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# Test Report for

## EAC 2005 VVSG Certification Testing

### Performed on Election Systems & Software EVS

### 5.2.2.0

Issue Date: 01/13/2017

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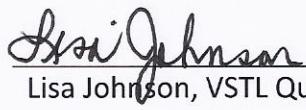
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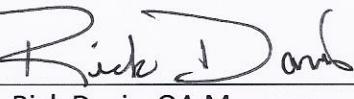


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## **REVISIONS**

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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
<i>Proprietary Software</i>	
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
<i>Proprietary Hardening Software</i>	
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
<i>COTS Software</i>	
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

### 1.1.1 Baseline Certified System (Continued)

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

Hardware Component	Hardware Version	Firmware Version
<i>Proprietary Hardware</i>		
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
<i>COTS Hardware</i>		
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
Delkin USB Flash Drives	512 MB, 1, 2, 4, & 8 GB	N/A
Delkin Compact Flash	1 GB	N/A
DS850 Report Printer	OKI B431d & 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](http://www.eac.gov/testing_and_certification/request_for_interpretations1.aspx)
- EAC Notices of Clarification (NOC) located at:  
[http://www.eac.gov/testing\\_and\\_certification/notice\\_of\\_clarifications.aspx](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](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	ESSEVSS5000
EVS 5.2.0.0	Modification	EVS 5.0.0.0	07/02/2014	ESSEVSS5200
EVS 5.2.1.0	Modification	EVS 5.2.0.0	12/17/2015	ESSEVSS5210
EVS 5.2.2.0	Modification	EVS 5.2.1.0	TBD	ESSEVSS5220

## 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 1.1 Description of EAC Certified System being modified. 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 voting system include changes to address functional upgrades, software fixes, software to enhance usability and an improved external power supply for the ExpressVote. One new hardware component, the DS450 central count tabulator, was submitted for testing. 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
<b><i>Proprietary Software</i></b>	
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
<b><i>Proprietary Hardening Scripts</i></b>	
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
<b><i>COTS Software</i></b>	
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**

<b>Classification</b>	<b>System Component</b>	<b>Hardware Version</b>	<b>Firmware Version</b>
<b>Proprietary Hardware</b>			
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	1.4.1.2
		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)		
<b>COTS Hardware</b>			
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 (External)	Zebra QR Code Scanner (Integrated w/ Rolling Kiosk)	DS457-SR20009	N/A

## 2.2.2 Test Materials (Continued)

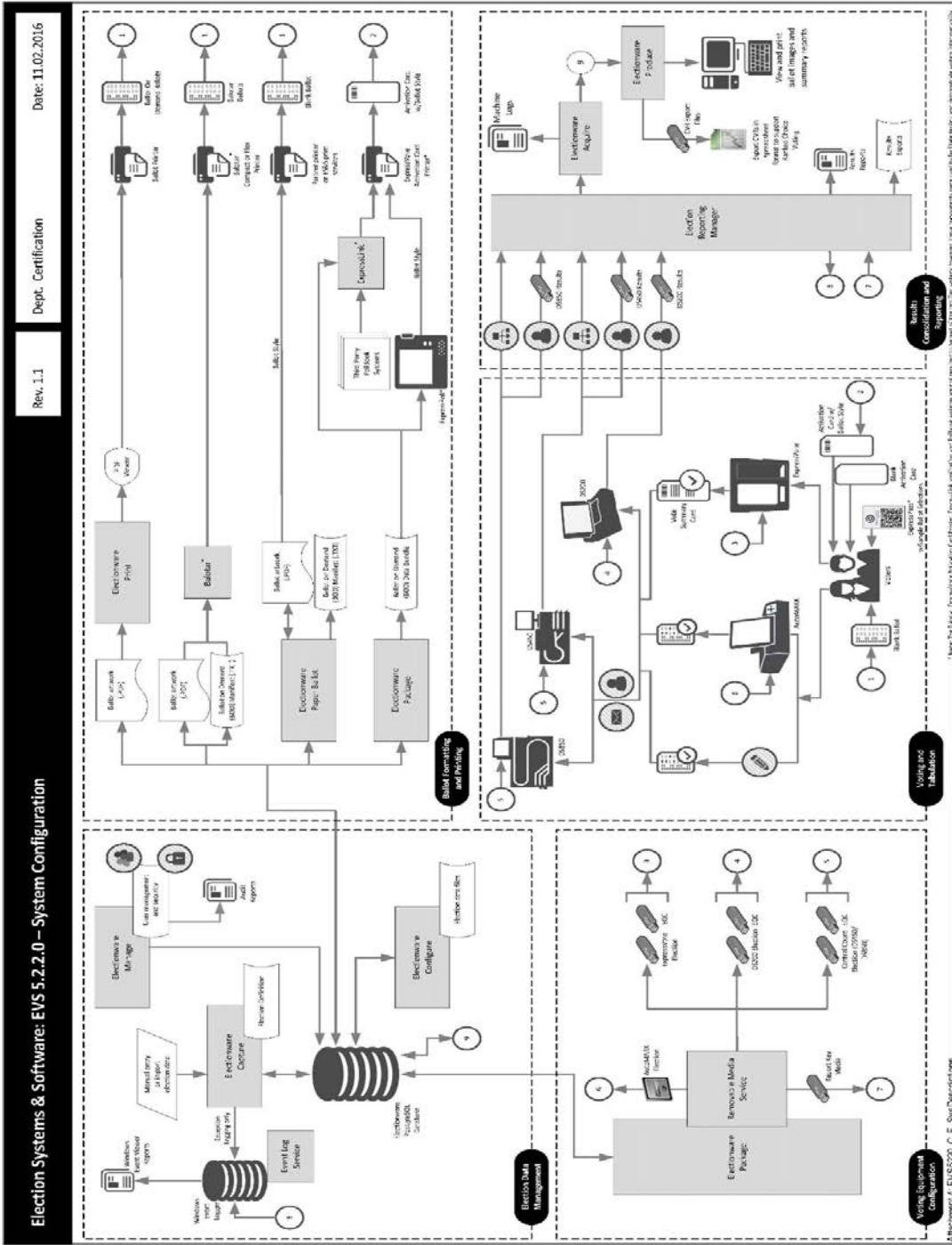
**Table 2-3 Proprietary and COTS Hardware (Continued)**

COTS Hardware			
Scanner (Integrated)	(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)

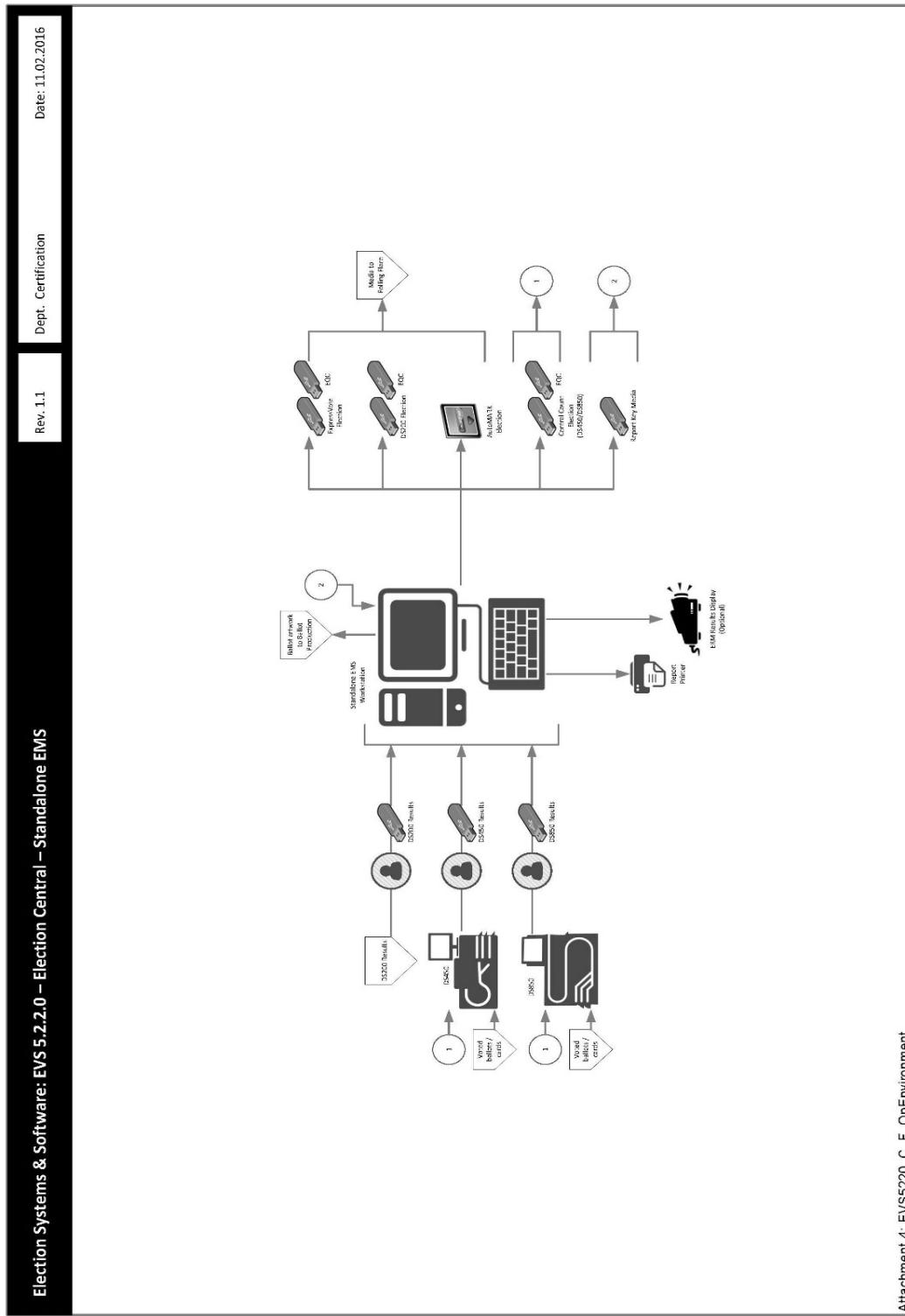


Figure 2-2. Standalone EMS Workstation

Attachment 4: EVSS220\_C\_F\_OpEnvirontment

## 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 <b>(Applicable to Design and Operation)</b>
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	
External telecommunications services	Electromagnetic signal environment: Including exposure to and generation of radio frequency energy

Procedural summaries and summary test results within this report verify that the Equipment Under Test (EUT) submitted for certification testing meets 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 structure 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  $\pm 15\%$  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	$\pm 15\%$	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  $\pm 2$  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	$5 \pm 30\%$	nanoseconds
Pulse Width	$50 \pm 30\%$	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 structure 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		kV
	A	B	C	D	A	B	C	A	B	
Test Levels	±2	±4	±8	±15	±2	±4	±8	±2	±4	±8
Number of Discharges	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 structure 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 (dB $\mu$ V)		Frequency Range (MHz)	3 Meter Test Limit (dB $\mu$ V)
	Quasi-peak <sup>1</sup>	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

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<sup>1</sup>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.

Radiated Emissions portion of the Electromagnetic Emissions Test 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, 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. 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. 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<sub>RMS</sub> 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 structure 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 structure 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
					<b>Total Ballot Positions</b>
					<b>2,716,800</b>

#### 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 without any degradation to structure and/or performance capabilities.

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 further examination, the resin was determined to be without any negative impact to the system and the EUT met the requirements of the PCA without any degradation to structure and/or performance capability.

### 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 demonstrated that the submitted modification performed as documented by the manufacturer and met the requirements 2005 VVSG Volume II Section 6.7. A deficiency was discovered and the manufacturer determined that they shall address it at a later date.

- 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.

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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, C, D, and E 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	<b>Election A:</b> <b>Limits Tested:</b> <ul style="list-style-type: none"> <li>▪ Maximum Precincts in an election (9900)*</li> <li>▪ Maximum Ballot Styles in an Election (9900)*</li> </ul> <b>Election B:</b> <b>Limits Tested:</b> <ul style="list-style-type: none"> <li>▪ Maximum Precinct elements in a tabulator (65,500)</li> <li>▪ Maximum Precinct elements in ERM (500,000).</li> </ul> <b>Election C:</b> <b>Limits Tested:</b> <ul style="list-style-type: none"> <li>▪ Maximum candidate counters/election (21,000)</li> <li>▪ Maximum candidates/contest (175)</li> <li>▪ Maximum "Vote for"/contest (98)</li> <li>▪ Maximum number of parties in a General Election (75)</li> </ul> <b>Election D:</b> <b>Limits Tested:</b> <ul style="list-style-type: none"> <li>▪ Maximum number of parties in a Primary Election (20 including nonpartisan party)</li> </ul> <b>Election E:</b> <b>Limits Tested:</b> <ul style="list-style-type: none"> <li>▪ Maximum district types (20)</li> <li>▪ Maximum district names (40)</li> </ul> <b>Election E:</b> <b>Limits Tested:</b> <ul style="list-style-type: none"> <li>▪ Maximum candidate\counters allowed per precinct (1,000)</li> <li>▪ Maximum contests allowed per ballot style (200)</li> </ul>
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#### **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, 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)

#### 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 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 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.

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. Five hundred sixty-eight source code deficiencies were discovered during testing. All identified source code deficiencies were resolved prior to the conclusion of the source code review process. The deficiencies are summarized 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 Embedded 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

#### **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 2.0 of 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.

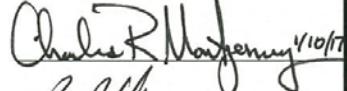
**Table B-1. Functional Deficiency Report**

NTS NOD ID	EAC VRT ID <sup>2</sup>	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 replaced 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.	ES&S replaced the QR 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 replaced the power cord for the power supply and replaced the QR Scanner from the UUT from NOD No. 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.
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.	ES&S replaced QR scanner and added a ferrite to the scanner USB cable.
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.	ES&S added a ferrite to the Log Printer's USB Cable.

<sup>2</sup> 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.

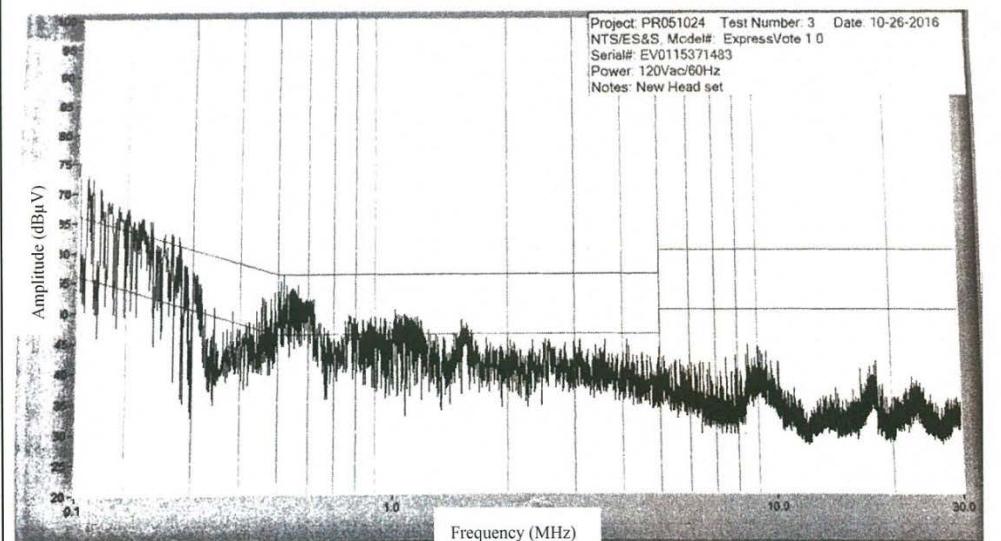
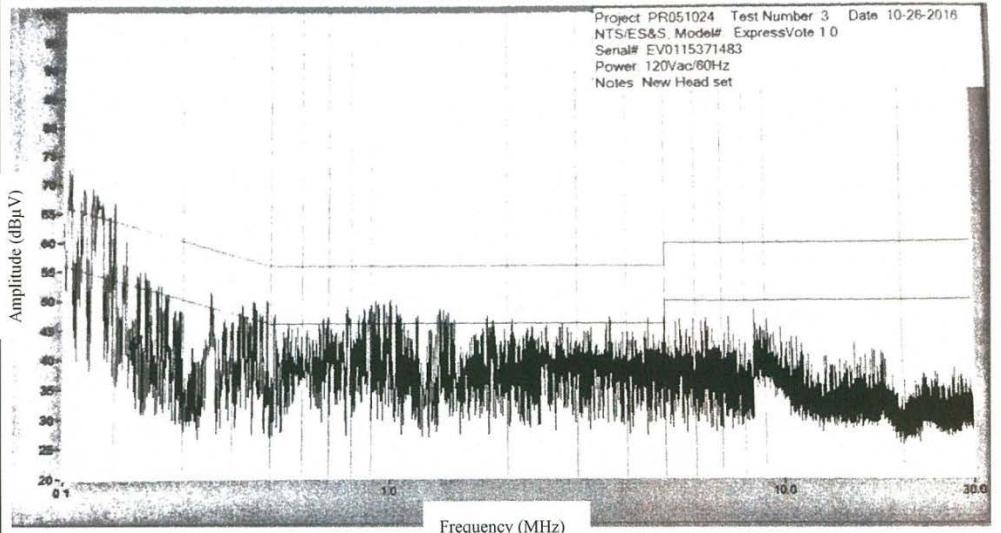


HUNTSVILLE OPERATIONS

NOTICE OF DEVIATION		DATE:	1/10/2017
NOTICE NO:	1	P.O. NUMBER:	ES&S-MSA-TA072
CUSTOMER:	ES&S	CONTRACT NO:	CON044644
NOTIFICATION MADE TO:	Sue McKay	NTS JOB NO:	PR051024
NOTIFICATION MADE BY:	Lisa Johnson	NOTIFICATION DATE:	10/26/2016
VIA:	Verbal/Email		
CATEGORY:	<input checked="" type="checkbox"/> SPECIMEN <input type="checkbox"/> PROCEDURE <input type="checkbox"/> TEST EQUIPMENT	DATE OF DEVIATION:	10/26/2016
PART NAME:	ExpressVote 1.0 with stand/booth configuration	PART NO:	EV0115371483
TEST:	Electromagnetic Emissions (Conducted Emissions)	I.D. NO:	HW 1.0
SPECIFICATION:	2005 VVSG Vol. I (FCC Part 15, Class B)	PARA. NO:	§ 4.1.2.9
<b>REQUIREMENTS:</b>			
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.			
<b>DESCRIPTION OF DEVIATION:</b>  The EUT exceeded the Conducted Emissions Test Limit between 100 kHz to 200 kHz by as much as 8 dB $\mu$ V.			
<b>DISPOSITION • COMMENTS • RECOMMENDATIONS:</b>  The customer was notified of the failure.			
SAFETY RELATED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO POTENTIAL 10 CFR PART 21: <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A			
RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: <input checked="" type="checkbox"/> CUSTOMER <input type="checkbox"/> NTS HUNTSVILLE			
CPAR REQUIRED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO CPAR NUMBER:			
<b>VERIFICATION:</b>			
CLIENT TEST WITNESS:	Sue McKay (IF APPLICABLE)	PROJECT ENGINEER:	 Charles R. Montgomery 1/10/17
GOV. QAR:	N/A (IF APPLICABLE)	DEPT. MANAGER:	 Lisa C. Johnson 01/10/2017
NTS QUALITY REPRESENTATIVE:	Sue C. Johnson	DATE:	01/10/2017
FOR NTS QA USE	Tracking Code:	3	
<input type="checkbox"/> 1. Employee Error <input type="checkbox"/> 2. Test Equipment Problem <input type="checkbox"/> 3. Customer Item Problem <input type="checkbox"/> 4. Weather <input type="checkbox"/> 5. Power Failure <input type="checkbox"/> 6. Equipment Limitations <input type="checkbox"/> 7. Other			



## 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


**HUNTSVILLE OPERATIONS**

































































































































































































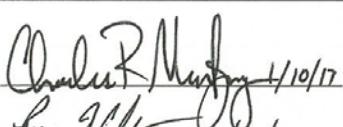




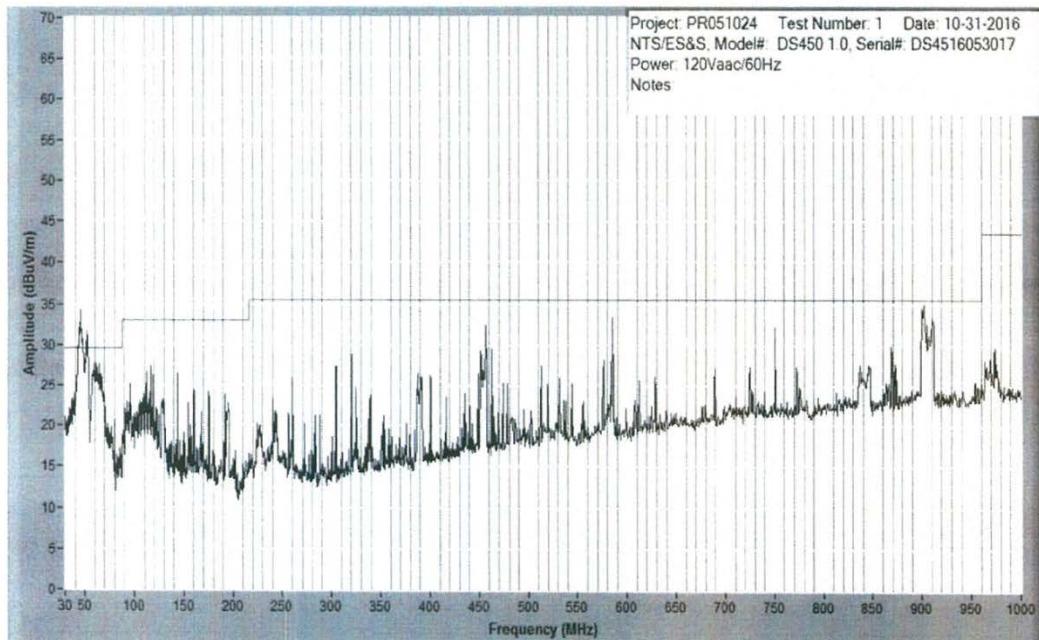
&lt;img alt="NTS Logo" data-bbox="134 135

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:		PART NO: EV0115371779			
TEST:		I.D. NO: H.W. 1.0			
SPECIFICATION:		PARA. NO: 4.1.2.6			
<b>REQUIREMENTS:</b> 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					
<b>DESCRIPTION OF DEVIATION:</b>  The QR Scanner's operation was interrupted on Line 1 at 2000 volts and did not recover.					
<b>DISPOSITION • COMMENTS • RECOMMENDATIONS:</b>  The customer was notified of the failure.					
SAFETY RELATED:		POTENTIAL 10 CFR PART 21:			
ESPONIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21:					
CPAR REQUIRED:		CPAR NUMBER:			
<b>VERIFICATION:</b>					
CLIENT TEST WITNESS:		Sue McKay (IF APPLICABLE)	PROJECT ENGINEER:		 Charles R. Montgomery 1/10/17
GOV. QAR:		N/A (IF APPLICABLE)	DEPT. MANAGER:		 Lynda C. Johnson 01/10/2017
NTS QUALITY REPRESENTATIVE:		DATE: 01/10/2017			
FOR NTS QA USE		Tracking Code:	3		
<input type="checkbox"/> 1. Employee Error <input type="checkbox"/> 2. Test Equipment Problem <input type="checkbox"/> 3. Customer Item Problem <input type="checkbox"/> 4. Weather <input type="checkbox"/> 5. Power Failure <input type="checkbox"/> 6. Equipment Limitations <input type="checkbox"/> 7. Other					



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:	<input checked="" type="checkbox"/> SPECIMEN <input type="checkbox"/> PROCEDURE <input type="checkbox"/> 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		
<b>REQUIREMENTS:</b>					
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.					
<b>DESCRIPTION OF DEVIATION:</b>					
The EUT exceeded the Radiated Emissions test limit.					
<b>DISPOSITION • COMMENTS • RECOMMENDATIONS:</b>					
The customer was notified of the failure.					
SAFETY RELATED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO POTENTIAL 10 CFR PART 21: <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A					
RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: <input type="checkbox"/> CUSTOMER <input type="checkbox"/> NTS HUNTSVILLE					
CPAR REQUIRED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO CPAR NUMBER:					
<b>VERIFICATION:</b>					
CLIENT TEST WITNESS:	Sue McKay (IF APPLICABLE)	PROJECT ENGINEER:	 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			
<input type="checkbox"/> 1. Employee Error <input type="checkbox"/> 2. Test Equipment Problem <input type="checkbox"/> 3. Customer Item Problem <input type="checkbox"/> 4. Weather <input type="checkbox"/> 5. Power Failure <input type="checkbox"/> 6. Equipment Limitations <input type="checkbox"/> 7. Other					


**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: Class B QP (dB)	FCC	Margin: Class B AV (dB)	FCC
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	-	-	



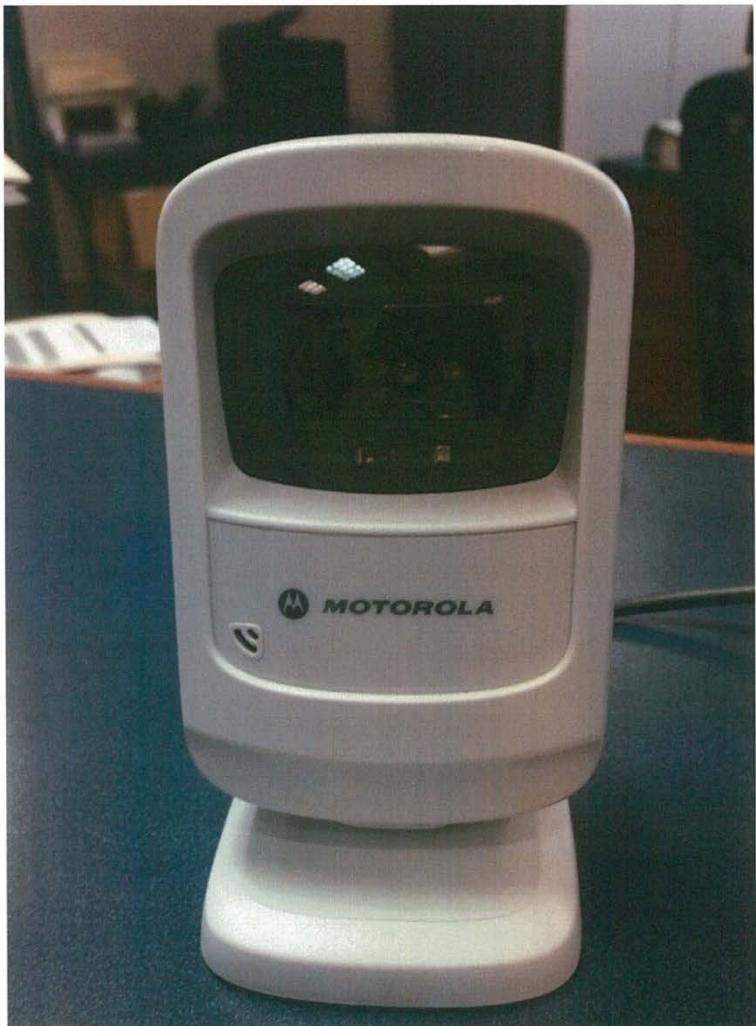
NOTICE OF DEVIATION		DATE:	1/10/2017
NOTICE NO:	5	P.O. NUMBER:	ES&S-MSA-TA072
CUSTOMER:	ES&S	CONTRACT NO:	CON044644
NOTIFICATION MADE TO:	Sue McKay	NTS JOB NO:	PR051024
NOTIFICATION MADE BY:	Lisa Johnson	NOTIFICATION DATE:	11/4/2016
VIA:	Verbal/Email		
CATEGORY:	<input checked="" type="checkbox"/> SPECIMEN <input type="checkbox"/> PROCEDURE <input type="checkbox"/> 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
<b>REQUIREMENTS:</b>			
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.			
<b>DESCRIPTION OF DEVIATION:</b>			
The QR Scanner's operation was interrupted at -15kV, air and did not recover.			
<b>DISPOSITION • COMMENTS • RECOMMENDATIONS:</b>			
The customer was notified of the failure. Run #1 failed 11/4/2016 and Run #2 11/7/2016.			
SAFETY RELATED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO POTENTIAL 10 CFR PART 21: <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A			
RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: <input checked="" type="checkbox"/> CUSTOMER <input type="checkbox"/> NTS HUNTSVILLE			
CPAR REQUIRED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO CPAR NUMBER:			
<b>VERIFICATION:</b>			
CLIENT TEST WITNESS:	Sue McKay (IF APPLICABLE)	PROJECT ENGINEER:	<i>Charles R. Matheny 1/10/17</i>
GOV. QAR:	N/A (IF APPLICABLE)	DEPT. MANAGER:	<i>Lyn G. Clegg 01/10/2017</i>
NTS QUALITY REPRESENTATIVE:	<i>Lisa C. Johnson</i>		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			



## NOTICE OF DEVIATION (CONTINUED)

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

### ADDITIONAL DESCRIPTION OF DEVIATION:



  
NTS  
Engineering Success  
HUNTSVILLE OPERATIONS

## NOTICE OF DEVIATION (CONTINUED)

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

### ADDITIONAL DESCRIPTION OF DEVIATION:





NOTICE OF DEVIATION		DATE:	1/10/2017
NOTICE NO:	6	P.O. NUMBER:	ES&S-MSA-TA072
CUSTOMER:	ES&S	CONTRACT NO:	CON044644
NOTIFICATION MADE TO:	Sue McKay	NTS JOB NO:	PR051024
NOTIFICATION MADE BY:	Lisa Johnson	NOTIFICATION DATE:	11/8/2016
		VIA:	Verbal/Email
CATEGORY:	<input checked="" type="checkbox"/> SPECIMEN <input type="checkbox"/> PROCEDURE <input type="checkbox"/> 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
<b>REQUIREMENTS:</b>			
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			
<b>DESCRIPTION OF DEVIATION:</b>			
The Log Printer's operation was interrupted on Line 1 at 2000 volts and did not recover.			
<b>DISPOSITION • COMMENTS • RECOMMENDATIONS:</b>			
The customer was notified of the failure.			
SAFETY RELATED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO POTENTIAL 10 CFR PART 21: <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A			
RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: <input checked="" type="checkbox"/> CUSTOMER <input type="checkbox"/> NTS HUNTSVILLE			
CPAR REQUIRED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		CPAR NUMBER:	
<b>VERIFICATION:</b>			
CLIENT TEST WITNESS:	Sue McKay (IF APPLICABLE)	PROJECT ENGINEER:	<i>Charles R. Mayberry</i> /10/17
GOV. QAR:	N/A (IF APPLICABLE)	DEPT. MANAGER:	<i>Tyra G. Ut</i> 01/10/2017
NTS QUALITY REPRESENTATIVE:	<i>Lisa C. Johnson</i>	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			

**APPENDIX C. AS-RUN TEST PLAN**

## C.1 AS-RUN TEST PLAN

Table C-1 details the changes made to the test plan during the course of testing. For a complete description, see NTS Test Plan PR051024-01 Rev. 5.

**Table C-1. As-Run Test Plan Changes**

Test Plan Section	Description of Change	Justification
Rev. 1	EAC Comment updates	Updates required by the EAC per their comments.
Rev. 2	EAC and ES&S Comment updates	Updates required by EAC & ES&S per their comments.
Rev. 3	Made EAC Comment adjustments	Updates required by the EAC per their comments.
Rev. 4	Removed state specific BUG35850 from sections section 1.1.3 & 4.1.1	Removed at the request of ES&S.
Rev. 5	Added BUG35683, BUG35850 & BUG35480 to sections 1.1.3 & 4.1.1.	Update required by the EAC.

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**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
<b><i>System Overview</i></b>			
System Overview	1.13	01-01	EVS5220_C_D_0100_SysOvr
<b><i>System Functionality Description</i></b>			
System Functionality Description	1.5	02-01	EVS5220_C_D_0200_SFD
<b><i>System Hardware Specification</i></b>			
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
<b><i>Software Design and Specification</i></b>			
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)**

<i>Software and Design Specification (continued)</i>			
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
<i>System Test/Verification Specification</i>			
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)**

<b>System Security Specification</b>			
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_EMSPublicationProcedure
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

**EVS 5.2.2.0 TECHNICAL DATA PACKAGE (Continued)**
**Table D-1. EVS 5.2.2.0 TDP (Continued)**

<b><i>System Operations Procedure</i></b>			
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
<b><i>System Maintenance Manuals</i></b>			
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
<b><i>Personnel Deployment and Training</i></b>			
Personnel Deployment and Training Program	1.1	09-01	ESSSYS_T_D_0900_TrainingProgram
<b><i>Configuration Management Plan</i></b>			
Configuration Management Program	2.1	10-01	ESSSYS_CM_P_1000_CMProgram
Technical Documentation Program	1.0	10-02	EVS5220_DOC_P_1000_TDProgram
<b><i>QA Program</i></b>			
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
<b><i>System Change Notes</i></b>			
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
<b><i>Attachments</i></b>			
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

(The remainder of this page intentionally left blank)

**APPENDIX F. PRODUCT SAFETY REPORT**



**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.



## 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



**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

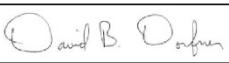
*"The test specifications are met."*

TÜV SÜD Product Service GmbH

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

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<b>TEST REPORT</b> <b>IEC 60950-1</b> <b>Information technology equipment – Safety –</b> <b>Part 1: General requirements</b>		
<b>Report Number.</b> .....	72120951-000	
Date of issue.....	2016-10-18	
Total number of pages .....	45	
<b>CB Testing Laboratory</b> .....	TÜV SÜD America Inc. Address ..... 5610 West Sligh Ave., Suite 100, Tampa, FL 33634 USA	
<b>Applicant's name</b> .....	Election Systems & Software LLC	
Address .....	11208 John Galt Blvd., Omaha, NE 68137 USA	
<b>Manufacturer's name</b> .....	Election Systems & Software LLC	
Address .....	11208 John Galt Blvd., Omaha, NE 68137 USA	
<b>Test specification:</b>		
Standard.....	UL 60950-1:2007/R:2014-10	
Test procedure .....	Report Only	
Non-standard test method.....	N/A	
<b>Test Report Form No.</b> .....	IEC60950_1E	
Test Report Form(s) Originator .....	SGS Fimko Ltd	
Master TRF.....	Dated 2013-07	
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<p>This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.</p> <p>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.</p> <p><b>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.</b></p>		
<b>Test item description</b> .....	Central Count Scanner and Tabulator	
<b>Trade Mark</b> .....		
<b>Manufacturer</b> .....	Election Systems & Software LLC 11208 John Galt Blvd., Omaha, NE 68137 USA	
<b>Model/Type reference</b> .....	DS450	
<b>Ratings</b> .....	120VAC, 50/60HZ, 12A, Class I equipment	

Testing procedure and testing location:	
<input checked="" type="checkbox"/>	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 
Approved by (name + signature) .... :	David 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):**

All required for this investigation.

**Testing location:**

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 includes US National Differences.

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Report No. 72120951-000

Copy of marking plate



Input 120VAC, 50/60Hz, 12A

TRF No. IEC60950\_1E



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

**Manufacturer's Declaration per sub-clause 4.2.5 of IEC60950-1:**

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	<b>GENERAL</b>	—	

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	P
1.6.2	Input current	(see appended table 1.6.2)
1.6.3	Voltage limit of hand-held equipment	Not hand-held
1.6.4	Neutral conductor	Neutral is insulated from earth with basic insulation throughout the equipment.

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.
1.7.1.1	Power rating marking	The required marking is located on the outside surface of the equipment.
	Multiple mains supply connections.....:	The equipment does not have multiple mains connections.
	Rated voltage(s) or voltage range(s) (V) .....	120VAC
	Symbol for nature of supply, for d.c. only .....	The equipment is for a.c. supply.
	Rated frequency or rated frequency range (Hz) ....	50/60Hz
	Rated current (mA or A) .....	Refer to marking plate, page 4.
1.7.1.2	Identification markings	P
	Manufacturer's name or trade-mark or identification mark .....	
	Model identification or type reference .....	DS450
	Symbol for Class II equipment only .....	The equipment is not Class II.
	Other markings and symbols .....	None.
1.7.1.3	Use of graphical symbols	None.
1.7.2	Safety instructions and marking	Sufficient instructions for installation and use provided.
1.7.2.1	General	The equipment is not Class II.
1.7.2.2	Disconnect devices	Statement not required.
1.7.2.3	Overcurrent protective device	Not Pluggable Type B or permanently connected.
1.7.2.4	IT power distribution systems	Not evaluated for IT power systems.

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 restricted access.	N/A

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

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

<b>2.3</b>	<b>TNV circuits</b>		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

<b>2.4</b>	<b>Limited current circuits</b>		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 $\mu$ F) .....		—
2.4.3	Connection of limited current circuits to other circuits		N/A

<b>2.5</b>	<b>Limited power sources</b>	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		

<b>2.6</b>	<b>Provisions for earthing and bonding</b>	P
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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 <sup>2</sup> ), AWG .....		—
2.6.3.3	Size of protective bonding conductors	Refer below.	P
	Rated current (A), cross-sectional area (mm <sup>2</sup> ), AWG .....	Min.18AWG wire used	—
	Protective current rating (A), cross-sectional area (mm <sup>2</sup> ), AWG..... :	20A.	
2.6.3.4	Resistance of earthing conductors and their terminations; resistance ( $\Omega$ ), 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 59m $\Omega$ .	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

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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
<b>2.7</b>	<b>Overcurrent and earth fault protection in primary circuits</b>		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
<b>2.8</b>	<b>Safety interlocks</b>		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
<b>2.9</b>	<b>Electrical insulation</b>		P

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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 ..... :		—
<b>2.10</b>	<b>Clearances, creepage distances and distances through insulation</b>		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

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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

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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	N/A
	a) Basic insulation not under stress .....	N/A	N/A
	b) Basic, supplementary, reinforced insulation .....	N/A	N/A
	c) Compliance with Annex U .....	N/A	N/A
	Two wires in contact inside wound component; angle between 45° and 90° .....	N/A	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	N/A
	- Basic insulation not under stress .....	N/A	N/A
	- Supplementary, reinforced insulation .....	N/A	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	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

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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.
3.1.2	Protection against mechanical damage	All internal wires are properly routed and away from sharp edges.
3.1.3	Securing of internal wiring	Internal wires are properly secured.
3.1.4	Insulation of conductors	Wiring insulation appropriate based on voltages. (see appended table 5.2)
3.1.5	Beads and ceramic insulators	None used.
3.1.6	Screws for electrical contact pressure	None used.
3.1.7	Insulating materials in electrical connections	None used.
3.1.8	Self-tapping and spaced thread screws	Thread-cutting or space thread screws are not used for electrical connections.
3.1.9	Termination of conductors	Wiring properly secured based on voltages.
	10 N pull test	Reliable connectors/terminals used.
3.1.10	Sleeving on wiring	None used.

3.2	Connection to a mains supply	P
3.2.1	Means of connection	Refer below:
3.2.1.1	Connection to an a.c. mains supply	Provided with appliance inlet.
3.2.1.2	Connection to a d.c. mains supply	The equipment is not for connection to a d.c. mains supply.
3.2.2	Multiple supply connections	Only one supply connection.
3.2.3	Permanently connected equipment	The equipment is not intended for permanent connection to the mains.

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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 <sup>2</sup> ), 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
<b>3.3</b>	<b>Wiring terminals for connection of external conductors</b>		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 <sup>2</sup> )..... :		—
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

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Clause	Requirement + Test	Result - Remark	Verdict

<b>3.4</b>	<b>Disconnection from the mains supply</b>		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

<b>3.5</b>	<b>Interconnection of equipment</b>		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

<b>4</b>	<b>PHYSICAL REQUIREMENTS</b>		P
<b>4.1</b>	<b>Stability</b>		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

<b>4.2</b>	<b>Mechanical strength</b>		P
4.2.1	General		P
	Rack-mounted equipment.	Not rack-mount equipment. (see Annex DD)	N/A

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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	Compleat 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 or 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

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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.
4.4.2	Protection in operator access areas .....	No hazardous moving parts accessible to the operator other than guarded fans.

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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

<b>4.5</b>	<b>Thermal requirements</b>	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)
4.5.4	Touch temperature limits	Complies. (see appended table 4.5)
4.5.5	Resistance to abnormal heat .....	: Certified components, no testing performed.

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

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Clause	Requirement + Test	Result - Remark	Verdict

<b>4.7</b>	<b>Resistance to fire</b>		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

<b>5</b>	<b>ELECTRICAL REQUIREMENTS AND SIMULATED ABNORMAL CONDITIONS</b>		P
<b>5.1</b>	<b>Touch current and protective conductor current</b>		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	—

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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		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) ..... : N/A		—
	Measured touch current (mA) ..... : N/A		—
	Max. allowed touch current (mA) ..... : N/A		—
5.1.8.2	Summation of touch currents from telecommunication networks	No TNV circuits.	N/A
	a) EUT with earthed telecommunication ports ..... : N/A		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)
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)
5.3.2	Motors	Only dc stepper motor and certified fans.
5.3.3	Transformers	No transformers. (see appended Annex C)
5.3.4	Functional insulation..... : N/A	No functional insulation relied upon for safety.
5.3.5	Electromechanical components	No such components.
5.3.6	Audio amplifiers in ITE ..... : N/A	No audio amplifiers.
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

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Clause	Requirement + Test	Result - Remark	Verdict
5.3.9.2	After the tests		N/A

<b>6</b>	<b>CONNECTION TO TELECOMMUNICATION NETWORKS</b>	N/A
<b>6.1</b>	<b>Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment</b>	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.
	Supply voltage (V) .....	—
	Current in the test circuit (mA) .....	—
6.1.2.2	Exclusions .....	N/A

<b>6.2</b>	<b>Protection of equipment users from overvoltages on telecommunication networks</b>	N/A
6.2.1	Separation requirements	No TNV Circuits.
6.2.2	Electric strength test procedure	N/A
6.2.2.1	Impulse test	(see appended table 5.2)
6.2.2.2	Steady-state test	(see appended table 5.2)
6.2.2.3	Compliance criteria	N/A

<b>6.3</b>	<b>Protection of the telecommunication wiring system from overheating</b>	N/A
	Max. output current (A) .....	—
	Current limiting method .....	—

<b>7</b>	<b>CONNECTION TO CABLE DISTRIBUTION SYSTEMS</b>	N/A
<b>7.1</b>	<b>General</b>	No CDS
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)
7.4.3	Impulse test	(see appended table 5.2)

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>A</b>	<b>ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE</b>		N/A
<b>A.1</b>	<b>Flammability test for fire enclosures of movable equipment having a total mass exceeding 18 kg, and of stationary equipment (see 4.7.3.2)</b>	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).....		—
<b>A.2</b>	<b>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)</b>		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).....		—
<b>A.3</b>	<b>Hot flaming oil test (see 4.6.2)</b>		N/A
A.3.1	Mounting of samples		N/A
A.3.2	Test procedure		N/A
A.3.3	Compliance criterion		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
<b>B</b>	<b>ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS (see 4.7.2.2 and 5.3.2)</b>		N/A
<b>B.1</b>	<b>General requirements</b>	Only dc stepper motor and certified fans.	N/A
	Position .....		—
	Manufacturer .....		—
	Type .....		—
	Rated values .....		—
<b>B.2</b>	<b>Test conditions</b>		N/A
<b>B.3</b>	<b>Maximum temperatures</b>	(see appended table 5.3)	N/A
<b>B.4</b>	<b>Running overload test</b>	(see appended table 5.3)	N/A
<b>B.5</b>	<b>Locked-rotor overload test</b>		N/A
	Test duration (days) .....		—
	Electric strength test; test voltage (V) .....		—
<b>B.6</b>	<b>Running overload test for d.c. motors in secondary circuits</b>		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>B.7</b>	<b>Locked-rotor overload test for d.c. motors in secondary circuits</b>	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>B.8</b>	<b>Test for motors with capacitors</b>	(see appended table 5.3)	N/A
<b>B.9</b>	<b>Test for three-phase motors</b>	(see appended table 5.3)	N/A
<b>B.10</b>	<b>Test for series motors</b>		N/A
	Operating voltage (V) .....		—

<b>C</b>	<b>ANNEX C, TRANSFORMERS (see 1.5.4 and 5.3.3)</b>		N/A
	Position .....	No transformers.	—
	Manufacturer .....		—
	Type .....		—
	Rated values .....		—
	Method of protection .....		—
<b>C.1</b>	<b>Overload test</b>	(see appended table 5.3)	N/A

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
C.2	<b>Insulation</b>  (see appended tables 5.2 and C2)	N/A	
	Protection from displacement of windings .....:	N/A	
D	<b>ANNEX D, MEASURING INSTRUMENTS FOR TOUCH-CURRENT TESTS (see 5.1.4)</b>		P
D.1	<b>Measuring instrument</b>	Measuring circuit D1 used.	P
D.2	<b>Alternative measuring instrument</b>		N/A
E	<b>ANNEX E, TEMPERATURE RISE OF A WINDING (see 1.4.13)</b>		N/A
F	<b>ANNEX F, MEASUREMENT OF CLEARANCES AND CREEPAGE DISTANCES (see 2.10 and Annex G)</b>		N/A
G	<b>ANNEX G, ALTERNATIVE METHOD FOR DETERMINING MINIMUM CLEARANCES</b>		N/A
G.1	<b>Clearances</b>	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	<b>Determination of mains transient voltage (V)</b>		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	<b>Determination of telecommunication network transient voltage (V) .....</b>		N/A
G.4	<b>Determination of required withstand voltage (V)</b>		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	<b>Measurement of transient voltages (V)</b>		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	<b>Determination of minimum clearances .....</b>		N/A

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H	<b>ANNEX H, IONIZING RADIATION (see 4.3.13)</b>	N/A
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J	<b>ANNEX J, TABLE OF ELECTROCHEMICAL POTENTIALS (see 2.6.5.6)</b>	N/A
	Metal(s) used ..... : Corrosion not critical.	—

K	<b>ANNEX K, THERMAL CONTROLS (see 1.5.3 and 5.3.8)</b>	N/A
K.1	Making and breaking capacity	No thermal controls relied upon for safety unless part of certified components.
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)

L	<b>ANNEX L, NORMAL LOAD CONDITIONS FOR SOME TYPES OF ELECTRICAL BUSINESS EQUIPMENT (see 1.2.2.1 and 4.5.2)</b>	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.

M	<b>ANNEX M, CRITERIA FOR TELEPHONE RINGING SIGNALS (see 2.3.1)</b>	N/A
M.1	Introduction	No TNV circuits.
M.2	Method A	N/A
M.3	Method B	N/A

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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

<b>N</b>	<b>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)</b>	N/A
N.1	ITU-T impulse test generators	Impulse Test not relied upon.
N.2	IEC 60065 impulse test generator	N/A

<b>P</b>	<b>ANNEX P, NORMATIVE REFERENCES</b>	—
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<b>Q</b>	<b>ANNEX Q, Voltage dependent resistors (VDRs) (see 1.5.9.1)</b>	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

<b>R</b>	<b>ANNEX R, EXAMPLES OF REQUIREMENTS FOR QUALITY CONTROL PROGRAMMES</b>	N/A
R.1	Minimum separation distances for unpopulated coated printed boards (see 2.10.6.2)	Coated PWB not relied upon for safety.
R.2	Reduced clearances (see 2.10.3)	N/A

<b>S</b>	<b>ANNEX S, PROCEDURE FOR IMPULSE TESTING (see 6.2.2.3)</b>	N/A
S.1	Test equipment	Impulse not relied upon.
S.2	Test procedure	N/A
S.3	Examples of waveforms during impulse testing	N/A

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<b>T</b>	<b>ANNEX T, GUIDANCE ON PROTECTION AGAINST INGRESS OF WATER (see 1.1.2)</b>	N/A
		No ingress protection claimed.

<b>U</b>	<b>ANNEX U, INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION (see 2.10.5.4)</b>	N/A
		Annex U not relied upon.

<b>V</b>	<b>ANNEX V, AC POWER DISTRIBUTION SYSTEMS (see 1.6.1)</b>	P
V.1	Introduction	P
V.2	TN power distribution systems	TN.

<b>W</b>	<b>ANNEX W, SUMMATION OF TOUCH CURRENTS</b>	N/A
W.1	Touch current from electronic circuits	No TNV circuits.
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

<b>X</b>	<b>ANNEX X, MAXIMUM HEATING EFFECT IN TRANSFORMER TESTS (see clause C.1)</b>	N/A
X.1	Determination of maximum input current	No transformers.
X.2	Overload test procedure	N/A

<b>Y</b>	<b>ANNEX Y, ULTRAVIOLET LIGHT CONDITIONING TEST (see 4.3.13.3)</b>	N/A
Y.1	Test apparatus .....	No UV.
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

<b>Z</b>	<b>ANNEX Z, OVERVOLTAGE CATEGORIES (see 2.10.3.2 and Clause G.2)</b>	N/A
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<b>AA</b>	<b>ANNEX AA, MANDREL TEST (see 2.10.5.8)</b>	N/A
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<b>BB</b>	<b>ANNEX BB, CHANGES IN THE SECOND EDITION</b>	—
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CC	ANNEX CC, Evaluation of integrated circuit (IC) current limiters	N/A
CC.1	General	No IC current limiters.
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.
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.
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

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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 <sup>1)</sup>
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/m1x	Rated 12VDC		UL 60950-1	UL 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.						

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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)	Rated (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.							

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<b>2.1.1.5 c) 1)</b>	<b>TABLE: max. V, A, VA test</b>					N/A
	Voltage (rated) (V)	Current (rated) (A)	Voltage (max.) (V)	Current (max.) (A)	VA (max.) (VA)	
supplementary information: Part of certified PSU.						

<b>2.1.1.5 c) 2)</b>	<b>TABLE: stored energy</b>					N/A
	Capacitance C ( $\mu$ F)	Voltage U (V)		Energy E (J)		
supplementary information: Part of certified PSU.						

<b>2.2</b>	<b>TABLE: evaluation of voltage limiting components in SELV circuits</b>			N/A
	Component (measured between)		max. voltage (V) (normal operation)	
	V peak	V d.c.	Voltage Limiting Components	
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.				

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Clause	Requirement + Test		Result - Remark		Verdict						
<b>2.5</b>	<b>TABLE: Limited power sources</b>				N/A						
Circuit output tested:											
Note: Measured Uoc (V) with all load circuits disconnected:											
Components	Sample No.	Uoc (V)	Is <sub>c</sub> (A)		VA						
			Meas.	Limit	Meas.	Limit					
supplementary information: Part of certified PSU.											
Sc=Short circuit, Oc=Open circuit											
<b>2.10.2</b>	<b>Table: working voltage measurement</b>				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	
<b>2.10.3 and 2.10.4</b>	<b>TABLE: Clearance and creepage distance measurements</b>					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	<b>TABLE: Distance through insulation measurements</b>					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									
<b>4.3.8 TABLE: Batteries</b>																
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								
Max. current during normal condition																
Max. current during fault condition																
Test results:																
- 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																

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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 <sub>min</sub> (°C) .....	25	25	25	25		—
	Ambient T <sub>max</sub> (°C) .....	25	25	25	25		—
Maximum measured temperature T of part/at.....		T (°C)				Allowed T <sub>max</sub> (°C)	
Time for Stabilized 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 continuous running process.							
Temperature T of winding:		t <sub>1</sub> (°C)	R <sub>1</sub> (Ω)	t <sub>2</sub> (°C)	R <sub>2</sub> (Ω)	T (°C)	Allowed T <sub>max</sub> (°C)
Supplementary information: Transformer part of certified PSU.							

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Clause	Requirement + Test	Result - Remark	Verdict

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

4.7	<b>TABLE: Resistance to fire</b>					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 Connectors (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
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.
Component: Fan Locked Rotor		Maximum temperature T (°C)		allowed T <sub>max</sub> (°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 shutted 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							

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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.



# 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.

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<b>IEC 60950-1:2005 (ed.2) (per IECEE CB Bulletin Website)</b>			
<b>Group</b>	<b>Group standard references</b>	<b>Last modification</b>	<b>File downloaded</b>
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)**

<b>Country</b>	<b>National standard reference</b>	<b>Last modification*</b>	<b>File downloaded</b>
USA – US	UL 60950-1, Second Edition	2007-08-08	X
<b>IEC 60950-1:2005 (ed.2) + A1:2009 + A2:2013 (per IECEE CB Bulletin Website)</b>			
<b>Country</b>	<b>National standard reference</b>	<b>Last modification*</b>	<b>File downloaded</b>
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.



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



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<b>IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)</b>			
Clause	Requirement + Test	Result - Remark	Verdict
General (A2:2013)	<p>Delete all the "country" notes in the reference document (IEC 60950-1:2005/A2:2013) according to the following list:</p> <p>2.7.1 Note *      2.10.3.1 Note 2  6.2.2. Note</p> <p>* Note of secretary: Text of Common Modification remains unchanged.</p>		P
1.1.1 (A1:2010)	<p><b>Replace</b> the text of NOTE 3 by the following.</p> <p>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>		P
1.3.Z1	<p>Add the following subclause:</p> <p>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.</p> <p>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.</p>	Not a portable sound system.	N/A
(A12:2011)	<p>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>		P
1.5.1 (Added info*)	<p>Add the following NOTE:</p> <p>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>		P
1.7.2.1 (A1:2010)	<p>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.</p>	Not a portable sound system.	N/A



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<b>IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)</b>			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.2.1 (A12.2011)	<p>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.</p>	Not a portable sound system.	N/A
<b>Zx Protection against excessive sound pressure from personal music players</b>			
	<p><b>Zx.1 General</b> 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:  <ul style="list-style-type: none"> <li>– is designed to allow the user to listen to recorded or broadcast sound or video; and</li> <li>– primarily uses headphones or earphones that can be worn in or on or around the ears; and</li> <li>– allows the user to walk around while in use.</li> </ul> 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.</p>	Not a personal music player.	N/A
	<p>The requirements do not apply:</p> <ul style="list-style-type: none"> <li>– while the personal music player is connected to an external amplifier; or</li> <li>– while the headphones or earphones are not used.</li> </ul> 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



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<b>IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>The requirements do not apply to:</p> <ul style="list-style-type: none"> <li>– hearing aid equipment and professional equipment;</li> </ul> <p>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.</p> <ul style="list-style-type: none"> <li>– 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.</li> </ul> <p>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.</p>	Not a personal music player.	N/A
	<p>For equipment which is clearly designed or intended for use by young children, the limits of EN 71-1 apply.</p>	Not a personal music player.	N/A
	<p><b>Zx.2 Equipment requirements</b></p> <p>No safety provision is required for equipment that complies with the following:</p> <ul style="list-style-type: none"> <li>– equipment provided as a package (personal music player with its listening device), where the acoustic output <math>L_{Aeq,T}</math> is <math>\leq 85</math> dBA measured while playing the fixed "programme simulation noise" as described in EN 50332-1; and</li> <li>– a personal music player provided with an analogue electrical output socket for a listening device, where the electrical output is <math>\leq 27</math> mV measured as described in EN 50332-2, while playing the fixed "programme simulation noise" as described in EN 50332-1.</li> </ul> <p>NOTE 1 Wherever the term acoustic output is used in this clause, the 30 s A-weighted equivalent sound pressure level <math>L_{Aeq,T}</math> is meant. See also Zx.5 and Annex Zx.</p>	Not a personal music player.	N/A



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<b>IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>All other equipment shall:</p> <ul style="list-style-type: none"> <li>a) protect the user from unintentional acoustic outputs exceeding those mentioned above; and</li> <li>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; and</li> <li>c) 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</li> </ul> <p>NOTE 2 Examples of means include visual or audible signals. Action from the user is always required.</p> <p>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.</p> <p>d) have a warning as specified in Zx.3; and</p> <p>e) not exceed the following:</p> <ul style="list-style-type: none"> <li>1) equipment provided as a package (player with its listening device), the acoustic output shall be <math>\leq 100</math> dBA measured while playing the fixed "programme simulation noise" described in EN 50332-1; and</li> <li>2) a personal music player provided with an analogue electrical output socket for a listening device, the electrical output shall be <math>\leq 150</math> mV measured as described in EN 50332-2, while playing the fixed "programme simulation noise" described in EN 50332-1.</li> </ul>	Not a personal music player.	N/A



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<b>IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>For music where the average sound pressure (long term <math>L_{Aeq,T}</math>) 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.</p> <p>NOTE 4 Classical music typically has an average sound pressure (long term <math>L_{Aeq,T}</math>) 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.</p> <p>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.</p>	Not a personal music player.	N/A
	<p><b>Zx.3 Warning</b></p> <p>The warning shall be placed on the equipment, or on the packaging, or in the instruction manual and shall consist of the following:</p> <ul style="list-style-type: none"> <li>– the symbol of Figure 1 with a minimum height of 5 mm; and</li> <li>– the following wording, or similar:</li> </ul> <p>"To prevent possible hearing damage, do not listen at high volume levels for long periods."</p> 	Not a personal music player.	N/A

**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.

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<b>IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	<b>Zx.4 Requirements for listening devices (headphones and earphones)</b>		
	<p><b>Zx.4.1 Wired listening devices with analogue input</b></p> <p>With 94 dBA sound pressure output <math>L_{Aeq,T}</math>, the input voltage of the fixed "programme simulation noise" described in EN 50332-2 shall be <math>\geq 75</math> mV.</p> <p>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).</p> <p>NOTE The values of 94 dBA – 75 mV correspond with 85dBA – 27 mV and 100 dBA – 150 mV.</p>	Not a personal music player.	N/A
	<p><b>Zx.4.2 Wired listening devices with digital input</b></p> <p>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 <math>L_{Aeq,T}</math> of the listening device shall be <math>\leq 100</math> dBA.</p> <p>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.).</p> <p>NOTE An example of a wired listening device with digital input is a USB headphone.</p>	Not a personal music player.	N/A
	<p><b>Zx.4.3 Wireless listening devices</b></p> <p>In wireless mode:</p> <ul style="list-style-type: none"> <li>– with any playing and transmitting device playing the fixed programme simulation noise described in EN 50332-1; and</li> <li>– respecting the wireless transmission standards, where an air interface standard exists that specifies the equivalent acoustic level; and</li> <li>– 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 <math>L_{Aeq,T}</math> of the listening device shall be <math>\leq 100</math> dBA.</li> </ul> <p>NOTE An example of a wireless listening device is a Bluetooth headphone.</p>	Not a personal music player.	N/A

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**US – United States of America**

<b>National Differences + A1:2012-01-29 Bulletin Information</b>		P
<b>N-C = National Condition</b>		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.
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.
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.
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.
	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.



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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



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<b>IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)</b>			
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 <sup>2</sup> ).	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 <sup>3</sup> (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 <sup>2</sup> (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 <sup>2</sup> 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



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<b>IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)</b>			
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
<b>N-D = National Differences</b>			P
1.5.1 N-D	<p>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.</p> <p>These components include:</p> <p>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.</p>	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	<p>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.</p> <p>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.</p>	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



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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 <u>shall be taken as 20 A not 16 A.</u>	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



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<b>IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)</b>			
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 country 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):





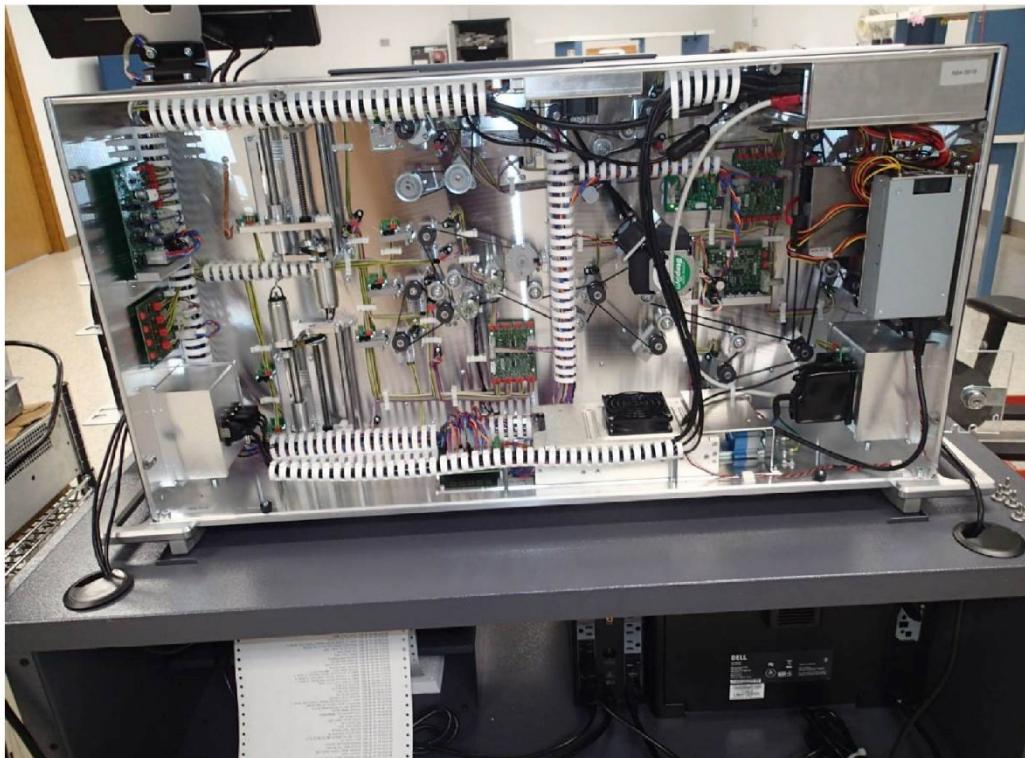
Model DS450 plus Cart with Side Work Surfaces Opened (Rear View):







Model DS450 with Rear Enclosure Removed:



**END OF TEST REPORT**