Test Report for EAC 2005 VVSG 1.0 Certification Testing Dominion Voting Systems Democracy Suite (D-Suite) Version 5.0 Voting System

EAC Project Number: DVS1601

Version: Revision A
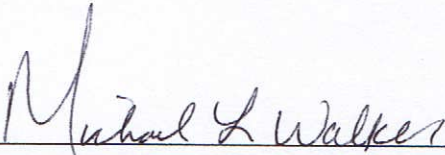
Date: 1/6/17

U.S. Election Assistance Commission

VSTL

EAC Lab Code 1501

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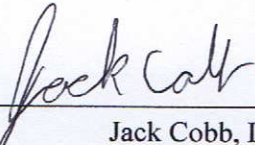NVLAP LAB CODE 200908-0

SIGNATURES

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REVISIONS

Revision	Description	Date
NR	Initial Release	12/2/16
A	Address EAC Comments	1/6/17

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1.0   INTRODUCTION

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to perform full certification testing during a new system campaign for the Dominion Voting Systems <mark>Democracy Suite 5.0 Voting System</mark> to the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. Certification testing of the <mark>Democracy Suite</mark> 5.0 Voting System submitted for evaluation was performed to ensure the applicable requirements of the EAC 2005 VVSG and the EAC Testing and Certification Program Manual, Version 2.0 were met. Additionally, all EAC Request for Interpretations (RFI) and Notices of Clarification (NOC) relevant to the system under test were incorporated in the test campaign.

Prior to submitting the voting system for testing, Dominion Voting Systems submitted an application package to the EAC for certification of the <mark>Democracy Suite</mark> 5.0 Voting System. The application was accepted by the EAC and the project was assigned the unique Project Number of DVS1601.

1.1   System Identification and Overview

The <mark>Democracy Suite</mark> 5.0 Voting System is a paper-based optical scan voting system with a hybrid paper/DRE option consisting of the following major components: The Election Management System (EMS), the ImageCast Central (ICC), the ImageCast Precinct (ICP), and the ImageCast X (ICX).

Election Management System (EMS)

The <mark>Democracy Suite</mark> 5.0 EMS consists of various components running as either a front-end/client application or as a back-end/server application. A listing of the applications and a brief description of each is presented below.

Front-end/Client applications:

- EMS Adjudication: Represents <mark>the client component</mark> responsible for adjudication, including reporting and generation of adjudicated result files from ImageCast Central tabulators and adjudication of write-in selections from ImageCast Precinct and ImageCast Central tabulators. <mark>This client component is installed on both the server and the client machines.</mark>

- EMS Audio Studio: A client application that 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.

- EMS Election Data Translator: End-user application used to export election data from election project and import election data into election project.

- **EMS Election Event Designer:** A client application that integrates election definition functionality together with ballot styling capabilities and represents a main pre-voting phase end-user application

- **ImageCast Voter Activation:** An application, installed on a workstation or laptop at the polling place, which allows the poll workers to program smart cards for voters. The smart cards are used to activate voting sessions on ImageCast X.

- **EMS Results Tally and Reporting:** A client application that integrates election results acquisition, validation, tabulation, reporting, and publishing capabilities and represents the main post-voting phase end-user application.

Back-end/Server applications:

- **EMS Adjudication Service:** Represents a server side application which provides ballot information such as contests, candidates and their coordinates from EMS to the Adjudication application.

- **EMS Application Server:** Represents a server side application responsible for executing long running processes, such as rendering ballots, generating audio files and election files, etc.

- **EMS Database Server:** Represents a server side RDBMS repository of the election project database which holds all the election project data, including pre-voting and post-voting data.

- **EMS Data Center Manager:** A server application that represents a system level configuration application used in EMS back-end data center configuration.

- **EMS Election Device Manager:** Application used for production and programming of election files, and other accompanying files, for ImageCast X terminals.

- **EMS File System Service:** A back-end application that acts as a stand-alone service that runs on client machines, enabling access to low level operating system API for partitioning CF cards, reading raw partition on ICP CF card, etc.

- **EMS NAS Server:** Represents a server side file repository of the election project file based artifacts, such as ballots, audio files, reports, log files, election files, etc.

- **Smart Card Helper Service:** A service that is installed on a workstation or laptop at the polling place, and provides required data format for programming smart cards for ImageCast devices, or, for jurisdiction's voting registration system in case of integration.

ImageCast Precinct (ICP)

The ICP device is a hybrid precinct optical scan paper/DRE ballot counter designed to provide six major functionalities: ballot scanning, second chance voting, accessible voting, ballot review, tabulation, and poll worker functions.

For both ballot scanning and tabulation functionalities the ICP scans marked paper ballots, interprets voter marks on the paper ballot and stores and tabulates each vote from each paper ballot.

Second Chance voting refers to scenarios in which an error has been detected on the voter's paper ballot (e.g., blank ballot, undervoted ballot, overvoted ballot, misread ballot, cross-over voted ballot), and the ICP notifies the voter by displaying a message or providing an audio visual cue, that one of these situations has been detected, and offers the voter an opportunity to reject and fix their ballot, or to cast the ballot as-is.

Accessible voting allows voters with disabilities to listen to an audio representation of a ballot and use a hand held controller called an Audio Tactile Interface (ATI) to make vote selections, which are then saved directly to the ICP when the voter casts their Accessible Voting ballot.

The Ballot Review feature allows a voter to review their vote selections using an audio or visual representation, which displays or presents the voter with a complete listing of all contests contained on the ballot and an indication of the results which will be recorded for each contest once the voter's ballot is cast.

For poll worker functions the ICP contains a small touch-screen LCD to allow the poll worker to initiate polling place activities, diagnostics and reports.

ImageCast Central (ICC) Count Scanner

The ICC 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.

ImageCast X (ICX) Ballot Marking Device (BMD)

The Democracy Suite ImageCast X ballot marking platform is a solution that is used for creation of paper cast vote records. These ballots can be scanned, reviewed, cast and tabulated at the polling location on an ImageCast Precinct device or later scanned and tabulated by the ImageCast Central optical ballot scanner. The ImageCast X also supports enhanced accessibility voting through optional accessories connected to the ImageCast X unit.

The ICX is a proprietary application which runs on any of the tablets listed in Table 1-21.

1.1.1   Software

For a detailed listing of the individual files included in the Democracy Suite 5.0 Voting System software listed in Tables 1-1, 1-2, 1-3, and 1-4, please reference Attachment C of this document.

Table 1-1. Democracy Suite 5.0 EMS Software Component Descriptions

Software	Version	Filename	Configuration	
			Standard	**Express**
EMS Election Event Designer (EED)	5.0.15.1	setup.exe: EED_FED_CERT_Setup_x64.msi	X	X
EMS Results Tally and Reporting (RTR)	5.0.15.1	setup.exe: RTR_FED_CERT_Setup_x64.msi	X	X
EMS Application Server	5.0.15.1	setup.exe: APPS_FED_CERT_Setup_x64.msi	X	X
EMS File System Service (FSS)	5.0.15.1	setup.exe: FSSSetup.msi	X	X
EMS Audio Studio (AS)	5.0.15.1	setup.exe: EMSAudioStudioSetup.msi	X	X
EMS Data Center Manager (DCM)	5.0.15.1	DemocracySuiteEMS_DCM.exe	X	X
EMS Election Data Translator (EDT)	5.0.15.1	setup.exe: EDTSetup_x86.msi EDTSetup_x64.msi	X	X
ImageCast Voter Activation (ICVA)	5.0.15.1	setup.exe: ICVASetup.msi	X	X
EMS Adjudication (Adj)	5.0.0.17002	DVS ImageCast Adjudication Client Setup.msi	X	X
EMS Adjudication Service	5.0.0.17002	DVS Adjudication Services Setup.msi	X	X
EMS Election Device Manager (EDM)	5.0.6165.23355	setup.exe: EdmInstaller.msi	X	X
Smart Card Helper Service	5.0.6165.23379	setup.exe: SmartCardServiceSetup.msi	X	X

Table 1-2. Democracy Suite 5.0 ImageCast Precinct Software Component Descriptions

Firmware/Software	Version	Filename
Election Firmware	5.0.1-US	cf2xx.sig
Firmware Updater	5.0.1-US	firmUp.enc
Firmware Extractor	5.0.1-US	FirmwareExtract.enc
Kernel (uClinux)	5.0.1-US	image.bin.gz
Boot Loader (COLILO)	20040221	colilo.bin
Asymmetric Key Generator	5.0.1-US	Keygen.enc
Asymmetric Key Exchange Utility	5.0.1-US	KeyExchange.enc
Firmware Extractor (Uses Technician Key)	5.0.1-US	TechExtract.enc

Table 1-3. Democracy Suite 5.0 ImageCast Central Software Component Descriptions

Firmware/Software	Version	Filename
ImageCast Central Application	5.0.1-0001	ICCSetup_v5.0.0.15.exe

Table 1-4. Democracy Suite 5.0 ImageCast X Software Component Descriptions

Firmware/Software	Version	Filename
ICX Application	5.0.6149.28963	ICX.apk
ICX Security Certificate	N/A	icx_pkcs12.pfx
ICX Security Certificate Password	N/A	icx_pfx.pwd

Table 1-5. Democracy Suite 5.0 EMS Client/Server Software Component Descriptions

Firmware/Software	Version	Filename	Configuration Standard	Express
Microsoft Windows Server	2012 R2 Standard	Physical Media from Microsoft	X	
Microsoft Windows	8.1 Professional	Physical Media from Microsoft	X	X
.NET Framework	3.5	Physical Media from Microsoft	X	X
Microsoft Visual J#	2.0	vjredist64.exe vjredist.exe	X	X
Microsoft Visual C++ 2013 Redistributable	2013	vcredist_x64.exe vcredist_x86.exe	X	X
Java Runtime Environment	7u76	jre-7u76-windows-x64.exe jre-7u76-windows-i586.exe	X	X
Java Runtime Environment	8u77	jre-8u77-windows-x64.exe jre-8u77-windows-i586.exe	X	X
Microsoft SQL Server 2012 Standard	2012 Standard	Physical Media from Microsoft	X	
Microsoft SQL Server 2012 Service Pack 2	2012 SP2	SQLServer2012SP2-KB2958429-x64-ENU.exe	X	
Microsoft SQL Server 2012 SP2 Express with Advanced Services	2012 SP2	SQLEXPRADV_x64_ENU.exe		X
Cepstral Voices	6.2.3.801	Allison (English): Cepstral_Allison_windows_6.2.3.801.exe Alejandra (Spanish): Cepstral_Alejandra_windows_6.2.3.801.exe	X	X
Arial Narrow Fonts	N/A	ARIALN.TTF ARIALNB.TTF ARIALNBI.TTF ARIALNI.TTF	X	X

Table 1-5. Democracy Suite 5.0 EMS Client/Server Software Component Descriptions *(continued)*

Firmware/Software	Version	Filename	Configuration	
			Standard	Express
Maxim iButton Driver	4.04	install_1_wire_drivers_x86_v404.msi install_1_wire_drivers_x64_v404.msi	X	X
Adobe Reader DC	AcrobatDC	AcroRdrDC1501020060_en_US.exe	X	X
Microsoft Access Database Engine	2010	AccessDatabaseEngine.exe AccessDatabaseEngine_x64.exe	X	X
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi	X	X

Table 1-6. Democracy Suite 5.0 EMS Software Platform Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
Infragistics NetAdvantage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi
Infragistics NetAdvantage WPF 2012.1	2012 Vol.1	NetAdvantage_WPF_20121.msi
TX Text Control Library for .NET	16.0	TXText Control.NET for Windows Forms 16.0.exe
SOX	14.3.1	sox.exe , libgomp-1.dll, pthreadgc2.dll, zlib1.dll
Log4net	1.2.10	log4net.dll, log4net.xml
NLog	1.0.0.505	NLog.dll
iTextSharp	5.0.5.0	itextsharp.dll
OpenSSL	1.2	openssl.exe, lebeay32.dll, ssleay32.dll
SQLite	1.0.65.0	System.Data.SQLite.DLL (32-bit and 64-bit)
Lame	3.99.4	lame.exe
Speex	1.0.4	speexdec.exe and speexenc.exe
Ghostscript	9.04	gsdll32.dll (32-bit and 64-bit)
PdfToImage.dll	1.2	PdfToImage.dll
SharpSSh package	1.1.1.13	Tamir.SharpSSH.dll, Diffie.Hellman.dll, Org.Mentalis.Security.dll
One Wire API for .NET	4.0.2.0	OneWireAPI.NET.dll
Avalon-framework-cvs-20020806	20020806	avalon-framework-cvs-20020806.jar

Table 1-6. Democracy Suite 5.0 EMS Software Platform Unmodified COTS Component Descriptions *(continued)*

Firmware/Software	Version	Filename
Batik	0.20-5	batik.jar
Fop	0.20-5	fop.jar
Microsoft Visual J# 2.0 Redistributable Package-Second Edition(x64)	2.0	vjc.dll , vjsjbc.dll, vjslibcw.dll, vjsnativ.dll , vjssupuilib.dll , vjsvwaux.dll
Entity framework	4.3.1	EntityFramework.dll
Spreadsheetlight	3.4.3	SpreadsheetLight.dll, SpreadsheetLight.xml
Open XML SDK 2.0 For Microsoft Office	2.0.5022.0	DocumentFormat.OpenXml.dll, DocumentFormat.OpenXml.xml

Table 1-7. Democracy Suite 5.0 ImageCast Precinct Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
OpenSSL	1.1.2	Openssl-fips-1.1.2.tar.gz
PNG Reference Library	1.2.24	libpng-1.2.24.tar.gz
Zlib	1.2.3	Zlib-1.2.3.tar.gz

Table 1-8. Democracy Suite 5.0 EDM Unmodified COTS Component Descriptions

Firmware/Software	Version	Filename
ASP.NET AJAX Control Toolkit	15.1.4.0	AjaxControlToolkit.Installer.15.1.4.0.exe
Entity Framework	6.1.3.net45	entityframework.6.1.3.nupkg
Ionics Zip Library	1.9.1.8	DotNetZipLib-DevKit-v1.9.zip
NLog Library	1.0.0.505	NLog-1.0-Refresh-bin.zip
SQLite	1.0.98.0	sqlite-netFx451-binary-bundle-x64-2013-1.0.98.0.zip
Google Text-to-Speech Engine	3.8.16	ARM: com.google.android.tts_3.8.16-210308160_minAPI15(armeabi-v7a)(nodpi).apk x86: com.google.android.ttscom.google.android.tts_3.8.16-210308163_minAPI15(x86)(nodpi).apk

Table 1-9. Democracy Suite 5.0 ImageCast Central Software Build Library Source Code (Unmodified COTS)

Firmware/Software	Version	Filename
OpenSSL	1.2.3	openssl-fips-1.2.3.tar.gz

Table 1-10. Democracy Suite 5.0 ImageCast Central Runtime Software Components (Unmodified COTS)

Firmware/Software	Version	Filename
1-Wire Driver (x86)	4.04	install_1_wire_drivers_x86_v404.msi
1-Wire Driver (x64)	4.04	install_1_wire_drivers_x64_v404.msi
Kofax VRS	4.5 Build 269	Kofax_VRS4_50_269_DR-G1130.iso
Kofax VRS Service Pack 1	4.5.1	vrs45sp1setup.exe
Canon DR-G1130 Driver	1.2 SP4	Physical Media from Canon
Canon DR-G1130 Component Installer	4.50	CI-DR-G1130.exe
Visual C++ 2013 Redistributable (x86)	12.0.30501	vcredist_x86.exe

Table 1-11. Democracy Suite 5.0 ImageCast Precinct Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
uClinux	20070130	uClinux-dist-20070130.tar.gz
COLILO Bootloader	20040221	Colilo20040221.tar.gz

Table 1-12. Democracy Suite 5.0 ImageCast X Modified COTS Software Component Descriptions

Firmware/Software	Version	Filename
Zxing Barcode Scanner	4.7.5	BS-4.7.5.zip
SoundTouch	1.9.2	Soundtouch-1.9.2.tar.gz

Table 1-13. Democracy Suite 5.0 EMS Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Windows 8.1 Professional	8.1	Physical Media from Microsoft
.NET Framework 3.5	3.5	Physical Media from Microsoft
Internet Information Server (IIS)	6	Physical Media from Microsoft

Table 1-13. Democracy Suite 5.0 EMS Software Build Environment Component Descriptions
(continued)

Firmware/Software	Version	Filename
7-Zip	9.20 (64 Bit)	7z920-x64.msi
Visual Studio 2013 Premium	2013.5	vs2013.5_prem_enu.iso
ImgBurn	2.5.7.0	SetupImgBurn_2.5.7.0.exe
Infragistics NetAdvantage Win Forms 2011.1	2011.1	NetAdvantage_WinForms_20111.msi
Infragistics Net Advantage – WPF 2012.1	2012.1	NetAdvantage_WPF_20121.msi
TX Text Control 16.0.NET	16	TX Text Control.NET for Windows Forms 16.0.exe
Speex	1.0.4	speex_win32_1.0.4_setup.exe
Microsoft Visual J#	2.0	vjredist64.exe
iTextSharp	5.0.5	itextsharp-5.0.5-dll.zip
Ghostscript	9.0.4	gs904w32.exe gs904w64.exe
Nlog	1.0.0.505	NLog-1.0-Refresh-bin.zip
OneWireAPI.NET	4.0	1-wiresdkver400_beta2.zip
Lame	3.99.4	lame3.99.4-20120130.zip
Sox	14.3.1	sox-14.3.1-win32.zip
Avalon Framework	20020806	avalon-framework-cvs-20020806.jar.zip
Fop	0.20-5	fop-0.20.5.jar
Batik	0.20-5	batik-1.5-fop-0.20-5.jar
SharpSSH	1.1.1.13	SharpSSH.zip
SQLite	1.0.65.0	SQLite-1.0.65.0-binaries.zip
OpenSSL	1.2	openssl-fips-1.2.tar.gz
ActivePerl	5.20.2	ActivePerl-5.20.2.2002-MSWin32-x86-64int-299195.msi
Patch	2.5.9-7	patch-2.5.9-7-bin.zip
ISOnewspaper	30.4	ISOnewspaper30v4_gr.icc.zip
Ogg Vorbis Encoder	2.88	oggenc2.88-1.3.5-generic.zip
Ogg Vorbis Encoder	1.10.1	oggdecV1.10.1.zip
Prism Mvvm	1.1.1	prism.mvvm.1.1.1.nupkg
PDF Printing	2.9.5.2	PDFPrinting.zip

Table 1-13. Democracy Suite 5.0 EMS Software Build Environment Component Descriptions
(continued)

Firmware/Software	Version	Filename
Entity Framework	6.1.3	entityframework.6.1.3.nupkg
WiX	3.10	Wix310.exe
Spreadsheet Light	3.4.3	spreadsheetlight.3.4.3.nupkg
Open XML SDK 2.0 for Microsoft Office	2.0	OpenXMLSDKv2.msi
Acrobat Reader	Acrobat DC	AcroRdrDC1501020060_en_US.exe
Arial Narrow Fonts	N/A	ArialNarrowFonts.zip
PdfToImage	1.2	ConvertPDF_source_1.2.zip

Table 1-14. Democracy Suite 5.0 ICC Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
NASM Assembler	2.09.07	nasm-2.09.07-win32.zip
OpenSSL	1.2.3	openssl-fips-1.2.3.tar.gz

Table 1-15. Democracy Suite 5.0 EDM Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ajax Control Toolkit	15.1.4	AjaxControlToolkit.Installer.15.1.4.0.exe
SQLite	1.0.98.0	sqlite-netFx451-binary-bundle-x64-2013-1.0.98.0.zip
Ionic	1.9.1.8	DotNetZipLib-DevKit-v1.9.zip
Google Text-to-speech Engine – Architecture arm	3.8.16	com.google.android.tts_3.8.16-210308160_minAPI15(armeabi-v7a)(nodpi).apk
Google Text-to-speech Engine – Architecture x86	3.8.16	com.google.android.ttscom.google.android.tts_3.8.16-210308163_minAPI15(x86)(nodpi).apk

Table 1-16. Democracy Suite 5.0 Adjudication Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
Microsoft Enterprise Library	5.0	Enterprise Library 5.0.msi
Microsoft Prism	4.0-November 2010	Prismv4.exe
Microsoft Identity Foundation SDK	4.0	WindowsIdentityFoundation-SDK-4.0.msi
Toggle Switch Control Library	1.1.1	ToggleSwitch 1.1.1.zip
Infragistics NetAdvantage Ultimate 2013.1	2013.1	NetAdvantage_dotNet_20131_WithSamplesAndHelp.zip

Table 1-16. Democracy Suite 5.0 Adjudication Software Build Environment Component Descriptions *(continued)*

Firmware/Software	Version	Filename
iTextSharp	5.5.1	itextsharp-all-5.5.1.zip
CLR Security	June 2010	clrsecurity_june10.zip
OpenSSL	1.0.2e	openssl-1.0.2e-i386-win32.zip
Community MSI Extensions	1.4	msiext-1.4.zip
TreeViewEx	3.0.0.0	TreeViewEx.dll

Table 1-17. Democracy Suite 5.0 ICL Software Build Environment Component Descriptions

Firmware/Software	Version	Filename
SharpZibLib	0.86.0	SharpZipLib_0860_Bin.zip
Microsoft Visual Studio 2013 Installer Projects Extension	2013	VSI_bundle.exe
Visual Basic Power Packs	12.0	vb_vbpowerpacks.exe

Table 1-18. Democracy Suite 5.0 ImageCast Precinct Election Firmware Compiler Descriptions

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

Table 1-19. Democracy Suite 5.0 ImageCast Precinct Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu 10.04 LTS – Long-term support	10.04	ubuntu-10.04.2-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 1-20. Democracy Suite 5.0 ImageCast X Firmware Build Environment Component Descriptions

Firmware/Software	Version	Filename
Ubuntu 14.04.4	14.04.4	ubuntu-14.04.4-desktop-amd64.iso

1.1.2 Hardware

For COTS equipment, every effort was made to verify that the COTS equipment had not been modified for use. This was accomplished by performing research using the COTS equipment manufacturer's websites based on the serial numbers and service tag numbers for each piece of equipment. Assigned test personnel evaluated COTS hardware, system software and communications components for proven performance in commercial applications other than voting. For PCs, laptops, and servers, the service tag information was compared to the system information found on each machine. Physical external and internal examination was also performed when the equipment was easily accessible without the possibility of damage. Hard drives, RAM memory, and other components were examined to verify that the components matched the information found on the COTS equipment manufacturer's websites.

Table 1-21. Voting System Equipment

Component	Serial Number
Proprietary Hardware	
ImageCast Precinct Optical Scanner PCOS-320C	AAFAJFM0061, AAFAJFN0030, AAFAJGI6764, AAFAJEL0352
ImageCast Precinct Optical Scanner PCOS-320A	AANAGCP0347, AANAGCP0002
ICP Ballot Box BOX-330A	AAUCCFX0083, AAUCCGI0011
ICX Samsung Tablet	[DVS-Samsung ICX-001], RF2GB01W0GD, RF2GB01V4HF, RF2GB01V5RL
ICX UPS Inline EMI Filter	[DVS-EMIFILTER-001] thru [DVS-EMIFILTER-003]
COTS Hardware	
Avalue 15" Tablet (SID-15V)	0E14AF00014, B03G005400006, B033G00540008, 9E274118, 1D274118
Avalue 21" Tablet (SID-21V)	0E14AF00027, B03G005500019, 03G005500009, 0039BZ2D, 0039B209
Dell OptiPlex 7440 All In One	HVNRFB2, HVNQFB2, HVNPFB2
Dell PowerEdge R630	4Z07T52
Canon imageFormula DR-G1130 Scanner	GF301092, GF304418
Dell Precision T3420 PC	HS0VFB2, HS0TFB2, HS0RFB2, HS0SFB2
HP LaserJet Pro Printer M402dn	PHBQF20342, PHBQF20345, PHBQC12619, PHBQC19613, PHBQC12519, PHBQD18790, PHBQC12616
Dell OptiPlex 9030 All-In-One	CF73S52

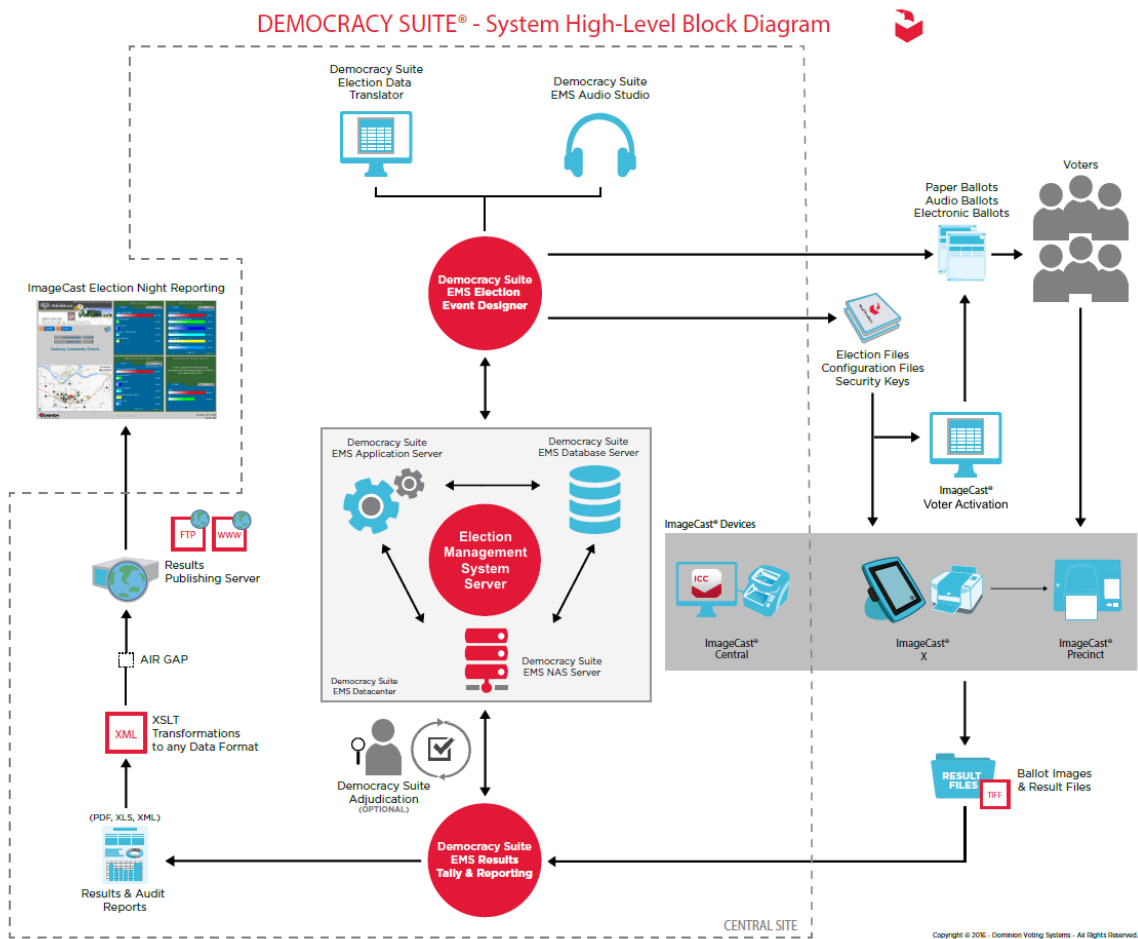**Table 1-22. Voting System Support Equipment**

Component	Serial Number
COTS Hardware	
Dell Ultrasharp 24" Monitor U2414H	1PVZ152, 62VZ152
Dell Monitor KM632	FYNTY12, CKX6Y12, CN-0524N3-72461-59H-6U5U
Dell Monitor P2414Hb	CN-0524N3-74261-5AH-2DNU, CN-0524N3-74261-5AH-2DAU
ABLENET Jelly Bean Twist 10033400	[DVS-ablenet-001] thru [DVS-ablenet-014]
Tecla ShieldDos KDL-02001	[DVS-Tecla-001] thru [DVS-Tecla-006]
Brother Laser Printer HL-L2300D	U63878K5N281729
Dell DVD Multi Recorder GP60NB60	[DVS-Dell-001]
Dell Latitude E7450 Laptop	30GFH72, 369FH72
Maxim iButton Programmer DS9490R# with DS1402	[DVS-Maxim-001] thru [DVS-Maxim-005]
APC Smart-UPS SMT1500	3S1536X06436, 3S1536X06475, 3S1536X06461, 3S1536X06485, 3S1536X06484, 3S1536X06322, 3S1536X07467, 3S1536X06484, 3S1536X06272, 3S1536X06201, 3S1536X07305, 3S1504X00395, 3S1504X00396
Dell X1008 Network Switch	4R8XX42, 26SXX42, 63SXX42
Dell X1018 Network Switch	6TN7Y42
Dell X1026 Network Switch	83D9Y42
Enabling Devices Sip and Puff	[DVS-enabling devices-001] - [DVS-enabling devices-002]
Cyber Acoustics Headphones ACM-70	[DVS-cyber acoustics-001] - [DVS-cyber acoustics-005]
4-Way Joystick Controller S26	PME QC 1550 12, [DVS-JOY-001], [DVS-JOY-002]
Enablemart # 88906 Rocker (Paddle) Switch	[DVS-paddle-001]
Dell PowerConnect 2808 Network Switch	3S2P0Z1
IOGEAR SDHC/microSDHC 0U51USC410 Card Reader	8632, 8633
Lexar USB 3.0 Dual-Slot Reader	24020845007435
Hoodman Steel USB 3.0 UDMA Reader 102015	[DVS-hoodman-001]
ATI Handset	98862010101-035, 98862010103-075, 00659010100-046, 98862010100-232
ATI-USB Handset	02440010100-011, [DVS-ATIUSB-001], [DVS-ATIUSB-002]

Table 1-22. Voting System Support Equipment *(continued)*

Component	Serial Number
ACS PC-Linked Smart Card Reader ACR39U	RR374-006272, RR374-010356, RR374-010365
Lexar Professional CF Card Reader Workflow CFR1	24050361400108, 24050361401994, 24050361401991, 24050361401990
CORCOM Filter P/N#: 15EMC1	[DVS-CorcomEMIFilter-001]
Delta Filter P/N#: 16PDCG5C	[DVS-DeltaEMIFILTER-001]

1.1.3   Block Diagram

The system overview of the submitted voting system is depicted in Figure 1-1.

Figure 1-1. Democracy Suite 5.0 System Overview

1.1.4 System Limits

The EMS platform was tested in two deployable hardware configurations:

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

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

The system limits that Dominion Voting Systems has stated to be supported by the Democracy Suite 5.0 and that were tested as part of this test campaign are provided in the table below.

Table 1-23. Democracy Suite 5.0 System Limits by Configuration

Characteristic	Configuration Values		Limiting Component
	Standard	Express	
Ballot positions	462	462	Ballot
Precincts in an election	1000	250	EMS
Contests in an election	4000	250	EMS
Candidates/Counters in an election	40000	2500	EMS
Candidates/Counters in a precinct	462	462	Tabulator
Candidates/Counters in a tabulator	10000	2500	Tabulator
Ballot Styles in an election	4000	750	Tabulator
Ballot IDs in a tabulator	200	200	ICP
Contests in a ballot style	125	125	ICX
Candidates in a contest	462	231	EMS
Ballot styles in a precinct	5	5	Tabulator
Number of political parties	30	30	Tabulator
"vote for" in a contest	30	30	Tabulator
Supported languages in an election	5	5	Tabulator
Number of write-ins	462	462	Ballot

1.1.5 Supported Languages

During the test campaign, it was verified that the submitted voting system supported the following languages:

- Alaskan Native
- Aleut
- Athabascan
- Chinese
- English
- Eskimo
- Filipino
- French
- Hindi
- Japanese
- Khmer
- Korean
- Spanish
- Thai
- Bengali
- Vietnamese
- Native American
  - Apache, Jicarilla, Keres, Navajo, Seminole, Towa, Ute, Yuman

Support for all stated languages was verified; however, only English and Spanish language ballots were cast during the performance of functional testing. Additionally, one character based language (Chinese) was tested during System Integration Testing. The system limitation of five languages in a single election, was tested at the same time that support for all stated languages was verified.

1.1.6 Supported Functionality

During the test campaign, it was verified that the Democracy Suite 5.0 supported the following voting variations:

- General Election
- Closed Primary
- Open Primary
- Early Voting

- Partisan/Non-Partisan Offices

- Write-In Voting

- Primary Presidential Delegation Nominations

- Split Precincts

- Vote for N of M

- Ballot Rotation

- Provisional or Challenged Ballots

1.1.7 Deliverable Materials

This subsection lists the materials identified by the manufacturer as materials deliverable to the end user for the system being tested. ==*For a detailed listing of the individual files included in the ImageCast Precinct, ImageCast Central Count, ImageCast X, and Election Management System software deliverables, please reference Attachment C of this document.*==

Table 1-24. Voting System Deliverables

Material	Version	Description
ImageCast Precinct Firmware	5.0.1-US	ICP Software
ImageCast Central Count	5.0.1-0001	ICC Software
ImageCast X	5.0.6149.28963	ICX Software
EMS Adjudication ==Application==	5.0.0.17002	EMS Software
EMS Adjudication Service	5.0.0.17002	EMS Software
EMS Application Server	5.0.15.1	EMS Software
EMS Audio Studio	5.0.15.1	EMS Software
EMS Data Center Manager	5.0.15.1	EMS Software
EMS Election Data Translator	5.0.15.1	EMS Software
EMS Election Event Designer	5.0.15.1	EMS Software
EMS File System Service	5.0.15.1	EMS Software
EMS Results Tally and Reporting	5.0.15.1	EMS Software
Smart Card Helper Service	5.0.6165.23379	EMS Software
ImageCast Voter Activation	5.0.15.1	EMS Software
EMS Election Device Manager	5.0.6165.23355	EMS Software
Democracy Suite System Overview	5.0::==46==	TDP Document
Democracy Suite Configuration Management Plan	5.0::==275==	TDP Document
==Democracy Suite System Identification Guide==	==5.0::270==	==TDP Document==

Table 1-24. Voting System Deliverables *(continued)*

Material	Version	Description
Democracy Suite EMS System Installation and Configuration Procedure	5.0::76	TDP Document
2.09 Democracy Suite EMS System Maintenance Manual	5.0::91	TDP Document
Democracy Suite ImageCast Central Installation and Configuration Procedure	5.0::54	TDP Document
Democracy Suite ImageCast X Installation and Configuration Procedure	5.0::20	TDP Document
2.09 Democracy Suite ImageCast X System Maintenance Manual	5.0::35	TDP Document
2.10 Democracy Suite Personnel Deployment and Training Requirements	5.0::76	TDP Document
Democracy Suite EMS Election Event Designer User Guide	5.0::120	TDP Document
Democracy Suite EMS Results Tally and Reporting User Guide	5.0::70	TDP Document
Democracy Suite EMS Audio Studio User Guide	5.0::65	TDP Document
ImageCast X Ballot Marking Device User Guide	5.0::61	TDP Document
Democracy Suite ImageCast Printing and Finishing Specification	5.0::45	TDP Document
Canon imageFORMULA DR-G1130 DR-G1100 User Manual	---	TDP Document

1.2 References

- Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, Volume I, "Voting System Performance Guidelines", and Volume II, "National Certification Testing Guidelines"

- Election Assistance Commission Testing and Certification Program Manual, Version 2.0

- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 2.0

- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2006 Edition, "NVLAP Procedures and General Requirements (NIST Handbook 150)", dated February 2006

- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, "Voting System Testing (NIST Handbook 150-22)", dated May 2008

- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002

- Pro V&V, Inc. Quality Assurance Manual, Revision 7.0

- Election Assistance Commission "Approval of Voting System Testing Application Package" letter dated May 6, 2016

- EAC Requests for Interpretation (RFI) (listed on www.eac.gov)

- EAC Notices of Clarification (NOC) (listed on www.eac.gov)

- Dominion Voting Systems Technical Data Package *(A listing of the* ==Democracy Suite== *5.0 documents submitted for this test campaign is listed in Section 4.6 of this Test Plan)*

1.3   Terms and Abbreviations

This subsection lists terms and abbreviations relevant to the hardware, the software, or this Test Plan.

"ADA" – Americans with Disabilities Act 1990

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"DRE" – Direct Record Electronic

"EAC" – United States Election Assistance Commission

"EMS" – Election Management System

"FCA" – Functional Configuration Audit

"HAVA" – Help America Vote Act

"ICC" – ImageCast Central

"ICP" – ImageCast Precinct

"ICX" – ImageCast X

"ISO" – International Organization for Standardization

"NOC" – Notice of Clarification

"PCA" – Physical Configuration Audit

"QA" – Quality Assurance

"RFI" – Request for Interpretation

"TDP" – Technical Data Package

"UPS" – Uninterruptible Power Supply

"VSTL" – Voting System Test Laboratory

"VVSG" – Voluntary Voting System Guidelines

2.0 CERTIFICATION TEST BACKGROUND

2.1 Revision History

The Democracy Suite 5.0 is a new voting system that has not previously been tested to applicable federal standards in the EAC Program. The Dominion Voting Systems Democracy Suite 4.14-E system, previously certified by the EAC (Reference NTS Report No. PR036164-01 Rev. C, which is available for viewing on the EAC's website at www.eac.gov), contains various components of the system currently under test; however, in some instances these components were modified to meet the performance characteristics of the Democracy Suite 5.0 System. For components that were not modified, the TDP review that was previously performed was utilized to meet the requirements of the required TDP review. All updated portions of the TDP were subjected to a full TDP review as part of this test program.

2.2 Implementation Statement

The Implementation Statement document dated 04/18/16 (amendment date 10/17/16) for the system is contained in the Democracy Suite application for system testing.

3.0 TEST FINDINGS AND RECOMMENDATION

To evaluate the Democracy Suite 5.0 test requirements, 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 of evaluation, are described below:

Section 2: Functional Requirements

The requirements in this section were tested during the FCA and System Integration Test. This evaluation utilized baseline test cases as well as specifically designed test cases and included predefined election definitions for the input data.

Section 3: Usability and Accessibility Requirements

The requirements in this section were tested during the Usability and Accessibility Testing. This evaluation utilized baseline test cases as well as specifically designed test cases and included predefined election definitions for the input data. Pro V&V reviewed the results of Summative Usability Testing performed on the ICP and ICX components by Dominion to verify that the submitted test results were in Common Industry Format.

Section 4: Hardware Requirements

No previous examinations have been performed on the Democracy Suite 5.0. The voting system hardware was subjected to the tests specified in Section 3.1.1. Testing was performed by personnel verified by Pro V&V to be qualified to perform the test. Pro V&V utilized a third-party test facility for performance of the electrical and environmental tests. All pre/post-tests were conducted by Pro V&V personnel.

Section 5: Software Requirements

The requirements in this section were tested utilizing a combination of review and functional testing during the Source Code Review, TDP Review, and FCA.

Section 6: Telecommunications Requirements

The requirements in this section were tested utilizing baseline test cases as well as specifically designed test cases.

Section 7: Security Requirements

The requirements in this section were tested during the Source Code Review, Security Tests, and FCA.

Section 8: Quality Assurance Requirements

The requirements in this section were tested throughout the test campaign. This testing utilized a TDP Review in conjunction with the Source Code Review and PCA to determine compliance to the EAC 2005 VVSG requirements and the requirements stated in the Dominion technical documentation. The review of the Quality Assurance documentation focused on Dominion's adherence to its stated QA processes.

Section 8: Configuration Management Requirements

The requirements in this section were tested throughout the test campaign. This testing utilized a TDP Review in conjunction with the Source Code Review and PCA to determine compliance to the EAC 2005 VVSG requirements and the requirements stated in the Dominion technical documentation. The review of the Configuration Management documentation focused on Dominion's adherence to its stated CM processes.

3.1   Summary of Findings and Recommendation

3.1.1   Hardware Testing

The Democracy Suite 5.0 Voting System is a paper-based optical scan voting system with a hybrid paper/DRE option consisting of the following major components: the Election Management System (EMS), the ImageCast Central (ICC), the ImageCast Precinct (ICP), and the ImageCast X (ICX). The Democracy Suite is comprised of one proprietary hardware component (ICP), one COTS hardware component (ICC), and one integrated COTS component (ICX). All

EMS functions are managed by proprietary software running on COTS PCs/laptops/servers, which is excluded from hardware testing.

ICP – The ICP component was subjected to the full suite of hardware and electrical testing required by the EAC 2005 VVSG as well as Usability, Security, Maintainability, Availability, and Accuracy Testing.

ICX – The ICX component was subjected to the full suite of hardware and electrical testing required by the EAC 2005 VVSG as well as Usability, Security, Maintainability, Availability, Safety, and Accuracy Testing.

ICC – The ICC component is unmodified COTS equipment and was exempt from non-operational hardware testing. The ICC was subjected to Temperature/Power Variation Testing in addition to being utilized in functional and system level testing such as accuracy, volume and stress, and system integration during the test campaign.

A list of hardware tests, and the components which were subjected to each test, are listed below:

Electrical Tests:

- Electrical Power Disturbance – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP
- Electromagnetic Radiation – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP
- Electrostatic Disruption – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP
- Electromagnetic Susceptibility – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP
- Electrical Fast Transient – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP
- Lightning Surge – ICX (Samsung Note Pro, A-Value 15", & Avalue 21") including HP Printer, ICP
- Conducted RF Immunity – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP
- Magnetic Fields Immunity – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP
- Electrical Supply – ICX (Samsung Note Pro, A-Value 15", & Avalue 21") including HP Printer, ICP, ICC (DR-G1130)

Environmental Tests:

- Bench Handling – ICX (Samsung Note Pro, Avalue 15", & Avalue 21"), ICP
- Vibration – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP

- Low Temperature – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP
- High Temperature – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP
- Humidity – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP
- Temperature Power Variation – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP, ICC (DR-G1130),
- Acoustic – ICX (Samsung Note Pro, Avalue 15", & Avalue 21") including HP Printer, ICP

Summary Findings

Hardware Testing was performed at the TÜV SÜD Canada Inc. facility located in Ontario, Canada.

Electrical Testing was performed on the components listed above. The procedures and results for this testing are included in TÜV SÜD Canada Inc. EMC Test Report File#: 7169000900-001, presented in Attachment A. The test results from this testing are summarized below:

Standard/Method	Description	Criteria	Class/Level	Result
FCC 15.107 ICES-003 VVSG Vol. 1 4.1.2.9	Power Line Conducted Emissions	N/A	Class B	Pass
FCC 15.109 ICES-003 VVSG Vol. 1 4.1.2.9	Radiated Emissions	N/A	Class B	Pass
EN61000-4-11 VVSG Vol. 1 4.1.2.5	Electrical Power Disturbance	Normal Operation & No Data Loss	Various	Pass
EN61000-4-4 VVSG Vol. 1 4.1.2.6	Electrical Fast Transient	Normal Operation & No Data Loss	±2kV - Mains ±1kV - I/O	Pass
EN61000-4-5 VVSG Vol. 1 4.1.2.7	Lightning Surge	Normal Operation & No Data Loss	±2kV Line - Line ±2kV Line - Ground	Pass
EN61000-4-2 VVSG Vol. 1 4.1.2.8	Electrostatic Disruption	Normal Operation & No Data Loss	±8kV Contact ±15kV Air	Pass
EN61000-4-3 VVSG Vol. 1 4.1.2.10	Electromagnetic Susceptibility	Normal Operation & No Data Loss	10 V/m, 80 MHz – 1 GHz	Pass

EN61000-4-6 VVSG Vol. 1 4.1.2.11	Conducted RF Immunity	Normal Operation & No Data Loss	10 Vrms, 150 kHz – 80 MHz	Pass
EN61000-4-8 VVSG Vol. 1 4.1.2.12	Magnetic Immunity	Normal Operation & No Data Loss	30 A/m	Pass
Overall Result				Pass

Additionally, a Ground Continuity Test, a Leakage Test, and a Dielectric Strength Test were also performed on the EMI filter that was introduced during EMI testing to mitigate an issue concerning the Conducted Electromagnetic Emissions Test, with all results passing. The procedures and results for this testing are included in TÜV SÜD Canada Inc. Technical Report No. 7169001570-000, Rev. 1, presented in Attachment A. The rationale for this additional testing can be found in the Modifications for Compliance section of the TÜV SÜD Canada Inc. EMC Test Report No. 7169000900-002, Rev. 2, presented in Attachment A.

Environmental Testing was performed on the components listed above. The procedures and results for this testing are included in TÜV SÜD Canada Inc. Report/Quotation Number: PVV-5028.00 (CM380832205802.0). The test results from this testing are summarized below:

Shock - Bench Handling (MIL-STD-810D, 516.3, I-3.8)

Using one edge as a pivot, the opposite edge of the chassis unit was lifted until the face reached 45° with horizontal bench top, or 4 inches above bench top (whichever occurred first). This was repeated with each practical edge, of the same horizontal face. At the conclusion of testing an operational status check was performed. Result – PASS

Vibration – Basic Transportation (MIL-STD-810D, 514.3, I-3.2.1)

Vibration was performed at ambient/room temperature (20ºC +/-3 ºC) in the X, Y and Z axis at the levels identified below:

Axis	Profile
X	BREF.POINTS FREQ PSD VALU 10 .00013 20 .00065 30 .00065 78 .00002 79 .00019 120 .00019 500 .00001
Y	BREAKPOINTS FREQ PSD VALUE 10 .00650 20 .00650 120 .00020 121 .00300 200 .00300 240 .00150 340 .00003 500 .00015
X	BREAKPOINTS FREQ PSD VALUE 10 .01500 40 .01500 500 .00015

At the conclusion of testing an operational status check was performed. Test Result - PASS

Low Temperature - Storage (MIL-STD-810D, 502.2, II-3)

Samples were soaked at a temperature of -4ºF (-20ºC +/-3 ºC) for a duration of 4 hours, after which operation was confirmed by Pro V&V. Samples were not powered, and were soaked in their packaging for the duration of the test. They were removed from the boxes for operational verification after the test. Test Result – PASS

High Temperature - Storage (MIL-STD-810D, 501.2, I-3.2)

Samples were soaked at a temperature of 140ºF (60ºC +/-3 ºC) for a duration of 4 hours, after which operation was confirmed by Pro V&V. Samples were not powered, and were soaked in their packaging for the duration of the test. They were removed from the boxes for operational verification after the test. Test Result – PASS

Humidity – Hot/Humid (MIL-STD-810D, 507.2, I-3.2)

Samples were soaked as per Table 507.2-I, Hot-Humid (Cycle 1), for a duration of 240 hours (10 days), after which operation was confirmed by Pro V&V. Samples were not powered/operational, and were soaked in their packaging for the duration of the test, and were removed from the boxes for operational verification. Test Result – PASS

Temp-Power Variation Testing (MIL-STD-810D, 501.2/502.2)

Samples completed 85 hours as per the following environment profile:

1- Ramp to 10°C
2- Hold 10°C for 12 hours
3- Ramp to 35°C over 1 hour
4- Hold 35°C for 12 hours
5- Ramp to 10°C over 1 hour
6- Repeat until 85 hours cycling at profile is achieved
7- Ramp to 35°C over 1 hour
8- Hold 35°C for 12 hours
9- Ramp to 23°C over 1 hour
10- Hold for duration of test

Samples were powered and being operated by Pro V&V for the duration of the environmental profile, to confirm operation. Test Result – PASS

3.1.2 System Level Testing

The Democracy Suite Election Management System (EMS) consists of a set of applications responsible for all pre-voting and post-voting activities used in election definition and management process. The Democracy Suite EMS applications are as follows:

- EMS Election Event Designer

- EMS Results Tally and Reporting

- EMS Audio Studio

- EMS Adjudication Application

- EMS Adjudication Service

- EMS File System Service

- EMS Election Data Translator

- Smart Card Helper Service

- ImageCast Voter Activation

- EMS Data Center Manager

- EMS Application Server*

- EMS Database Server*

- EMS NAS Server

- EMS Election Device Manager

The Democracy Suite 5.0 Voting System is a paper-based optical scan voting system with a hybrid paper/DRE option consisting of the following major components: The Election Management System (EMS), the ImageCast Central (ICC), the ImageCast Precinct (ICP), and the ImageCast X (ICX).

Pro V&V reviewed the manufacturer's program analysis, documentation, and module test case design and evaluated the test cases for each module with respect to flow control parameters and entry/exit data.

Component Level Testing was implemented during the FCA for each component and subcomponent. During the source code review, compliance builds, and security testing, Pro V&V utilized limited structural-based techniques (white-box testing). Additionally, specification-based techniques (black-box testing) were utilized for the individual software components.

Pro V&V defined the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performed as expected, the results were accepted. If the system did not perform as expected, an analysis was performed to determine the cause. If needed, the test was repeated in an attempt to reproduce the results. If the failure could be reproduced and the expected results were not met, the system was determined to have failed the test. If the results could not be reproduced, the test continued. All errors encountered were documented and tracked through resolution.

3.1.2.1 Functional Configuration Audit (FCA)

System Level testing was implemented to evaluate the complete system. This testing included all proprietary components and COTS components (software, hardware, and peripherals) in both the EMS Standard and EMS Express system configurations. For software system tests, the tests were designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases were prepared independently to assess the response of the hardware and software to a range of conditions.

The FCA is a verification of every system function cited in the manufacturer's documentation. It verifies the accuracy and completeness of the system Technical Data Package (TDP). Also the various options of software counting logic that are claimed in the manufacturer's documentation were tested during the system-level FCA. Generic test ballots or test entry data for the ICP's DRE voting, representing particular sequences of ballot-counting events, were used in conjunction with other testing to examine the counting logic during this audit. Copies of all of the manufacturer's test cases generated for module or unit testing, integration testing, and system testing were submitted to the VSTL for review. Relevant FCA results also acted as exploratory assessments for other testing.

For this campaign FCA testing included several exhaustive paths applied in concert:

- FCA-VVSG Testing: Each component of the system was evaluated against a standardized test-case suite centered upon requirements stated in the VVSG and administered through a test-management software tool. All applicable tests-cases were performed while any non-applicable test-cases (e.g. VVPAT requirements, etc.) were logged as "n/a" for substantiation. The system operations and functional capabilities were categorized in the tool as follows by the phase of election activity in which they are required:

  o Pre-voting Capabilities: These functional capabilities are used to prepare the voting system for voting. They include ballot preparation, the preparation of election-specific software (including firmware), the production of ballots, the installation of ballots and ballot counting software (including firmware), and system and equipment tests.

  o Voting System Capabilities: These functional capabilities include all operations conducted at the polling place by voters and officials including the generation of status messages.

  o Post-voting Capabilities: These functional capabilities apply after all votes have been cast. They include closing the polling place; obtaining reports by voting machine, polling place, and precinct; tabulation of paper ballots at the central location; accumulation of results from all voting methods; obtaining consolidated reports; and obtaining reports of audit trails.

- FCA-Limits Testing: System limits as defined in the TDP and/or COTS manuals were tested for the DRE, the BMD, and paper ballot operational setups.

- FCA-Claims Testing: System user instructions and procedures found in the TDP were followed to verify their accuracy and completeness. In addition any functional claims discovered in the TDP that were not specifically examined in other areas or that were items of interest were also tested.

- FCA-Mapping: All functional paths (buttons, dropdowns, etc.) were mapped by qualified VSTL personnel, to help ensure all functional options had been noted and exercised. Any items of interest were examined and/or tested.

  Issues found during these efforts were tracked using an issue tracking software program and issue tracking spreadsheets.

Summary Findings

At the conclusion of the test campaign, it was determined that all issues had been communicated to Dominion and successfully addressed.

3.1.2.2 TDP Review

In order to determine full compliance with the EAC 2005 VVSG, three phases of TDP review were conducted:

- Initial TDP Review: The first review was performed to determine whether the TDP submitted was complete enough to perform the TDP review. This was an abbreviated review. Each document was read to determine whether it provided enough description of the submitted voting system components and whether it at least generically addressed VVSG requirements. The results of the review were used in determining contractual requirements for the test campaign.

- Compliance Review: This review was conducted on a document-by-document basis to determine if every Federal or manufacturer-stated requirement had been met based on the context of each requirement. This review did not address consistency or completeness of documents. The review was more complex than the initial TDP review. Results of the review of each document were entered on the TDP Review Checklist and were reported to the manufacturer for disposition of any anomalies. This process was ongoing until all anomalies were resolved. Any revised documents during the TDP review process were compared with the previous document revision to determine changes made, and the document was re-reviewed to determine whether subject requirements had been met.

- Consistency/Completeness Review: The third TDP review was completed after the review for compliance had been performed. This review was to ensure the information included in the TDP documents was consistent across documents, especially in component naming, software and firmware versioning, and the hardware, software, and firmware included with the voting system submitted for testing. As with the other TDP reviews, the TDP Review Checklist was utilized to report any anomalies to the manufacturer for resolution, if required. The TDP review continued until all anomalies had been satisfactorily resolved.

A listing of all documents contained in the Democracy Suite 5.0 TDP is provided in Table 3-2.

Table 3-2. TDP Documents

Document Number	Description	Version
Adjudication Documents		
2.05	Democracy Suite Adjudication Software Design and Specification	5.0::50
2.08	Democracy Suite Adjudication System Operation Procedures	5.0::101
2.09	Democracy Suite Adjudication System Maintenance Manual	5.0::36
Democracy Suite Documents		
2.02	Democracy Suite System Overview	5.0::39
2.06	Democracy Suite System Security Specification	5.0::467
2.07	Democracy Suite System Test and Verification	5.0::127
2.10	Democracy Suite Personnel Deployment and Training Requirements	5.0::76
2.11	Democracy Suite Configuration Management Process	5.0::275
2.12	Democracy Suite Quality Assurance Program	5.0::102

Table 3-2. TDP Documents *(continued)*

Document Number	Description	Version
2.13	Democracy Suite System Change Notes	5.0::21
---	Democracy Suite System Identification Guide	5.0::270
EMS Documents		
2.03	Democracy Suite EMS Functional Description	5.0::297
2.05	Democracy Suite EMS Software Design and Specification	5.0::249
2.08	Democracy Suite EMS System Operations Procedures	5.0::653
2.09	Democracy Suite EMS System Maintenance Manual	5.0::91
---	Democracy Suite EMS System Installation and Configuration Procedure	5.0::76
ImageCast Central Documents		
2.03	Democracy Suite ImageCast Central Functionality Description	5.0::116
2.05	Democracy Suite ImageCast Central Software Design and Specification	5.0::62
2.08	Democracy Suite ImageCast Central System Operation Procedures	5.0::146
---	Democracy Suite ImageCast Central Installation and Configuration Procedure	5.0::54
ImageCast Precinct Documents		
2.03	Democracy Suite ImageCast Precinct Functionality Description	5.0::147
2.04	Democracy Suite ImageCast Precinct System Hardware Specification	5.0::115
2.04.1	Democracy suite ImageCast Precinct System Hardware Characteristics	5.0::68
2.05	Democracy Suite ImageCast Precinct Software Design and Specification	5.0::124
2.08	Democracy Suite ImageCast Precinct System Operation Procedures	5.0::241
2.09	Democracy Suite ImageCast Precinct System Maintenance Manual	5.0::98
---	Usability Test Report of ImageCast Precinct 5.0 With 36 Participants for VVSG 1.0	5.0::14
ImageCast X Documents		
2.03	Democracy Suite ImageCast X Functionality Description	5.0::31
2.05	Democracy Suite ImageCast X Software Design and Specification	5.0::49
2.08	Democracy Suite ImageCast X System Operation Procedures	5.0::93
2.09	Democracy Suite ImageCast X System Maintenance Manual	5.0::35
---	Democracy Suite ImageCast X Installation and Configuration Procedure	5.0::20
---	Usability Test Report Of ImageCast X 5.0 With 36 Participants for VVSG 1.0	5.0::13

Table 3-2. TDP Documents *(continued)*

Document Number	Description	Version
	User Guides	
---	Democracy Suite ImageCast Adjudication User Guide	5.0::80
---	Canon imageFORMULA DR-G1130 DR-G1100 User Manual	---
---	Democracy Suite Election Device Management User Guide	5.0::11
---	Democracy Suite EMS Audio Studio User Guide	5.0::65
---	Democracy Suite EMS Election Data Translator User Guide	5.0::54
---	Democracy Suite EMS Election Event Designer User Guide	5.0::120
---	Democracy Suite EMS Mobile Ballot Production User Guide	5.0::20
---	Democracy Suite EMS Results Tally and Reporting User Guide	5.0::70
---	Democracy Suite ImageCast Central User Guide	5.0::79
---	Democracy Suite ImageCast Precinct User Guide	5.0::39
---	Democracy Suite ImageCast Voter Activation User Guide	5.0::18
---	ImageCast X Ballot Marking Device User Guide	5.0::61
---	Dell Latitude E7450 Owner's Manual	---
---	SID-15V-Z37-A1R User Manual	Rev. 1.0
---	SID-21V-Z37-A1R User Manual	Rev. 1.0
---	Samsung GALAXY Note PRO Android Tablet User Manual	---
	Supplementary Documents	
---	AT4 Wireless Test Report No. (NIE) 39698RSE.001 (Tecla Shield)	---
---	Cyber Acoustics ACM-70B Stereo Headphones Product Sheet	---
---	Democracy Suite ImageCast C++ Coding Standard	5.0::14
---	Democracy Suite C# Automated Code Review Process	5.0::9
---	Dell Latitude E7450/Latitude 7450 Regulatory Compliance Sheet	---
---	Dell OptiPlex 9020 AIO Regulatory Compliance Sheet	---
---	Dell OptiPlex 9030 AIO Regulatory Compliance Sheet	---
---	Dell Networking X-Series Specification Sheet	Ver. 1.9
---	Dell OptiPlex 9020 All-in-One Technical Specification Sheet	---
---	Dell OptiPlex 9030 All-in-One Technical Specification Sheet	---
---	Dell B2360d and B2360dn Brochure	---
---	Dominion Voting Systems Java Coding Standards	1.0
---	Dominion Voting Systems JavaScript Coding Standards	1.0

Table 3-2. TDP Documents *(continued)*

Document Number	Description	Version
---	Democracy Suite ImageCast Device Configuration Files	5.0::53
---	Democracy Suite ImageCast Printing and Finishing Specification	5.0::45
---	Democracy Suite ImageCast Total Results File Format	5.0::16
---	Democracy Suite ImageCast Precinct Election Definition Files	5.0::28
---	Democracy Suite ImageCast Precinct Extracting Firmware Contents	5.0::14
---	Democracy Suite ImageCast Precinct Firmware Update Procedure	5.0::25
---	Democracy Suite ImageCast Precinct Level One (L1) Maintenance Manual	5.0::39
---	Democracy Suite ImageCast Precinct Technical Guide	5.0::23
---	YEDU.E95462 Uninterruptible Power-supply Equipment Sheet	---
---	Dell Latitude E7440 Regulatory Compliance Sheet	Rev. A09
---	Dell PowerEdge R630 Regulatory Compliance Sheet	Rev. A10
---	Dell Precision T1700 MT Regulatory Compliance Sheet	Rev. A09
---	Dell PowerConnect 2808 Product Safety. EMC, and Environmental DataSheet	---
---	Dell PowerConnect 2816 Product Safety. EMC, and Environmental DataSheet	---
---	LAVA STS Product Family User Manual	Rev. A01
---	APC Smart-UPS 230V Product Information Sheet	---
---	SAMSUNG Android Tablet Health and Safety and Warranty Guide	---
Build Documents		
---	Democracy Suite EMS Software Build Document	2.3.1_8
---	Democracy Suite ImageCast Precinct Firmware Build and Install	5.0::42
---	ImageCast X Build	5.0.7

Summary Findings

- Initial TDP Review: The first review (Initial TDP Review) was performed to determine whether the TDP for the submitted system was complete enough to perform TDP review. Following this abbreviated review, it was determined that the TDP, as submitted, contained adequate information to begin the Compliance Review.

- Regulatory/Compliance Review: This review was conducted on a document-by-document basis to determine if every regulatory or customer-stated requirement had been met based on

the context of each requirement. This review did not address consistency or completeness of documents. The review was more complex than the initial TDP review.

- Complete/Final Review: It was verified during this review that all discrepancies noted had been successfully resolved.

3.1.2.3 Security Functions

The objective of the Security Testing was to evaluate the effectiveness of the voting system in detecting, preventing, recording, reporting, and recovering from security threats. To evaluate the integrity of the system, Pro V&V developed specifically designed test cases in an attempt to defeat the access controls and security measures documented in the system TDP ==as well verifying compliance to EAC RFI 2012-05==. A threat matrix was created to determine the risks and vulnerabilities. An evaluation of the system was accomplished by utilizing a combination of functional testing, source code review, and ==static code analyzers==. All findings were reported to the EAC and Dominion Voting Systems.

Summary Findings

During the execution of these test procedures, the system was inspected for various physical, logical, and administrative controls and measure that were in place to meet the objectives of the security standards which include: protection of the critical elements of the voting system; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief; identifying fraudulent or erroneous changes to the voting system; and protecting the secrecy in the voting process.

The test methods for performing the Security Testing were execution and review. The examiner reviewed the submitted TDP to verify that documented access and physical controls were in place. Following the documented procedures, the examiner configured the voting system for use and functionality to verify that the documented controls were in place and adequate and met the stated requirements.

Physical Security was tested by setting up the system as described in the TDP and then examining the effectiveness and comprehensiveness of physical security measures.

Administrative Security was tested by examining the system's documented security instructions and procedures for effectiveness and breadth.

Logical Security was tested as part of FCA testing by a recognized security expert who not only reviewed the physical and administrative testing outcomes, but performed the following tests on system components: Vulnerability Scans, SCAP Scans, and Physical Bypass Attempts.

Two configurations were tested; EMS Express and EMS Standard. EMS Express has all EMS software components installed on a workstation PC that may be connected to one or more additional workstations. In this configuration, the workstation acts as an EMS server. EMS Standard has the EMS server components installed on a single physical ==server== with EMS clients connected via a switch.

Any concerns noted were reported to the manufacturer and successfully addressed.

3.1.2.4 Source Code Review

Pro V&V reviewed the submitted source code to the EAC 2005 VVSG and the manufacturer-submitted coding standards using both Automated Source Code Review and Manual Review methods. Prior to initiating the software review, Pro V&V verified that the submitted documentation was sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

Summary Findings

- Automated Source Code Review: The Automated Source Code Review was performed during the EMS and ICX Compliance and Trusted Builds. No source code issues were found during the Automated Source Code review of both the ICX and the EMS.

- Manual Source Code Review: The Manual Source Code review was performed prior to the ICC and ICP Compliance and Trusted Builds. The Manual Source Code Reviews identified a number of issues which were reported to Dominion for resolution. A summary of these issues and the number of instances encountered is as follows:

    - Module over 240 lines in length – 4 instances

    - Code needs in-line comments – 5 instances

    - Implied Comparison is not allowed – 1 instance

    - Variable needs comment – 2 instances

    - Define needs comment – 1 instance

    - Return needs comment – 1 instance

    - Module needs purpose – 1 instance

    - Parameter needs comment – 3 instances

    - Incorrect file name in Header – 1 instance

    - Input parameter needs validation before use – 7 instances

- Compliance Build: The compliance build was performed following the compliance review. Once the compliance review was performed and the source was deemed stable enough to

proceed with testing, the source code and all additional packages were compiled into a Compliance Build.

- Trusted Build: The trusted build consisted of inspecting customer submitted source code, COTS, and Third Party software products and combining them to create the executable code. This inspection followed the documented process from the "United States Election Assistance Commission Voting System Test Laboratory Program Manual" Section 5.5 – 5.7. <mark>Performance of the trusted build includes the build documentation review. The Trusted Build was performed following the completion of the Functional Configuration Audit. See Attachment C of this document for details.</mark>

3.2   Anomalies and Resolutions

When a result is encountered during test performance that deviates from what is standard or expected, a root cause analysis is performed. Pro V&V considers it an anomaly if no root cause can be determined. In instances in which a root cause is established, the results are then considered deficiencies. <mark>A root cause was determined for each anomaly which made them deficiencies.</mark>

3.3   Correction of Deficiencies

Any violation of the specified requirement or a result is encountered during test performance that deviates from what is standard or expected in which a root cause is established is considered to be a deficiency. Deficiencies are logged throughout the test campaign in to Pro V&V tracking system (Mantis) and the EAC Virtual Review Tool (VRT) for disposition and resolution. All deficiencies encountered during the <mark>Democracy Suite</mark> 5.0 test campaign were successfully resolved and are listed in the table below.

Table 3-3. Deficiencies and Resolutions

VRT ID #	Deficiency	Resolution
341	The Temperature Power Variation test was performed on two ImageCast Precinct (ICP) optical scan tabulators. During Run 31 (Hour 31) the ICP unit with serial number AAFAJEL0352, ended the run short 1 ballot. The ballot counter on the ICP read 3099 total ballots cast, and the expected result was 3100 total ballot cast. The ballots were removed from both ICP ballot boxes and manually counted. Each ICP ballot box contained the expected 100 ballots.	Targeted testing was performed on the ICP unit to test for Paper Jams and instances of possible multifeeds as a result of using an election with multiple ballot sizes, with a total of 900 ballots being cast. <mark>This behavior was not replicated and all results were verified. The VSTL and the EAC agreed to attempt this targeted testing prior to moving forward with an additional higher volume test to try and replicate the issue.</mark> <mark>A regression test doubling the amount of ballots cast for a total of 17000 ballots were cast on the affected ICP unit. No issues occurred during this</mark>

		<mark>testing and the original behavior which occurred during the Temperature Power Variation Test did not occur again. All results were verified and accepted by the EAC allowing testing to continue forward. The Root Cause Analysis provided by Dominion determined the action could be repeated after many attempts using precise timing. The resolution was to change the messaging to be more explicit and informative to the end user during a Paper Jam and Casting of a ballot with no tabulator application code change required.</mark>
346	The EMS Election Event Designer application Version 5.0.12.1 displays an error message which says: "Ambiguous Configuration File," when importing the Device Configuration File (DCF) settings into an election	This issue occurred as the result of multiple DCF files being included in the EMS software build. A new software build of the EMS <mark>(ver. 5.0.13.15)</mark> was performed and was confirmed to only contain one DCF file. Regression testing was performed and DCF files imported properly into the election.
347	A ballot was inserted into the ballot slot on the ICP and a second ballot was inserted immediately after the first ballot was inserted. The first ballot was then rejected by the ICP and returned to the voter. No message was displayed on the ICP screen to notify the voter of the "error" condition which caused the first ballot to be returned to the voter.	A new source code release of the ICP <mark>(ver. 5.0.1-US)</mark> was built and loaded onto the ICP units. <mark>Dominion corrected a bug in the code to prevent this behavior which was verified during a functional regression test.</mark>
348	A ballot was inserted into an ICP unit. The ballot was returned to the voter as a "Misread ballot." The same ballot was then re-fed into the ICP and was accepted by the unit. Upon reviewing the Audit Logs however, the error itself is logged, but the fact that the ballot was returned to the voter was not present in the audit log entrie(s).	A new source code release of the ICP <mark>(ver. 5.0.1-US)</mark> was built and loaded onto the ICP units. <mark>Dominion corrected a bug in the code to prevent this behavior, which was verified during a functional regression test.</mark>
350	When voting in an Accessible (Audio) Voting Session on the ICP, the default English instructions say: "...For Cantonese, press the Red X shaped button". The election in which the issue occurred contains only the English and Spanish language. Cantonese is not part of the election. If the voter presses the Red X button, instructions and the ballot continue in English.	This issue was isolated to the default audio files included in the EMS software build. The incorrect files were replaced with corrected files in a new EMS Source Code release and a new build of the EMS <mark>(ver. 5.0.13.15)</mark> was performed. Functional Regression testing was performed on an ICP unit in an Accessible Voting Session. The audio files now say the

		correct language name.
		<mark>Pro V&V recommends that Dominion Voting Systems implement policies and procedures for Quality Control, to prevent this issue from occurring in the future.</mark>
351	When generating the Audit logs in EED, there appear to be "blank" entries in the Audit log PDF file. An entry will have a timestamp, but no user name, or audit information. These items usually have the same timestamp as the entry above the "blank" entry.	This behavior was identified as being a result of Multi-Threading being used when generating logs and reports. The "blank" lines occur as a result of the processing threads closing and notifying the centralized logging module that its operation has been completed. Dominion addressed this issue by adding a description of this behavior in the 2.03 EMS <mark>Functional</mark> Description TDP document.
352	Audit logs were exported from the ICX application version 5.0.6050.279, however, the logs ended abruptly during the middle of an audit log entry.

Multiple logs exported by the ICX have logs that end with a partial entry on the last line. When the next log in the sequence is opened however, the audit log does not continue from the end point of the previous log, so the last entry from the first log is incomplete. | This issue was addressed in a new ICX source code release which was built <mark>(ICX ver. 5.0.6149.28963)</mark> and installed on the ICX units. <mark>Dominion corrected a bug in the code to prevent this behavior. This change was verified during a functional regression test, which verified that a complete export of the audit logs occurred, and that the audit logs were not truncated.</mark> |
| 353 | When voting an Audio Ballot on the ICP using a binary input device, increasing the volume to maximum then increasing the volume more, causes the audio to "loop" back around to the low volume settings, which is 20db, which is too silent to be heard. The volume can be increased back to higher levels, however the volume can only be increased at certain points in the instructions, which at 20db are too quiet to hear.

Additionally, the instructions for increasing the volume are unclear, and lack the required information. The first issue regarding the unclear instructions, is that the voter is never notified that increasing the volume multiple times, causes the volume to loop back around. The second issue regarding the unclear instructions is that the instructions say that using the (control method) of choice, can be used to CHANGE the volume. This may be | This issue was addressed by changing the ICP Device Configuration File (DCF) to allow the minimum volume to be set to a specific value much closer to the initial volume. Additionally the instructions were clarified to avoid possible confusion. These changes were included in a new source code release which was built <mark>(EMS ver. 5.0.13.15)</mark> and then tested during Functional Regression testing to confirm the changes. |

	confusing to some voters as using a binary input can only INCREASE the volume, as the binary input requires this.	
354	When voting an Accessible (Audio) ballot on the ICP, if a voter deselects a candidate (choice), the audio playback which says that the candidate (choice) has been deselected, is pronounced incorrectly. The audio playback says: "[Your choice] has been "DEH-selected."	This issue was identified as a Common/Static Audio file which had an incorrect pronunciation of the word "Deselected." A properly pronounced audio file was included in a new source code release (EMS ver. 5.0.13.15). The issue was then tested during functional regression testing and the pronunciation was confirmed to be correct.
355	If a user attempts to remove a "Base/Audio Language Profile" from a Choice Prototype in an election, an unhandled exception occurs.	This issue was identified as a source code issue. A new source code release was submitted and built (EMS ver. 5.0.13.15). This issue was tested during Functional Regression testing, and the unhandled exception no longer occurs.
356	When performing the Translation activities on an election, Elector Groups were selected for translation. An elector group was selected, and the Content Type was set to RTF Text. RTF Text was then edited, and changes saved and refreshed. However, the RTF Text set for the Elector Group was ignored by the system. Therefore, the Elector Group could not be properly translated for both Audio Languages.	This issue was identified as a source code issue and an attempt was made to address the issue in the EMS Version 5.0.14.1. The item was tested during functional regression, and identified to be working. However, during System Integration Testing an election with a larger number of Elector Groups was being designed, and the issue presented itself again. After further testing it appeared as though the original issue was partially fixed, however with multiple elector groups, the original behavior would manifest itself in a majority of the elector groups with some groups working as intended.

A new build of the EMS was performed, version 5.0.15.1, and regression testing was performed. Using an election with multiple Elector Groups, RTF Styling of Elector Group Translations was performed on each of the 5 groups. All 5 groups were able to be properly translated using RTF Styling, without issue. |
| 357 | In the Translation menu, audio was generated | This issue has been identified as a |

	for a Measure Contest. The audio was generated then played back in the Translation Menu Settings window. When the audio was played back, the audio contained the contest name, Vote For value, and included the Referendum text. The audio was then regenerated by pressing the Generate Audio button in the same window, then the audio playback was started. This time, the audio contained only the Contest Name and Vote For value, with the Referendum Text content not being present.	combination of discrepancy #359, and an inadvertent configuration mistake made as a result of tester error, during setup of the EMS Server. Issue #359 prevented the user from properly configuring and setting up the Measure Contests for proper audio generation. The configuration mistake was related to an extra license key (a license for the Port Concurrency option) being registered with the Cepstral Voices application, which caused the system to have difficulties properly generating the audio. The Configuration Mistake was remedied and no longer presents an issue. Issue #359 was addressed in a new Source Code release for the EMS (ver. 5.0.13.15). The new build of the EMS was loaded, and functional regression testing was performed. Functional Regression testing identified that this issue is no longer present.
358	While voting an audio ballot on the ICX using the ATI handset, the voter was unable to Pause or Resume audio playback using the ATI.	This issue was addressed by adding a capability to pause the audio on the ICX units by pressing the Help button on the ATI handset. Once the audio is paused, the voter can then return to the ballot at which point the audio file being played when the audio was paused, is repeated from the beginning of the audio file. This issue was verified to be resolved during Functional Regression testing. This was addressed in a new build of the ICX ver. 5.0.6149.28963.
359	When attempting to translate a Referendum contest in the EED application, the Title and Description radio buttons are available to allow for these items to be defined and audio generated separately. However, when the Title or Description radio buttons are selected, they do not allow for these items to be recorded separately, as they do not appear to affect the information being translated.	This was identified as an issue with the EMS Source Code. A new source code release was submitted and built (EMS ver. 5.0.13.15). Functional Regression testing was performed to verify that this issue had been fixed and that the Title and Description radio buttons worked as intended.
360	During Volume and Stress Testing, the System Limits Election was loaded onto ImageCast Precinct Optical Scan Tabulators, and ballot test decks were cast and election results were generated. While attempting to import these	This item was identified as a Source Code Issue. A new build of the EMS was performed. Using EMS version 5.0.13.15, the results were able to be imported into the RTR application

	election results into the EMS Results Tally and Reporting (RTR) application, an error message displayed which stated: Errors: -Unable to retrieve data using query The EMS Event logs from the Event Viewer, contain an event which says: "EmsLogger: Operation failed when calling Win32 API with error code 158. The segment is already unlocked Project: User: Thread: 86"	without issue. After the Trusted Build of the EMS was performed, regression testing was performed on this issue a second time, to ensure that the issue was no longer present in the software. The results were able to be imported in the RTR application version 5.0.15.1 without issue.
361	The System Limits election results for ICP were imported into the RTR application. This consisted of 4000 ballots covering the 4000 possible ballot styles, and was comprised of 20 separately defined ICP tabulators. The 20 ICP tabulators were selected using the Report Filtering options in the Election Summary Report window. When the report generation process was started, the animation that indicates that report generation is in progress began, however report generation never completed. The report window in RTR displayed an error message which said: "Report processing has been canceled by the user. (inProcessingAborted)"	This issue occurred as a result of the large amount of data being processed, causing the Reporting Service to timeout. The multiple ICP Tabulators (with extremely large amounts of associated voting data) being included in a single report caused the Report to take over 30 minutes (the default report timeout setting) for the report to generate. Thus the process was cancelled by the system. To address this, information was added to the system documentation which states that it is recommended that a maximum of 5 tabulators are selected in the Report Filtering options in order to avoid a Report Generation Timeout from occurring.
362	The ICX application crashed while voting a ballot in the Maximum Contests Election used during Volume and Stress Testing. The user was making vote selections, when the ICX application crashed and notified the user that something went wrong, and instructed them to seek administrative assistance. The user was required to press the Continue button, at which time the application restarted. Instead of being able to start a new voting session using a voter activation card, the user was required to access the poll worker functions of the ICX using a Poll Worker Card. At this time the user was required to select the desired tabulator, decrypt the election files, then "open polls". At this point the user was able to activate a new ballot, for marking on the ICX.	This issue occurred as a result of an ICX source code issue. A new source code release was provided and built. The issue was isolated to a single file in the ICX Source code. The original Source Code file which contained the issue was compared to the same file from the new source code drop. A direct comparison of these files was performed and inspected by qualified Pro V&V personnel to verify the changes. Using the new ICX build (ver. 5.0.6149.28963), functional regression testing was performed which verified that the issue no longer occurred.
363	While generating the Election Summary Report for the ICC in the System Limits Election, the generated report preview was incomplete. The report preview ended	This issue was identified as being caused by the RDL files which are used for Report Generation using the SQL Reporting Services. The RDL

	displaying the 57th Subdivision contest, when in fact the last contest in the report was the 320th Subdivision contest. Additionally, the generated report preview listed the page values as "1 of 1" when in fact the correct value would be "1 of 447."	file installed at the time was not properly processing page breaks, thus causing the report to not only be truncated, but also caused the page view counter to incorrectly read 1 of 1. A new RDL file was supplied which addressed these issues with properly formatted page breaks. The RDL file was updated in the EMS, and the Election Summary Reports were regenerated, and the Report Preview properly showed all of the contests and the page number value in the preview window was formatted correctly. This RDL file was subsequently included in a new build of the EMS Source code ==(ver. 5.0.15.1)==.
364	An attempt was made to generate an Audit Log Report of user activity in the EED application, for the System Limits Election. The Audit Log Report failed to generate however, due to an unhandled exception occurring in the .NET framework. This behavior occurred when there were a significant number of log entries included within the selected time period for which the Audit Log Report was to be generated.	This issue was identified as being caused by a limit in the EED application, limiting the number of rows in an Audit Log Report to 1,000,000. For this issue specifically, the issue was caused by a limit in the PDF reporting format, which limits the number of rows to 50,000. Information regarding these limits was added to the EMS EED User Guide. The included information discusses these limits and instructs the user to use filter settings to reduce the number of rows in the report, so that it will generate correctly.

ATTACHMENT A

(Hardware Test Reports)

ATTACHMENT B

(Warrant of Accepting Change Control Responsibility)

1201 18TH STREET, SUITE 210 DENVER, CO 80202

December 1, 2016

Mr. Ryan Wilson   *sent via electronic transmission*
Project Manager
Pro V&V
700 Boulevard South, Suite 102
Huntsville, AL 35806
Email:Ryan.Wilson@provandv.com

RE: WARRANT OF ACCEPTING CHANGE CONTROL RESPONSIBILITY

Dear Mr. Wilson:

Dominion Voting Systems, Inc. (Dominion) accepts its responsibility to ensure that any system bearing the US Election Assistance Commission (EAC) mark of certification, or otherwise represented as EAC certified, is configured consistent with the system certified by the EAC and the EAC certification documentation. Any modifications by Dominion to such systems will have been authorized by the EAC as a certified modification or de minimis change.

Sincerely,

Ian S. Piper
Director, Federal Certification
Dominion Voting Systems, Inc.

ATTACHMENT C

Trusted Build

The Democracy Suite 5.0 Voting System Trusted Build was performed using the steps described in section 5.5 of the EAC Voting System Testing and Certification Program Manual, Version 2.0. The Trusted Build yielded the following software outputs which are described below along with their associated Filenames and Hash Values in SHA 256 format:

EMS Version 5.0.15.1 – The EMS trusted build was performed using the "Democracy Suite EMS Software Build Environment Install Document for EMS Suite" document Version 2.3.1_8, dated 11/08/2016, provided by Dominion Voting Systems. The EMS build includes the following components: EMS Version 5.0.15.1, Adjudication Version 5.0.0.17002, and ICC Version 5.0.1-0001. The trusted build yielded the following output files and their associated Hash Values:

- **Democracy_Suite_5.0.15.1.iso**
  SHA256 - 66d88a02406ce87220b3d807c344bb143f9788e69f8b1c293108f5421235557e

  - Adjudication**DVS Adjudication Services Setup.msi**
    SHA256 - ad773d096a13e3277b97fda425794761a227c1b8241e102b81713674867a5197
  - Adjudication**DVS ImageCast Adjudication Client Setup.msi**
    SHA256 - 57894888a1f668232a5213cec53340683c244a0e94079d67223bf1d6cde9465d
  - Adjudication**InstallWithLogging.bat**
    SHA256 - 027ad0e8e4d35181b54988dfd38b9d69fcfb4b365e8300b134714171f5784bcb
  - EdmAdmin**EdmInstaller.msi**
    SHA256 - 6406845dfe3a30361a926484580c49ffae29e40a9b8a0aadebf1d0b2141f51f0
  - EdmAdmin**setup.exe**
    SHA256 - 9ce8595f59c6f15ae616d615cbdfb42bc3197d50ddf50854b455ff27283cd39c
  - EMSAPPS\\x64**APPS_FED_CERT_Setup_x64.msi**
    SHA256 - 0c23d91b32bfa5f8463585bc87a395901ef7e498953e6c1372d7a0f31a734ae4
  - EMSAPPS\\x64**setup.exe**
    SHA256 - 1018ee1798cc19a25371e8dc575d9bff49bb7ba23c6bddd63b97f7bf3d78a5b9
  - EMSAS\\x32**EMSAudioStudioSetup.msi**
    SHA256 - fe614dc80f1c367c4a188e0cda4f66301dfaf9c510ef39ca5725dc21a7ca1352
  - EMSAS\\x32**setup.exe**
    SHA256 - 3139eafb12f385f55f28271f65c1ae178497c23d4e0cbfe9ac3a969c51716d96
  - EMSDCM\\x32**DemocracySuiteEMS_DCM.exe**
    SHA256 - f265505431445e5578bf0bdbf15a482c9693227bcebbebe9bdbcb710b67e1199
  - EMSDCM\\x32**DemocracySuiteEMS_DCM.exe.config**
    SHA256 - 8c1b006dbd52069dd23b864a5bbcb2a125340b80857185eb5ef2501c47173a4c
  - EMSDCM\\x32**DVS.Utilities.Common.dll**
    SHA256 - a1d429119ca80e3e8decfaadc5fb583ae0bea504c255d00eba56a71df52ad615
  - EMSDCM\\x32**DVS.Utilities.MSWinManager.dll**
    SHA256 - 5213286a9add05b5bb83924dcafefcb135ff828d752cc9678062a9604926ad04
  - EMSDCM\\x32**NLog.config**
    SHA256 - 1cf182c4496852131d5d85b68b3a14636dd487dbe446711a0c3a712a3b0d971a
  - EMSDCM\\x32**NLog.dll**
    SHA256 - e17aac589bd48a623857de7f8113bcae6f72e4fe4652ca615ffa1028353b246d
  - EMSDCM\\x32**Static.zip**

SHA256 - 506f3823dbeb6080112669caf97323e510bc906c3a2f239e9a467bcfd9d9e017

- ○ EMSEDT\x32**EDTSetup_x86.msi**
SHA256 - e5058497ea04f70dcf7d27384d2cf8333e7aa5303ed5f1c3ef4419f74485fb6a
- ○ EMSEDT\x32**setup.exe**
SHA256 - c263194f55a920ea17c4179104cd5d91890e74cd95297ddf12b19f4fa156a310
- ○ EMSEDT\x64**EDTSetup_x64.msi**
SHA256 - dec81d52420d7c45b34af56d078203bde2990a9098c9b9ca311dbd2ee1507be5
- ○ EMSEDT\x64**setup.exe**
SHA256 - 01b65ed106fc301d75ac5eacf98dc6d826de080fed58d1d194b56d994db94b82
- ○ EMSEED\x64**EED_FED_CERT_Setup_x64.msi**
SHA256 - 153f9439a4f73e116c58adcf675eb3a3687469904fe869417e686651b65c83cc
- ○ EMSEED\x64**setup.exe**
SHA256 - 82145930f18dada43943cc0c2cd246454e8732abaf9c7ff07ff11e06b46a9367
- ○ EMSFSS\x32**FSSSetup.msi**
SHA256 - f37c95b1372f6e5a7aca143219affbd3c4ee3bc41896b10b212a7d57def50b78
- ○ EMSFSS\x32**setup.exe**
SHA256 - 98086648dc146277a3038305bb3da942224346bb2efe88d20fdebe60c9b6113f
- ○ EMSICVA\x64**ICVASetup.msi**
SHA256 - 60f206af479045f5068809925923c1fc347bbb259356f6ad2b09d09ebaabd160a
- ○ EMSICVA\x64**setup.exe**
SHA256 - 73f261e9c5de9ab6ebdf1bb592bd39b032db367deaecdd6c635b690a498ae48b
- ○ EMSRTR\x64**RTR_FED_CERT_Setup_x64.msi**
SHA256 - 2cd2f8912cabfdf175e95cdd7486c5d64fac4ab59feb0dea24f18ffb9b610132
- ○ EMSRTR\x64**setup.exe**
SHA256 - ee74ac3aa112b7f4149be5164476b1fc901eaa5a9c2e4cc1a5449c76450d7c78
- ○ ICC_INSTALL**ICCSetup_v5.0.1.0.exe**
SHA256 - af58ce39683e81a8d5c9a20c273609bf221ed32a4985804be28b3e7420320e64
- ○ SmartCardService**setup.exe**
SHA256 - 78dbba848bfcfdbbed9f3c27903c2278a39e7cc5576fd1033592a1cedcf3c410
- ○ SmartCardService**SmartCardServiceSetup.msi**
SHA256 - a446b51144b6f3bbd5fcfbedd0f70f05c741c10a8f9c362f575125b06861a5bf

ICP Version 5.0.1-US – The ICP trusted build was performed using the "ICP Firmware Build and Install" document Version 5.0::42, dated May 25, 2016, provided by Dominion Voting Systems. The trusted build yielded the following output files and their associated Hash Values:

- • ApplUpdateCard**cf2xx.sig**
SHA 256 - a64628837afee4f9a52354a012a35d37b609f66d0695fd436a66efe03e83b4b7
- • ApplUpdateCard**colilo.bin**
SHA 256 - 24104a477672cc20d37e0910ab27d715e7d87b0dad5d24c7a26aba3ea5fa4a30
- • ApplUpdateCard**firmUp.enc**
SHA 256 - 22dfef5fec2c315dafe5e13f273468860d9b0ef7bfa8604ca3959cf6b6e53874
- • ApplUpdateCard**image.bin.gz**
SHA256 - 1e9f545f3b9c91e00df5aa0914b3039f7db822d29e3a7c59a3bcf9546aeb4ba7

- Utilities**FirmwareExtract.enc**
  SHA 256 - 88ea876bea619b232c9114245ef3773e66c6e89c501475357d00748613779617
- Utilities**KeyExchange.enc**
  SHA 256 - 7d91ade815afa742ec33ea589f018bb57f49ec1a3d3fbd0bad8c22a9afd7aa09
- Utilities**keyGen.enc**
  SHA 256 - 27bd0f9530c2ed9b396f395bc576f5e6929ac7a54eeb6f24d767dbaa297f91ff
- Utilities**TechExtract.enc**
  SHA256 - e2f1237f8114da6f267ddfe7cff3a9620ba04662c12ec73990e26d1fed4b6b51

ICX Version 5.0.6149.28963 – The ICX trusted build was performed using the "ImageCast X Build" document Version 5.0.7, dated 10/28/2016, provided by Dominion Voting Systems. The trusted build yielded the following output files and their associated Hash Values:

- **ICX.apk**
  SHA 256 - db02c2b5555d5e624456c509594ef1f496cb838b02be3cff1bb6fc0ca242552a
- **icx_pkcs12.pfx**
  SHA 256 - e50b789fda4224d488b0943aee7f4bfb5ce350a6f67e7474042eb19e2e36440d
- **icx_pfx.pwd**
  SHA 256 - c598b8e0067d86a89431a82587f22975b10ecd02a96aad5999649483cc5dbdd0

ATTACHMENT D

(As-Run Test Plan)