test**	N/A

Voltage (rated) (V)	Current (rated) (A)	Voltage (max.) (V)	Current (max.) (A)	VA (max.) (VA)
supplementary information: Part of certified PSU.				

2.1.1.5 c) 2)	**TABLE: stored energy**	N/A

Capacitance C (µF)	Voltage U (V)	Energy E (J)
supplementary information: Part of certified PSU.		

2.2	**TABLE: evaluation of voltage limiting components in SELV circuits**	N/A

Component (measured between)	max. voltage (V) (normal operation)		Voltage Limiting Components
	V peak	V d.c.	

Fault test performed on voltage limiting components	Voltage measured (V) in SELV circuits (V peak or V d.c.)
supplementary information: Part of certified PSU.	

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

2.5	**TABLE: Limited power sources**	N/A

Circuit output tested:

Note: Measured Uoc (V) with all load circuits disconnected:

Components	Sample No.	Uoc (V)	I_{sc} (A)		VA	
			Meas.	Limit	Meas.	Limit

supplementary information: Part of certified PSU.

Sc=Short circuit, Oc=Open circuit

2.10.2	**Table: working voltage measurement**	N/A

Location	RMS voltage (V)	Peak voltage (V)	Comments

supplementary information: Part of certified PSU.

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

2.10.3 and 2.10.4	TABLE: Clearance and creepage distance measurements					P
Clearance (cl) and creepage distance (cr) at/of/between:	U peak (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required cr (mm)	cr (mm)
Functional:						
Basic/supplementary:						
AC Terminal Block (terminals L/N to PE)	170	120	1.0	6.5	1.5	6.5
Reinforced:						
Supplementary information: Cl and Cr are part of power supply certification except for BI of terminal block.						

2.10.5	TABLE: Distance through insulation measurements				N/A
Distance through insulation (DTI) at/of:	U peak (V)	U rms (V)	Test voltage (V)	Required DTI (mm)	DTI (mm)
Supplementary information: Part of certified PSU.					

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.3.8	**TABLE: Batteries**									N/A
The tests of 4.3.8 are applicable only when appropriate battery data is not available										
Is it possible to install the battery in a reverse polarity position?										
	Non-rechargeable batteries			Rechargeable batteries						
	Discharging		Un-intentional charging	Charging		Discharging		Reversed charging		
	Meas. current	Manuf. Specs.		Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	
Max. current during normal condition										
Max. current during fault condition										
Test results:										Verdict
- Chemical leaks										
- Explosion of the battery										
- Emission of flame or expulsion of molten metal										
- Electric strength tests of equipment after completion of tests										
Supplementary information: No batteries										

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.3.8	**TABLE: Batteries**	N/A

Battery category	:	(Lithium, NiMh, NiCad, Lithium Ion ...)
Manufacturer	:	
Type / model	:	
Voltage	:	
Capacity	:	mAh
Tested and Certified by (incl. Ref. No.)	:	
Circuit protection diagram:		

MARKINGS AND INSTRUCTIONS (1.7.13)	
Location of replaceable battery	
Language(s) .....:	
Close to the battery .....:	
In the servicing instructions .....:	
In the operating instructions .....:	

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.5	**TABLE: Thermal requirements:**						P
	Supply voltage (V) ..... :	108V/ 50Hz	108V/ 60Hz	127.2V/ 60Hz	127.2V/ 50Hz		—
	Ambient T_{min} (°C) ..... :	25	25	25	25		—
	Ambient T_{max} (°C) ..... :	25	25	25	25		—
Maximum measured temperature T of part/at..... :		T (°C)					Allowed T_{max} (°C)
Time for Stablized Temperatures (hours)		1.5	1.5	1.0	1.0		—
AC Inlet Filter Body		30.2	29.8	29.4	28.7		60
Input Inductor Windings (Systium PSU)		39.6	39.1	38.4	37.6		90
Bulk Capacitor Body (Systium PSU)		39.1	38.6	38.1	37.3		85
Transformer (T1) Windings (Systium PSU)		42.9	42.4	41.9	41.2		90
Input Inductor Windings (Astec PSU)		31.0	30.7	30.2	29.9		90
Bulk (C9) Capacitor Body (Astec PSU)		31.6	31.2	30.9	30.5		85
Transformer (T1) Windings (Astec PSU)		36.7	36.5	36.2	35.8		90
Inductor (L8) Windings (Astec PSU)		32.2	31.9	31.6	31.3		90
Side Fan Case (Traco)		29.6	29.3	29.0	28.7		90
Steeper Motor Case		28.9	28.6	28.2	28.0		90
Monitor Enclosure (Plastic)		28.7	28.3	22.8	27.9		95
Top of Enclosure Metal (Hot Spot)		28.5	28.4	28.2	27.7		70
Internal Ambient		30.4	30.1	29.7	29.1		reference

Supplementary information: MNL was feeding paper ballots through scanner system. Filled ballot paper tray as needed for a continious running process.

Temperature T of winding:	t_1 (°C)	R_1 (Ω)	t_2 (°C)	R_2 (Ω)	T (°C)	Allowed T_{max} (°C)	Insulation class

Supplementary information: Transformer part of certified PSU.

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.5.5	TABLE: Ball pressure test of thermoplastic parts		N/A
	Allowed impression diameter (mm) .....:	≤ 2 mm	—
Part		Test temperature (°C)	Impression diameter (mm)
Supplementary information: Part of certified PSU.			

4.7	TABLE: Resistance to fire				P
Part	Manufacturer of material	Type of material	Thickness (mm)	Flammability class	Evidence
Enclosure	Various	Metal	Min. 2.0 mm thickness,	N/A	Evaluated in equipment.
PWB	Various	Various	Rated 105°C.	Flame rated 94V-0.	Certified by UL
Supplementary information:					

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

5.1	TABLE: touch current measurement				P
Measured between:		Measured (mA)		Limit (mA)	Comments/conditions
P1 Normal (ON)		0.050	<0.005	3.5	Only single supply connection.
P2 Reversed (ON)		0.050	<0.005	3.5	Only single supply connection.
e Open		x	—	—	
e Closed		—	x	—	
P1 Normal (OFF)		0.005	<0.005	3.5	Only single supply connection.
P1 Reversed (OFF)		0.005	<0.005	3.5	Only single supply connection.
e Open		x	—	—	
e Closed		—	x	—	
supplementary information: Using measuring circuit D1.					

5.2	TABLE: Electric strength tests, impulse tests and voltage surge tests			P
Test voltage applied between:		Voltage shape (AC, DC, impulse, surge)	Test voltage (V)	Breakdown Yes / No
Functional:				
Basic/supplementary:				
Mains to Ground (AC Inlet)		DC	1414	No
Reinforced:				
L/N to external USB Connetors (for signal only)		DC	2828	No
Supplementary information: Certified UL power supplies.				

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

5.3	**TABLE: Fault condition tests**		P
	Ambient temperature (°C) .....:	24	—
	Power source for EUT: Manufacturer, model/type, output rating .....:	90V/60Hz	—

Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
DS450	Fans locked rotor	108	1 hour 8 min.	N/A	N/A	Using MNL. 108V/60Hz tested since it had the highest normal temperature results. The side, top, Astec PSU and Systium PSU fan rotors were locked.

	TABLE: maximum temperatures	Test					P
	test voltage (V) .....:	108V/60Hz					—
	t_{amb1} (°C) .....:	25					—
	t_{amb2} (°C) .....:	25					—

Component: Fan Locked Rotor	Maximum temperature T (°C)					allowed T_{max} (°C)
AC Inlet Filter Body	32.4					No limit
Input Inductor Windings (Systium PSU)	43.8					150
Bulk Capacitor Body (Systium PSU)	43.2					No limit
Transformer (T1) Windings (Systium PSU)	46.1					150
Input Inductor Windings (Astec PSU)	47.9					150
Bulk (C9) Capacitor Body (Astec PSU)	81.2					No limit
Transformer (T1) Windings (Astec PSU)	78.4					150
Inductor (L8) Windings (Astec PSU)	62.4					150
Side Fan Case (Traco)	36.4					150
Steeper Motor Case	34.7					150
Top of Enclosure Metal (Hot Spot)	28.3					70
Supplementary information: Using MNL. 108V/60Hz tested since it had the highest normal temperature results. The side, top, Astec PSU and Systium PSU fan rotors were locked. Test ran for 1 hour and 8 minutes before UL certified power supply Astec shuted down. After cool down normal operation.						

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

C.2	TABLE: transformers						N/A
Loc.	Tested insulation	Working voltage peak / V (2.10.2)	Working voltage rms / V (2.10.2)	Required electric strength (5.2)	Required clearance / mm (2.10.3)	Required creepage distance / mm (2.10.4)	Required distance thr. insul. (2.10.5)
Loc.	Tested insulation			Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers
supplementary information: Part of certified PSU.							

C.2	TABLE: transformers	N/A
Transformer		

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

List of test equipment used: Equipment list available in TÜV SÜD project file under same report number and equipment asset number indicated on test data sheets.

Clause	Measurement / testing	Testing / measuring equipment / material used	Range used	Calibration date

Attachment No.1

ATTACHMENT TO TEST REPORT
IEC 60950-1:2005 + A1:2009 + A2:2013
EUROPEAN GROUP DIFFERENCES
and
NATIONAL DEVIATIONS

Information Technology Equipment – Safety –
Part 1: General Requirements

Report Reference No.: 72120951-000

Dated of issue: 2016-10-18

Explanation for Abbreviations (if any differ from main report):
SAME as base report. 72120951-000

Possible test case verdicts:
- test case does not apply to the test object..... : ☒ N/A / ☐ N (Not Applicable)
- test object does meet the requirement..... : P (Pass)
- test object does not meet the requirement ..... : F (Fail)

Remarks:
Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Attachment No.1

Date: 2016-10-18 Page 2 of 15 Rpt. No.: 72120951-000

IEC 60950-1:2005 (ed.2) (per IECEE CB Bulletin Website)			
Group	**Group standard references**	**Last modification**	**File downloaded**
CENELEC	EN 60950-1:2006	2008-09-24	X
CENELEC	EN 60950-1:2006 + A11:2009	2009-06-23	X
CENELEC	EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011	2011-08-19	X
CENELEC	EN 60950-1:2006/A2:2013	2013-09-03	X

IEC 60950-1:2005 (ed.2) (per IECEE CB Bulletin Website)			
Country	**National standard reference**	**Last modification***	**File downloaded**
USA – US	UL 60950-1, Second Edition	2007-08-08	X
IEC 60950-1:2005 (ed.2) + A1:2009 + A2:2013 (per IECEE CB Bulletin Website)			
Country	**National standard reference**	**Last modification***	**File downloaded**
United States (USA) – US	**UL 60950-1 Am.1; Am.2**	**2014-01-24**	**X**

* The last modified date indicates the last time the standard reference / attachment for this standard was modified.
The date 2007-05-29 is the date the information was imported into the online CB Bulletin from the previous non-database version.

Attachment No.1

Date: 2016-10-18 Page 3 of 15 Rpt. No.: 72120951-000

ATTACHMENT TO TEST REPORT IEC 60950-1 **EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES** Information technology equipment – Safety – Part 1: General requirements	
Differences according to.....:	EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2:2013
Attachment Form No......:	EU_GD_IEC60950_1E
Attachment Originator.....:	SGS Fimko Ltd
Master Attachment.....:	Date 2013-09

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EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 + A2:2013 – CENELEC COMMON MODIFICATIONS

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	Clauses, subclauses, notes, tables and figures which are additional to those in IEC60950-1 and it´s amendmets are prefixed "Z"		—
Contents (A2:2013)	Add the following annexes: Annex ZA (normative) Normative references to international publications with their corresponding European publications Annex ZB (normative) Special national conditions Annex ZD (informative) IEC and CENELEC code designations for flexible cords		—
General	Delete all the "country" notes in the reference document (IEC 60950-1:2005) according to the following list: 1.4.8 Note 2; 1.5.1 Note 2 & 3; 1.5.7.1 Note 1.5.8 Note 2; 1.5.9.4 Note; 1.7.2.1 Note 4, 5 & 6 2.2.3 Note; 2.2.4 Note; 2.3.2 Note 2.3.2.1 Note 2; 2.3.4 Note 2; 2.6.3.3 Note 2 & 3 2.7.1 Note; 2.10.3.2 Note 2; 2.10.5.13 Note 3 3.2.1.1 Note; 3.2.4 Note 3.; 2.5.1 Note 2 4.3.6 Note 1 & 2; 4.7 Note 4; 4.7.2.2 Note 4.7.3.1 Note 2; 5.1.7.1 Note 3 & 4; 5.3.7 Note 1 6 Note 2 & 5; 6.1.2.1 Note 2; 6.1.2.2 Note 6.2.2 Note; 6.2.2.1 Note 2; 6.2.2.2 Note 7.1 Note 3; 7.2 Note; 7.3 Note 1 & 2 G.2.1 Note 2; Annex H Note 2		—
General (A1:2010)	Delete all the "country" notes in the reference document (IEC 60950-1:2005/A1:2010) according to the following list: 1.5.7.1 Note; 6.1.2.1 Note 2 6.2.2.1 Note 2; EE.3 Note		—

Attachment No.1

Date: 2016-10-18 Page 4 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
General (A2:2013)	Delete all the "country" notes in the reference document (IEC 60950-1:2005/A2:2013) according to the following list: 2.7.1 Note * 2.10.3.1 Note 2 6.2.2. Note * Note of secretary: Text of Common Modification remains unchanged.		P
1.1.1 (A1:2010)	**Replace** the text of NOTE 3 by the following. NOTE 3 The requirements of EN 60065 may also be used to meet safety requirements for multimedia equipment. See IEC Guide 112, Guide on the safety of multimedia equipment. For television sets EN 60065 applies.		P
1.3.Z1	Add the following subclause: 1.3.Z1 Exposure to excessive sound pressure The apparatus shall be so designed and constructed as to present no danger when used for its intended purpose, either in normal operating conditions or under fault conditions, particularly providing protection against exposure to excessive sound pressures from headphones or earphones. NOTE Z1 A new method of measurement is described in EN 50332-1, Sound system equipment: Headphones and earphones associated with portable audio equipment - Maximum sound pressure level measurement methodology and limit considerations - Part 1: General method for "one package equipment", and in EN 50332-2, Sound system equipment: Headphones and earphones associated with portable audio equipment - Maximum sound pressure level measurement methodology and limit considerations - Part 2: Guidelines to associate sets with headphones coming from different manufacturers.	Not a portable sound system.	N/A
(A12:2011)	In EN 60950-1:2006/A12:2011 Delete the addition of 1.3.Z1 / EN 60950-1:2006 Delete the definition 1.2.3.Z1 / EN 60950-1:2006 /A1:2010		P
1.5.1 (Added info*)	Add the following NOTE: NOTE Z1 The use of certain substances in electrical and electronic equipment is restricted within the EU: see Directive 2002/95/EC. New Directive 2011/65/11 *		P
1.7.2.1 (A1:2010)	In addition, for a PORTABLE SOUND SYSTEM, the instructions shall include a warning that excessive sound pressure from earphones and headphones can cause hearing loss.	Not a portable sound system.	N/A

Attachment No.1

Date: 2016-10-18 Page 5 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.2.1 (A12.2011)	In EN 60950-1:2006/A12:2011 Delete NOTE Z1 and the addition for Portable Sound System. Add the following clause and annex to the existing standard and amendments.	Not a portable sound system.	N/A
	Zx Protection against excessive sound pressure from personal music players		
	Zx.1 General This sub-clause specifies requirements for protection against excessive sound pressure from personal music players that are closely coupled to the ear. It also specifies requirements for earphones and headphones intended for use with personal music players. A personal music player is a portable equipment for personal use, that: – is designed to allow the user to listen to recorded or broadcast sound or video; and – primarily uses headphones or earphones that can be worn in or on or around the ears; and – allows the user to walk around while in use. NOTE 1 Examples are hand-held or body-worn portable CD players, MP3 audio players, mobile phones with MP3 type features, PDA's or similar equipment. A personal music player and earphones or headphones intended to be used with personal music players shall comply with the requirements of this sub-clause. The requirements in this sub-clause are valid for music or video mode only.	Not a personal music player.	N/A
	The requirements do not apply: – while the personal music player is connected to an external amplifier; or – while the headphones or earphones are not used. NOTE 2 An external amplifier is an amplifier which is not part of the personal music player or the listening device, but which is intended to play the music as a standalone music player.	Not a personal music player.	N/A

Attachment No.1

Date: 2016-10-18 Page 6 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	The requirements do not apply to: – hearing aid equipment and professional equipment; NOTE 3 Professional equipment is equipment sold through special sales channels. All products sold through normal electronics stores are considered not to be professional equipment. – analogue personal music players (personal music players without any kind of digital processing of the sound signal) that are brought to the market before the end of 2015. NOTE 4 This exemption has been allowed because this technology is falling out of use and it is expected that within a few years it will no longer exist. This exemption will not be extended to other technologies.	Not a personal music player.	N/A
	For equipment which is clearly designed or intended for use by young children, the limits of EN 71-1 apply.	Not a personal music player.	N/A
	Zx.2 Equipment requirements No safety provision is required for equipment that complies with the following: – equipment provided as a package (personal music player with its listening device), where the acoustic output $L_{Aeq,T}$ is ≤ 85 dBA measured while playing the fixed "programme simulation noise" as described in EN 50332-1; and – a personal music player provided with an analogue electrical output socket for a listening device, where the electrical output is ≤ 27 mV measured as described in EN 50332-2, while playing the fixed "programme simulation noise" as described in EN 50332-1. NOTE 1 Wherever the term acoustic output is used in this clause, the 30 s A-weighted equivalent sound pressure level $L_{Aeq,T}$ is meant. See also Zx.5 and Annex Zx.	Not a personal music player.	N/A

Attachment No.1

Date: 2016-10-18 Page 7 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	All other equipment shall: a) protect the user from unintentional acoustic outputs exceeding those mentioned above; and b) have a standard acoustic output level not exceeding those mentioned above, and automatically return to an output level not exceeding those mentioned above when the power is switched off; andc) provide a means to actively inform the user of the increased sound pressure when the equipment is operated with an acoustic output exceeding those mentioned above. Any means used shall be acknowledged by the user before activating a mode of operation which allows for an acoustic output exceeding those mentioned above. The acknowledgement does not need to be repeated more than once every 20 h of cumulative listening time; and NOTE 2 Examples of means include visual or audible signals. Action from the user is always required. NOTE 3 The 20 h listening time is the accumulative listening time, independent how often and how long the personal music player has been switched off. d) have a warning as specified in Zx.3; and e) not exceed the following: 1) equipment provided as a package (player with Its listening device), the acoustic output shall be ≤ 100 dBA measured while playing the fixed "programme simulation noise" described in EN 50332-1; and 2) a personal music player provided with an analogue electrical output socket for a listening device, the electrical output shall be ≤ 150 mV measured as described in EN 50332-2, while playing the fixed "programme simulation noise" described in EN 50332-1.	Not a personal music player.	N/A

Attachment No.1

Date: 2016-10-18 Page 8 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	For music where the average sound pressure (long term $L_{Aeq,T}$) measured over the duration of the song is lower than the average produced by the programme simulation noise, the warning does not need to be given as long as the average sound pressure of the song is below the basic limit of 85 dBA. In this case T becomes the duration of the song. NOTE 4 Classical music typically has an average sound pressure (long term $L_{Aeq,T}$) which is much lower than the average programme simulation noise. Therefore, if the player is capable to analyse the song and compare it with the programme simulation noise, the warning does not need to be given as long as the average sound pressure of the song is below the basic limit of 85 dBA. For example, if the player is set with the programme simulation noise to 85 dBA, but the average music level of the song is only 65 dBA, there is no need to give a warning or ask an acknowledgement as long as the average sound level of the song is not above the basic limit of 85 dBA.	Not a personal music player.	N/A
	Zx.3 Warning The warning shall be placed on the equipment, or on the packaging, or in the instruction manual and shall consist of the following: – the symbol of Figure 1 with a minimum height of 5 mm; and – the following wording, or similar: "To prevent possible hearing damage, do not listen at high volume levels for long periods." **Figure 1 – Warning label (IEC 60417-6044)** Alternatively, the entire warning may be given through the equipment display during use, when the user is asked to acknowledge activation of the higher level.	Not a personal music player.	N/A

Attachment No.1

Date: 2016-10-18 Page 9 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	Zx.4 Requirements for listening devices (headphones and earphones)		
	Zx.4.1 Wired listening devices with analogue input With 94 dBA sound pressure output $L_{Aeq,T}$, the input voltage of the fixed "programme simulation noise" described in EN 50332-2 shall be ≥ 75 mV. This requirement is applicable in any mode where the headphones can operate (active or passive), including any available setting (for example built-in volume level control). NOTE The values of 94 dBA – 75 mV correspond with 85dBA – 27 mV and 100 dBA – 150 mV.	Not a personal music player.	N/A
	Zx.4.2 Wired listening devices with digital input With any playing device playing the fixed "programme simulation noise" described in EN 50332-1 (and respecting the digital interface standards, where a digital interface standard exists that specifies the equivalent acoustic level), the acoustic output $L_{Aeq,T}$ of the listening device shall be ≤ 100 dBA. This requirement is applicable in any mode where the headphones can operate, including any available setting (for example built-in volume level control, additional sound feature like equalization, etc.). NOTE An example of a wired listening device with digital input is a USB headphone.	Not a personal music player.	N/A
	Zx.4.3 Wireless listening devices In wireless mode: – with any playing and transmitting device playing the fixed programme simulation noise described in EN 50332-1; and – respecting the wireless transmission standards, where an air interface standard exists that specifies the equivalent acoustic level; and – with volume and sound settings in the listening device (for example built-in volume level control, additional sound feature like equalization, etc.) set to the combination of positions that maximize the measured acoustic output for the abovementioned programme simulation noise, the acoustic output $L_{Aeq,T}$ of the listening device shall be ≤ 100 dBA. NOTE An example of a wireless listening device is a Bluetooth headphone.	Not a personal music player.	N/A

Attachment No.1

Date: 2016-10-18 Page 10 of 15 Rpt. No.: 72120951-000

US – United States of America			
	National Differences + A1:2012-01-29 Bulletin Information		P
N-C = National Condition			P
1.1.1 N-C	All equipment is to be designed to allow installation in accordance with the National Electrical Code (NEC), ANSI/NFPA 70, the Canadian Electrical Code (CED), Part I, CAN/CSA C22.1, and when applicable, the National Electrical Safety Code, IEEE C2. Also, unless marked or otherwise identified, installation is allowed per the Standard for the Protection of Electronic Computer/Data-Processing Equipment, ANSI/NFPA 75.	Considered.	—
1.1.2	Baby monitors are required to additionally comply with ASTM F2951, Consumer Safety Specification for Baby Monitors.	Not a baby monitor.	N/A
1.4.14 N-C	For Pluggable Equipment Type A, the protection in the installation is assumed to be 20 A.	Not for connection to a.c. mains.	N/A
1.5.5 N-C	For lengths exceeding 3.05 m, external interconnecting flexible cord and cable assemblies are required to be a suitable cable type specified in the NEC For lengths 3.05 m or less, external interconnecting flexible cord and cable assemblies that are not types specified in the NEC are required to have special construction features and identification markings.	All external interconnecting cables are suitable cable type specified in the NEC.	P
1.7.1 N-C	Equipment for use on a.c. mains supply systems with a neutral and more than one phase conductor (e.g. 120/240 V, 3-wire) require a special marking format for electrical ratings. A voltage rating that exceeds an attachment plug cap rating is only permitted if it does not exceed the extreme operating conditions in Table 2 of CAN/CSA C22.2 No. 235, and if it is part of a range that extends into the Table 2 "Normal Operating Conditions."	Not for connection to a.c. mains.	N/A
	Likewise, a voltage rating shall not be lower than the specified "Normal Operating Conditions," unless it is part of a range that extends into the "Normal Operating Conditions."		
1.7.7 N-C	Wiring terminals intended to supply Class 2 outputs in accordance with the NEC or CEC Part 1 shall be marked with the voltage rating and "Class 2" or equivalent. The marking shall be located adjacent to the terminals and shall be visible during wiring.	No such terminals.	N/A

Attachment No.1

Date: 2016-10-18 Page 11 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
2.5 N-C	Where a fuse is used to provide Class 2, Limited Power Source, or TNV current limiting, it shall not be operator-accessible unless it is not interchangeable.	Not used.	N/A
2.6.3.3 N-C	The first column on Table 2D modified to require, "Smaller of the RATED CURRENT of the equipment or the PROTECTIVE CURRENT RATING of the circuit under consideration."	Considered.	P
2.7.1 N-C	Suitable NEC/CEC branch circuit protection rated at the maximum circuit rating is required for all standard supply outlets and receptacles (such as supplied in power distribution units) if the supply branch circuit protection is not suitable. Power distribution transformers distributing power at 100 volts or more, and rated 10 kVA or more, require special transformer overcurrent protection.	20A branch circuit protection.	N/A
3.2 N-C	Wiring methods (terminals, leads, etc.) used for the connection of the equipment to the mains shall be in accordance with the NEC/CEC.	Appliance inlet.	N/A
3.2.1 N-C	Power supply cords are required to have attachment plugs rated not less than 125 percent of the rated current of the equipment.	Power supply cord not evaluated.	N/A
3.2.1.2 N-C	Equipment connected to a centralized d.c. power system, and having one pole of the DC mains input terminal connected to the main protective earthing terminal in the equipment, is required to comply with special earthing, wiring, marking and installation instruction requirements.	No connection to dc mains.	N/A
3.2.3 N-C	Permanent connection of equipment to the mains supply by a power supply cord is not permitted, except for certain equipment, such as ATMs.	Not permanently connected equipment.	N/A
3.2.5 N-C	Power supply cords are required to be no longer than 4.5 m in length. Minimum cord length is required to be 1.5 m, with certain constructions such as external power supplies allowed to consider both input and output cord lengths into the requirement. Flexible power supply cords are required to be compatible with Article 400 of the NEC, and Tables 11 and 12 of the CEC.	Power supply cord not evaluated.	N/A
3.2.9 N-C	Permanently connected equipment must have a suitable wiring compartment and wire bending space.	Not permanently connected equipment.	N/A
3.3 N-C	Wiring terminals and associated spacings for field wiring connections shall comply with CSA C22.2 No. 0.	No wiring terminals.	N/A

Attachment No.1

Date: 2016-10-18 Page 12 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
3.3.3 N-C	Wire binding screws are not permitted to attach conductors larger than 10 AWG (5.3 mm^2).	No wire binding screws provided.	N/A
3.3.4 N-C	Terminals for permanent wiring, including protective earthing terminals, must be suitable for U.S/Canadian wire gauge sizes, rated 125 percent of the equipment rating, and be specially marked when specified (1.7.7).	Not permanently connected equipment.	N/A
3.3.5	First column of Table 3E revised to require "Smaller of the RATED CURRENT of the equipment or the PROTECTIVE CURRENT RATING of the circuit under consideration."	No wiring terminals.	N/A
3.4.2 N-C	Motor control devices are required for cord-connected equipment with a motor if the equipment is rated more than 12 A, or if the motor has a nominal voltage rating greater than 120 V, or is rated more than 1/3 hp (locked rotor current over 43 A).	No connection to dc mains.	N/A
3.4.8 N-C	Vertically-mounted disconnect switches and circuit breakers are required to have the "on" position indicated by the handle in the up position.	No disconnect switches.	N/A
3.4.11 N-C	For computer room applications, equipment with battery systems capable of supplying 750 VA for five minutes are required to have a battery disconnect means that may be connected to the computer room remote power-off circuit.	No batteries.	N/A
4.3.12 N-C	The maximum quantity of flammable liquid stored in equipment is required to comply with NFPA 30.	No flammable liquids in the equipment.	N/A
4.3.13.5 N-C	Equipment with lasers is required to meet the U.S. Code of Federal Regulations 21 CFR 1040 (and the Canadian Radiation Emitting Devices Act, REDR C1370).	Laser printer is certified and is *compliant with 21 CFR 1040.*	P
4.7 N-C	For computer room applications, automated information storage systems with combustible media greater than 0.76 m^3 (27 cu ft) are required to have a provision for connection of either automatic sprinklers or a gaseous agent extinguishing system with an extended discharge.	The equipment has no combustible area greater than 27 cubic feet.	N/A
4.7.3.1 N-C	For computer room applications, enclosures with combustible material measuring greater than 0.9 m^2 (10 sq ft) or a single dimension greater than 1.8 m (6 ft) are required to have a flame spread rating of 50 or less. For other applications, enclosures with the same dimensions require a flame spread rating of 200 or less.	The equipment has no combustible material greater than 0.93m^2 or single dimension greater than 1.8m.	N/A
4.7.3.1	Non-metallic enclosures of equipment for use in spaces used for environmental air (plenums) are required to comply with UL 2043.	Not for use in air plenums.	N/A

National Deviations – IEC 60950-1 2.2 Ed – 2015-01-28 / Rev. 01

Attachment No.1

Date: 2016-10-18 Page 13 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
Annex H N-C	Equipment that produces ionizing radiation is required to comply with the U.S. Code of Federal Regulations, 21 CFR 1020 (and the Canadian Radiation Emitting Devices Act, REDR C1370).	The equipment does not produce ionizing radiation.	N/A
N-D = National Differences			P
1.5.1 N-D	Some components and materials associated with the risk of fire, electric shock, or personal injury are required to have component or material ratings in accordance with the applicable national (U.S. and Canadian) component or material requirements. These components include: attachment plugs, battery packs (rechargeable type, used with transportable equipment), cathode ray tubes, circuit breakers, communication circuit accessories, connectors (used for current interruption of non-LPS circuits), cord sets and power supply cords, direct plug-in equipment, enclosures (outdoor), flexible cords and cables, fuses (branch circuit), fuseholders, ground-fault current interrupters, industrial control equipment, insulating tape, interconnecting cables, lampholders, limit controls, printed wiring, protectors for communications circuits, receptacles, solid state controls, supplementary protectors, switches (including interlock switches), thermal cutoffs, thermostats, (multi-layer) transformer winding wire, transient voltage surge suppressors, tubing, wire connectors, and wire and cables.	All critical components are IEC, CSA, or UL certified. See appended table 1.5.1 in this report.	P
1.6.1.2 N-D	A circuit for connection to the DC Mains Supply is classified as either a SELV Circuit, TNV-2 Circuit or Hazardous Voltage Circuit depending on the maximum operating voltage of the supply. This maximum operating voltage is to include consideration of the battery charging "float voltage" associated with the intended supply system, regardless of the marked power rating of the equipment.	Not for connection to dc. mains.	N/A
2.3.1 N-D	For TNV-2 and TNV-3 circuits with other than ringing signals and with voltages exceeding 42.4 Vpeak or 60 Vd.c., the max. acceptable current through a 2000 ohm resistor (or greater) connected across the voltage source with other loads disconnected is 7.1 mA peak or 30 mA d.c. under normal operating conditions.	No TNV circuits.	N/A
2.3.2.1 N-D	In the event of a single fault between TNV and SELV circuits, the limits of 2.2.3 apply to SELV Circuits and accessible conductive parts.	No TNV circuits.	N/A

Attachment No.1

Date: 2016-10-18 Page 14 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
2.6.2 N-D	Equipment with functional earthing is required to be marked with the functional earthing symbol (IEC 60417-6092).	No functional earthing.	N/A
2.6.3.3	The current rating of the circuit shall be taken as 20 A not 16 A.	Considered.	—
2.6.3.4 N-D	Protective bonding conductors of non-standard protective bonding constructions (e.g., printed circuit traces) may be subjected to the additional limited short circuit test conditions specified.	No non-standard bonding constructions used.	N/A
4.2.8.1 N-D	Enclosures around CRTs with a face diameter of 160 mm or more are required to reduce the risk of injury due to the implosion of the CRT.	Not a CRT.	N/A
4.2.11 N-D	For equipment intended for mounting on racks and provided with slide/rails allowing the equipment to slide away from the rack for installation, service and maintenance, additional construction, performance and marking requirements are applicable to determine the adequacy of the slide/rails.	National Difference removed per A1.	—
4.3.2 N-D	Equipment with handles is required to comply with special loading tests.	DS450 has two metal handles 16mm in thickness. Complies with loading test. Weight of equipment is 58.5kg with weight of 117kg applied to each handle.	P
4.3.8 N-D	Battery packs for both portable and stationary applications are required to comply with special component requirements.	No battery packs unless part of certified equipment.	N/A
5.1.8.3 N-D	Equipment intended to receive telecommunication ringing signals is required to comply with a special touch current measurement tests.	No TNV circuits.	N/A
5.3.7 N-D	Internal (e.g., card cage) SELV circuit connectors and printed wiring board connectors that are accessible to the operator and that deliver power are to be overloaded. During abnormal operating testing, if a circuit is interrupted by the opening of a component, the test shall be repeated twice (three tests total) using new components as necessary.	No internal SELV circuit connectors or printed wiring board connectors that deliver power are accessible to the operator.	N/A
6.4 N-D	Equipment intended for connection to telecommunication network outside plant cable is required to be protected against overvoltage from power line crosses in accordance with 6.4 and Annex NAC.	No TNV circuits.	N/A

Attachment No.1

Date: 2016-10-18 Page 15 of 15 Rpt. No.: 72120951-000

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
Annex EE	UL articulated accessibility probe (Fig EE.3) required for assessing accessibility to document/media shredders instead of the Figure 2A test finger.	Not a document / media shredder.	N/A
Annex M.2 N-D	Continuous ringing signals up to 16 mA only are permitted if the equipment is subjected to special installation and performance restrictions.	No TNV circuits.	N/A
Annex NAD N-D	Equipment connected to a telecommunication and cable distribution networks and supplied with an earphone intended to be held against, or in the ear is required to comply with special acoustic pressure requirements.	No earpiece provided with the equipment.	N/A
~~Annex NAF~~	~~Document (paper) shredders likely to be…~~	Deleted per A1.	—

Note: Before placing the products in the different countries, the manufacturer must ensure that:

1. Operating Instructions, Ratings Labels and Warnings Labels shall be written in an Accepted or Official Language of the county in question.

   Instructions and other text required by this standard shall be written in the official language of the country in which the equipment is to be sold. This includes warnings/caution markings.

According to the German Equipment Safety Law the user manual has to contain the following points, if applicable, since all are safety relevant points:

- kind of mounting/installation
- instruction about handling at use of the devices (possibly forbiddance of certain work processes)
- maintenance
- accessories
- spare parts

2. The end product shall comply with the National Standards and/or Electrical Codes of the country in question.

---------- END REPORT ----------

ATTACHMENT # 2

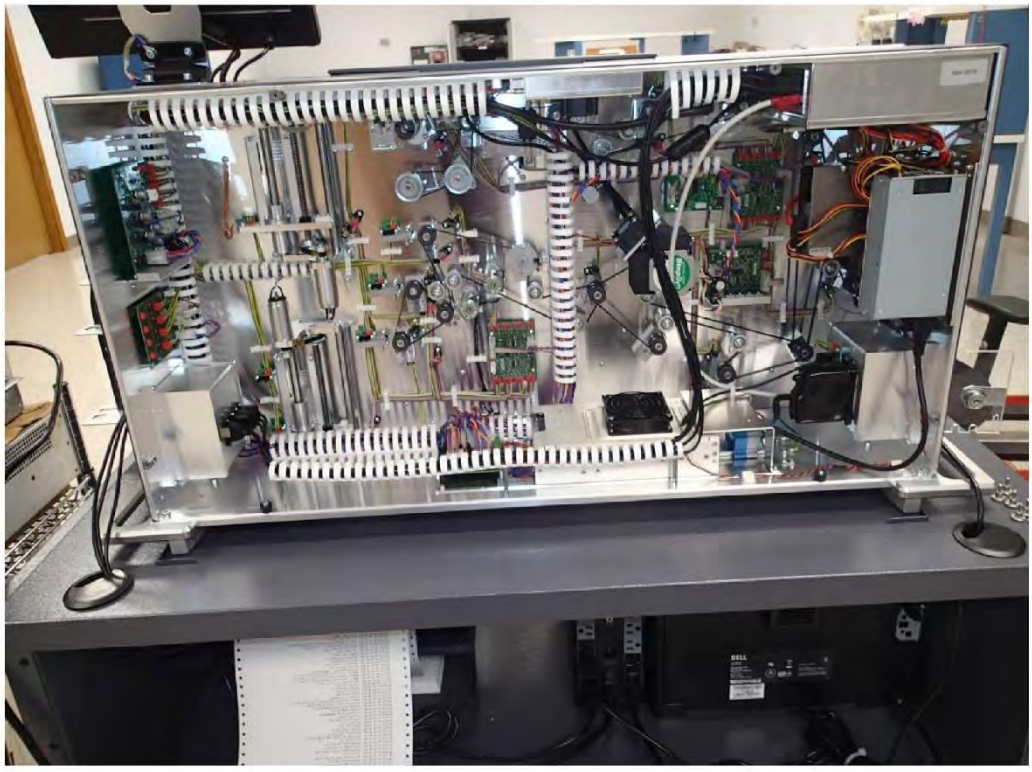
Photograph Documentation

TOTAL PAGES:	**5 pages**
COVER PAGE:	**1 page**
PHOTOS:	**4 pages**

Model DS450 plus Cart with Side Work Surfaces Opened (Front View):

Model DS450 plus Cart with Side Work Surfaces Opened (Rear View):

Model DS450 with Rear Enclosure Removed:



END OF TEST REPORT