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## TEST REPORT

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### NATIONAL CERTIFICATION TEST REPORT

#### CERTIFICATION TESTING OF THE DOMINION DEMOCRACY SUITE VERSION 4.0 VOTING SYSTEM

EAC CERTIFICATION NUMBER – DVS-40-G-10

for

Dominion Voting Systems, Inc.  
1201 18th Street, Suite 210  
Denver, Colorado 80202

STATE OF ALABAMA  
COUNTY OF MADISON }

Robert D. Hardy, Department Manager, being duly sworn, deposes and says: The information contained in this report is the result of complete and carefully conducted testing and is to the best of his knowledge true and correct in all respects.

*Robert D. Hardy*

SUBSCRIBED and sworn to before me this 10 day of May 2012

*Sandra A. Hantel*  
Notary Public in and for the State of Alabama at Large

My Commission expires June 2, 2015

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## **1.0 INTRODUCTION**

### **1.1 Scope**

This report presents the test results for a full certification testing campaign of the Dominion Voting Systems Democracy Suite 4.0. The primary purpose of Certification Testing was to demonstrate that the system meets or exceeds the requirements of the Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG). The certification test procedure was intended to discover defects in software design and system operation which, should they occur in actual election use, could result in failure to complete election operations in a satisfactory manner. The tests were also intended to demonstrate system compliance with levels of design, performance, and quality claimed for them by manufacturers.

This report is valid only for the system identified in Section 2 of this report. Any changes, revisions, or corrections made to the system after this evaluation shall be submitted to the EAC to determine if the modified system requires a new application, or can be submitted as a modified system. The scope of testing required will be determined based upon the degree of modification.

### **1.2 Objective**

The objective of this test program was to ensure that the Dominion Voting Systems Democracy Suite 4.0 complied with the hardware and software requirements of the EAC 2005 VVSG. The scope and detail of the requirements tested in certification were selected to correspond to the design and complexity of the system submitted by Dominion Voting Systems for testing. The examination included focused in-depth examination of the voting system, the inspection and evaluation of system documentation and execution of functional tests to verify system performance and function under normal and abnormal conditions.

### **1.3. Test Report Overview**

This test report consists of four main sections and appendices:

- 1.0 Introduction – Provides: the architecture of the National Certification Test Report (hereafter referred to as Test Report); a brief overview of the testing scope of the Test Report; a list of documentation, customer information, and references applicable to the voting system hardware, software, and this test report.
- 2.0 System Identification – Provides information about the system tested that includes the system name and major subsystems, test support hardware, and specific documentation provided by the vendor used to support testing.
- 3.0 Test Background – Contains information about the certification test process and a list of terms and nomenclature pertinent to the Test Report and system tested.
- 4.0 Test Procedures and Results – Provides a summary of the results of the testing process.
- Appendices– Information supporting reviews and testing of the voting system are included as appendices to this report. This includes: Notices of Anomaly, the Hardware Test Report, Election Definitions, Source Code Review Report, TDP Review Report, Test Case Procedure Specifications for the Functional Configuration Audit, Security Test, Usability Test, Physical Configuration Audit, Risk Assessment, and Deficiency Reports; the Warrant of Accepting Change Control responsibility letter; Witnessed Build documentation; and the as-run Certification Test Plan.

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**1.0 INTRODUCTION (Continued)**

**1.4 Customer**

Dominion Voting Systems  
1201 18<sup>th</sup> Street, Suite 210  
Denver, Colorado 80202

**1.5 References**

The documents listed were utilized to perform testing.

- Election Assistance Commission 2005 Voluntary Voting System Guidelines, Volume I, Version 1.0, “Voting System Performance Guidelines”, and Volume II, Version 1.0, “National Certification Testing Guidelines”, dated December 2005
- Election Assistance Commission Testing and Certification Program Manual, Version 1.0, effective date January 1, 2007
- Election Assistance Commission Voting System Test laboratory Program Manual, Version 1.0, effective date July 2008
- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2006 Edition, “NVLAP Procedures and General Requirements (NIST Handbook 150)”, dated February 2006
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, “Voting System Testing (NIST Handbook 150-22)”, dated May 2008
- United States 107<sup>th</sup> Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- Wyle Laboratories’ Test Guidelines Documents: EMI-001A, “Wyle Laboratories’ 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”
- Wyle Laboratories’ Quality Assurance Program Manual, Revision 5
- ANSI/NCSL Z540-1, “Calibration Laboratories and Measuring and Test Equipment, General Requirements”
- ISO 10012-1, “Quality Assurance Requirements for Measuring Equipment”
- EAC Requests for Interpretation and Notices of Clarification (listed on [www.eac.gov](http://www.eac.gov))

A listing of the Democracy Suite 4.0 Voting System Technical Data Package (TDP) Documents submitted for this test effort is listed in Section 2.5, “Vendor Technical Data Package”.

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## **2.0 SYSTEM IDENTIFICATION AND OVERVIEW**

### **2.1 System Overview**

The Dominion Voting Systems Democracy Suite Version 4.0 Voting System is a paper-based, optical scan voting system. The Democracy Suite Version 4.0 Voting System hardware consists of four major components:

1. The Election Management System (EMS)
2. ImageCast Evolution (ICE) precinct scanner with optional ballot marking capabilities
3. ImageCast Precinct (ICP) precinct scanner
4. ImageCast Central (ICC) central count scanner

The Dominion Voting System Technical Data Package was the source for much of this information.

The following paragraphs address the design methodology and product description of the Democracy Suite Version 4.0 Voting System as taken from the Dominion Voting Systems, Inc. Technical Documentation.

#### **Election Management System**

The Dominion Voting Systems Democracy Suite 4.0 EMS consists of seven components running as either a front-end/client application or as a back-end/server application. Below is a list and brief description of each.

- Democracy Suite 4.0 EMS Election Event Designer client application - integrates election definition functionality and represents a main pre-voting phase end-user application.
- Democracy Suite 4.0 EMS Results Tally and Reporting client application - integrates election results acquisition, validation, tabulation, reporting and publishing capabilities and represents a main post-voting phase end-user application.
- Democracy Suite 4.0 EMS Audio Studio client application - represents an end-user helper application used to record audio files for a given election project. As such, it is utilized during the pre-voting phase of the election cycle.
- Democracy Suite 4.0 EMS Data Center Manager client application - represents a system level configuration application used in EMS back-end data center configuration.
- Democracy Suite 4.0 EMS Application Server application - represents a server side application responsible for executing long running processes, such as rendering ballots, generating audio files and election files.
- Democracy Suite 4.0 EMS Network Attached Storage (NAS) Server application - represents a server side file repository for election project file based artifacts, such as ballots, audio files, reports, log files, and election files.
- Democracy Suite 4.0 EMS Database Server application - represents a server side RDBMS repository of the election project database which holds all the election project data, such as districts, precincts, candidates, contests, ballot layouts, tabulators, vote totals, and poll status.

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.1 System Overview (Continued)

#### Election Management System (Continued)

The EMS platform was tested in two deployable physical hardware configurations:

***EMS Express hardware configuration*** - all EMS software components are installed on a single physical PC or laptop. This is a standalone configuration.

***EMS Standard hardware configuration*** - the EMS server components are installed on a single physical server, in addition to the Universal Power Supply (UPS) and Local Area Network (LAN) switch devices, while the EMS client components are installed on one or more physical PCs or laptops. All system components are interconnected in a client-server local LAN environment.

#### ImageCast Evolution (ICE) Precinct Ballot Tabulator

The Dominion Democracy Suite ImageCast Evolution system employs a precinct-level optical scan ballot counter (tabulator) in conjunction with an external ballot box. This tabulator is designed to mark and/or scan paper ballots, interpret voting marks, communicate these interpretations back to the voter (either visually through the integrated LCD display or audibly via integrated headphones), and upon the voter's acceptance, deposit the ballots into the secure ballot box. The unit also features a Sip and Puff device or Audio Tactile Interface (ATI) which permits voters who cannot negotiate a paper ballot to generate a synchronously human and machine-readable ballot from elector-input vote selections. In this sense, the ImageCast Evolution acts as a ballot marking device. The binary inputs are interchangeable and may be shared between the ICE and ICP units.



**Photograph No. 1**  
**View of ICE Precinct Ballot Tabulator\*\***

**\*\* Pictures of the ICE unit within the testing phase do not show the colored "Cast" and "Return" buttons. The ICE unit pictured on this page is the final production look for this unit and there is no functional difference between the units.**

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.1 System Overview (Continued)

#### **ImageCast Precinct (ICP) Precinct Ballot Tabulator**

The ImageCast Precinct Ballot Counter is a precinct-based optical scan ballot tabulator that is used in conjunction with ImageCast compatible ballot storage boxes. The system is designed to scan marked paper ballots, interpret voter marks on the paper ballot and safely store and tabulate each vote from each paper ballot. In addition, the ImageCast Precinct supports enhanced accessibility voting which may be accomplished via a Sip and Puff device or Audio Tactile Interface (ATI) connected to the ImageCast unit. The binary inputs are interchangeable and may be shared between the ICE and ICP units.



**Photograph No. 2**  
**View of ICP Precinct Ballot Counter**

#### **Central Tabulator: ImageCast Central Count (ICC)**

The Dominion Democracy Suite ICC Ballot Counter system is a high-speed, central ballot scan tabulator based on Commercial off the Shelf (COTS) hardware, coupled with the custom-made ballot processing application software. It is used for high speed scanning and counting of paper ballots. Central scanning system hardware consists of a combination of two COTS devices used together to provide the required ballot scanning processing functionality:

- Canon DR-X10C Scanner: used to provide ballot scanning and image transfers to the local ImageCast Central Workstation.
- ImageCast Central Workstation: a COTS computer used for ballot image and election rules processing and results transfer to the EMS Datacenter. The ImageCast Central Workstation is COTS hardware which executes software for both image processing and election rules application.

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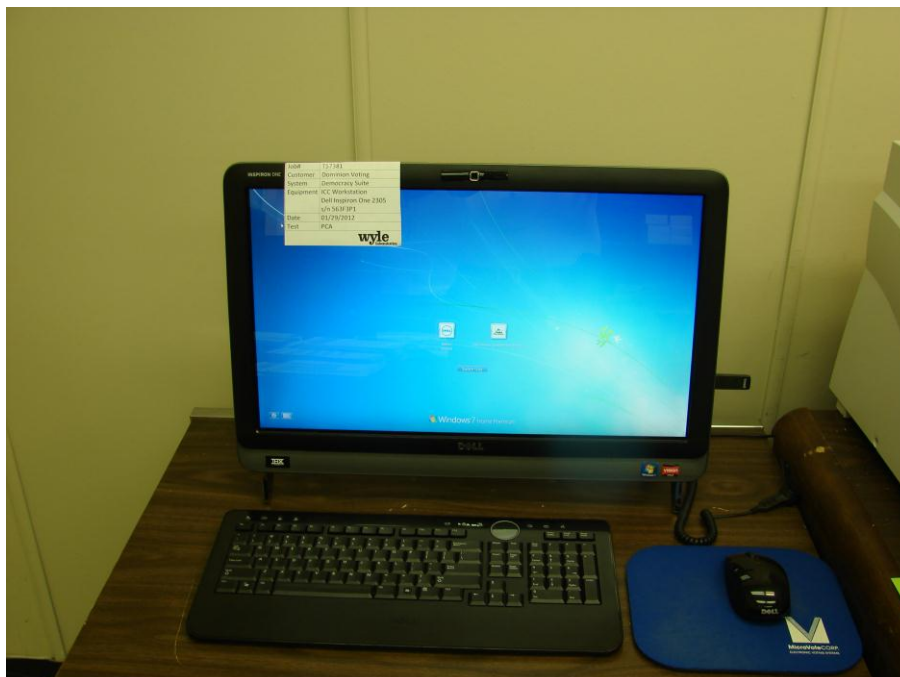


## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.1 System Overview (Continued)



**Photograph No. 3**  
**ICC Central Count Tabulator**



**Photograph No. 4**  
**ICC Workstation**



## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.2 Software

This section defines the two types of software required for testing: software used for the testing of hardware, software, security and system integration; and supporting software required for the test environment (operating systems, compilers, assemblers, database managers, and any other supporting software). All COTS third-party software was downloaded or retrieved by Wyle qualified personnel. These products were verified not to have been modified and were built into the Democracy Suite for the entire test campaign. Wyle believes these components to have proven performance in other commercial applications. Both COTS and non-COTS software components are listed in this section.

**Table 2-1 Democracy Suite 4.0 EMS Software Platform Component Descriptions**

Software Required For Testing	Software Version	Filename
Democracy Suite EMS EED Client Application	4.6	setup.exe: EED_FED_CERT.Setup.msi EED_FED_CERT.Setup_64b.msi
Democracy Suite EMS RTR Client Application	4.6	setup.exe: RTR_FED_CERT.Setup.msi RTR_FED_CERT.Setup_x64.Setup.msi
Democracy Suite EMS Application Server	4.6	setup.exe: EMSApplicationServer_FED_CERT.Setu p.msi EMSApplicationServer_FED_CERT.Setu p_x64.Setup.msi
Democracy Suite EMS File System Service	4.6	Setup.exe: DVS.Utilities.FileSystemServiceSetup.m si
Democracy Suite EMS Audio Studio Client Application	4.6	setup.exe: EMSAS2010_Setup.msi
Democracy Suite EMS Data Center Manager	4.6	DemocracySuiteEMS_DCM.exe
.NET Framework 3.5 Library	4.0	dotNetFx40_Full_x86_x64.exe
NetAdvantage for .NET 2008 Vol. 1 CLR 2.0	2008 Vol.1 CLR 2.0	NetAdvantage_WinForms_20081_CLR2 0_Product.exe (for details see document Components_3rdParty_1.0.xlsx)

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## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.2 Software (Continued)

**Table 2-2 Democracy Suite 4.0 ImageCast Precinct Software Component Descriptions**

Software Required For Testing	Software Version	Filename
Election Firmware	4.6.4-US	cf2xx.sig
Firmware Updater	4.6.4-US	firmUp.enc
Firmware Extractor	4.6.4-US	FirmwareExtract.enc
Kernel (uClinux)	4.6.4-US	Image.bin.gz
Boot Loader (COLILO)	20040221	colilo.bin

**Table 2-3 Democracy Suite 4.0 ImageCast Evolution Software Component Descriptions**

Software Required For Testing	Software Version	Filename
VotingMachine	4.6	VotingMachine-4.6.tar.bz2
libAudio	0.3.7	libAudio-0.3.7.tar.bz2
libGenIO	0.3.24	libGenIO-0.3.24.tar.bz2
libScanner	0.2.31	libScanner-0.2.31.tar.bz2
libCrypto	0.3.11	libCrypto-0.3.11.tar.bz2
libPower	0.3.2	libPower-0.3.2.tar.bz2
Atmega RTC & Logger	1.0.7	logger-1.0.7.tar.bz2
Atmega Power	1.0.10	power-1.0.10.tar.bz2

**Table 2-4 Democracy Suite 4.0 ImageCast Central Software Component Descriptions**

Software Required For Testing	Software Version	Filename
ImageCast Central Application	4.6.3	ImageCast Central.exe
Image-Analysis DLL	4.6.3	ImgProc.dll

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**2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)**

**2.2 Software (Continued)**

**Table 2-5 Democracy Suite 4.0 EMS Software Platform Third Party  
Software Component Descriptions**

Software Required For Testing	Software Version	Filename
NetAdvantage for .NET Windows Forms 2008 Subscription	2008 Vol.1 CLR 2.0	NetAdvantage_WinForms_20081_CLR20_Product.exe
TxText Control .NET Version 14	16.0	tx_1600_dotnetserver_sp1.zip
Cepstral Text-to-Speech Desktop Voices	5.1.0	Cepstral_Allison_windows_5.1.0.msi + 3 more voices

**Table 2-6 Democracy Suite 4.0 EMS Client Application Software  
Component Descriptions**

Software Required For Testing	Software Version	Filename
Microsoft Windows 7 x64	6.1	Microsoft DVD provided
Windows Server 2008 R2 x64	6.1	Microsoft DVD provided
Microsoft SQL Server 2008 R2 x64 or Microsoft SQL Server 2008 Express R2 x64	10.0	Microsoft DVD provided
Microsoft .NET Framework 4.0	4.0	dotNetFx40_Full_x86_x64.exe
Microsoft Visual J# Redistributable 2.0 x64	2.0 x64	vjredist64.exe
Adobe Acrobat Reader 9.3 or higher	9.0	AdbeRdr930_en_US.exe
Dallas 1-Wire Device Driver version 4.0.3b x64	4.0	install_1_wire_drivers_x64_v403beta.msi
Cepstral Text-to-Speech Desktop Voices	5.1.0	Cepstral_Allison_windows_5.1.0.msi + 3 more voices
Java Runtime Environment 6.0	6.0	jre-6u18-windows-x64.exe
Microsoft IIS 7.5	7.5	Microsoft DVD provided

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## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.2 Software (Continued)

**Table 2-7 Democracy Suite 4.0 EMS Software Platform Unmodified  
COTS Components Descriptions**

Software Required For Testing	Software Version	Filename
TX Text Control Library for .NET	16.0	tx_1600_dotnetserver_sp1.zip (for details see document Components_3rdParty_1.0.xlsx)
OneWire API for .NET	4.0.2.0	OneWireAPI.NET.dll (for details see document Components_3rdParty_1.0.xlsx)
SOX – audio converter application	14.3.1	sox.exe (for details see document Components_3rdParty_1.0.xlsx)
Log4net	1.2.10	log4net.dll, log4net.xml (for details see document Components_3rdParty_1.0.xlsx)
NLog – log library	1.0.0.505	NLog.dll (for details see document Components_3rdParty_1.0.xlsx)
Cepstral Text-to-Speech	5.1.0	Cepstral_Allison_windows_5.1.0.msi + 3 more voices (for details see document Components_3rdParty_1.0.xlsx)
iTextSharp – pdf generation library	4.0.3	itextsharp.dll (for details see document Components_3rdParty_1.0.xlsx)
openssl.exe, libeay32.dll, ssleay32.dll	1.2	openssl.exe, lebeay32.dll, ssleay32.dll (for details see document Components_3rdParty_1.0.xlsx)
SQLite	1.0.65.0	System.Data.SQLite.DLL 32-bit and 64-bit (for details see document Components_3rdParty_1.0.xlsx)
Lame	3.98	System.Data.SQLite.DLL 32-bit and 64-bit (for details see document Components_3rdParty_1.0.xlsx)
Speex	1.0.4	speexdec.exe and speexenc.exe (for details see document Components_3rdParty_1.0.xlsx)
Ghostscript	11.5.1.22 66	gsdll32.dll – both 32-bit and 64-bit (for details see document Components_3rdParty_1.0.xlsx)
PdfToImage.dll	1.2	PdfToImage.dll (for details see document Components_3rdParty_1.0.xlsx)
Tamir.SharpSSH.dll, DiffieHellman.dll, Org.Mentalis.Security.dll – Cryptography	SharpSSH package 1.1.1.13	Tamir.SharpSSH.sll, Diffie.Hellman.dll, Org.Mentalis.Security.dll (for details see document Components_3rdParty_1.0.xlsx)

**2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)**

**2.2 Software (Continued)**

**Table 2-8 Democracy Suite 4.0 ImageCast Precinct Unmodified  
COTS Software Component Descriptions**

Software Required For Testing	Software Version	Filename
PNG Reference Library	1.2.24	libpng-1.2.24.tar.gz
OpenSSL	1.1.2	Openssl-fips-1.1.2.tar.gz
Zlib	1.2.3	Zlib-1.2.3.tar.gz

**Table 2-9 Democracy Suite 4.0 ImageCast Evolution Unmodified  
COTS Software Component Descriptions**

Software Required For Testing	Software Version	Filename
libogg	1.2.2	libogg-1.2.2.tar.gz
libspeex	1.2rc1	speex-1.2rc1.tar.gz
libSoundTouch	1.5.0	soundtouch-1.5.0.tar.gz
Freetype	2.4.4	freetype-2.4.4.tar.bz2
libPNG	1.5.2	libpng-1.5.2.tar.gz
zlib	1.2.5	zlib-1.2.5.tar.bz2
Qt Everywhere	4.7.3	qt-everywhere-opensource-src-4.7.3.tar.gz
fontconfig	2.8.0	fontconfig-2.8.0.tar.gz
log4cxx	0.10.0	apache-log4cxx-0.10.0.tar.gz
apr	1.4.4	apr-1.4.4.tar.bz2
apr-util	1.3.11	apr-util-1.3.11.tar.bz2
sqlite	3.7.6.2	sqlite-autoconf-3070602.tar.gz
libusb	1.0.8	libusb-1.0.8.tar.bz2
libusb-compat	0.1.3	libusb-compat-0.1.3.tar.bz2
glibc	2.13	glibc-2.13.tar.bz2
busybox	1.18.4	busybox-1.18.4.tar.bz2
dropbear	0.53.1	dropbear-0.53.1.tar.bz2
i2c-tools	3.0.3	i2c-tools-3.0.3.tar.bz2
e2fsprogs	1.41.14	e2fsprogs-1.41.14.tar.gz
expat	2.0.1	expat-2.0.1.tar.gz
libjpeg	8c	jpegsrc.v8c.tar.gz
libtiff	3.9.5	tiff-3.9.5.tar.gz
tzcode	2011g	tzcode2011g.tar.gz
tzdata	2011g	tzdata2011g.tar.gz
sysfsutils	2.1.0	sysfsutils-2.1.0.tar.gz
openssl-fips	1.2.3	openssl-fips-1.2.3.tar.gz
usb-modeswitch	1.1.7	usb-modeswitch-1.1.7.tar.bz2
usb-modeswitch-data	2011-02-27	usb-modeswitch-data-20110227.tar.bz2

**2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)**

**2.2 Software (Continued)**

**Table 2-10 Democracy Suite 4.0 - ImageCast Central  
Build Environment  
Software Build Components (Unmodified COTS)**

Software Required For Building ICC application	Software Version	Filename
Windows 7	Home Premium	OEM installed, or full CD from Microsoft
Visual Studio	2005	Full CD from Microsoft

**Table 2-11 Democracy Suite 4.0 - ImageCast Central  
Build Environment Setup  
Software Utilities (Unmodified COTS)**

Software Required For Build Environment Setup	Software Version	Filename
7-Zip	9.20	7z920.exe
Active Perl 64-bit	5.12.4.1205	ActivePerl-5.12.4.1205-MSWin32-x64-294981.msi
Active Perl 32-bit	5.12.4.1205	ActivePerl-5.12.4.1205-MSWin32-x86-294981.msi
Nasm	2.09.07	nasm-2.09.07-win32.zip

**Table 2-12 Democracy Suite 4.0 - ImageCast Central  
Software Build  
Library Source Code (Unmodified COTS)**

Software Required For Build Environment Setup	Software Version	Filename
OpenSSL	Fips 1.2.3	openssl-fips-1.2.3.tar.gz

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**2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)**

**2.2 Software (Continued)**

**Table 2-13 Democracy Suite 4.0 - ImageCast Central  
Runtime Software Components (Unmodified COTS)**

Software Required For Testing ICC application	Software Version	Filename
Imgcomp.dll	2.11	apiman.zip
1 Wire driver 64-bit	4.03	install_1_wire_drivers_x64_v403.msi
1 Wire driver 32-bit	4.03	install_1_wire_drivers_x86_v403.msi
Kofax VRS	4.50	Full CD from Kofax
Canon Scanner driver	1.8	X10DRIT_V18.exe
VCredist	4/10/2006	vcredist_x86.exe

**Table 2-14 Democracy Suite 4.0 ImageCast Precinct Modified  
COTS Software Component Descriptions**

Software Required For Testing	Software Version	Filename
uClinux	20070130	uClinux-dist- 20070130.tar.gz
COLILO Boot Loader	20040221	Colilo20040221.tar.gz

**Table 2-15 Democracy Suite 4.0 ImageCast Evolution Modified  
COTS Software Component Descriptions**

Software Required For Testing	Software Version	Filename
Kernel	2.6.30	linux-2.6.30.9.tar.bz2
U-BOOT	1.3.4	u-boot-1.3.4.tar.bz2

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**2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)**

**2.2 Software (Continued)**

**Table 2-16 Democracy Suite 4.0 EMS Software Build  
Environment Component Descriptions**

Software Required For Testing	Software Version	Filename
Microsoft Windows Server 2008 R2 x64	6.1	Microsoft DVD provided
.NET Framework	4.0	dotNetFx40_Full_x86_x64.exe
Microsoft Visual J# 2.0 Redistributable	2.0 x64	vjredist64.exe
Microsoft Visual Studio 2010	10.0	Microsoft DVD provided (Microsoft patch KB2286556 VS10-KB2286556-x86.exe has to be installed)
Microsoft Visual Studio 2010 Service Pack 1	10.0.30319 SP1	VS2010SP1dvd1.iso
Cruise Control	1.5	CruiseControl.NET-1.5.7256.1-Setup
Nant	0.90	nant-0.90-bin.zip
Csunit	2.1.1	csUnit.2.1.1.BETA.setup
7-Zip	9.20 x64	7z920-x64.msi
NetAdvantage Infragistics	2008 Vol.1 CLR 2.0	NetAdvantage_WinForms_20081_CLR20_Product.exe
Tx Text Control 16.0.NET	16.0	tx_1600_dotnetserver_sp1.zip
Adobe Acrobat Reader 9.3 or higher	9.3	AdbeRdr930_en_US.exe
ImgBurn 2.5 or higher	2.5.1.0	SetupImgBurn_2.5.0.0.exe

**Table 2-17 Democracy Suite 4.0 ImageCast Precinct Election  
Firmware Compiler Descriptions**

Software Required For Testing	Software Version	Filename
g++ (GNU C++ compiler)	gcc3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh

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## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.2 Software (Continued)

**Table 2-18 Democracy Suite 4.0 ImageCast Evolution  
Election Firmware Compiler Descriptions**

Software Required For Testing	Software Version	Filename
g++ (GNU C++ compiler)	gcc-4.5.55-eglibc-2.11.55	freescale-powerpc-linux-gnu-2010.09-55.i686.rpm

**Table 2-19 Democracy Suite 4.0 ImageCast Precinct Firmware  
Build Environment Component Descriptions**

Software Required For Testing	Software Version	Filename
Ubuntu 10.04.3 LTS – Long-term support	10.04.3	ubuntu-10.04.3-desktop-amd64.iso
Toolchain Installation Script	N/A	Toolchain.sh
m68k uClinux tools base gcc	3.4.0-20040603	m68k-uclinux-tools-base-gcc3.4.0-20040603.sh
m68k uClinux tools c++ gcc	3.4.0-20040603	m68k-uclinux-tools-c++-gcc3.4.0-20040603.sh
m68k uClinux tools gdb	20040603	m68k-uclinux-tools-gdb-20040603.sh
OpenSSL	1.1.2	Openssl-fips-1.1.2.tar.gz

**Table 2-20 Democracy Suite 4.0 ImageCast Evolution Firmware  
Build Environment Component Descriptions**

Software Required For Testing	Software Version	Filename
Ubuntu	10.04.3 LTS	ubuntu-10.04.3-desktop-i386.iso
LTIB	10.1.1a-sv	ltib-10-1-1a-sv.tar.gz
g++ (GNU C++ compiler)	gcc-4.5.55-eglibc-2.11.55	freescale-powerpc-linux-gnu-2010.09-55.i686.rpm

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## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.3 Hardware

The system submitted by Dominion Voting Systems, Inc. for certification testing consisted of the following hardware, firmware, and software source code components.

**Table 2-21 Democracy 4.0 Voting System Equipment Description**

Equipment	Manufacturer	Version/Model	Specifications	Serial Number
PC1	Dell	Precision T1500	Processor: Intel Core i7-860 2.8 GHz, Memory: 4x 1GB 1333MHz DDR3, Hard Drive Capacity: 500 GB	61VNNM1
PC2	Dell	Precision T1500	Processor: Intel Core i7-860 2.8 GHz, Memory: 4x 1GB 1333MHz DDR3, Hard Drive Capacity: 500 GB	61TPNM1
PC3	Dell	Precision T1500	Processor: Intel Core i7-860 2.8 GHz, Memory: 4x 1GB 1333MHz DDR3, Hard Drive Capacity: 500 GB	61YMMN1
PC4	Dell	Precision T1500	Processor: Intel Core i7-860 2.8 GHz, Memory: 4x 1GB 1333MHz DDR3, Hard Drive Capacity: 500 GB	61TNNM1
PC5	Dell	Inspiron One 2305	Processor: AMD Athlon II X2 240e 2.8 GHz, Memory: 8GB Dual Channel 1333MHz DDR3, Hard Drive Capacity: 1 TB	564C3P1, 563F3P1
SERVER1	Dell	PowerEdge R610	Processor: Intel Xeon E5620 2.4 GHz, Memory: 8x 2GB 1333MHz DDR3, Hard Drive Capacity: 2x 500 GB	5M9NNM1
SERVER2	Dell	PowerEdge R610	Processor: Intel Xeon E5620 2.4 GHz, Memory: 8x 2GB 1333MHz DDR3, Hard Drive Capacity: 2x 500 GB	5M8PNM1
SERVER3	Dell	PowerEdge R610	Processor: Intel Xeon E5620 2.4 GHz, Memory: 8x 2GB 1333MHz DDR3, Hard Drive Capacity: 2x 500 GB	5M8QNM1
STORAGE1	Rocstor	Guardian 4RM Raid System	Disk space: 2 TB (Striped + Mirrored), Processor: 400 MHz storage I/O, Hot bus interface: eSATA, Drive bus interface: SATA II	ROC732621047 /SB09010154
STORAGE2	Rocstor	Guardian 4RM Raid System	Disk space: 2 TB, Processor: 400 MHz storage I/O, Hot bus interface: eSATA, Drive bus interface: SATA II	ROC732621045 /SB09010157
STORAGE3	Rocstor	Guardian 4RM Raid System	Disk space: 2 TB, Processor: 400 MHz storage I/O, Hot bus interface: eSATA, Drive bus interface: SATA II	ROC732621046 /SB09010161
STORAGE4	Rocstor	Commander 2UE Portable Hard Drive	Hard Drive Capacity: 500 GB	5VJ4DRJP
STORAGE5	Rocstor	Commander 2UE Portable Hard Drive	Hard Drive Capacity: 500 GB	5VJ48VFJ

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## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.3 Hardware (Continued)

**Table 2-22 Build Machine Description**

Equipment	Manufacturer	Version/Model	Serial Number	COTS/ Non-COTS
Build 1	SuperMicro	SuperServer 7045	BM-57381-001	COTS

**Table 2-23 Dominion 4.0 COTS Voting System Support Equipment Description**

Test Material	Make	Model	Quantity	Serial Number
COTS Central High Speed Scanner	Canon	DR-X10C	2	ED300874, ED300880
iButton (SHA-1) with USB Reader/Writer	Maxim	USB R/W: DS9490R iButton: DS1963S	3	4D027C, 4C9CF5, 514DFD
iButton (SHA-1)	Maxim	DS1963S	20	4CE4C9, 4D064A
LCD Monitor	Soyo	18.5" wide LCD	1	DYLM19R6-KLE-10202
LCD Monitor	Samsung	23" wide LCD	1	MY23HVMS701197B
LCD Monitor	Dell	1909W	4	07E-4EUS, 07F-071S, 07F-06US, 07F-074S
LCD Monitor	Dell	N445N	3	2TWC, 2UOC, 2U6C
Audio Adapter	Soundwave	USB Soundwave 7.1 Audio Adapter	2	SW-57381-001, SW-57381-002
PCI Software	Soundwave	Soundwave 7.1 PCI Software	2	n/a
USB Software	Soundwave	USB Soundwave 7.1 Software	1	n/a
Networking Switch	D-Link	D-Link DES-1105 5-Port Switch	1	DRL728A001397
Mouse	Dell	USB w/rollerball	4	G1A00M0M, 10203JTI, LZA30491960, 438027372
Mouse	Microsoft	USB w/rollerball	1	X800898
Keyboard	Kensington	USB	1	D0713000487
Keyboard	Microsoft	USB	1	6968200717217
Keyboard	IBM	USB	1	2162079
Compact Flash Reader	SanDisk	USB	3	0171618, 0201833, 0171631
Networking Switch	D-Link	DGS-2208 8-Port Switch	2	F36J69C004821, F36J69C004824
Headphones	Radio Shack	33-276-01	1	Headphones
eSATA PCI Card (Installed into Servers and PCs)	SIIG, Inc.	eSATA II PCIe Pro Card	7	n/a
Card Reader	GGI Gear	Compact Flash Card Reader	4	CFRW-57381-001 thru 004
Sony	Headphone	MDR-G45LP-01	1	Sony
Cyber Acoustics Headphone	Cyber Acoustics	ACM-70	2	DVS23000048
Sip & Puff	Origin Instruments	Air Voter	7	AV-57381-001 thru 003, 002251, 002268, 002267
Footswitch Pair	Enabling Devices	Rocker Paddle	4	RP-57381-001 thru 004
Compact Flash Cards	RiData	CFC-14A	100	Wyle-assigned numbers: CF-XXX

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.3 Hardware (Continued)

**Table 2-24 Democracy 4.0 Voting System Equipment**

Equipment	Description	Serial Numbers
ImageCast Precinct (ICP)	Precinct Count Optical Scanner PSOS 320A	WLDAFBH0001, WLDAFBH0002, WLDAFBH004, WLDAFBH0005, WLDAFBH0018, WLDAFBH0019, WLDAFBH0023
ImageCast Evolution (ICE)	Precinct Count Optical Scanner PSOS 400A	ICE2P1005, ICE2P1006, ICE2P1007, ICE2P1008
ICP Ballot Box	Externally Secure Ballot Box	BOX-57381-011, BOX-57381-012, BOX-57381-013, BOX-57381-014, BOX-57381-015
ICE Ballot Box	Externally Secure Ballot Box	BOX-57381-01, BOX-57381-02, BOX-57381-03, BOX-57381-04

### 2.4 Test Tools/Materials

This subsection enumerates any and all test materials needed to perform voter system testing. The scope of testing determines the quantity of a specific material required.

The following test materials are required to support the Democracy Suite 4.0 certification testing:

**Table 2-25 Test Support Materials**

Test Material	Manufacturer/Description	Quantity
Disposable Mouthpieces	(Sip & Puff) p/n AC-310	30
ATI Handsets	Dominion	5
Black Ballot Privacy Sleeves	Dominion	2
White Ballot Privacy Sleeves	Dominion	4
Black Privacy Labels (set of 2 pieces)	Dominion	4
White Privacy Labels	Dominion	4
Combination Lock	MASTER Lock	1
Keyed Lock	MASTER Lock	2
Memory Flash Cards	SanDisk (4GB)	100
Ballots	Dominion	8000
Dominion Cleaning Kit	Dominion	2
Permanent Markers	p/n SHARPIE1 BK	10
Thermal Printer Rolls	ICP/ICE Paper Rolls	120
Election Tamper Evident Seals (Silver)	Dominion	20
Tamper Evident Tie Wrap	Dominion	50
Sanitary Headphone Cover	Dominion	10

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## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.5 Vendor Technical Data Package

The Technical Data Package (TDP) contains information about requirements, design, configuration management, quality assurance, and system operations. The EAC 2005 VVSG requirements state that, at a minimum, the TDP shall contain the following documentation: system configuration overview; system functionality description; system hardware specifications; software design and specifications; system test and verification specifications; system security specifications; user/system operations procedures; system maintenance procedures; personnel deployment and training requirements; configuration management plan; quality assurance program; and system change notes.

The documents listed in Table 2-26 comprise the Democracy Suite Voting System TDP:

**Table 2-26 Democracy Suite Voting System TDP**

Democracy Suite 4.0 TDP Documents	System	Version	Date	Document Number
<i>Documents describing overall system performance:</i>				
System Configuration Overview	All	1.2.0::225	3/22/12	2.02
System Security Specification	All	1.1.0::293	3/22/12	2.06
Configuration Management Process	All	1.2.0::148	3/22/12	2.11
Quality Assurance Program	All	1.2.0::74	3/22/12	2.12
System Test and Verification	All	1.1.0::96	3/22/12	2.07
System Test and Verification Suites	All	1.2.0::3	3/22/12	2.07
Personnel Training and Deployment Requirements	All	1.1.0::42	3/22/12	2.10
<i>Documents describing functionality, hardware, software design, maintenance, and operation:</i>				
EMS Functional Description	EMS	1.1.0::209	3/22/12	2.03
ICE Functional Description	ICE	1.2.0::58	3/22/12	2.03
ICP Functional Description	ICP	1.1.0::100	3/22/12	2.03
ICC Functional Description	ICC	1.1.0::48	3/22/12	2.03
ICE Tabulator System Hardware Specification	ICE	1.2.0::254	3/22/12	2.04
ICP Tabulator System Hardware Specification	ICP	1.1.0::67	3/22/12	2.04
ICE System Hardware Characteristics	ICE	1.2.0::77	3/22/12	2.04
ICP System Hardware Characteristics	ICP	1.1.0::40	3/22/12	2.04
EMS Software and Design Specification	EMS	1.0.0::186	3/22/12	2.05
ICE Software and Design Specification	ICE	1.0.0::70	3/22/12	2.05
ICP Software and Design Specification	ICP	1.1.0::93	3/22/12	2.05
ICC Software and Design Specification	ICC	1.0.0::25	3/22/12	2.05
ICP System Operation Procedures	ICP	1.1.0::147	3/22/12	2.08
EMS System Operation Procedures	EMS	1.2.0::387	3/22/12	2.08
ICE System Operation Procedures	ICE	1.0.0::79	3/22/12	2.08
ICC System Operation Procedures	ICC	1.1.0::67	3/22/12	2.08
ICP System Maintenance Manual	ICP	1.1.0::58	3/22/12	2.09
ICE System Maintenance Manual	ICE	1.1.0::109	3/22/12	2.09
EMS System Maintenance Manual	EMS	1.0.0::45	3/22/12	2.09
Election Event Designer Users Guide	EMS	1.3.3	3/22/12	N/A
Results Tally and Reporting Users Guide	EMS	1.2.7	3/22/12	N/A
Audio Studio Users Guide	EMS	1.2.3	3/22/12	N/A
ImageCast Precinct Approved Parts List	ICP	V3	3/22/12	N/A
ImageCast Precinct Configuration Files	ICP	1.0.0::18	3/22/12	N/A
ImageCast Precinct Election Definition Files	ICP	2.5.1	3/22/12	N/A
ImageCast Precinct Firmware Build and Install Document	ICP	1.0.0::19	3/22/12	N/A
ImageCast Precinct Firmware Update	ICP	1.0.0::8	3/22/12	N/A
ImageCast Precinct Technical Guide	ICP	1.0.0::8	3/22/12	N/A
Engineering Product Development Processes	ICP	P0.2	3/22/12	N/A
Dominion Voting C C++ Coding Standard	All	1.0.0::7	3/22/12	N/A
Dominion Voting Usability Study	ICP	1.0.0::20	3/22/12	N/A
Dominion Voting Usability Study	ICE	1.0.0::35	3/22/12	N/A

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.6 Deliverable Materials

The materials listed on Table 2-8 are identified by Dominion Voting Systems to be delivered as part of the Democracy Suite Voting System to the end users.

**Table 2-27 Democracy Suite Voting System Deliverables**

<b>Deliverable Material</b>	<b>Version</b>	<b>Description</b>
Election Event Designer	4.6	EMS client application
Results Tally and Reporting	4.6	EMS client application
Audio Studio	4.6	EMS client application
Application Server	4.6	EMS server application
Datacenter Manager	4.6	EMS server application
ImageCast Evolution	400A w/Firmware version 4.6.2.3 loaded	Precinct ballot scanner and ADA accessible voting device
ImageCast Precinct	320A w/Firmware version 4.6.4 loaded	Precinct ballot scanner and ADA accessible voting device
ImageCast Central Count	Canon DR-X10C w/Firmware version 4.6.3 loaded	Central ballot scanner
ImageCast Evolution Metal Ballot Box	BOX-400A	ICE Metal Ballot box
ImageCast Precinct Metal Ballot Box	BOX-310A	ICP Metal Ballot box
ImageCast Precinct Plastic Ballot Box	BOX-330A	ICP Plastic Ballot box
Rocstor Encrypted NAS	Dell PowerEdge R610	Encrypted Network Attached Storage module for server and data backup
Rocstor Portable Hard Drive	Rocstor Commander 2UE Portable Hard Drive	Encrypted and ruggedized external hard drive
iButton with Reader/Writer	Maxim USB R/W: DS9490R iButton: DS1963S	Security authentication token with programmer
ICE/ICP Headphones	Cyber Acoustics	Headphones used for audio voting
Sip/Puff Device	Origin Instruments Air Voter	Binary input device for disabled voters
Footswitch Pair	Enabling Devices	Binary input device for disabled voters
Compact Flash Cards	CFC-14A	Transport Media

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## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (Continued)

### 2.6 Deliverable Materials (Continued)

**Table 2-27 Democracy Suite Voting System Deliverables (Continued)**

<b>Deliverable Material</b>	<b>Version</b>	<b>Description</b>
ATI Handset	Dominion	ADA voting device used in conjunction with Binary input devices
ICP System Operation Procedures	1.1.0::147	TDP Document
EMS System Operation Procedures	1.2.0::387	TDP Document
ICE System Operation Procedures	1.0.0::79	TDP Document
ICC System Operation Procedures	1.1.0::67	TDP Document
ICP System Maintenance Manual	1.1.0::58	TDP Document
ICE System Maintenance Manual	1.1.0::109	TDP Document
Election Event Designer User's Guide	1.3.3	TDP Document
Results Tally and Reporting User's Guide	1.2.7	TDP Document
Audio Studio User's Guide	1.2.3	TDP Document

### 2.7 End User Documentation

The following documents constitute the deliverables to the end user at election central:

- Democracy Suite EMS Audio Studio User Manual, Revision 1.2.3
- Democracy Suite Election Event User Manual, Revision 1.3.3
- Democracy Suite Results Tally and Reporting User Manual, Version 1.2.7
- ImageCast Evolution Technical Guide, Version 1.0.0::54
- ICC User Guide, Canon DR-X10C User Manual
- ImageCast Precinct Technical Guide, Version 1.0.0::8

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### 3.0 TEST BACKGROUND

Wyle Laboratories is an independent testing laboratory for systems and components under harsh environments, including dynamic and climatic extremes as well as the testing of electronic voting systems. Wyle holds the following accreditations:

- ISO-9001:2000
- NVLAP Accredited ISO 17025:2005
- EAC Accredited VSTL, NIST 150,150-22
- A2LA Accredited (Certification No.'s 845.01, 845.02, and 845.03)
- FCC Approved Contractor Test Site (Part 15, 18, 68)

### 3.1 General Information

All testing performed as part of the test effort was performed at the Wyle Laboratories' Huntsville, Alabama facility with the exception of the Product Safety Review which was performed by a third party test laboratory at the location listed below. Certification testing included: the inspection and evaluation of voting system documentation; tests of voting system under conditions simulating the intended storage, operation, transportation, and maintenance environments; and operational tests verifying system performance and function under normal and abnormal conditions. Qualification/Certification testing was limited to the Dominion Voting Systems, Inc. Democracy Suite Version 4.0 Voting System, which includes items listed in Section 2 of this report.

The Product Safety Review was performed at the following location:

MET Laboratories, Inc.  
Safety Certifications  
901 Sheldon Drive  
Cary, NC 27513

### 3.2 Testing Scope

To evaluate the system test requirements and the scope of the test campaign, each section of the EAC 2005 VVSG was analyzed to determine the applicable tests. The EAC 2005 VVSG Volume I Sections, along with the strategy for evaluation, are described below:

- **Section 2: Functional Requirements** – The requirements in this section were tested during the FCA and System Integration test utilizing the “Wyle Baseline Test Cases” along with test cases specially designed for the Dominion Voting Systems Democracy Suite 4.0. The data input during these tests consisted of the predefined election definitions as contained in Appendix A.5 of this report.
- **Section 3: Usability and Accessibility** – The requirements in this section were tested during the Usability Test utilizing a combination of the “Wyle Baseline Test Cases” and the “Wyle Baseline Usability Test Cases”. The data input during this test consisted of the predefined election definitions contained in Appendix A.5 of this report.
- **Section 4: Hardware Requirements** – The requirements in this section were tested by trained Wyle personnel per sections 4.5 of this report.
- **Section 5: Software Requirements** – The requirements in this section were tested during source code review, TDP review, and FCA. A combination of review and functional testing was performed to ensure these requirements were met.

### 3.0 TEST BACKGROUND (Continued)

#### 3.2 Testing Scope (Continued)

- **Section 6: Telecommunication** – These requirements were deemed “Not-Applicable” to this test campaign since there is no telecommunications in the Democracy Suite 4.0.
- **Section 7: Security Requirements** – The requirements in this section were tested during source code review, FCA, System Integration, and Security Tests.
- **Section 8: Quality Assurance (QA) Requirements** – The requirements in this section were tested throughout the test campaign via various methods. TDP review was performed on the Dominion Voting Systems QA documentation to determine compliance to EAC 2005 VVSG requirements and the requirements stated in the Dominion Voting Systems QA Program document. All source code was checked to ensure that proper QA documentation had been completed. All equipment received for initial testing and follow up testing was checked against Dominion Voting Systems documentation to ensure their QA process is being followed.
- **Section 9: Configuration Management (CM) Requirements** – The requirements in this section were tested throughout the test campaign. TDP review was performed on the Dominion Voting Systems configuration management documentation to determine EAC 2005 VVSG compliance and to further determine whether Dominion Voting Systems is following its documented CM requirements within the TDP. Any anomalies were formally reported to Dominion Voting Systems. During source code review, Wyle qualified personnel verified that Dominion Voting Systems was following EAC 2005 VVSG CM requirements as well as Dominion Voting Systems CM requirements. Any anomalies were formally reported to Dominion Voting Systems. All equipment received for initial testing and follow up testing was checked against Dominion Voting Systems documentation to ensure their CM process is being followed.

The Dominion Voting Systems Democracy Suite 4.0 Voting System is a paper- based precinct counting system. Therefore, all EAC 2005 VVSG requirements intended for DRE were excluded from this test campaign, as well as the following:

- Volume I Section 6 (Telecommunication Requirements)
- Volume I Section 7.5.2-7.5.4 (Telecommunications and Data Transmission)
- Volume I Section 7.6 (Use of Public Communication Networks)
- Volume I Section 7.7 (Wireless Communications)
- Volume I Section 7.9 (Voter Verifiable Paper Audit Trail Requirements)

The rationale for not evaluating the Democracy Suite ICP Voting System to the requirements contained in the indicated sections of the EAC 2005 VVSG is described in Table 3-1.

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### 3.0 TEST BACKGROUND (Continued)

### 3.2 Testing Scope (Continued)

**Table 3-1 Not Applicable Requirements**

<b>EAC 2005 VVSG Volume I Section</b>	<b>Rationale for 'Not Applicable'</b>
6, 7.5.2-7.5.4	These requirements are written for use on public networks. The Dominion Voting Systems Democracy Suite 4.0 Voting System does not use public networks.
7.6	This section pertains to "Voting systems that transmit data over public telecommunications..." The Dominion Voting Systems Democracy Suite ICP does not support transmission over public networks.
7.7	No wireless technology is present in the Dominion Voting Systems Democracy Suite ICP Voting System.
7.9	The Dominion Voting Systems Democracy Suite ICP Voting System is a paper based system.

Refer to the Requirements Matrix for this test campaign contained Appendix E of this document for specific requirements that are excluded during this test campaign.

### 3.3 Wyle Quality Assurance

All work performed on this program was in accordance with Wyle Laboratories' Quality Assurance Program and Wyle Laboratories' Quality Program Manual, which conforms to the applicable portions of International Standard Organization (ISO) Guide 17025.

The Wyle Laboratories, Huntsville Facility, Quality Management System is registered in compliance with the ISO-9001 International Quality Standard. Registration has been completed by Quality Management Institute (QMI), a Division of Canadian Standards Association (CSA).

### 3.4 Test Equipment and Instrumentation

All instrumentation, measuring, and test equipment used in the performance of this test program was calibrated in accordance with Wyle Laboratories' Quality Assurance Program, which complies with the requirements of ANSI/NCSL 2540-1, ISO 10012-1, and ISO/IEC 17025. Standards used in performing all calibrations are traceable to the National Institute of Standards and Technology (NIST) by report number and date. When no national standards exist, the standards are traceable to international standards, or the basis for calibration is otherwise documented.

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### 3.0 TEST BACKGROUND (Continued)

#### 3.5 Terms and Abbreviations

This subsection defines all terms and abbreviations applicable to the development of the Test Plan.

**Table 3-2 Terms and Abbreviations**

Term	Abbreviation	Definition
Americans with Disabilities Act of 1990	ADA	ADA is a wide-ranging civil rights law that prohibits, under certain circumstances, discrimination based on disability.
Audio Tactile Interface	ATI	Voter interface designed to not require visual reading of a ballot.
Conformité Européenne (European Conformity)	CE	---
Configuration Management	CM	---
Commercial Off the Shelf	COTS	Commercial, readily available hardware or software
Direct Record Electronic	DRE	---
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.
EMS Election Event Designer	EED	EMS application used for election definition functionality.
Election Management System	EMS	An umbrella term for the software application used to define and report election projects.
Equipment Under Test	EUT	---
Functional Configuration Audit	FCA	Exhaustive verification of every system function and combination of functions cited in the manufacturer's documentation.
Federal Communications Commission	FCC	---

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3.0 TEST BACKGROUND (Continued)

3.5 Terms and Abbreviations (Continued)

Table 3-2 Terms and Abbreviations (Continued)

Term	Abbreviation	Definition
Help America Vote Act	HAVA	Act created by United States Congress in 2002.
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.
ImageCast Precinct	ICP	Precinct-level optical scanner and tabulator with audio voting capabilities.
ImageCast Evolution	ICE	Precinct-level optical scanner, tabulator with audio voting, and Ballot Marker.
ImageCast Central	ICC	High-speed central ballot scan tabulator.
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. A trusted build of the executable system is performed to ensure the certified release is built from tested components.
Quality Assurance	QA	---
EMS Results, Tally and Reporting	RTR	EMS application used to integrate election results and reporting.
System Under Test	SUT	---
Test Case Procedure Specifications	TCPS	Wyle-developed document that specifies test items, input specifications, output specifications, environmental needs, special procedural requirements, inter-case dependencies, and all validated test cases that were executed during the area under test.
Technical Data Package	TDP	Manufacturer documentation related to the voting system required to be submitted as a precondition of certification testing.
Underwriters Laboratories Inc.	UL	---
Uninterruptible Power Supply	UPS	---
Voluntary Voting System Guidelines	EAC 2005 VVSG	Published by the EAC, the third iteration of national level voting system standards.
Wyle Operating Procedure	WoP	Wyle Test Method or Test Procedure.

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## **4.0 TEST FINDINGS AND RECOMMENDATIONS**

The Dominion Voting Systems Democracy Suite 4.0 Voting System, as identified in Section 2 of this report, was subjected to the tests as summarized in the following paragraphs.

### **4.1 Source Code Review**

As part of the pre-testing activities, the Dominion Voting Systems Democracy Suite 4.0 Voting System received a 100% source code review to the EAC 2005 VVSG coding standards and the manufacturer supplied coding standards. The review was conducted per the guideline described in the following paragraph.

As the updated source code was received, an SHA1 hash value was created for each source code file. The source code team then conducted a full review of every line of modified source code. This was done to identify any violation of EAC 2005 VVSG coding standards or manufacturer supplied coding standards. The COTS tools utilized by the source code group were Beyond Compare and Crimson Editor. Each identified violation was then recorded by making notes of the standards violation along with directory name, file name, and line number.

#### **Summary Findings**

Other than the coding standards noted in the technical summary reports, no other deficiencies or significant problems were found during the source code review. A technical summary report of all identified standards violations was sent to Dominion Voting systems for resolution. Dominion Voting Systems then corrected all standards violations and re-submitted the source code for re-review. This process was repeated as many times as necessary, until all identified standards violations were corrected. The source code review report that summarizes the discrepancies noted is included in Appendix A.8 of this report. The Notice of Anomaly (NOA No. 2) documenting that discrepancies were found is included in Appendix A.1 of this report.

### **4.2 Witnessed Build**

A Witnessed Build of the software was created using Dominion's trusted build documents. The "Trusted Build" was performed by completing the following tasks in the order listed:

- Clear hard drive of existing data
- Retrieve the compliant source code
- Retrieve the installation media for OS, compilers, and build software
- Construct the build environment
- Create digital signatures of the build environment
- Load the compliant source code into the build environment
- Create a digital signature of the pre build environment
- Create a disk image of the pre-build environment
- Build executable code
- Create a digital signature of executable code
- Create a disk image of the post-build environment
- Build installation media

#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

##### **4.2 Witnessed Build (Continued)**

- Create a digital signature of the installation media
- Install executable code onto the system and validate the software/firmware
- Deliver source code with digital signature, disk image of pre-build environment with digital signatures, disk image of post-build environment with digital signatures, executable code with digital signatures, and installation media with signatures to EAC Approved Repository.

The “Trusted Build” for the Dominion Democracy Suite 4.0 includes source code, data, and script files, in clear text form. The build also includes COTS software on commercially available media, COTS software downloaded by the VSTL, COTS software verified by SHA1 from the software supplier, and picture and sound files in binary format provided by Dominion Voting Systems. The first step of the process was to clean the hard drives by writing data to every spot on the hard drive, so the drive is cleared of existing data. The Microsoft Windows 7 Professional operating system was then loaded and the applications from the VSTL reviewed source along with the VSTL verified COTS software was built. The final step was installing the applications on the hardware.

##### **Summary Findings**

Wyle performed a Witnessed Build for each software component of the Dominion Democracy Suite 4.0 on March 6, 2012. Dominion’s Technical Representative for the Witnessed Build was Marko Krstović. The products from the Witness Build shall be supplied to the EAC as part of the certification effort. The detailed steps followed during the performance of the Witnessed Build are presented in Appendix C.

##### **4.3 Technical Data Package Review**

The Dominion Voting Systems Democracy Suite 4.0 Voting System Technical Data Package (TDP) was reviewed to the VVSG. This review was performed as part of the pre-testing activities. The documents included in the TDP review are listed in Section 2.5 of this document.

The TDP contains information about requirements, design, configuration management, quality assurance, and system operations. The EAC requirements state that, at a minimum, the TDP shall contain the following documentation: system configuration overview; system functionality description; system hardware specifications; software design and specifications; system test and verification specifications; system security specifications; user/system operations procedures; system maintenance procedures; personnel deployment and training requirements; configuration management plan; quality assurance program; and system change notes.

The TDP documents were reviewed for accuracy, completeness, and compliance to the VVSG. The TDP documentation served as the basis for design and development of the functional tests. Functional testing also identified text in the TDP that conflicted with the actual operation of the system. These discrepancies were reported to Dominion Voting Systems and tracked as test exceptions until verified that the applicable documents had been corrected.

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#### 4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)

#### 4.3 Technical Data Package Review (Continued)

##### Summary Findings

The review results were recorded in a worksheet that provided the pass/fail compliance to each applicable VVSG requirement. Dominion corrected nonconformance observations and resubmitted the associated documents for review. This process continued until the TDP complied with TDP Standards.

A summary of the TDP issues encountered is provided below.

- Documents that were not included in the submitted TDP package were referenced for information.
- Some descriptive information included was inconsistent with descriptions in other TDP documents
- Placeholders within the some of the documents indicated information was not yet inserted
- Not all VVSG requirements were initially addressed in some of the documents
- Some of the individual user guides included information which conflicted with the actual information encountered when verified during the testing process.

All noted TDP issues were resolved prior to the conclusion of the review process. Notice of Anomaly (NOA No. 4), included in Appendix A.7 of this report summarizes the discrepancies in the TDP.

#### 4.4 QA and CM System Review

The Dominion Voting Systems QA Plan and CM Plan state that they comply with ISO 9001 and cite internal Dominion Voting Systems ISO 9001 documentation for details. Both the Dominion Voting Systems QA Plan and CM Plan were reviewed to determine compliance with EAC 2005 VVSG Volume II Section 2, and Volume I Sections 8 and 9, EAC stated requirements, and with the requirements of the internal Dominion Voting Systems ISO documentation. Also, the Dominion Voting Systems TDP documentation package was reviewed to determine if the Dominion Voting Systems QA Plan and the CM Plan were being followed.

##### Summary Findings

Wyle conducted a remote audit of Dominion Voting Systems' QA Program, during which Wyle requested artifacts from Dominion Voting Systems' documented QA Program. Wyle provided Dominion Voting Systems an artifact checklist targeting the following areas:

- Pre-Product Development
- Product Change Management
- Fielded Products and Manufacturing

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#### 4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)

#### 4.4 QA and CM System Review (Continued)

##### Summary Findings (Continued)

Dominion Voting Systems was allowed an 8-hour business day to provide the requested artifacts. Wyle reviewed the received artifacts against the Dominion Voting Systems documented procedures. Wyle accepted all of the artifacts received during this audit as meeting the stated process and procedures in the Dominion Voting Systems QA & CM Plan. One issue was noted: the term “ECR” was still in their documentation. Dominion currently uses the term “ECO” (Engineering Change Order). Both artifacts were provided to Wyle for review. Dominion Voting Systems updated all relevant TDP documents to reflect this.

#### 4.5 Hardware Testing

Hardware testing included: the inspection and evaluation of voting system documentation; tests of voting system under conditions simulating the intended storage, operation, transportation, and maintenance environments; and operational tests verifying system performance and function under normal and abnormal conditions. Hardware testing was limited to the Democracy Suite Version 4.0 Voting System.

**Table 4-1 VVSG Test Requirements**

REPORT SECTION	VVSG VOL. II SECTION	TEST DESCRIPTION
4.3	2.1	Technical Data Package Review
4.6.1	4.6.4	Low Temperature Test
4.6.1	4.6.5	High Temperature Test
4.6.1	4.6.3	Vibration Test
4.6.1	4.6.2	Bench Handling Test
4.6.1	4.6.6	Humidity Test
4.6.2	4.7.1	Temperature/Power Variation Test
4.6.2	3.2.2.2.c (Vol. I)	Acoustic Noise Level Test
4.7.1	4.8A	Electrical Power Disturbance Test
4.7.2	4.8B	Electromagnetic Radiation Test
4.7.3	4.8C	Electrostatic Disruption Test
4.7.4	4.8D	Electromagnetic Susceptibility Test
4.7.5	4.8E	Electrical Fast Transient Test
4.7.6	4.8F	Lightning Surge Test
4.7.7	4.8G	Conducted RF Immunity Test
4.7.8	4.8H	Magnetic Fields Immunity Test
4.7.9	4.3.8 (Vol. I)	Product Safety Review, UL60950-1
4.7.10	4.1.2.4 (Vol. I)	Electrical Supply
4.7.11	4.7.2	Maintainability Test

#### 4.6 Environmental Tests

Environmental tests were performed to ensure that the EUT and associated machine resident firmware were in compliance with the VVSG.

During test performance, the EUT was configured as it would be for use in an election precinct.

#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.6 Environmental Tests (Continued)**

##### **4.6.1 Non-Operating Environmental Tests (Continued)**

The EUT was subjected to various Non-Operating Environmental Tests. Prior to and immediately following each test environment, the EUT was powered and subjected to operability functional checks to verify continued proper operation. The EUT was not powered during the performance of any of the non-operating tests.

##### **Low Temperature Test**

The EUT was subjected to a Low Temperature Test in accordance with section 4.6.2 of Volume II of the VVSG. The purpose of this test is to simulate stresses associated with the storage of voting machines and ballot counters. This test is equivalent to the procedure of MIL-STD-810D, Method 502.2, Procedure I-Storage, with a minimum temperature of -4°F.

Prior to test initiation, the EUT was subjected to a baseline operability checkout to verify system readiness. The EUT was then placed in an environmental test chamber and the chamber temperature was lowered to -4°F and allowed to stabilize. Upon temperature stabilization, the temperature was maintained for an additional four hours. The temperature was then returned to standard laboratory ambient conditions at a rate not exceeding 10°F per minute.

The EUT was removed from the chamber and inspected for any obvious signs of degradation and/or damage. None were observed. The EUT was successfully subjected to a post-test operability checkout.

The EUT successfully completed the requirements of the Low Temperature Test. The Low Temperature Test Chamber Circular Chart and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

##### **High Temperature Test**

The EUT was subjected to a High Temperature Test in accordance with section 4.6.5 of Volume II of the VVSG. The purpose of this test is to simulate stresses associated with the storage of voting machines and ballot counters. This test is equivalent to the procedure of MIL-STD-810D, Method 501.2, Procedure I-Storage, with a maximum temperature of 140°F.

Prior to test initiation, the EUT was subjected to a baseline operability checkout to verify system readiness. The EUT was then placed in an environmental test chamber and the chamber temperature was raised to 140°F and allowed to stabilize. Upon temperature stabilization, the temperature was maintained for an additional four hours. The temperature was then returned to standard laboratory ambient conditions at a rate not exceeding 10°F per minute.

The EUT was removed from the chamber and inspected for any obvious signs of degradation and/or damage. None were observed. The EUT was successfully subjected to a post-test operability checkout.

The EUT successfully completed the requirements of the High Temperature Test. The High Temperature Test Chamber Circular Chart and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.6 Environmental Tests (Continued)**

##### **4.6.1 Non-Operating Environmental Tests (Continued)**

###### **Vibration Test**

The EUT was subjected to a Vibration Test in accordance with section 4.6.3 of Volume II of the VVSG. The purpose of this test is to simulate stresses faced during transport of voting machines and ballot counters between storage locations and polling places. This test is equivalent to the procedure of MIL-STD-810D, Method 514.3, Category 1- Basic Transportation, Common Carrier.

Prior to test initiation, the EUT was subjected to a baseline operability checkout to verify system readiness. Upon completion, the EUT was secured to an electro dynamics shaker. One control accelerometer was affixed to the shaker table. The EUT was subjected to the Basic Transportation, Common Carrier profile as depicted in Mil-Std-810D, Method 514.3, Category I, with a frequency range from 10 to 500 Hz and an overall rms level of 1.04, 0.74, and 0.20 G for a duration of 30 minutes in each orthogonal axis. Upon test completion, the EUT was inspected for any obvious signs of degradation and/or damage. None were observed. The EUT was successfully subjected to a post-test operability checkout.

The EUT successfully completed the requirements of the Vibration Test. The Vibration Test Data Sheets and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

###### **Bench Handling Test**

The EUT was subjected to a Bench Handling Test in accordance with section 4.6.2 of Volume II of the VVSG. The purpose of this test is to simulate stresses faced during maintenance and repair of voting machines and ballot counters. This test is equivalent to the procedure of MIL-STD-810D, Method 516.3, Procedure VI.

Prior to performance of the test, the EUT was subjected to a baseline operability checkout. Following the checkout, each edge of the base of the machine was raised to a height of four inches above the surface and allowed to drop freely. This was performed six times per edge, for a total of 24 drops. Upon test completion, the EUT was inspected for any obvious signs of degradation and/or damage. None were observed. The EUT was subjected to a post-test operability checkout and continued operability verified.

The EUT successfully completed the requirements of the Bench Handling Test. The Bench Handling Data Sheet and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

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**4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

**4.6 Environmental Tests (Continued)**

**4.6.1 Non-Operating Environmental Tests (Continued)**

**Humidity Test**

The EUT was subjected to a Humidity Test in accordance with section 4.6.6 of Volume II of the VVSG. The purpose of the test is to simulate stresses encountered during storage of voting machines and ballot counters. This test is similar to the procedure of MIL-STD-810D, Method 507.2, Procedure I-Natural Hot-Humid.

The EUT was subjected to a baseline operability checkout to verify system readiness. Upon completion, the EUT was placed in an environmental test chamber and was subjected to a 10-day humidity cycle in accordance with the 24-hour cycle values. For a full description of the Humidity Test Data see the Hardware Report in Appendix A.2.

Upon test completion, the EUT was inspected for any obvious signs of degradation and/or damage. None were observed. The EUT was successfully subjected to a post-test operability checkout.

The EUT Voting Machine System successfully completed the requirements of the Humidity Test. The Chamber Circular Chart and Instrumentation Equipment Sheet for the test are presented in the Hardware Test Report Appendix A.2.

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#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.6 Environmental Tests (Continued)**

##### **4.6.2 Operating Environmental Tests**

###### **Temperature/Power Variation Test**

The EUT was subjected to a Temperature and Power Variation Test in accordance with section 4.7.1 of Volume II of the VVSG. The purpose of this test is to evaluate system operation under various environmental conditions. The duration of the test is 163 hours, with 48 hours in the environmental test chamber. For the remaining hours, the equipment was operated at room temperature. This test is similar to the low temperature and high temperature tests of MIL-STD-810-D, Method 502.2 and Method 501.2.

To perform the test, the EUT was placed inside an environmental walk-in test chamber and connected to a variable voltage power source. The temperature inside the chamber and the voltage supplied to the hardware varied from 40°F to 100°F and from 105 VAC to 129 VAC. During test, one hundred ballots were counted every hour. The Environmental Test Profile, Chamber Thermal Circular Charts, and Instrumentation Equipment Sheet for the test are presented in the Hardware Test Report Appendix A.2.

The EUT successfully completed the requirements of the Operating Environmental Test.

###### **Acoustic Noise Level Test**

The EUT was subjected to an Acoustic Noise Level Test to satisfy the following requirements of Section 3.2.2.2 (c) of the VVSG:

###### **Section 3.2.2.2 (c) of the VVSG**

- v. The voting machine shall set the initial volume for each voter between 40 and 50 dB SPL.
- vi. The voting machine shall provide a volume control with an adjustable volume from a minimum of 20 dB SPL up to a maximum of 100 dB SPL, in increments no greater than 10 dB.
- vii. The audio system shall be able to reproduce frequencies over the audible speech range of 315 Hz to 10 KHz.

The Acoustic Noise Level Test Data Sheet indicating successful test completion is contained in the Hardware Test Report Appendix A.2.

#### **4.7 Electrical Tests**

Electrical tests were performed to ensure that the EUT and associated machine resident firmware were in compliance with the VVSG.

During test performance, the EUT was configured as it would be for use in an election precinct.

The EUT was subjected to various electrical tests to ensure continued system operation and reliability in the presence of abnormal electrical events. The EUT was powered and actively counting ballots during all electrical tests. Prior to and immediately following each electrical test, an operational status check was performed.

#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.7 Electrical Tests (Continued)**

##### **4.7.1 Electrical Power Disturbance**

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

The EUT was configured to run in an automated ballot count test mode, where continual ballot processing would occur during the testing, and subjected to the voltage dips and surges over periods ranging from 20 ms to four hours.

The EUT successfully met the requirements of the Electrical Power Disturbance Test. The Test Data Sheet, Photographs, and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

##### **4.7.2 Electromagnetic Radiation Test (FCC Part 15 Emissions)**

Electromagnetic Radiation emissions measurements were performed in accordance with section 4.8 of Volume II of the VVSG. This testing was performed to ensure that emissions emanating from the unit do not exceed the limits of FCC Part 15, Class B emissions. The EUT was configured to run in an automated ballot count test mode, where continual ballot processing would occur during the testing.

The EUT was found to comply with the required emissions limits. The Test Data Sheet, Photographs, and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

##### **4.7.3 Electrostatic Disruption**

Electrostatic Disruption testing was performed in accordance with Section 4.8 of Volume II of the VVSG to ensure that should an electrostatic discharge event occur during equipment setup and/or ballot counting, that the EUT would continue to operate normally. A momentary interruption is allowed so long as normal operation is resumed without human intervention or loss of data.

The EUT was configured to run in an automated ballot count test mode, where continual ballot processing would occur during the testing without operator intervention. The EUT was then subjected to electrostatic discharges of +/- 8 kV contact and +/- 15 kV air. Discharges were performed at areas typical of those which might be touched during normal operation, including the touch screen, user buttons, and other likely points of contact.

There was no loss of normal operation or loss of data as a result of the applied discharges.

The EUT successfully met the requirements of the Electrostatic Disruption Test. The Test Data Sheet, Photographs, and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

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#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.7 Electrical Tests (Continued)**

##### **4.7.4 Electromagnetic Susceptibility**

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

The EUT was configured to run in an automated ballot count test mode, where continual ballot processing would occur during the testing without operator intervention. The EUT was then subjected to ambient electromagnetic fields at 10 V/m over a range of 80 MHz to 1000 MHz.

There was no loss of normal operation or loss of data as a result of the applied electromagnetic fields.

The EUT successfully met the requirements of the Electromagnetic Susceptibility Test. The Test Data Sheet, Photographs, and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

##### **4.7.5 Electrical Fast Transients**

Electrical Fast Transients (EFT) testing was performed in accordance with Section 4.8 of Volume II of the VVSG 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 EUT was configured to run in an automated ballot count test mode, where continual ballot processing would occur during the testing without operator intervention. The EUT was then subjected to electrostatic fast transients of 2 kV applied to its AC power lines.

There was no loss of normal operation or loss of data as a result of the applied transients.

The EUT successfully met the requirements of the Electrical Fast Transients Test. The Test Data Sheet, Photographs, and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

##### **4.7.6 Lightning Surge**

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

The EUT was configured to run in an automated ballot count test mode, where continual ballot processing would occur during the testing. The EUT power input lines were then subjected to lightning surge testing at a level of 2 kV applied to its AC power line.

The EUT successfully met the requirements of the Lightning Surge Test. The Test Data Sheet, Photographs, and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

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#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.7 Electrical Tests (Continued)**

##### **4.7.7 Conducted RF Immunity**

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

The EUT was configured to run in an automated ballot count test mode, where continual ballot processing would occur during the testing without operator intervention. The EUT was then subjected to conducted RF energy of 10 Vrms applied to its power lines over a frequency range of 150 kHz to 80 MHz.

There was no loss of normal operation or loss of data as a result of the applied conducted RF energy. The EUT successfully met the requirements of the Conducted RF Immunity Test. The Test Data Sheet, Photographs, and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

##### **4.7.8 Magnetic Fields Immunity**

Magnetic Fields Immunity testing was performed in accordance with section 4.8 of Volume II of the VVSG. This testing was performed to ensure that the EUT will be able to withstand AC magnetic fields without disruption of normal operation or loss of data.

The EUT was configured to run in an automated ballot count test mode, where continual ballot processing would occur during the testing. The EUT was then subjected to AC magnetic fields of 30 A/M at a 60 Hz power line frequency.

There was no loss of normal operation or loss of data as a result of the applied magnetic field.

The EUT successfully met the requirements of the Magnetic Fields Immunity Test. The Test Data Sheet, Photographs, and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

##### **4.7.9 Product Safety Review**

The VVSG states that all voting systems shall meet the following requirements for safety:

All voting systems and their components shall be designed to eliminate hazards to personnel or to the equipment itself.

Defects in design and construction that can result in personal injury or equipment damage must be detected and corrected before voting systems and components are placed into service.

Equipment design for personnel safety shall be equal to or better than the appropriate requirements of the Occupational Safety and Health Act, Code of Federal Regulations, Title 29, Part 1910.

To satisfy these requirements, the voting system was subjected to a Product Safety Review in accordance with UL 60950-1, "Safety of Information Technology Equipment".

Hardware Test Report Appendix A.2 contains the Product Safety Review data.

#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.7 Electrical Tests (Continued)**

##### **4.7.10 Electrical Supply Testing**

Components of voting systems that require an electrical supply shall meet the following standards:

Precinct count voting systems shall operate with the electrical supply ordinarily found in polling places (Nominal 120 Vac/60Hz/1 phase).

Central count voting systems shall operate with the electrical supply ordinarily found in central tabulation facilities or computer room facilities (Nominal 120 Vac/60Hz/1, nominal 208 Vac/60Hz/3 or nominal 240 Vac/60Hz/2).

All voting machines shall also be capable of operating for a period of at least 2 hours on backup power, such that no voting data is lost or corrupted nor normal operations interrupted. When backup power is exhausted the voting machine shall retain the contents of all memories intact.

The EUT successfully met the requirements of the Electrical Supply Test. The Test Data Sheet, Photographs, and Instrumentation Equipment Sheet are contained in the Hardware Test Report Appendix A.2.

##### **4.7.11 Maintainability**

All maintenance required actions listed in the TDP were performed by Wyle Laboratories personnel to determine the ability to perform the actions required.

#### **4.8 System Level Testing**

System Level Testing was performed to evaluate the integrated operation of the voting system hardware and software. The suite of tests that comprise the System level Testing includes: Volume and Stress Test, System Integration Test, Security Test, Usability and Accessibility Tests, Data Accuracy, as well as the Physical and Functional Configuration Audits.

As part of System Level Testing, the system limits that Dominion voting Systems has stated to be supported by the Democracy Suite 4.0 Voting System as well as the tested values and the test performed to verify each limit are compiled in Table 4-3.

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#### 4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)

#### 4.8 System Level Testing (Continued)

Table 4-3 Democracy Suite 4.0 System Limits

Limit (Maximum Number of)	Declared Value		Tested Value	Test Performed
	Express	Standard		
Ballot Positions	462	462	462	Volume and Stress
Precincts in Election	250	1000	1000	Volume and Stress
Contests in Election	250	1000	4000	Volume and Stress
Candidates/Counters in Election	2500	10000	40000	Volume and Stress
Candidates/Counters in Precinct	462	462	462	Volume and Stress
Candidates/Counters in Tabulator	2500	10000	10000	Volume and Stress
Ballot Styles in Election	750	3000	4000	Volume and Stress
Contests in a Ballot Style	156	156	156	Volume and Stress
Candidates in a Contests	231	231	462	Volume and Stress
Ballot Styles in a Precinct	5	5	5	Volume and Stress
Number of Parties	30*	30*	Verified Possible	Volume and Stress (20)
Vote For in Contest	30	30	30	Volume and Stress
Supported Languages per Election	5*	5*	Verified Possible	System Integration (3)
Number of Write-ins	462	462	462	Volume and Stress

\*“Verified Possible” means that the limit was tested during the FCA, but could not be verified in an election environment because of dependencies in the ballot layout configuration. The stated limits in the “Test Performed” column were tested in an election environment.

An overview of the suite of tests performed during System Level Testing is provided in the following paragraphs, along with the summary findings of each test.

##### 4.8.1 Volume and Stress Test

The Democracy Suite 4.0 Voting System 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: Volume and Stress-MaxCandidates, Volume and Stress-MaxContests, and Volume and Stress-SystemLimits contained in Appendix A.6).

#### 4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)

#### 4.8 System Level Testing (Continued)

#### 4.8.1 Volume and Stress Test (Continued)

**Table 4-4 Democracy Suite 4.0 Volume and Stress**

Ballot Positions	462
Ballot Styles	4000
Election Parameters	Closed Primary: No Open Primary: No Partisan offices: Yes Non-Partisan offices: Yes Write-in voting: Yes Primary presidential delegation nominations: No Ballot Rotation: No Straight Party voting: No Cross-party endorsement: No Split Precincts: No Vote for N of M: Yes Recall issues, with options: No Cumulative voting: No Ranked order voting: No Provisional or challenged ballots: No Early Voting: Yes
Precincts	1000
Parties	20
Languages	English
Voting Pattern	<p>“Test Decks” were created for each Election Definition:</p> <p><b>Maximum Candidates-</b> Two test decks containing 480 ballots (240 ballots per Ballot style) will be marked in a matrix pattern. The Test Decks will be cast 5 times on each tabulator (ICE and ICP) to produce 4800 cast ballots. Additionally, the test decks will be fed into the Central Count System 25 times to produce 12000 scanned ballots. The total ballots processed for this election will be 16800.</p> <p><b>Maximum Contests-</b> Two test decks containing 400 ballots (200 ballots per Ballot style) will be marked in a matrix pattern. The Test Decks will be cast 5 times on each tabulator (ICE and ICP) to produce 4000 cast ballots. Additionally, the test decks will be fed into the Central Count System 25 times to produce 10000 scanned ballots. The total ballots processed for this election will be 14000.</p> <p><b>System Limits-</b> This election will exercise a total of 10 Tabulators, 1000 Precincts, and 4 Electoral Districts (ED). Each of the 10 tabulators will consist of 100 Precincts and 400 Contests, with each contest containing 10 choices. The purpose is to investigate the system’s response to process, store, and report data when the maximum allowable Precincts are present on the ballot. The election will subject the ICC, ICE and ICP to ballot processing at the high volume rates to evaluate software response to hardware-generated interrupts and wait states.</p>

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#### 4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)

#### 4.8 System Level Testing (Continued)

##### 4.8.1 Volume and Stress Test (Continued)

**Table 4-5 Democracy Suite 4.0 Volume and Stress Ballots Cast**

Total Ballots Cast	System	# Ballots	# Machines	# Runs	Total
	ICE	2,880	2	5	28,800
	ICP	2,880	2	5	28,800
	ICC Max Candidate	480	1	25	12,000
	ICC Max Contest	400	1	25	10,000
	ICC System Limits	4,000	1	1	4,000
	Total				83,600
	Total Ballots scanned by ICC: 26,000				

#### **Summary Findings**

At the conclusion of the Volume and Stress Test, the ICP, ICE, and ICC units successfully exercised 462 ballot positions in 4,000 ballot styles. There were 2 ICP, 2 ICE, and 1 ICC component used for the duration of Volume and Stress performance. A total of 83,600 ballots were processed without issue. There were no anomalies noted during testing.

##### 4.8.2 System Integration Test

System Integration Testing was performed to test all system hardware, software, and peripherals. System Integration Testing focused on the complete system including all proprietary software, proprietary hardware, proprietary peripherals, COTS software, COTS hardware, and COTS peripherals configured as a precinct count unit as described in the Dominion Voting Systems-submitted TDP for the Democracy Suite 4.0 Voting System. To perform the System Integration Testing, Wyle developed specific procedures and test cases designed to test the system as a whole. These procedures demonstrated compliance of the Democracy Suite 4.0 Voting System to Sections 2, 3, 4, 5, and 6 of Volume I of the VVSG.

The five election definitions exercised during the System Integration Testing are listed below and are presented in Appendix A.5 for further reference:

- GEN-01
- GEN-02
- GEN-03
- PRIM-01
- PRIM-03

#### **Summary Findings**

Through System Integration Testing, it was demonstrated that the system performed as documented with all components performing their intended functions. No anomalies were noted during testing. The individual requirements can be traced to the Requirements Matrix contained in Appendix D.

#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.8 System Level Testing (Continued)**

##### **4.8.3 Security Test**

The Democracy Suite 4.0 was subjected to Security Testing in accordance with the requirements of Section 7 of Volume I and Section 6.4 of Volume II of the VVSG. The purpose of the Security Test was to verify that security technologies implemented in the Democracy Suite to secure the hardware, software, and storage media during pre-voting, voting, and post-voting activities perform as documented in the Dominion-supplied technical documentation and that it meets the requirements of the VVSG.

The Security Test was performed by running a security test suite to provide verification of the access controls and the physical controls documented by Dominion and to gather the necessary information, which was provided to a certified security professional for analysis.

##### **Summary Findings**

After the initial security test findings were reported to Dominion, they supplied Wyle with an updated System Security Spec document. Wyle reviewed the document and an analysis was performed on the EMS desktop configured as documented by Dominion. Attempts were made to access certain functions of the EMS by users that did not have permissions to access those functions. Those attempts were unsuccessful.

In addition, security tie straps and tamper evident seals were provided and documented for the ICP and ICE hardware. The security tie straps/tamper evident seals and their documented installation were analyzed and found to be adequate. Wyle has determined the Dominion Democracy Suite, Version 4.0, to be compliant with the security requirements of the EAC 2005 VVSG. The security assessment report can be found in Appendix A.10 of this report.

##### **4.8.4 Usability and Accessibility Test**

The Democracy Suite 4.0 Voting System was subjected to Usability and Accessibility Tests in accordance with Volume I, Section 3 of the EAC 2005 VVSG. The purpose of this testing was to assess conformance to the usability and accessibility requirements in the EAC 2005 VVSG. Conformance to these requirements should result in an improved quality of interaction between the voter and the voting system and the effectiveness with which the system provides a comfortable and efficient voting session that provides confidence to the voter that their votes are cast correctly. Additional requirements for task performance are independence and privacy: the voter should normally be able to complete the voting task without assistance from others and the voter selections should be private.

The Usability and Accessibility requirements set forth by the VVSG and the Help America Vote Act (HAVA) ensure that all eligible voters are provided the ability to vote without discrimination regardless of any disabilities. As stated in the VVSG, to meet the requirements of the Usability and Accessibility Test, the voting system shall: conform to the specified usability requirements of Volume I, Section 3.1; provide the capabilities required by Volume I, Section 3.2; and, operate consistently with vendor specifications and documentation.

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#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.8 System Level Testing (Continued)**

##### **4.8.4 Usability and Accessibility Test (Continued)**

The requirements for physical, sensory, or cognitive disabilities shall be followed according to HAVA (a) (3) (B). Alternative languages shall be in accordance with HAVA (a) (4) and privacy mandated by HAVA (a) (1) (C). In addition Common Industry Format (CIF) shall be used for testing purposes according to ANSI/INCITS 354-2001 and in accordance with the VVSG. To help meet this requirement, Dominion Voting Systems submitted a summative usability test report to Wyle for review and is included in Appendix A.12 of this report.

##### **Summary Findings**

During test performance, two issues were noted relating to usability of the voting system. The first was classified as a major issue concerning the binary inputs, which led to a firmware update of the ATI. The second was classified as a minor issue due to incorrect foot paddles provided by the manufacturer. The correct foot paddles were provided and documented within the PCA and the as-run Test Plan. Both items were included in a full regression test on the ICP and ICE units in which no further issues were found. The test cases performed and the procedures followed during the Usability and Accessibility Test are documented in the Wyle Test Case Procedure Specification presented in Appendix A.5 of this report.

##### **4.8.5 Data Accuracy Test**

The Democracy Suite 4.0 Voting System was subjected to a Data Accuracy Test in accordance with the requirements of Section 4.7.1.1 of Volume II of the VVSG. The accuracy test for ICP was performed during hardware testing in conjunction with the Temperature/Power Variation Test. The ICE and ICC units were tested independently within a lab environment.

Per the EAC 2005 VVSG, 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.

**ICP-**The Data Accuracy test was performed in conjunction with the Temperature/Power Variation Test conducted during the hardware test portion of the test campaign. The ICP successfully met the requirements of the Data Accuracy Test by scanning and processing 2,673,000 ballot positions accurately, therefore exceeding the minimum requirement. The election definitions utilized during this test are presented in Appendix A.6 of this report.

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#### 4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)

#### 4.8 System Level Testing (Continued)

##### 4.8.5 Data Accuracy Test (Continued)

**ICE**-The Accuracy test requirements for the ICE were met by the execution of two accuracy tests. Since Wyle considers the ICE as a paper based scanner and a ballot marker, the first accuracy test for the ICE was performed by using both paper-based and audio ballots. The majority of the vote processing was utilizing the paper-based functionality, while audio votes were being cast at defined intervals between ballot scans. After analyzing the processes and researching past testing, Wyle believes the architecture, data flow, and integration of the recording process of an audio ballot and the scanning of a paper ballot in an ICE unit are similar and use many of the same software modules. Based on this, Wyle has concluded that the audio feature should not be subjected to the full requirement of Volume II, Section 4.7.1.1; therefore during test performance, 5000 audio ballot positions were cast to satisfy the execution of the feature. The remaining ballot positions were captured with paper-based voting. All results were validated and verified against the election definition voting matrix for expected results. The ICE processed the minimum number of ballot positions without error and the test was accepted. The election definitions utilized during this test are presented in Appendix A.6 of this report.

The second accuracy test consisted of the ICE Ballot Marking Device (BMD). Wyle utilized a maximum position ballot with the ICE, which was manually voted in order to verify the components correctly tabulate 1,549,703 ballot positions within the allowable target error rate. All results were validated and verified against the election definition voting matrix for expected results. The ICE processed the minimum number of ballot positions, during both tests, without error and the test were accepted. The election definitions utilized during this test are presented in Appendix A.6 of this report.

**ICC**-The ICC accuracy test was exercised by using only paper-based ballots. All results were validated and verified against the election definition voting matrix for expected results. The ICC processed the minimum number of ballot positions without error and the test was accepted. The election definitions utilized during this test are presented in Appendix A.6 of this report.

**Table 4-6 Democracy Suite 4.0 Accuracy**

Ballot Size	No. of Ballots	No. Vendor Marked	No. Hand Marked	No. Ballot Positions per Ballot	No. of Machines in Test	X Voted=	Total
11 inch	50	10	40	198	3	6	178,200
14 inch	50	10	40	270	3	6	243,000
17 inch	50	10	40	342	3	6	307,800
20 inch	50	10	40	414	3	6	372,600
22 inch	55	10	45	462	3	6	457,380
<b>Total</b>	<b>255</b>	<b>50</b>	<b>205</b>	<b>1,686</b>	<b>N/A</b>	<b>30</b>	<b>1,558,980</b>



#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.8 System Level Testing (Continued)**

#### **4.8.5 Data Accuracy Test (Continued)**

##### **Summary Findings**

The Democracy Suite 4.0 Voting System successfully met the requirements of the Data Accuracy Test by scanning and processing at least 1,549,703 ballot positions.

#### **4.8.6 Physical Configuration Audit**

A Physical Configuration Audit (PCA) of the Democracy Suite 4.0 Voting System was performed as part of the pre-testing activities in accordance with Section 6.6 of Volume II of the 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.

The PCA performed on the Democracy Suite 4.0 Voting System consisted of inspecting the following:

- The Democracy Suite Election Management System (EMS) software platform;
- The Democracy Suite ImageCast Precinct (ICP) Precinct Count Optical Scanner
- ImageCast Evolution (ICE) Precinct Count Optical Scanner with optional ballot marking capabilities
- The Democracy Suite ImageCast Central (ICC) Optical Central Count High Speed Scanner
- All accessories, equipment and documentation used with the Democracy Suite 4.0 Voting System.

##### **Summary Findings**

An initial baseline PCA was performed prior to commencement of the test campaign and is included in the Certification Test Plan contained in Appendix D. The initial PCA was revised during testing. The final PCA is presented in Appendix A.9 of this report. No discrepancies were noted during the PCA.

#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.8 System Level Testing (Continued)**

##### **4.8.7 Functional Configuration Audit (FCA)**

The functional configuration audit encompasses an examination of manufacturer's tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer's documentation submitted for the TDP. In addition to functioning according to the manufacturer's documentation, tests were conducted to insure all applicable EAC 2005 VVSG requirements are met.

A Functional Configuration Audit (FCA) of the Dominion Democracy Suite 4.0 was performed in accordance with Section 6.7 of Volume II of the VVSG. The purpose of the FCA was to verify that the Democracy 4.0 performs as documented in the Dominion-supplied technical documentation during pre-voting, voting, and post-voting activities and validate that the Democracy 4.0 meets the requirements of the EAC 2005 VVSG. To perform the FCA, the Democracy 4.0 was subjected to a series of tests to simulate pre-voting, voting, and post-voting activities. These tests were performed to ensure compatibility of voting machine functions at the precinct level using the referenced firmware. During the FCA, both normal and abnormal data was input into the system to attempt to introduce errors and test for error recovery. The activities simulated were:

- Verification of hardware status via diagnostic reports prior to election
- Performing procedures required to prepare hardware for election operations
- Obtaining 'zero' machine report printouts on all contest fields
- Performing procedures to open the polling place and enable ballot counting
- Casting of ballots to demonstrate proper processing, error handling, and generation of audit data
- Performing hardware operations required to disable ballot counting and closing the polls
- Obtaining machine reports and verifying correctness
- Obtaining machine-generated audit logs and verifying correctness

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#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

#### **4.8 System Level Testing (Continued)**

##### **4.8.7 Functional Configuration Audit (FCA) (Continued)**

The FCA was divided into three phases: pre-voting, voting, and post-voting. The three phases are described in greater detail in the following paragraphs:

1. Pre-Voting

Pre-Voting encompasses all activities performed to the point of loading the election data on a transport media. These activities include verifying roles, user administration, database administration, defining the political subdivisions, defining election types, defining voting variations, defining the ballot contents, audio ballot definition, election definition loading, auditing election creation process, producing pre- election reports, adding to existing elections, updating existing elections, modifying ballot styles, verifying alternative language translations, and loading an election on precinct count devices.

2. Voting

Voting encompasses all activities performed by poll workers, voters, and warehouse maintenance technicians after an election has been loaded, through the processing of special votes such as absentee and provisional ballots. These activities include pre-election logic testing, diagnostic tests, opening the polls, activating ballots, voting and casting both normal and audio ballots, utilizing the usability and accessibility aspects of the accessible voting station, closing the polls, printing machine reports, performing post-election maintenance tasks, and executing special voting sessions such as the processing of absentee and provisional ballots.

3. Post-Voting

Post-Voting encompasses all activities performed from verification of machine reports to the EMS post-election activities. These activities include verifying election results, tabulation of results, consolidating voted data, Transport Media (TM) maintenance & cleaning, Transport Media logs, concluding an election, backing up results, retaining election data for 22 months, deleting elections, and auditing voting machine log.

#### **Summary Findings**

There were deficiencies and anomalies noted during this test. All deficiencies were documented during real-time test performance and were compiled into a report (presented in the Deficiency Report contained in Appendix A.11) for resolution tracking. The system successfully recovered from all abnormal and error conditions unless noted in the deficiency report. All deficiencies noted were corrected prior to the conclusion of the test campaign. Notice of Anomaly No. 6 documenting successful resolution of all discrepancies noted during testing is presented in Appendix A.1.

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## **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

### **4.8 System Level Testing (Continued)**

#### **4.8.8 Availability**

The voting system achieved at least 99 percent availability during normal operation for the applicable functions of the system.

### **4.9 Anomalies and Resolutions**

Wyle performed compliance testing of the Dominion Voting Systems Democracy Suite 4.0 Voting System to the EAC 2005 VVSG. During the test campaign, all data from all “pre-testing”, hardware testing, software testing, functional testing, security testing, volume testing, stress testing, usability testing, accessibility testing, and reliability testing activities was combined to ensure all applicable EAC 2005 VVSG requirements that are supported by the Democracy Suite 4.0 Voting System had been tested.

A total of eight Notices of Anomaly were issued throughout the test campaign upon occurrence of a verified failure, an unexpected test result, or any significant unsatisfactory condition. All anomalies encountered during testing were successfully resolved prior to test completion. The Notices of Anomaly generated are presented in their entirety in Appendix A.1 of this report and are summarized below.

Notice of Anomaly No. 1: Acoustic Level and Hearing Aid Compatibility Test: The initial volume level setting exceeded the maximum accepted level of 50 dB. Dominion Voting Systems was notified of the anomaly and performed a source code revision to adjust the initial volume setting and replaced the headset to eliminate the wired-in volume control. The test was then repeated and the initial volume setting was measure to be 41 dBA, which is within the allowable range.

Notice of Anomaly No. 2: Source Code Review: Review of the submitted source code comprising the Democracy Suite Version 4.0 Voting System revealed deviations from the standard as well as issues with the commenting. Upon completion of the review for each source code submission, a technical summary report of all identified standards violations was sent to Dominion Voting Systems for resolution. Dominion Voting Systems then corrected the reported violations and re-submitted the source code for re-review. This process was repeated as many times as necessary until all identified standards violations were corrected.

Notice of Anomaly No. 3: Functional Configuration Audit (FCA): During the performance of the Functional Configuration Audit on the Democracy Suite Version 4.0 Voting System it was discovered that the PCOS 320A ImageCast Precinct Tabulator did not write an entry to the printed audit log when a date/time change was performed. Wyle reported the nonconformance to Dominion Voting Systems. Dominion Voting Systems revised the system source code to add a feature into the ICP resident firmware that would log the date/time event. During regression testing, Wyle verified that this feature was added.

Notice of Anomaly No. 4: Technical Data Package (TDP) Review: Review of the submitted documentation revealed discrepancies between the TDP and the EAC 2005 VVSG requirements. Functional testing also identified text in the TDP that conflicted with the actual operation of the system. Each noted discrepancy was documented in detail in the Wyle-generated TDP review reports on file as raw data.

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#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

##### **4.9 Anomalies and Resolutions (Continued)**

Notice of Anomaly No. 5: Electrostatic Disruption (ESD): During the performance of the ESD hardware test, the ImageCast Evolution touchscreen became unresponsive after being subjected to six pulses of 15 kV air discharge. The nonconformance was reported to Dominion Voting Systems, who addressed the issue two-fold. A software resolution was implemented to re-initialize the LCD touchscreen in the event communication is lost, along with a hardware modification which included the application of Kapton tape to the edges of the LCD touchscreen. Upon re-test, Wyle verified the solutions adequately protected the LCD from becoming unresponsive.

Notice of Anomaly No. 6: Lightning Surge: During lightning surge test performed by Wyle Labs to the VVSG 2005 volume I specifications, the power adaptor used for the ImageCast Evolution stopped working when it was hit by +2KV line to line surge. A second power adaptor was used to repeat the test and the same outcome was discovered. Upon two consecutive failures the testing was halted at Wyle Labs and failed power adaptors were sent to Dominion Voting Systems for failure analysis. Dominion Voting Systems tested five sample power adapters (2 from the same batch as the power adapters at Wyle and 3 from a different batch) and found that all five passed the +2KV surge test. As a result, Dominion stated with confidence that the power adapters were adequately designed to withstand the power surge and submitted five new samples to Wyle for follow-up testing. The test was then repeated at Wyle and results verified the power supply was able to withstand the +2KV surge.

Notice of Anomaly No. 7: Temperature and Power Variation: During an interim verification of voting totals of the Temperature and Power Variation test, a discrepancy was found where a candidate received one less vote than expected on an ImageCast Evolution unit. Wyle notified Dominion Voting Systems of the issue and halted the test. The specific ballot and its associated electronic image were analyzed by Wyle and Dominion Voting System, and found that because the ballot image was skewed in the area the candidate appeared on the ballot, the ballot should have been rejected by the ICE unit. Further investigation revealed that an incorrect threshold setting in the Election Management System for the associated election prevented the ballot from being rejected; therefore, the anomaly was resolved by correcting the threshold setting prior to repeating the test.

Notice of Anomaly No. 8: System Integration: Two issues were found during the Usability and Accessibility portion of the System Integration test. The first issue was related to the binary input devices which led to a firmware update of the ATI device. The second issue was related to incorrect foot pedals supplied by the vendor. Both issues were resolved and verified prior to the conclusion of System Integration Testing.

##### **4.10 Deficiencies and Resolutions**

During the test campaign, deficiencies were noted that were related to system functionality and usability. The deficiencies were discovered as part of the FCA, during hardware test performance, system integration testing, usability testing, volume and stress testing, or were noted during the general test campaign and not linked to a specific test or VVSG requirement. All deficiencies were documented during real-time test performance and were compiled into a report (presented in the Deficiency Report contained in Appendix A.11) for resolution tracking. All deficiencies noted were corrected prior to the conclusion of the test campaign.

#### **4.0 TEST FINDINGS AND RECOMMENDATIONS (Continued)**

##### **4.11 Recommendation for Certification**

Wyle performed conformance/specification testing on the Dominion Voting Systems Democracy Suite 4.0 to the EAC 2005 VVSG (Version 1.0). During the test campaign, all data from pre-testing, hardware testing, software testing, functional testing, security testing, volume testing, stress testing, usability testing, accessibility testing, and reliability testing activities was combined to ensure all VVSG requirements that are supported by the Democracy Suite 4.0 had been tested. Wyle also used discretion as granted by the VVSG to design and exercise FCA Test Cases, perform source code reviews, and perform Security Tests.

Wyle concludes that the Democracy Suite 4.0, submitted by Dominion Voting Systems, meets all applicable requirements for certification as set forth in the Election Assistance Commission (EAC) 2005 Voluntary Voting Systems Guidelines, Version 1.0, as well as all additional tests performed at Wyle's discretion. As such, Wyle recommends that the EAC grant the Dominion Voting Systems Democracy Suite 4.0, certification to the VVSG

This report is valid only for the system identified in Section 2 of this report. Any changes, revisions, or corrections made to the system after this evaluation shall be submitted to the EAC to determine if the modified system requires a new application, or can be submitted as a modified system. The scope of testing required will be determined based upon the degree of modification.

**Due to the varying requirements of individual jurisdictions, it is recommended by the VVSG that local jurisdictions perform pre-election logic and accuracy tests on all systems prior to their use in an election within their jurisdiction.**

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**APPENDIX A**  
**ADDITIONAL FINDINGS**

- A.1 [NOTICE OF ANOMALY](#)
- A.2 [HARDWARE TEST REPORT](#)
- A.3 [FUNCTIONAL CONFIGURATION AUDIT TEST CASE PROCEDURE SPECIFICATION](#)
- A.4 [SECURITY TEST CASE PROCEDURE SPECIFICATION](#)
- A.5 [USABILITY TEST CASE PROCEDURE SPECIFICATION](#)
- A.6 [ELECTION DEFINITIONS](#)
- A.7 **TECHNICAL DATA PACKAGE REVIEW REPORT**
  - A.7-1 [TDP REVIEW SUMMARY](#)
  - A.7-2 [TDP COMPLIANCE MATRIX](#)
- A.8 [DOMINION SOURCE CODE REVIEW REPORT](#)
- A.9 [PHYSICAL CONFIGURATION AUDIT](#)
- A.10 [DOMINION SECURITY ASSESSMENT REPORT](#)
- A.11 [DEFICIENCY REPORT](#)
- A.12 **SUMMATIVE USABILITY REPORT**
  - A.12-1 [USABILITY STUDY OF DOMINION VOTING SYSTEMS IMAGECAST AND IMAGECAST WITH BALLOT MARKING DEVICE](#)
  - A.12-2 [USABILITY STUDY IMAGECAST EVOLUTION \(ICE\)](#)

**APPENDIX B**

**WARRANT OF ACCEPTING CHANGE CONTROL RESPONSIBILITY**

**DOMINION WARRANT OF ACCEPTANCE CHANGE CONTROL**



**APPENDIX C**

**WITNESS BUILD**

**DOMINION WITNESS BUILD PROCEDURE**

**ATTACHMENT D**

**WYLE LABORATORIES' CERTIFICATION TEST PLAN NO. T57381-01**

**DOMINION DEMOCRACY SUITE 4.0 AS RUN TEST PLAN**

ATTACHMENT E  
REQUIREMENTS MATRIX

**DEMOCRACY SUITE REQUIREMENTS MATRIX**

**ATTACHMENT F**

**DOMINION CONFORMITY STATEMENT**

**DOMINION CONFORMITY STATEMENT**

**ATTACHMENT G**

**DOMINION ATTESTATION OF DURABILITY**

**DOMINION ATTESTATION OF DURABILITY**