



---

Test Report of  
EAC 2005 VVSG Certification Testing  
Performed on Dominion Voting Systems 4.14-D

EAC CERTIFICATION NUMBER: DVS-DemSuite4.14-D

Issue Date: 11/19/2014

---

Prepared for: **Dominion Voting Systems, Inc.**  
1201 18th Street, Suite 210  
Denver, Colorado 80202

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



**SIGNATURES**

Approved by: Michael L. Walker Date: 11-19-14  
Michael L. Walker, Project Manager

Approved by: Frank Padilla Date: 11-19-14  
Frank Padilla, Program Manager

Approved by: Robert Hardy Date: 11/19/14  
Robert Hardy, Department Manager

Reviewed by: Bonda Mous Date: 11/19/14  
For Rick Davis, QA Manager



**TABLE OF CONTENTS****PAGE NO.**

<b>1.0</b>	<b>Introduction .....</b>	<b>6</b>
1.1	Testing Scope .....	6
1.2	Objective .....	8
1.3	Customer .....	8
1.4	References .....	8
<b>2.0</b>	<b>System Identification and Overview .....</b>	<b>9</b>
2.1	System Overview .....	9
2.2	System Limits .....	15
2.3	Hardware .....	15
2.4	Software .....	17
2.5	Test Support Materials .....	23
2.6	Vendor Technical Data Package .....	23
2.7	Deliverable Materials .....	25
<b>3.0</b>	<b>Test Background .....</b>	<b>25</b>
3.1	General Information .....	25
3.2	Certification Testing Scope .....	26
3.3	NTS Quality Assurance .....	26
3.4	Test Equipment and Instrumentation .....	27
3.5	Terms and Abbreviations .....	27
<b>4.0</b>	<b>Test Findings and Recommendations .....</b>	<b>29</b>
4.1	Source Code Review .....	29
4.2	Trusted Builds .....	30
4.3	Technical Data Package Review .....	31
4.4	Hardware Testing .....	32
4.4.1	Electromagnetic Radiation Test (FCC Part 15 Emissions) .....	34
4.4.2	Conducted RF Immunity .....	34
4.4.3	Electrostatic Disruption Test .....	35
4.4.4	Electromagnetic Susceptibility Test .....	36
4.4.5	Temperature Power Variation Test .....	36
4.4.6	Electrical Supply Test .....	37
4.4.7	Maintainability .....	37
4.5	System Level Testing .....	38
4.5.1	Volume and Stress Test .....	38
4.5.2	System Integration Test .....	40
4.5.3	Usability and Accessibility Test .....	41
4.5.4	Data Accuracy Test .....	41
4.5.5	Physical Configuration Audit .....	42
4.5.6	Functional Configuration Audit (FCA) .....	43
4.5.7	Security Testing .....	43
4.5.8	Availability .....	43
4.6	Quality Assurance/Configuration Management Test .....	44
4.7	Discrepancies and Resolutions .....	44
4.8	Recommendation for Certification .....	45



**APPENDICIES**

**APPENDIX A – NTS CERTIFICATION As Run TEST PLAN NO. PR031072-01 ..... 46**

**APPENDIX B – TECHNICAL DATA PACKAGE (TDP) ISSUES REPORT ..... 124**

**APPENDIX C – DISCREPANCY REPORT ..... 132**

**APPENDIX D – INSTRUMENTATION SHEETS ..... 136**

**APPENDIX E – DURABILITY ATTESTATION ..... 159**

## 1.0 INTRODUCTION

Dominion Voting Systems submitted the Democracy Suite 4.14-D voting system to the U.S. Election Assistance Commission (EAC), application number DVS1402, for certification testing to the 2005 Voluntary Voting System Guidelines Standards (2005 VVSG). The modifications submitted were tested by NTS Huntsville (NTS) based on the “modified system” requirements set forth in section 4.4.2.3 of the EAC Testing and Certification Program Manual. The Democracy Suite 4.14-D Voting System is a modification to the previously certified Democracy Suite 4.14-B (Certification number: DemSuite-4-14-B). This National Certification Test Report (hereafter referred to as Test Report) presents the test results for testing of the Democracy Suite 4.14-D Voting System.

### 1.1 Testing Scope

The focus of this test campaign was to test the submitted modifications to the Democracy Suite 4.14-B voting system. This report is valid only for the system identified in section 2.0, System Identification and Overview. In addition, the modifications summarized in this scope section represent the only changes that were reviewed by NTS. Any changes, revisions, or corrections not listed in this report or made to the system after this evaluation are required to be submitted to the EAC for assessment.

The modifications submitted as part of the Democracy Suite 4.14-D Voting System are listed below:

1. Introduction of a new optional Adjudication application that allows review of voter intent on a ballot by ballot basis from the ImageCast Central device utilized during either absentee voting or post-voting activity phases.
2. In the EMS EDT module:
  - a. Added support for Cross-Over rule for Open Primaries into the spreadsheet.
3. In the EMS EED module:
  - a. Added the ability to override global settings for visual elements on the level of contest.
  - b. Added the ability to print graphics on selected contests in the candidate cell next to the candidate name.
  - c. Added the ability to generate a printer calibration sheet.
  - d. Added the ability to render crop marks on the ballot.
  - e. Added basic control of the layout and content of Write-in cells.
  - f. Extended election files for ICP with list of audio languages per Ballot Manifestation. Support for languages without textual representation, i.e. audio-only languages (Navajo)
  - g. Added new Office Type Party Preference.
  - h. Added ability to render Party Preference Contests on ballot.
  - i. Added ability to pass Party Preference Contest Information to tabulators via election files.
  - j. Added support for Undeclared Open Primaries into election files for tabulators.
  - k. Added ability to apply Cross-Over rule to Elector Groups.
  - l. Added support for creation of audio for Electoral Groups.
4. In the RTR module:
  - a. Added the ability to manage reporting profiles.
  - b. Added ability to import/export reporting profiles.
  - c. Added ability to handle Party Preference Contest results.
  - d. Added support for Undeclared Open Primary voting rules.

## 1.0 INTRODUCTION (CONTINUED)

### 1.1 Testing Scope (continued)

5. Across the system, added support for Open Primary elections.
6. Updated Dominion logos used in the applications.
7. In the ICP application:
  - a. Changes in program code for accessing thresholds in the battery voltage table.
  - b. Added support for languages without textual representation (i.e., Navajo).
  - c. Added Open Primary including the Pick-A-Party variant as required for WI.
  - d. Added support for Open Primaries including a DCF option to group per election group on the report tape.
  - e. Added DCF option to format Zero Totals tape separate from Results tape format.
8. In the ICE application:
  - a. Modified override default configuration. Override functionality enables improved configurability in the following ways: new translation adding, translation files overriding, and static audio files overriding.
  - b. Added MBS (Machine Behavioral Settings) options to report multiple write-in positions separately on zero reports and results reports, to provide Total Cast and Total Voters on the results transfer report, and to support an optional external COTS display for accessible voting sessions.
  - c. Improved presentations of voting rule error messages.
  - d. Added three additional languages to the install package: Hindi, Khmer, and Thai.
  - e. Added the ability to allow unit to scan and cast marked ballots while ballot selections are being made concurrently during an independent accessible voting session, using the ATI and the external COTS display.
  - f. Added the ability to enable an external monitor in the diagnostics menu.
  - g. Added additional options to the Print Head Servicing feature: frequency of print head cleaning, and number of servicing routines in the cleaning procedure.
  - h. In the ICE configuration, added an optional external COTS display to present the ballot image and the voter's selections during an accessible voting session.
  - i. Added a new main LCD panel.
  - j. The following logos were updated: Boot Startup Logo, Linux Startup Logo, Application Startup Logo, Verification Screen displays the new logo and a new monochrome hourglass widget.
  - k. Added ability to respond to cross-over ballot errors. New MBS options introduced:
    - Show/hide Partisan contests on the reports.
    - Show/hide Elector Groups on the reports.
    - Ballot Review improvements:
  - l. For open primaries, improvements were made to the Ballot Review function, where if there are no votes on entire Open Primary ballot, for the contest that belongs to an Elector Group, report it as "NO VOTES CAST."

## 1.0 INTRODUCTION (CONTINUED)

### 1.1 Testing Scope (continued)

- m. Support for Party Preference rule in Standard and AVS.
  - n. Added ability to report Party Preference Contest on the tape.
  - o. For support of audio notification when voting error occurs in Standard voting session, added MBS option to enable/disable audio and added MBS option for volume adjustment.
  - p. Modified listing of audio languages at the beginning of an AVS session to present according to 'global order' from EMS. The default audio language is always listed first.
9. In the ICC configuration:
- a. Added the Canon DR-G1130 scanner.
  - b. Added the ability to apply Open Primary voting rules (e.g. Stop on Cross Votes).
10. In the EMS Standard Server configuration, added a hardware RAID controller to improve the performance of that computer configuration utilizing the following parameters:
- Raid 1 (system partition) = (2) 1 TB mirrored drives. One disk needed for recovery.
  - Raid 10 (data partition) = (4) 1 TB striped drives. Two disks needed for recovery.

### 1.2 Objective

The objective of the Democracy Suite 4.14-D test program was to determine if the modifications to the previously certified system were compliant with the EAC 2005 VVSG requirements. The scope of the compliance review was derived from the system modifications detailed in the application submitted to the EAC by Dominion Voting Systems.

### 1.3 Customer

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

### 1.4 References

- Election Assistance Commission 2005 Voluntary Voting System Guidelines, Volume I, Version 1.0, "Voting System Performance Guidelines," and Volume II, Version 1.0, "National Certification Testing Guidelines," dated December 2005
- Election Assistance Commission Testing and Certification Program Manual, Version 1.0, expires July 2017
- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 1.0, expires July 2017
- 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

## 1.0 INTRODUCTION (CONTINUED)

### 1.1 Testing Scope (continued)

- 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))
- EAC Quality Monitoring Program residing on:  
[http://www.eac.gov/testing\\_and\\_certification/quality\\_monitoring\\_program.aspx](http://www.eac.gov/testing_and_certification/quality_monitoring_program.aspx)
- Dominion Voting Systems' Democracy Suite 4.0 VSTL Certification Test Report Rev. A (listed on [www.eac.gov](http://www.eac.gov))
- Dominion Voting Systems Democracy Suite 4.0 Technical Data Package
- Dominion Voting Systems' Democracy Suite 4.14 Modification VSTL Certification Test Report Rev. C (listed on [www.eac.gov](http://www.eac.gov))
- Dominion Voting Systems' Democracy Suite 4.14-A Modification VSTL Certification Test Report Rev. B (listed on [www.eac.gov](http://www.eac.gov))
- Dominion Voting Systems' Democracy Suite 4.14-B Modification VSTL Certification Test Report Rev. B (listed on [www.eac.gov](http://www.eac.gov))
- Dominion Voting Systems Democracy Suite 4.14-B Technical Data Package
- Dominion Voting Systems Democracy Suite 4.14-D Technical Data Package

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW

### 2.1 System Overview

Dominion Voting Systems' Democracy Suite 4.14-D Voting System is a paper-based, optical scan voting system. The voting system hardware consists of four major components:

#### Election Management System

The EMS consists of eleven components deployed as either front-end (client) applications or back-end (server) applications:

- Election Event Designer (client) – Integrates election definition functionality and represents a main pre-voting phase end-user application.
- Results Tally and Reporting (client) – Integrates election results acquisition, validation, tabulation, reporting and publishing capabilities and represents a main post-voting phase end-user application.
- Audio Studio (client) – 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.
- Data Center Manager (client) – Represents a system-level configuration application used in EMS back-end data center configuration.
- Election Data Translator (client) – Exports and imports data in a format suitable for rapid interaction with the Election Event Designer (EED).

## **2.0 SYSTEM IDENTIFICATION AND OVERVIEW (CONTINUED)**

### **2.1 System Overview (Continued)**

- Application Server (server) – Responsible for executing long running processes, such as rendering ballots, generating audio files and election files.
- Network Attached Storage (NAS) Server application (server) – Represents a file repository for election project file based artifacts, such as ballots, audio files, reports, log files, and election files.
- EMS Adjudication – Represents the server and client components responsible for adjudication, including reporting and generation of adjudicated result files from ImageCast Central tabulators.
- 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 File System Service – A stand-alone service that runs on client machines, enabling access to low level operating system API for partitioning CF cards and reading raw partition data on the ICP CF card.
- Database Server application (server) – A Relational Database Management System (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 status of polls.

The EMS is certified to be deployed in two separate physical hardware configurations:

- EMS Express hardware configuration – A stand-alone EMS system consisting of all software components installed on a single PC or laptop.
- EMS Standard hardware configuration – A closed-network EMS configuration consisting of EMS server components installed on a single server, Local Area Network (LAN) switch devices, and EMS client components installed on one or more PCs or laptops. In this configuration, all system components are interconnected in a client-server LAN environment.

(The remainder of this page intentionally left blank)

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (CONTINUED)

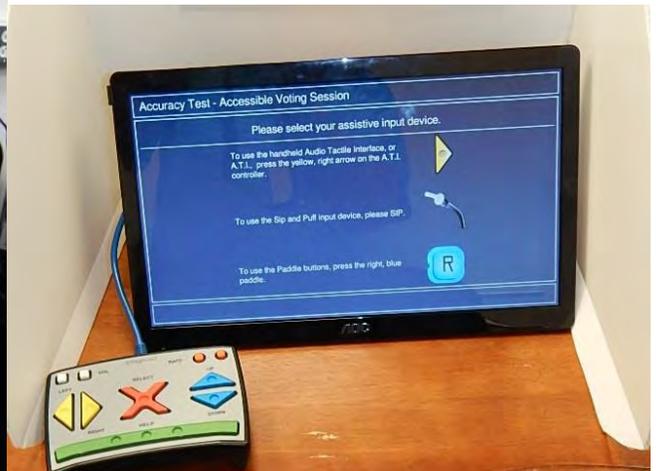
### 2.1 System Overview (Continued)

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

The ImageCast Evolution 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 and/or audibly via integrated headphones), and upon the voter's acceptance, deposit the ballots into the secure ballot box. The tabulator also features binary input devices which permit voters who cannot negotiate a paper ballot to generate a synchronously human and machine-readable ballot from elector-input vote selections (ADA sessions). The supported binary input devices include a Sip and Puff device, Foot Pedals, and Audio Tactile Interface (ATI). The addition of the external monitor added in this modification allows for simultaneous ADA and ballot casting sessions. In this sense, the ImageCast Evolution acts as a ballot marking device. These devices are interchangeable and may be shared between the ICE and ICP units. Additionally, ballots marked by the ImageCast Evolution may be subsequently scanned on the ImageCast Precinct or the ImageCast Central if a recount is required.



**Figure No. 1**  
**ImageCast Evolution**



**Figure No. 2**  
**External ADA Monitor**

(The remainder of this page intentionally left blank)

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (CONTINUED)

### 2.1 System Overview (Continued)

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

The ImageCast Precinct 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 the paper ballot. Like the ImageCast Evolution, the ImageCast Precinct also supports enhanced accessibility voting which is enabled by connecting the interchangeable Sip-and-Puff device, Foot Pedals, or Audio Tactile Interface (ATI).



**Figure No. 3**  
**ImageCast Precinct**

(The remainder of this page intentionally left blank)

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (CONTINUED)

### 2.1 System Overview (Continued)

#### ImageCast Central Count (ICC)

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

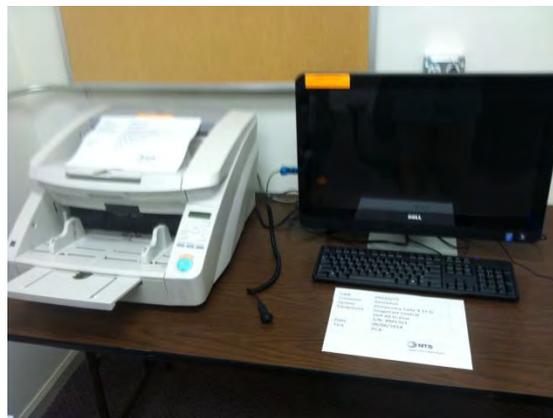
- Canon DR-X10C Scanner: Provides high-speed ballot scanning functionality, transferring the scanned images to the connected ImageCast Central Workstation.
- Canon DR-G1130 Scanner: Provides high-speed ballot scanning functionality, transferring the scanned images to the connected ImageCast Central Workstation.
- ImageCast Central Workstation: An all-in-one PC workstation used for ballot image and election rules processing. The workstation can be deployed in a stand-alone or networked configuration, allowing for automatic results transfers to the EMS Datacenter. The ImageCast Central workstation is COTS hardware which executes software for both image-processing and election rules application, such as "Vote for 2."



**Figure No. 4**  
**ImageCast Central (DR-X10C)**



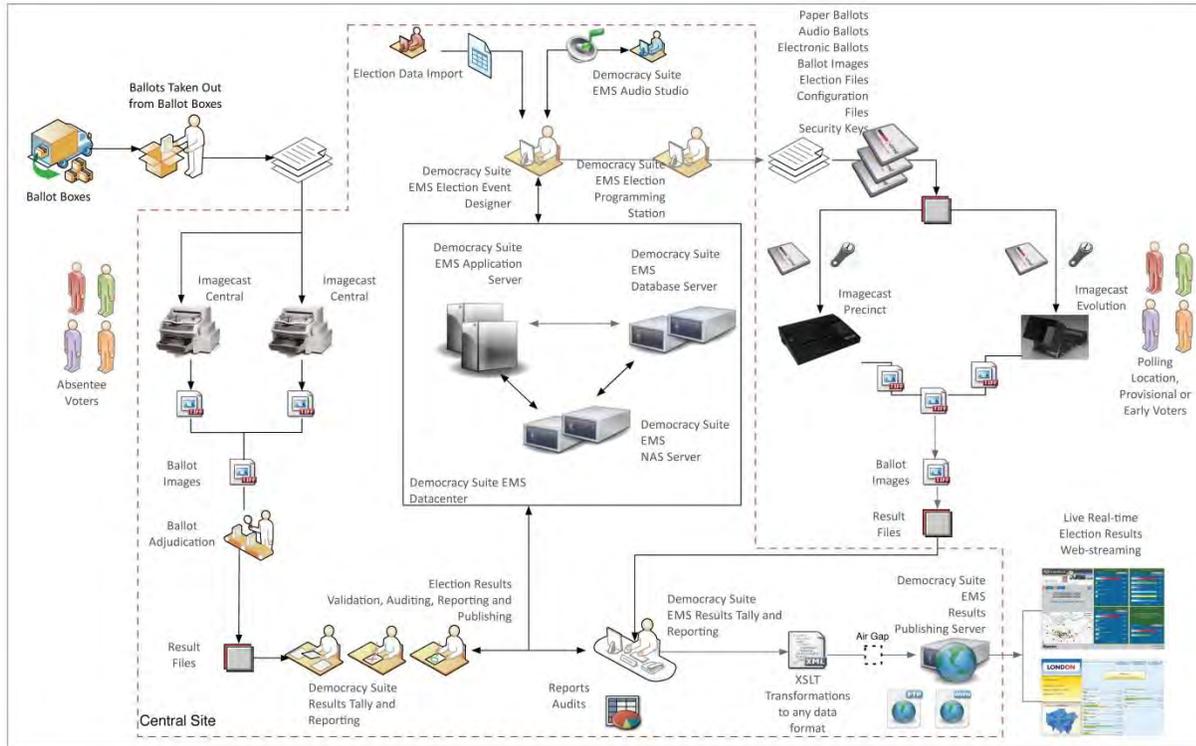
**Figure No. 5**  
**ImageCast Central (Canon DR-G1130)**



**Figure No. 6**  
**ImageCast Central (Canon DR-G1130) with workstation**

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (CONTINUED)

### 2.1 System Overview (Continued)



**Figure 7**  
**System Overview Diagram**

(The remainder of this page intentionally left blank)

4.14 **SYSTEM IDENTIFICATION AND OVERVIEW (CONTINUED)**

2.2 **System Limits**

The system limits of the Democracy Suite 4.14-D System are identified in Table 2-1.

**Table 2-1 Democracy Suite 4.14-D System Limits**

Limit (Maximum Number of)	Value (by Configuration)		Limiting Component
	Express	Standard	
Ballot Positions	462	462	22 Inch Portrait Ballot
Precincts in Election	250	1000	Memory
Contests in Election	250	4000	Memory
Candidates/Counters in Election	2500	40000	Memory
Candidates/Counters in Precinct	462	462	22 Inch Portrait Ballot
Candidates/Counters in Tabulator	2500	10000	Memory
Ballot Styles in Election	750	4000	Memory
Contests in a Ballot Style	156	156	22 Inch Portrait Ballot
Candidates in a Contests	231	462	22 Inch Portrait Ballot (Column Span 3)
Ballot Styles in a Precinct	5	5	Memory
Number of Parties	30	30	22 Inch Portrait Ballot
Vote For in Contest	30	30	22 Inch Portrait Ballot
Supported Languages per Election	5	5	Memory
Number of Write-ins	462	462	22 Inch Portrait Ballot

2.3 **Hardware**

The hardware components identified in Tables 2-2 – 2-4 were utilized for certification testing of the Democracy Suite 4.14-D System.

**Table 2-2 Democracy Suite 4.14-D COTS Voting System Equipment Description**

Equipment	Manufacturer	Model	Specifications	Serial Number
EMS Server PC	Dell	PowerEdge T620	Intel Xeon CPU E5-2640 v2@2.00GHz, 32GB RAM, (6) 1 TB (PERC H710 RAID Controller)	J8H9H02
EMS Client PC	Dell	Precision T1700	Intel Core i5-4570@3.2GHz, 8GB RAM, 500 GB HD	4QGQY12
EMS Express Laptop	Dell	Latitude E6540	Intel Core i7-4810MQ@2.8GHz, 8GB RAM, 500GB HD	FRB8H12
High-Speed Scanners	Canon	DR-X10C	Scanning Speeds: 130 ppm and 260 ipm	ED300880
		DR-G1130	Scanning Speeds: 130 ppm and 260 ipm	GF301677, GF300207
ICC Workstation	Dell	OptiPlex 9020	Intel Core i7-4770S@3.1GHz, 8GB RAM, 500 GB HD	4NPL9Z1
		OptiPlex 9030	Intel Core i5-45900S@3.0GHz 8GB RAM, 500 GB HD	FYNTY12

**2.0 SYSTEM IDENTIFICATION AND OVERVIEW (CONTINUED)**
**2.3 Hardware (Continued)**
**Table 2-3 Democracy Suite 4.14-D COTS Voting System Support Equipment Description**

Test Material	Make	Model	Quantity	Serial Number(s)
USB reader/Writer	Maxim	USB R/W: DS9490R	3	4D027C, 4C9CF5, 514DFD
iButton (SHA-1)	Maxim	DS1963S	2	4CE4C9, 4D064A
ICE external LCD monitor	AOC	E1649FWU	3	D2RE4HA020348, D2RE4HA017467, D2RE4HA017592
LCD Monitor	Soyo	18.5" wide LCD	1	DYLM19R6-KLE-10202
LCD Monitor	Samsung	23" wide LCD	1	MY23HVM5701197B
LCD Monitor	Dell	1909W	4	07E-4EUS, 07F-071S, 07F-06US, 07F-074S
LCD Monitor	Dell	N445N	3	2TWC, 2UOC, 2U6C
Footswitch Pair	--	Kinesis	4	FS-57381-001 thru 004
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
Compact Flash Cards	RiData	CFC-14A	50	NTS-assigned numbers: CF-XXX
		RDCF8G-233XMCB2-1	2	
		RDCF16G-233XMCB2-1	2	
		RDCF32G-233XMCB2-1	2	
	SanDisk Extreme	SDCFX-016G	2	NTS-assigned numbers: CF-XXX
		SDCFX-032G	2	
SanDisk	8 GB	40	NTS-assigned numbers: CF-XXX	
Compact Flash Reader	SanDisk	USB	3	0171618, 0201833, 0171631
	GGI Gear	USB	4	CFRW-57381-001 thru 004
Networking Switch	D-Link	D-Link DES-1105 5-Port Switch	1	DRL728A001397
Mouse	Dell	USB w/rollerball	1	G1A00M0M
Mouse	Microsoft	USB w/rollerball	1	X800898
Headphones	Cyber Acoustics	ACM-70	2	DVS23000048,049
Sip & Puff	Origin Instruments	Air Voter	7	AV-57381-001 thru 003, 002251, 002268, 002267
UPS for ICC	APC	C1000	1	3S1427X10085
UPS for EMS		C1500	1	3S1425X00415
Build Server	SuperMicro	SuperServer 7045	1	BM-57381-001

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

**2.3 Hardware (Continued)**

**Table 2-4 Democracy Suite 4.14-D Voting System Equipment**

Equipment	Manufacturer	Serial Number(s)
ImageCast Precinct (ICP)	Dominion Voting Systems	WLDAFBH0023, WLDAFBH0018, AANAGCP0265
ImageCast Evolution (ICE)	Dominion Voting Systems	CAFEBDC0015, AAFEBDZ0068, AAFEBEC0097, AAFEBEP0003
ICE Plastic Ballot Box	Dominion Voting Systems	AAUCBEJ0120, AAUCBEG0018, AAUCBEA0043
ICP Metal Ballot Box	Dominion Voting Systems	BOX-57381-011, BOX-57381-014, BOX-57381-014

**2.4 Software**

The software components identified in Table 2-5 – 2-18 were utilized for certification testing of the Democracy Suite 4.14-D System.

**Table 2-5 Democracy Suite 4.14-D EMS Software Platform Components**

Software Required For Testing	Software Version	Filename
EMS Election Event Designer (EED)	4.14.37	EED_FED_CERT.Setup_64b.msi
EMS Results Tally and Reporting (RTR)	4.14.37	RTR_FED_CERT.Setup_x64.Setup.msi
EMS File System Service (FSS)	4.14.37	DemocracySuiteEMS_FSS_Setup.msi
EMS Audio Studio (AS)	4.14.37	EMSAS2010Setup.msi
EMS Data Center Manager (DCM)	4.14.37	DemocracySuiteEMS_DCM.exe
EMS Election Data Translator (EDT)	4.14.37	ElectionDataTranslatorSetup_x64.msi
EMS Application Server (APPS)	4.14.37	EMSApplicationServer_FED_CERT.Setup_x64.Setup.msi
EMS Adjudication	2.4.1.3201	DVS ImageCast Adjudication Client Setup

**Table 2-6 Democracy Suite 4.14-D EMS Software Platform Third Party Software Components**

Software Required For Testing	Software Version	Filename
Infragistics NetAdvantage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi
TX Text Control Library for .NET	16.0	TX Text Control.NET for Windows Forms 16.0.exe

(The remainder of this page intentionally left blank)

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

**2.4 Software (Continued)**

**Table 2-7 Democracy Suite 4.14-D EMS Client Application Software Components**

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
Adobe Reader	10.1.1	AdbeRdr1011_en_US.exe
Microsoft .NET Framework 4.0	4.0	dotNetFx40_Full_x86_x64.exe
Microsoft SQL Server 2008 R2 x64	10.0	Microsoft DVD provided
Microsoft SQL Server 2008 Express R2 x64	10.50.4000.0	SQLEXPADV_x64_ENU.exe
Microsoft SQL Server 2008 R2 SP2x64	10.50.4000.0	SQLServer2008R2SP2-KB2630458-x64-ENU.exe
Microsoft Visual J# 2.0 Redistributable Package – Second Edition (x64)	2.0	vjredist64.exe
1-Wire Driver version 4.0.3b x64	4.0.3	install_1_wire_drivers_x64_v403beta.msi
Java Runtime Environment 6.0 x64	6.0.290	jre-6u29-windows-x64.exe
Microsoft Visual C++ 2010 SP1 Redistributable Package(x86)	10.0.40219	vc redistrib_x86.exe
Microsoft Access Database Engine 2010 Redistributable	1 (published 12/16/2010)	AccessDatabaseEngine.exe AccessDatabaseEngine_x64.exe

(The remainder of this page intentionally left blank)

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

**2.4 Software (Continued)**

**Table 2-8 Democracy Suite 4.14-D EMS Software Platform Unmodified COTS Components**

Software Required For Testing	Software Version	Filename (for details see document Components_3rdParty_1.0.xlsx)
Infragistics NetAdvantage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi
TX Text Control Library for .NET	16.0	TX Text Control.NET for Windows Forms 16.0.exe
Microsoft.Net Framework Library	4.0	dotNetFx40_Full_x86_x64.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	1.2.3	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 – both 32-bit and 64-bit
PdfToImage	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
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

**Table 2-9 Democracy Suite 4.14-D ICP Unmodified COTS Software Components**

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

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

**2.4 Software (Continued)**

**Table 2-10 Democracy Suite 4.14-D EMS Software Build Environment Components**

Software Required For Testing	Software Version	Filename
Microsoft Windows Server 2008 R2 x64	6.1	Microsoft DVD provided
7-Zip	9.20	7z920-x64.msi
Microsoft Visual Studio 2010	10.0	Microsoft DVD provided
Microsoft SDK for Windows 7	7.1	GRMSDKX_EN_DVD.iso
Microsoft.NET Framework Library	4.0	dotNetFx40_Full_x86_x64
Microsoft Visual Studio 2010 Service Pack 1	10.0 SP1	VS2010SP1dvd1.iso
Microsoft patch KB2286556	N/A	VS10-KB2286556-x86.exe
ImgBurn	2.5.7.0	SetupImgBurn_2.5.7.0.exe
Infragistics NetAdvantage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi
TX Text Control Library for .NET	16.0	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 Redistributable Package – Second Edition (x64)	2.0	vjredist64.exe
ActivePerl	5.12.4	ActivePerl-5.14.3.1404-MSWin32-x64-296513.msi

**Table 2-11 Democracy Suite 4.14-D ICE Software Components**

Software Required For Testing	Software Version	Filename
Voting Machine	4.14.21	GApplication-4.14.21.vhd.7z
Election Application	4.14.21	dvs
Linux Kernel	2.6.30.9-dvs-21.3	ulmage
Linux Device File	1.3	mpc8347dvs.dtb
Root File System	1.0.21	rfs
Ram Disk	1.0.1	initrd.img
Boot Startup Logo	5.0.0	logo_platform.bmp
Linux Startup Logo	5.0.0	logo_os.bmp
Boot Loader	1.3.4.29	u-boot.bin
Motherboard FPGA	1.1.5	ice2_mc_p1.bit
Scanner Board FPGA	1.1.2	ice2_scb_p2.bit
Logger Controller	1.0.11	logger.bin
Power Controller	2.0.7	power.bin
Integrated Printer	4.1.6	integratedPrinter.hex, printerFont.hex

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

**2.4 Software (Continued)**

**Table 2-12 Democracy Suite 4.14-D ICE Unmodified COTS Software Components**

Software Required For Testing	Software Version	Filename
busybox	1.20.2	busybox-1.20.2.tar.bz2
e2fsprogs	1.42.4	e2fsprogs-1.42.4.tar.gz
expat	2.1.0	expat-2.1.0.tar.gz
fontconfig	2.9.0	fontconfig-2.9.0.tar.gz
freetype	2.4.9	freetype-2.4.9.tar.bz2
i2c-tools	3.1.0	i2c-tools-3.1.0.tar.bz2
libjpeg	v8d	jpegsrc.v8d.tar.gz
libogg	1.3.0	libogg-1.3.0.tar.gz
libpng	1.5.10	libpng-1.5.10.tar.gz
libusb	1.0.8	libusb-1.0.8.tar.bz2
libusb-compat	0.1.3	libusb-compat-0.1.3.tar.bz2
linux	2.6.30.9	linux-2.6.30.9.tar.bz2
openssl-fips	1.2.3	openssl-fips-1.2.3.tar.gz
ppp	2.4.5	ppp-2.4.5.tar.gz
qt-everywhere	4.7.3	qt-everywhere-opensource-src-4.7.3.tar.gz
skell	1.19	skell-1.19.tar.gz
soundtouch	1.6.0	soundtouch-1.6.0.tar.gz
speex	1.2rc1	speex-1.2rc1.tar.gz
sqlite	3.7.13	sqlite-autoconf-3071300.tar.gz
sysfsutils	2.1.0	sysfsutils-2.1.0.tar.gz
libtiff	4.0.1	tiff-4.0.1.tar.gz
tzcode	2012b	tzcode2012b.tar.gz
tzdata	2012c	tzdata2012c.tar.gz
usb-modeswitch	1.2.4	usb-modeswitch-1.2.4.tar.bz2
usb-modeswitch-data	20120815	usb-modeswitch-data-20120815.tar.bz2
zlib	1.2.7	zlib-1.2.7.tar.bz2
log4cplus	1.0.4.1	log4cplus-1.0.4.1.tar.bz2
quazip	0.5	quazip-0.5.tar.gz

**Table 2-13 Democracy Suite 4.14-D ICE Modified COTS Software Components**

Software Required For Testing	Software Version	Filename
Kernel	2.6.30.9-dvs-21.3	ulmage
U-BOOT	1.3.4.29	u-boot.bin

**Table 2-14 Democracy Suite 4.14-D ICE Election Firmware Compiler**

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

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

**2.4 Software (Continued)**

**Table 2-15 Democracy Suite 4.14-D ICE Firmware Build Environment Components**

Software Required For Testing	Software Version	Filename
Ubuntu	10.04 LTS	ubuntu-10.04.4-desktop-i386.iso
LTIB	10.1.1a	ltib-10-1-1a-sv.tar.gz
g++ (GNU C++ compiler)	gcc-4.5.38-eglibc-2.11.38	freescale-powerpc-linux-gnu-2011.03-38.i686.rpm

**Table 2-16 Democracy Suite 4.14-D ICP Software Components**

Software Required For Testing	Software Version	Filename
Election Firmware	4.14.17-US	cf2xx.sig
Firmware Updater	4.14.17-US	firmUp.enc
Firmware Extractor	4.14.17-US	FirmwareExtract.enc
Kernel (uClinux)	4.14.17-US	Image.bin.gz
Boot Loader (COLILO)	20040221	colilo.bin

**Table 2-17 Democracy Suite 4.14-D ICC Software Components**

Software Required For Testing	Software Version	Filename
ImageCast Central Application	4.14.17	ImageCast Central.exe
Image-Analysis DLL	4.14.4	ImgProc.dll
Windows 7x64	COTS	Operating System for COTS ICC computer when using Canon DR-X10C and DR-G1130 scanners

**Table 2-18 Democracy Suite 4.14-D - ICC 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
Kofax VRS	4.50	Full CD from Kofax
VCredist	4/10/2006	vcredist_x86.exe

(The remainder of this page intentionally left blank)

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (CONTINUED)

### 2.5 Test Support Materials

This subsection identifies all test materials required to perform voting system testing.

The test materials listed in Table 2-19 were required to support the Democracy Suite 4.14-D certification testing:

**Table 2-19 Democracy Suite 4.14-D Test Support Materials**

Test Material
Privacy Panels (set of 2 pieces)
Security Keys
Thermal Printer Rolls
Dominion Cleaning Kit
Sharpie Permanent Markers
Ballots

### 2.6 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 2-20 comprise the Democracy Suite 4.14-D Voting System TDP. These documents are considered an addition to the Democracy Suite 4.14-B voting system's TDP, certified by the EAC on January 7, 2014 (DemSuite-4-14-B).

(The remainder of this page intentionally left blank)

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

**2.6 Vendor Technical Data Package (Continued)**

**Table 2-20 Democracy Suite 4.14-D Voting System TDP**

Document Title	Version	Date	Document Number
System Overview	4.14.D::301	10/17/14	2.02
System Security Specification	4.14.D::377	10/31/14	2.06
Configuration Management Plan	4.14.D::205	10/22/14	2.11
Quality Assurance Program	1.2.0::80	10/16/12	2.12
System Test and Verification Plan	1.1.0::104	10/16/12	2.07
System Test and Verification Suites	4.14.D::1	8/21/14	2.07
Personnel Training and Deployment Requirements	1.1.0::53	4/9/13	2.10
EMS Functionality Description	4.14.D::251	7/22/14	2.03
ICE Functionality Description	4.14-D::80	10/2/14	2.03
ICP Functionality Description	4.14.D::125	10/20/14	2.03
ICC Functionality Description	4.14.D::88	10/17/14	2.03
ICE System Hardware Specification	1.2.0::305	10/20/14	2.04
ICP System Hardware Specification	1.1.0::98	10/20/14	2.04
ICE System Hardware Characteristics	1.2.0::95	10/20/14	2.04.1
ICP System Hardware Characteristics	1.1.0::56	10/20/14	2.04.1
EMS Software Design and Specification	4.14.D::219	7/22/14	2.05
ICE Software Design and Specification	4.14.D::112	7/28/14	2.05
ICP Software Design and Specification	4.14.D::112	10/20/14	2.05
ICC Software Design and Specification	1.0.0::34	11/30/12	2.05
Adjudication Software Design and Specification	4.14.D::25	7/22/14	2.05
ICP System Operation Procedures	4.14.D::197	7/28/14	2.08
EMS System Operation Procedures	4.14.D::538	10/22/14	2.08
ICE System Operation Procedures	4.14.D::155	7/22/14	2.08
ICC System Operation Procedures	4.14.D::122	10/16/14	2.08
ICP System Maintenance Manual	1.1.0::66	10/16/12	2.09
ICE System Maintenance Manual	1.1.0::115	10/16/12	2.09
EMS System Maintenance Manual	1.0.0::50	10/16/12	2.09
Adjudication System Maintenance Manual	4.14D::9	7/27/14	2.09
EMS Election Event Designer User's Guide	4.14.D::233	10/21/14	N/A
EMS Results Tally & Reporting User's Guide	4.14.D::153	9/23/14	N/A
EMS Audio Studio User's Manual	4.14.D::49	10/1/14	N/A
Adjudication User's Manual	4.14.D::41	7/28/14	N/A
EMS Build and Install	2.1.0::18	8/11/14	N/A
ICP Device Configuration Files	4.14.D::26	7/30/14	N/A
ImageCast Election Definition Files	3.0.13	4/9/14	N/A
ICP Firmware Build and Install	4.2.14	10/3/12	N/A
ICP Firmware Update Procedure	1.0.0::15	8/14/14	N/A
ICP Technical Guide	1.0.0::9	10/17/12	N/A
ICE Technical Guide	1.0.0::60	10/17/12	N/A
ICE Build Procedure	4.14.D::49	7/21/14	N/A
ICE Firmware Installation Procedure	4.14.D::41	8/26/14	N/A
Dominion Voting C C++ Coding Standard	1.0.0::8	7/27/12	N/A
Dominion Voting Usability Study – ICP	1.0.0::26	7/27/12	N/A
Dominion Voting Usability Study – ICE	1.0.0::36	7/13/12	N/A

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (CONTINUED)

### 2.7 Deliverable Materials

The materials listed in Table 2-21 are identified by Dominion Voting Systems to be delivered as part of the Democracy Suite 4.14-D Voting System to the end users.

**Table 2-21 Democracy Suite 4.14-D Voting System Deliverables**

Deliverable Material	Version	Description
ImageCast Evolution Firmware	4.14.21	ICE Software
ImageCast Precinct Firmware	4.14.17-US	ICP Software
ImageCast Central Count	4.14.17	ICC Software
Election Event Designer	4.14.37	EMS Software
Results Tally and Reporting	4.14.37	EMS Software
File System Service	4.14.37	EMS Software
Audio Studio	4.14.37	EMS Software
Data Center Manager	4.14.37	EMS Software
Application Server	4.14.37	EMS Software
Adjudication	2.4.1.3201	EMS Software
Democracy Suite System Overview	4.14.D::301, dated 10/17/14	TDP Document
Democracy Suite Configuration Management Plan	4.14.D::205, dated 10/22/14	TDP Document

## 3.0 TEST BACKGROUND

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

- ISO-9001:2000
- 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)

### 3.1 General Information

All testing performed as part of the test effort was performed at the NTS Huntsville and Plano facilities. Qualification/Certification testing was limited to the Democracy Suite Version 4.14-D Voting System which includes the items listed in Section 2.0 of this test report.

(The remainder of this page intentionally left blank)

### 3.0 TEST BACKGROUND (CONTINUED)

#### 3.2 Certification 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 tests utilizing the “NTS Baseline Test Cases” along with test cases specially designed for the Democracy Suite 4.14-D.
- **Section 3: Usability and Accessibility** – The requirements in this section were tested during this test campaign on the ICE with an optional COTS external monitor. During this test campaign, the ICE with an optional COTS external monitor was verified that it meets the Usability and Accessibility requirements of the 2005 VVSG.
- **Section 4: Hardware Requirements** – The requirements in this section were tested and/or evaluated by trained NTS personnel per section 4.4 and table 4-1.
- **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 were performed to ensure these requirements are met.
- **Section 6: Telecommunication** – The requirements in this section were not tested during this test campaign because no changes were included in this modification to the Standard Networking Configuration from the Democracy Suite 4.14-B EAC-certified system.
- **Section 7: Security Requirements** – The requirements in this section were reviewed to determine the impact of the modification. It was determined that a SCAP review was required.
- **Section 8: Quality Assurance (QA) Requirements** – The QA requirements were spot checked and limited to only the changes included within this modification. The following documents were utilized during the limited review process:
  - 2.12 Quality Assurance Plan
- **Section 9: Configuration Management (CM) Requirements** – The CM requirements were spot checked and limited to only the changes included within this modification. The following documents were utilized during the limited review process:
  - 2.11 - Democracy Suite Configuration Management Process

#### 3.3 NTS Quality Assurance

All work performed on this test campaign was in accordance to the NTS Huntsville and NTS Plano Quality Assurance Programs and the NTS Huntsville Quality Program Manual, which conforms to the applicable portions of International Standard Organization (ISO) Guide 17025.

The NTS 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).

(The remainder of this page intentionally left blank)

**3.0 TEST BACKGROUND (CONTINUED)**

**3.4 Test Equipment and Instrumentation**

All instrumentation, measuring, and test equipment used in the performance of this test program were calibrated in accordance with NTS Huntsville’s Quality Assurance Program, which complies with the requirements of ANSI/NC SL 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.

**3.5 Terms and Abbreviations**

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

**Table 3-1 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 Studio	AS	EMS application used to record audio files.
Audio Tactile Interface	ATI	Voter interface designed to not require visual reading of a ballot. The same ATI is utilized for both the ICP and ICE.
Configuration Management	CM	---
Commercial Off the Shelf	COTS	Commercial, readily available hardware devices (such as card readers, printers or personal computers) or software products (such as operating systems, programming language compilers, or database management systems)
Direct Record Electronic	DRE	An electronic voting system that utilizes electronic components for the functions of ballot presentation, vote capture, vote recording, and tabulation which are logically and physically integrated into a single unit. A DRE produces a tabulation of the voting data stored in a removable memory component and in printed hardcopy.
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.

(The remainder of this page intentionally left blank)

**3.0 TEST BACKGROUND (CONTINUED)**

**3.5 Terms and Abbreviations (Continued)**

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

<b>Term</b>	<b>Abbreviation</b>	<b>Definition</b>
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.
Functional Configuration Audit	FCA	Exhaustive verification of every system function and combination of functions cited in the manufacturer’s documentation.
Help America Vote Act	HAVA	Act created by United States Congress in 2002.
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 integrated Ballot-marking Device
ImageCast Central	ICC	COTS High-speed central ballot scan tabulator.
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.
Operating Procedure	OP	Test Method or Test Procedure.
Relational Database Management System	RDBMS	A database management system (DBMS) that is based on the relational model
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.
Quality Assurance	QA	---
Results, Tally and Reporting	RTR	EMS application used to integrate election results and reporting.
Technical Data Package	TDP	Manufacturer documentation related to the voting system required to be submitted as a precondition of certification testing.
Trusted Build	---	Final build of source code performed by a trusted source and overseen by the manufacturer which is delivered to the EAC designated repository; also referred to as a “Witness Build”.
Voluntary Voting System Guidelines	EAC 2005 VVSG	Published by the EAC, the third iteration of national level voting system standards.
Voting System Test Laboratory	VSTL	An independent, non-federal laboratory qualified to test voting systems to Federal standards.

## 4.0 TEST FINDINGS AND RECOMMENDATIONS

The Dominion Voting Systems Democracy Suite 4.14-D Voting System, as identified in Section 2.0 of this report, was subjected to the tests as summarized in this section.

### 4.1 Source Code Review

As part of testing activities, the source code submitted for the Democracy Suite 4.14-D System was compared to the baseline version included in the Democracy Suite 4.14-B System. Any code changes were reviewed by NTS to determine its compliance to the 2005 VVSG and manufacturer coding standards.

#### Summary Findings

A total of six software suites were examined: Adjudication, EMS, ICC, ICE, and ICP. This is a summary of the issues discovered.

**Adjudication:**

No Issues

**ICC:**

Header Revision History	3
Units Called	1
Multiple Entry Exit	3

**ICP:**

Header Revision History	5
Units Called	9
Inconsistent Indenting	1
Line Too Long	2
Over 6 Levels of Indenting	1

**EMS:**

Header Inputs or Outputs	1
Header Revision History	9
Multiple Entry Exit	1
No Case Default	1
Non-Enumerated Constant	1

**ICE:**

Units Called	4
No Case Default	4
Inconsistent Indenting	1
Over 6 Levels of Indenting	3
Non-Initialized Variables	1
Non-Enumerated Constant	3

All identified source code issues were resolved prior to the conclusion of the source code review process.

(The remainder of this page intentionally left blank)

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

### **4.2 Trusted Builds**

Trusted builds of the Democracy Suite 4.14-D software were performed by utilizing Dominion Voting Systems' trusted build documentation.

The following steps were performed in the order listed by NTS Huntsville to complete the trusted builds:

- 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 disk image of the build environment
- Load the compliant source code into the build environment
- Create a disk image of the pre-build environment
- Create a digital signature of the pre-build environment
- Build executable code
- Create a disk image of the post-build environment
- Create a digital signature of executable code
- Create installation media
- 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 to the EAC Repository.

(The remainder of this page intentionally left blank)

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

### **4.2 Trusted Builds (Continued)**

The Trusted Builds for the Democracy Suite 4.14-D System included source code, data, and script files in clear text form. The builds included COTS software provided to NTS Huntsville on commercially available media, COTS software downloaded and verified by the VSTL, COTS software verified by SHA256 from the software supplier, and picture and sound files in binary format provided by Dominion Voting Systems. Each component required for the Trusted Build was verified by NTS Huntsville prior to performing the Trusted Build.

Prior to performing the Trusted Builds, the PC hard drive was cleared of any existing data by writing data to every hard drive sector. The operating system identified for the Trusted Build was installed, followed by all prerequisite software, data files, and configurations identified in the build documentation. Lastly, the software was built by performing the process provided by Dominion Voting Systems.

#### **Summary Findings**

NTS Huntsville performed Trusted Builds for all components of the Democracy Suite 4.14-D System between August 21 and October 17, 2014. The Dominion Voting Systems' Technical Representatives for the Trusted Builds were Elena Spasic, Ben Rice, and Reed Bodwell.

The software products resulting from the Trusted Builds shall be supplied to the EAC at the conclusion of the certification effort. No deficiencies were noted during the performance of the Trusted Builds.

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

The Democracy Suite 4.14-D Voting System Technical Data Package (TDP) was reviewed to the 2005 VVSG. This review was performed as part of the testing activities. The TDP review only included the revised and new documents submitted for this testing campaign. The documents were reviewed for accuracy, completeness, and compliance to the 2005 VVSG.

(The remainder of this page intentionally left blank)

## **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. There were 114 discrepancies reported to Dominion and internally tracked by NTS Huntsville as test exceptions until verified that the applicable documents had been corrected. Dominion corrected nonconformance observations and resubmitted the associated documents for review. This process continued until the TDP complied with the applicable TDP standards in the EAC 2005 VVSG.

A summary of the TDP issues encountered is provided below:

- Some descriptive information included was inconsistent with descriptions in other TDP documents.
- Some documents included functionality not supported in the voting system.
- Some of the individual user guides included information which conflicted with the actual information utilized during the testing process.

All identified TDP issues were resolved prior to the conclusion of the TDP review process. The Technical Data Package Review Report that summarizes the 114 discrepancies noted is included in Appendix B of this report.

### **4.4 Hardware Testing**

As part of the Democracy Suite 4.14-D campaign, Dominion submitted two new hardware components: the COTS scanner DR-G1130 for use with ICC central count software and an external COTS monitor for facilitating simultaneous ADA and ballot casting sessions on the ICE. All other voting system components were examined during the PCA and verified by NTS as unmodified. Thus, only the two new hardware components were subject to hardware testing.

The submitted voting system hardware consisted only of COTS hardware whose configuration was not modified. Table 4-1 details the 2005 VVSG hardware requirements that each component were required to have met. NTS Huntsville used Volume II section 4.6.1 of the VVSG and EAC RFI 2008-01 to make this determination.

(The remainder of this page intentionally left blank)

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

**4.4 Hardware Testing (Continued)**

**Table 4-1 Hardware Test Examination Results**

<b>Test/EAC 2005 VVSG Section</b>	<b>Procedure/Description</b>	<b>ICC (DR-G1130)</b>	<b>ICE EXT. Mon</b>
<i>Electromagnetic Radiation/4.1.2.9</i>	FCC Part 15 Class B for both radiated and conducted emissions	Exempt (COTS)	Tested
<i>Low Temperature/4.1.2.14</i>	MIL-STD-810D minimum temperature shall be -4°F	Exempt (COTS)	Accept (Reuse)
<i>Vibration/4.1.2.14</i>	MIL-STD-810D, Method 514.3 physical shock and vibration during handling and transport	Exempt (COTS)	Accept (Reuse)
<i>Lightning Surge/4.1.2.7</i>	IEC 61000-4-5 (1995-02)	Exempt (COTS)	Accept (Reuse)
<i>High Temperature/4.1.2.14</i>	MIL-STD-810D, Method 501.2 maximum temperature shall be 140°F	Exempt (COTS)	Accept (Reuse)
<i>Bench Handling</i>	MIL-STD-810D, Method 516.3 Procedure VI six 4" drops on each edge totaling 24 drops	Exempt (COTS)	Accept (Reuse)
<i>Electrical Fast Transient/4.1.2.6</i>	IEC 61000-4-4 (2004)	Exempt (COTS)	Accept (Reuse)
<i>Humidity Test/4.1.2.14</i>	MIL-STD-810D, Method 501.2 ten 24 hour humidity cycles	Exempt (COTS)	Accept (Reuse)
<i>Electrostatic Disruption/4.1.2.8</i>	IEC 61000-4-2 (1995-01) 15kV air discharge and 8kV contact discharge	Exempt (COTS)	Tested
<i>Electromagnetic Susceptibility/4.1.2.10</i>	IEC 61000-4-3 (2006) electromagnetic field of 10V/m modulated by a 1kHz, 80% AM modulation at 80MHz to 1000MHz frequency	Exempt (COTS)	Tested
<i>Conducted RF Immunity/4.1.2.11</i>	IEC 61000-4-6 (1996-04) conducted radio frequency energy	Exempt (COTS)	Tested
<i>Magnetic Fields Immunity/4.1.2.12</i>	IEC 61000-4-8 (1993-06) AC magnetic fields of 30 A/m at 60Hz	Exempt (COTS)	Accept (Reuse)
<i>Electrical Power Disturbance/4.1.2.5</i>	IEC 61000-4-11 (1994-06) power surges and dips	Exempt (COTS)	Accept (Reuse)
<i>Temperature/Power Variation/4.1.2.13</i>	MIL-STD-810D, Method 502.2 and Method 501.2 163 hours at 50°F to 95°F	Tested	Accept (Reuse)
<i>Safety/4.3.8</i>	UL 60950-1 product safety review	Exempt (COTS)	Accept (Reuse)

(The remainder of this page intentionally left blank)

## 4.0 TEST FINDINGS AND RECOMMENDATIONS (CONTINUED)

### 4.4 Hardware Testing (Continued)

#### 4.4.1 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 ICE (with external ADA monitor) do not exceed the limits of FCC Part 15, Class B emissions. The ICE (with external ADA monitor) was configured to run in an automated ballot casting mode with an active ADA session running on the external monitor.

##### Summary Findings

The ICE (with external ADA monitor) was found to not exceed the limits<sup>1</sup> of FCC Part 15, Class B emissions. The Test Data Sheet and Instrumentation Equipment Sheets are in Appendix D.

#### 4.4.2 Conducted RF Immunity

Conducted RF Immunity Testing was performed in accordance with Sections 4.1.2.11 (a) of Volume I and 4.8 of Volume II of the 2005 VVSG. Section 4.1.2.11 (b) of Volume I is not applicable because there are no signal/control lines greater than three meters. This testing was performed to ensure that the ICE (with external ADA monitor) was able to withstand conducted RF energy onto its power lines without disruption of normal operation or loss of data.

The ICE (with external ADA monitor) was configured to run in an automated ballot casting mode with an active ADA session running on the external monitor. The component was then subjected to conducted RF energy of 10 V rms applied to its power lines over a frequency range of 150 kHz to 80 MHz.

##### Summary Findings

The ICE (with external ADA monitor) successfully met the requirements of the Conducted RF Immunity Test. The Test Data Sheet and Instrumentation Equipment Sheets are in Appendix D.

---

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

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

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

**4.4 Hardware Testing (Continued)**

**4.4.3 Electrostatic Disruption Test**

Electrostatic Disruption Testing was performed in accordance with sections 4.1.2.8 of Volume I and 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 component would continue to operate normally.

Two ESD tests were conducted during the course of the test campaign. The first ESD test was conducted on the ICE (with external ADA monitor). The second test was conducted on the new primary LCD panel for the ICE. For each test, the ICE was configured to run in an automated ballot casting mode with an active ADA session running on the external monitor. The ICE was then subjected to electrostatic discharges of +/- 8 kV contact and +/- 15 kV air. Discharges were focused on areas most frequently touched during normal operation, including the touch screen, user buttons, cables, connectors and other points of contact used by the voter or poll worker.

**Table 4-2 Electrostatic Discharge Test Levels**

Requirements			
Characteristic	Capacitance	Resistance	Value
Pulse Wave Shape (RC Network)	150 pf	330 Ω	pf / Ω
Test Levels	Discharge Types		Value
	Air	Direct	
	±15	±8	kV
Rise Time	≤1		nanosecond
Pulse Decay Time	≈30 at 50% height		nanosecond
Pulse Repetition	≥1		per second
Total Injected Pulse at each Test Point	10		per polarity (±)
Temperature	≥15 to ≤35		°C
Relative Humidity	≥30 to ≤60		%

**Summary Findings**

The ICE (with external ADA monitor) and the new primary LCD panel successfully met the requirements of the Electrostatic Disruption Test. The Test Data Sheet and Instrumentation Equipment Sheets are in Appendix D.

(The remainder of this page intentionally left blank)

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

### **4.4 Hardware Testing (Continued)**

#### **4.4.4 Electromagnetic Susceptibility Test**

Electromagnetic Susceptibility Testing was performed at the NTS Plano facility. Testing was supervised by NTS Huntsville VSTL personnel and was performed in accordance with Sections 4.1.2.10 of Volume I and 4.8 of Volume II of the 2005 VVSG.

The ICE (with external ADA monitor) was configured to run in an automated ballot casting mode with an active ADA session running on the external monitor. The ICE (with external ADA monitor) was then subjected to ambient electromagnetic fields at 10 V/m over a range of 80 MHz to 1000 MHz. Testing was conducted utilizing both horizontally and vertically polarized waves. The limits were measured with a maximum scan rate of 1% of the fundamental frequency and the dwell duration was three seconds.

#### **Summary Findings**

The ICE (with external ADA monitor) successfully completed the requirements of the Electromagnetic Susceptibility Test. The Test Data Sheet and Instrumentation Equipment Sheets are in Appendix D.

#### **4.4.5 Temperature Power Variation Test**

The ICC (DR-G1130) 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 was to evaluate system operation under various environmental conditions. The cumulative duration of at least 163 hours was achieved by utilizing two units for a period of 85 hours based on the EAC RFI 2008-01, 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, both components were 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 50°F to 95°F and from 105 VAC to 129 VAC. During test performance, the operational functions were continuously exercised by the scanning of ballots.

#### **Summary Findings**

One discrepancy was discovered during the Temperature Power Variation Test. After the 48 hour environmental portion of the testing was completed, the unit was removed from the chamber and relocated to complete the testing. Upon restart, the unit presented an error during scanning. The details of the error and resolution are located in the Discrepancy Report in Appendix C (ID 30). An additional 37 hours were added to the test per Appendix C.4 of the 2005 VVSG Volume II. At the conclusion of the 122 hours the ICC (DR-G1130) was found to have successfully met the requirements of the Temperature/Power Variation Test. The Test Data Sheet and Instrumentation Equipment Sheets are in Appendix D.

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

### **4.4 Hardware Testing (Continued)**

#### **4.4.6 Electrical Supply Test**

Electrical Supply Testing was performed in accordance with Section 4.1.2.4 of Volume I of the VVSG. The test was performed to ensure that the ICE (with external ADA monitor) would continue to operate a minimum of two hours when power is lost. Additionally, the ICC (DR-G1130) was tested to ensure that the system would complete the current operation and allow for a graceful shutdown per RFI 2009-03. In both tests, it was required that the voting system perform a successful shutdown without loss or degradation of the voting and audit data and allow voters to resume voting once the voting system has reverted back to primary power.

To perform the test, both components were configured for normal operation. The components were then operated as designed for fifteen minutes prior to the removal of the AC input power. Once AC power was interrupted, the ICE (with external ADA monitor) was continuously operated for a minimum period of two hours. The ICC (DR-G1130) was allowed to complete the current scanning session and then was powered down. The AC power was restored to both systems and they were operated for an additional fifteen minutes.

#### **Summary Findings**

The ICE (with external ADA monitor) and the ICC (DR-G1130) successfully completed the requirements of the Electrical Supply Test.

#### **4.4.7 Maintainability**

Maintainability Testing was performed in accordance with Section 4.7.2 of Volume II of the VVSG. This test was performed to evaluate the ease with which preventive and corrective maintenance actions can be performed. This test factored in design characteristics of equipment: software processes the vendor and election officials have in place for preventing failures, and procedures for addressing failures. The test includes the ability of equipment and software to self-diagnose problems and make non-technical election workers aware of a problem. Maintainability addresses all scheduled and unscheduled events which are performed to determine operational status and make component adjustments or repairs.

The ICE (with external ADA monitor) and the ICC (DR-G1130) were evaluated with the appropriate vendor documentation. Maintainability was determined based on the presence of specific physical attributes that aid system maintenance activities and the ease with which system maintenance tasks were able to be performed.

#### **Summary Findings**

The ICE (with external ADA monitor) and the ICC (DR-G1130) successfully completed the requirements of the Maintainability Test.

(The remainder of this page intentionally left blank)

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

**4.5 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, Usability and Accessibility Tests, Data Accuracy, as well as the Physical and Functional Configuration Audits.

**4.5.1 Volume and Stress Test**

The Democracy Suite 4.14-D 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 ICC’s (DR-G1130) response to conditions that attempt to overload the system’s capacity to process, store, and report data. Testing was performed by exercising election definitions developed specifically to test for volume and stress. The ICC (DR-G1130) system limits, tested limit values and the election definition used to verify each limit is listed in Table 4-3.

**Table 4-3 ICC 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

(The remainder of this page intentionally left blank)

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

**4.5 System Level Testing**

**4.5.1 Volume and Stress Test (Continued)**

**Table 4-3 ICC Volume and Stress (Continued)**

Voting Pattern	<p>“Test Decks” were created for each Election Definition:  <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 fed into the Central Count System 25 times to produce 12,000 scanned ballots.  <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 fed into the Central Count System 25 times to produce 10,000 scanned ballots.  <b>System Limits-</b> This election will exercise a total of 10 Tabulators, 1,000 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 to ballot processing at the high volume rates to evaluate software response to hardware-generated interrupts and wait states.</p>																													
Total Ballots Cast	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">System</th> <th style="text-align: center;">No. Ballots</th> <th style="text-align: center;">No. Machines</th> <th style="text-align: center;">No. Runs per unit</th> <th style="text-align: center;">Total</th> </tr> </thead> <tbody> <tr> <td>*ICC Max Candidate</td> <td style="text-align: center;">480</td> <td style="text-align: center;">3</td> <td style="text-align: center;">25</td> <td style="text-align: center;">36,000</td> </tr> <tr> <td>ICC Max Contest</td> <td style="text-align: center;">400</td> <td style="text-align: center;">1</td> <td style="text-align: center;">25</td> <td style="text-align: center;">10,000</td> </tr> <tr> <td>ICC System Limits</td> <td style="text-align: center;">4,000</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">4,000</td> </tr> <tr> <td colspan="4" style="text-align: right;"><b>Total</b></td> <td style="text-align: center;"><b>50,000</b></td> </tr> </tbody> </table> <p>Total Ballots scanned by ICC: 50,000</p>					System	No. Ballots	No. Machines	No. Runs per unit	Total	*ICC Max Candidate	480	3	25	36,000	ICC Max Contest	400	1	25	10,000	ICC System Limits	4,000	1	1	4,000	<b>Total</b>				<b>50,000</b>
System	No. Ballots	No. Machines	No. Runs per unit	Total																										
*ICC Max Candidate	480	3	25	36,000																										
ICC Max Contest	400	1	25	10,000																										
ICC System Limits	4,000	1	1	4,000																										
<b>Total</b>				<b>50,000</b>																										

\*This includes scan totals for initial run and re-test with additional unit added

All totals were verified against the expected results matrix to verify accuracy and the system’s ability to handle the TDP stated limits.

**Summary Findings**

One discrepancy was discovered during testing. Upon result verification, it was discovered that a single vote was missing from the Max Candidates election. The details of the error and resolution are located in the Discrepancy Report in Appendix C (ID 24). The direct cause of the error was unable to be determined and additional internal testing by Dominion was unable to reproduce the incident. It was decided that the Max Candidate portion of the volume test would be retested. A second ICC (DR-G1130) unit was added to the testing. The Max Candidate election was reprocessed on the original scanner and duplicated in parallel on the second unit in an effort to expand number of ballots processed. At the conclusion of the Volume and Stress Test re-test, it was determined that the ICC (DR-G1130) successfully met the test requirements.

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

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

#### **4.5.2 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 and COTS software, hardware, and peripherals configured as described in the Dominion-submitted TDP for the Democracy 4.14-D Voting System.

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

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

- GEN-01
- GEN-02
- GEN-03
- PRIM-01
- PRIM-02
- 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 remainder of this page intentionally left blank)

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

**4.5 System Level Testing (Continued)**

**4.5.3 Usability and Accessibility Test**

The ICE (with external ADA monitor) was subjected to Usability and Accessibility Testing in accordance with Volume I, Section 3 of the EAC 2005 VVSG. The purpose of this testing was to determine if the ICE (with external ADA monitor) conforms to the Usability and Accessibility requirements in the EAC 2005 VVSG.

The Usability and Accessibility requirements state that 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.

**Summary Findings**

The ICE (with external ADA monitor) successfully met the requirements of the Usability and Accessibility Test.

**4.5.4 Data Accuracy Test**

Per the VVSG Vol. II Section 4.7.1.1, “As indicated in Volume I, Section 4, 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 capable of reading and recording at least 1,549,703 ballot positions correctly. An accuracy test was performed on the ICC (DR-G1130). Based on the evaluation of the software changes to the ICE and ICP; NTS Huntsville determined these components were excluded from the accuracy test. The table below summarizes the accuracy test breakdown for the ICC (DR-G1130).

**Table 4-4 ICC (DR-G1130) 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 Ballot Positions	Total Ballots
11 inch	100	30	70	198	2	5	198,000	1,000
14 inch	100	30	70	270	2	5	270,000	1,000
17 inch	100	30	70	342	2	5	342,000	1,000
20 inch	100	30	70	414	2	5	414,000	1,000
22 inch	100	30	70	462	2	5	462,000	1,000
Total	500	150	350	N/A	N/A	25	1,686,000	5,000

**Summary Findings**

The ICC (DR-G1130) successfully met the requirements of the Data Accuracy Test by scanning and processing at least 1,549,703 ballot positions.

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

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

#### **4.5.5 Physical Configuration Audit**

A Physical Configuration Audit (PCA) of the Democracy Suite 4.14-D Voting System was performed as part of the testing activities in accordance with Volume II, Section 6.6 of Volume II of the EAC 2005 VVSG. The PCA compares the voting system components submitted for certification with the vendor's technical documentation and confirms that the documentation submitted meets the requirements of the Guidelines. The PCA included the following activities:

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

The PCA performed on the Democracy Suite 4.14-D Voting System consisted of inspecting the following:

- The Democracy Suite 4.14-D Election Management System (EMS) software platform
- ICP Precinct Digital Scanner
- ICE Ballot Scanner and ADA Ballot Marking Device
- ICC (DR-G1130) and ICC (DR-X10C) Digital Scan Central Ballot Scanners
- All accessories, equipment, and documentation used with the Democracy Suite 4.14-D Voting System

#### **Summary Findings**

A PCA was performed to baseline the system's hardware and software components that were used during the test campaign. No discrepancies were noted during the PCA.

(The remainder of this page intentionally left blank)

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

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

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

A Functional Configuration Audit of the Democracy Suite 4.14-D 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 Suite 4.14-D system under scope performed as documented in the Dominion-supplied technical documentation during pre-voting, voting, and post-voting activities and validated that the Democracy Suite 4.14-D meets the requirements of the EAC 2005 VVSG. The FCA for the Democracy Suite 4.14-D campaign included the EMS, ICP, ICE, ICE (with external ADA monitor), and ICC (DR-G1130). To perform the FCA, tests were designed to ensure compatibility of voting machine functions 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.

##### **Summary Findings**

A Functional Configuration Audit was performed on the 4.14-D system. A total of fourteen discrepancies were documented during the FCA (Discrepancy ID numbers: 06 - 17, 19 and 20). The discrepancies discovered during the FCA and their resolutions are in the Discrepancy Report located in Appendix C of this report. All discrepancies were corrected and retested prior to the conclusion of the test campaign. Upon retest, it was found that all requirements of the FCA were met.

#### **4.5.7 Security Testing**

Democracy Suite 4.14-D was subjected to a SCAP Security review. The review was conducted to verify that the operating environment is configured to match industry recognized security profiles. The Dominion TDP was utilized during this portion of testing to ensure the proper configuration of the operating environment.

##### **Summary Findings:**

During the Democracy Suite 4.14-DS state test campaign that was being conducted in parallel to the EAC campaign, it was discovered that the operating system security settings did not match the settings stated in the Dominion TDP document 2.06 - Democracy Suite Security Specification. The documentation and security scripts were harmonized and NTS testers re-hardened the systems. Upon retest, NTS determined the Democracy Suite 4.14-D Voting System to be compliant with the security requirements of the EAC 2005 VVSG.

#### **4.5.8 Availability**

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

(The remainder of this page intentionally left blank)

## 4.0 TEST FINDINGS AND RECOMMENDATIONS (CONTINUED)

### 4.6 Quality Assurance/Configuration Management Test

As part of the modification, NTS Huntsville personnel conducted a QA/CM review to verify that the manufacturer correctly followed their documented processes for a modified system. The QA/CM requirements were spot checked and limited to only the changes included within this modification. NTS Huntsville provided Dominion Voting a quality assurance audit list in which Dominion Voting was required to complete and deliver within 24 hours. The quality assurance audit utilized the following guidelines as the focus of the review:

The basis of this examination is to ensure:

- Conformance with the requirements to provide information on vendor practices required by these Guidelines.
- Conformance of system documentation and other information provided by the vendor with the documented practices for quality assurance and configuration management.

The focus of this examination is to assess whether the vendor's quality assurance program provide:

- Clearly measurable quality standards.
- An effective testing program throughout the system development life cycle.
- Application of quality assurance program to external providers of the system components and supplies.
- Comprehensive monitoring of system performance in the field and diagnosis of system failures
- Effective record keeping of system failures to support analysis of failure patterns and potential causes
- Effective processes for notifying customers of system failures and corrective measures are taken

#### **Summary Findings**

Dominion Voting supplied NTS Huntsville with the requested documentation and answers within the allowed 24 hour window. NTS Huntsville reviewed the provided information and deemed it acceptable to satisfy the requirements of this section in conjunction with the NTS Huntsville TDP review.

### 4.7 Discrepancies and Resolutions

A total of 18 discrepancies were discovered during testing of the Democracy Suite Voting System. NTS defines a discrepancy as any issue (functional, physical, test error, etc.) encountered during testing that was not the expected result as defined by the test case. Discrepancies are placed into the NTS discrepancy tracking system (Mantis) for disposition and resolution.

All discrepancies encountered during testing were successfully resolved prior to test completion. The discrepancies generated are summarized in the summary findings below their respected section of the test report and their resolutions are presented in their entirety in Appendix C of this report.

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

##### **4.8 Recommendation for Certification**

NTS Huntsville performed conformance testing on the Dominion Democracy Suite 4.14-D Voting System to the EAC 2005 VVSG (Version 1.0). NTS determined that the modifications met the requirements of the EAC 2005 VVSG and the manufacturer's technical documentation. As such, NTS Huntsville recommends the EAC grant the Democracy Suite 4.14-D Voting System certification to the EAC 2005 VVSG.

This report is valid only for the equipment identified in Section 2 of this report. Due to the varying requirements of individual jurisdictions, it is recommended by the EAC 2005 VVSG that local jurisdictions perform acceptance tests on all systems prior to their implementation within their jurisdiction.

**APPENDIX A - NTS CERTIFICATION AS RUN TEST PLAN NO. PR031072-01**



---

As Run Test Plan of  
EAC 2005 VVSG Certification Testing  
Performed on Dominion Voting Systems  
4.14-D

Issue Date: 10/22/2014

---

Prepared for: **Dominion Voting Systems, Inc.**  
1201 18<sup>th</sup> Street, Suite 210  
Denver, Colorado 80202

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



## TABLE OF CONTENTS

	<u>PAGE NO.</u>
<b>1.0 INTRODUCTION.....</b>	<b>6</b>
1.1 Established Baseline System .....	6
1.2 Scope Of Modification .....	7
1.3 Initial Assessment .....	9
1.4 References .....	9
1.5 Terms And Abbreviations .....	10
1.6 Testing Responsibilities.....	12
1.6.1 Project Schedule.....	12
1.6.2 Test Case Development .....	12
1.6.3 Test Procedure Development And Validation.....	12
1.6.4 Third-Party Tests .....	12
1.7 Target Of Evaluation Description .....	12
1.7.1 System Overview.....	12
1.7.2 System Operational Concept.....	18
<b>2.0 PRE-CERTIFICATION TESTING AND ISSUES .....</b>	<b>19</b>
2.1 Evaluation Of Prior Vstl Testing.....	19
2.2 Known Field Issues .....	19
<b>3.0 MATERIALS REQUIRED FOR TESTING .....</b>	<b>19</b>
3.1 Software .....	19
3.2 Equipment .....	20
3.3 Test Tools/Materials .....	23
3.4 Deliverable Materials.....	24
<b>4.0 TEST SPECIFICATIONS .....</b>	<b>27</b>
4.1 Requirements (Strategy Of Evaluation).....	27
4.2 Hardware Configuration And Design.....	30
4.3 Software System Functions.....	31
4.4 Test Case Design.....	31
4.4.1 Hardware Qualitative Examination Design .....	31
4.4.3 Software Module Test Case Design And Data .....	37
4.4.4 Software Functional Test Case Design And Data .....	38
4.4.5 System Level Test Case Design.....	39
4.5 TDP Evaluation .....	40
4.6 Source Code Review.....	42
4.7 QA And CM System Review.....	44

**TABLE OF CONTENTS (Continued)**

	<u>PAGE NO.</u>
<b>5.0 TEST DATA .....</b>	<b>44</b>
5.1 Test Data Recording .....	44
5.2 Test Data Criteria .....	44
5.3 Test Data Reduction.....	44
<b>6.0 TEST PROCEDURE AND CONDITIONS .....</b>	<b>45</b>
6.1 Facility Requirements .....	45
6.2 Test Set-Up .....	46
6.3 Test Sequence .....	53
6.3.1 Hardware Test Descriptions .....	53
6.3.2 Software Test Descriptions.....	55
6.3.3 System Testing.....	58
<b>7.0 TEST OPERATIONS PROCEDURES .....</b>	<b>61</b>
7.1 Proprietary Data .....	61
<b>APPENDIX A PROJECT SCHEDULE .....</b>	<b>62</b>
<b>APPENDIX B CHANGE NOTES .....</b>	<b>64</b>
<b>APPENDIX C SOFTWARE TABLES .....</b>	<b>68</b>

**LIST OF TABLES**

	<u>PAGE NO.</u>
Table 1-1 Democracy Suite 4.14-B Voting System Hardware Components.....	6
Table 1-2 Democracy Suite 4.14-B Voting System Software Components .....	7
Table 1-3 Democracy Suite 4.14-B Voting System EMS Components .....	7
Table 1-4 Terms and Abbreviations.....	10
Table 3-1 Software Utilized for Testing.....	19
Table 3-2 Voting Equipment .....	20
Table 3-3 ICC Equipment .....	21
Table 3-4 COTS Equipment.....	20
Table 3-5 Democracy Suite COTS Equipment .....	21
Table 3-6 Software Build Equipment .....	21
Table 3-7 Test Tools/Materials .....	23
Table 3-8 Deliverable Materials .....	24
Table 4-1 ICP Hardware Test Examination Results .....	31
Table 4-2 ICE Hardware Test Examination Results .....	33
Table 4-3 ICC Hardware Test Examination Results .....	35
Table 4-4 Democracy Suite 4.14D TDP Documents .....	40
Table 6-1 Democracy Suite 4.14D Hardware Test Sequence .....	54
Table 6-2 Democracy Suite 4.14D Software Test Sequence .....	57
Table 6-3 Democracy Suite 4.14D System Test Sequence.....	60

**LIST OF FIGURES**

	<u>PAGE NO.</u>
Figure 1-1 ImageCast Evolution on Plastic Ballot Box.....	15
Figure 1-2 ImageCast Precinct on Metal Ballot Box .....	16
Figure 1-3 Canon DR-G1130 Scanner with ImageCast Central Workstation .....	17
Figure 1-4 PhotScribe Scanner.....	18
Figure 1-5 System Overview Diagram .....	18

**1.0 INTRODUCTION**

The purpose of this National Certification Test Plan (Test Plan) is to document the procedures that National Technical Systems (NTS) will follow to perform certification testing of the Dominion Voting Systems' Democracy Suite 4.14-D voting system to the requirements set forth in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (EAC 2005 VVSG). Prior to submitting the system for certification testing, Dominion Voting Systems submitted an application to the EAC for certification of the Democracy Suite 4.14-D voting system modification to the previously certified Democracy Suite 4.14-B voting system (Certification number: DemSuite-4-14-B). This test plan follows Notice of Clarification 09-005: Development and Submission of Test Plans for Modifications to EAC Certified Systems and Notice of Clarification 13-02: Detailed Description of Changes for Modifications.

At test conclusion, the results of all testing performed as part of this test campaign will be submitted to the EAC in the form of a final report.

**1.1 Established Baseline System**

The baseline system for this modification is the Democracy Suite 4.14-B voting system. Tables 1-1, 1-2, and 1-3 describe the certified equipment and firmware versions. For full details about the Democracy Suite 4.14-B system, refer to the Dominion Voting Systems' Final Test Report (Rev B) located on the EAC's website at <http://www.eac.gov>.

**Table 1-1 Democracy Suite 4.14-B Voting System Hardware Components**

Component	Hardware Version	Software/Firmware Version
ICE – Precinct ballot scanner	PCOS-410A	4.14.13
ICP – Precinct ballot scanner	PCOS-320A and PCOS-320C	4.14.9-US
ICC – Ballot scanner	Canon DR-X10C	N/A
ICE – Plastic ballot box	Box-410A	N/A
ICE – Coroplast Ballot Box	Box-420A	N/A
ICP – Metal ballot box	Box-310A	N/A
ICP – Plastic Ballot Box	Box-330C	N/A
ICP – Coroplast Ballot Box	Box-340C	N/A
ICP – Coroplast Ballot Box w/latch	Box-341-C	N/A

(The remainder of this page intentionally left blank)

**1.0 INTRODUCTION (Continued)**

**1.1 Established Baseline System (Continued)**

**Table 1-2 Democracy Suite 4.14-B Voting System Software Components**

Component	Version
Election Event Designer (EED)	4.14.23
Results Tally and Reporting (RTR)	4.14.23
File System Service (FSS)	4.14.23
Audio Studio (AS)	4.14.23
Data Center Manager	4.14.23
Application Server	4.14.23
Network Attached Storage Server	4.14.23
Database Server	4.14.23
Election Data Translator	4.14.23
ImageCast Central	4.14.4

**Table 1-3 Democracy Suite 4.14-B Voting System EMS Components**

Equipment	Description	Serial Number
EMS PC 1	Dell Precision T1500	CP7GGX1
EMS PC 2	Dell OptiPlex 7010	2Y7BGX1
EMS LAPTOP	HP 2000 Notebook PC	2C32NR

**1.2 Scope of Modification**

The scope of this modification includes the following changes to address new system functionality and hardware updates for the Democracy Suite voting system.

1. Introduction of a new optional Adjudication application that allows review of voter intent on a ballot-by-ballot basis from the ImageCast Central device utilized during either absentee voting or post-voting activity phases.
2. In the EMS EED module:
  - a. Added the ability to override global settings for visual elements on the level of contrast.
  - b. Added the ability to print graphics on selected contests in the candidate cell next to the candidate name.
  - c. Added the ability to generate a printer calibration sheet.
  - d. Added the ability to render crop marks on the ballot.
3. In the RTR module, added the ability to manage reporting profiles.
4. Across the system, added support for Open Primary elections.

**1.0 INTRODUCTION (Continued)****1.2 Scope of Modification (Continued)**

5. Updated the Dominion logos used in the applications.
6. In the ICP application:
  - a. Modified code to support firmware changes in the battery voltage table.
  - b. Added support for languages without textual representation (i.e., Navajo).
7. In the ICE application:
  - a. Added MBS (Machine Behavioral Settings) options to report multiple write-in positions separately on zero reports and results reports, to provide Total Cast and Total Voters on the results transfer report, and to support an optional external COTS display for accessible voting sessions.
  - b. Improved presentations of voting rule error messages.
  - c. Added three additional languages to the install package: Hindi, Khmer, and Thai.
  - d. Added the ability to allow unit to scan and cast marked ballots while ballot selections are being made concurrently during an independent accessible voting session, which is using the ATI and the external COTS display.
  - e. Added the ability to enable an external monitor in the diagnostics menu.
  - f. Added additional options to the Print Head Servicing feature: frequency of print head cleaning, and number of servicing routines in the cleaning procedure.
8. In the ICE configuration, added an optional external COTS display to present the ballot image and the voter's selections during an accessible voting session.
9. In the ICC configuration, added the Canon DR-G1130 scanner.
10. In the EMS Standard Server configuration, added a hardware RAID controller to improve the performance of that computer configuration utilizing the following parameters:
  - Raid 1 (system partition) = (2) 1 TB mirrored drives. One disk needed for recovery
  - Raid 10 (data partition) = (4) 1 TB striped drives. Two disks needed for recovery

(The remainder of this page intentionally left blank)

### 1.3 Initial Assessment

All versions of the precinct tabulators were submitted for testing in previous EAC campaigns. NTS personnel have analyzed the results of the ICP and ICE testing to determine prior testing acceptance. Based on this analysis, NTS is applying for reuse of all prior testing within the EAC test campaigns unless otherwise notated within this document. In addition, to verify that the modifications to the voting system do not introduce any nonconformities or instabilities, the Democracy Suite 4.14-D voting system shall be subjected to a system integration test to ensure all components interact properly.

### 1.4 References

The documents listed below were used in the development of the Test Plan and are utilized to perform certification 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, expires July 2017
- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 1.0, expires July 2017
- 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
- 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 (listed on <http://www.eac.gov>)
- EAC Notices of Clarification (listed on <http://www.eac.gov>)

1.0 INTRODUCTION (Continued)

1.4 References (Continued)

- EAC Quality Monitoring Program residing at:  
[http://www.eac.gov/testing\\_and\\_certification/quality\\_monitoring\\_program.aspx](http://www.eac.gov/testing_and_certification/quality_monitoring_program.aspx)
- Dominion Voting Systems Democracy Suite 4.14-B VSTL Certification Test Report Rev. B (listed on <http://www.eac.gov>)
- Dominion Voting Systems Democracy Suite 4.14-B Technical Data Package

1.5 Terms and Abbreviations

Table 1-4 defines all terms and abbreviations applicable to the development of this Test Plan.

Table 1-4 Terms and Abbreviations

Term	Abbreviation	Definition
Americans with Disabilities Act of 1990 (Amended 2008)	ADA	ADA is a wide-ranging civil rights law that prohibits, under certain circumstances, discrimination based on disability.
Audio Studio	AS	EMS application used to record audio files.
Audio Tactile Interface	ATI	Electronic voter interface that does not require visual reading of a ballot. Audio is used to convey information to the voter and sensitive tactile controls allow the voter to convey information to the system.
Configuration Management	CM	---
Commercial Off the Shelf	COTS	Commercial, readily available hardware or software.
Direct Record Electronic	DRE	An electronic voting system that utilizes electronic components for the functions of ballot presentation, vote capture, vote recording, and tabulation which are logically and physically integrated into a single unit. A DRE produces a tabulation of the voting data stored in a removable memory component and in printed hardcopy.
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.
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	---
Help America Vote Act	HAVA	Act created by United States Congress in 2002.

1.0 INTRODUCTION (Continued)

1.5 Terms and Abbreviations (Continued)

Table 1-4 Terms and Abbreviations (Continued)

Term	Abbreviation	Definition
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 integrated Ballot-marking Device
ImageCast Central	ICC	COTS High-speed central ballot scan tabulator.
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.
National Technical Systems, Inc.	NTS	---
Machine Behavioral Settings	MBS	The Machine Behavior Settings file (MBS file) represents the XML file that defines the behavior of an ImageCast® Evolution device. This file determines how the ImageCast® Evolution device machine will operate.
NTS Operating Procedure	OP	NTS Test Method or Test Procedure.
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.
Quality Assurance	QA	---
System Under Test	SUT	Refers to the system as a whole (all components)
Test Case Procedure Specifications	TCPS	NTS-developed document that specifies test items, input specifications, output specifications, environmental needs, special procedural requirements, inter-case dependencies, and all validated test cases that will be 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.

## **1.0 INTRODUCTION (Continued)**

### **1.6 Testing Responsibilities**

Prior to the development of this test plan, NTS evaluated test results from the Democracy Suite 4.14-B test campaign performed by Wyle Laboratories. The purpose of this evaluation was to determine the scope of testing required for system certification. Based on this evaluation, NTS determined that testing from the previous test campaign can be utilized to satisfy some requirements of this test campaign. Sections 2.1 and 4.4.1 contain additional details of this evaluation. All other core and non-core software and hardware certification testing shall be conducted under the guidance of qualified NTS personnel.

#### **1.6.1 Project Schedule**

This information is contained in a NTS-generated Microsoft Project schedule. This schedule is presented in Appendix A, "Dominion Project Schedule." The dates on the schedule are not firm dates but estimates presented for planning purposes.

#### **1.6.2 Test Case Development**

NTS will utilize the "NTS Baseline Test Cases" for the Functional and System Integration Tests. These will be augmented with specially designed test cases tailored to the Democracy Suite 4.14-D system.

#### **1.6.3 Test Procedure Development and Validation**

NTS will utilize the NTS Operating Procedures (OPs) during the duration of this test program.

#### **1.6.4 Third-Party Tests**

NTS will not utilize any third-party testing during performance of the Democracy Suite 4.14-D test campaign.

### **1.7 Target of Evaluation Description**

The following sections address the design methodology and product description of the Democracy Suite 4.14-D test campaign, as taken from the Dominion Voting Systems' technical documentation.

#### **1.7.1 System Overview**

The Dominion Voting Systems Democracy Suite 4.14-D System is a paper-based optical scan voting system and a modification of the previously-certified Democracy Suite 4.14-B System.

The certified system consists of four major components: the Election Management System (EMS), ImageCast Evolution (ICE) precinct scanner and ballot marking device, ImageCast Precinct (ICP) precinct scanner with audio ballot, and ImageCast Central (ICC) central count scanner.

## 1.0 INTRODUCTION (Continued)

### 1.7.1 System Overview (Continued)

#### Election Management System

The EMS consists of eleven components running as either a front-end/client application or as a back-end/server application. Below is an overview and brief description of each.

- Election Event Designer (EED) client application - integrates election definition functionality and represents a main pre-voting phase end-user application.
- 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.
- 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.
- Data Center Manager client application - represents a system level configuration application used in EMS back-end data center configuration.
- Application Server application - represents a server side application responsible for executing long running processes, such as rendering ballots, generating audio files and election files, etc.
- 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, election files, etc.
- Database Server application - represents a server side database repository of the election project database which holds all the election project data, including pre-voting and post-voting data.
- Election Data Translator (EDT) - exports and imports data in a format suitable for usage in the Election Event Designer (EED) application.
- EMS Adjudication - Represents the server and client components responsible for adjudication, including reporting and generation of adjudicated result files from ImageCast Central tabulators.
- 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

## 1.0 INTRODUCTION (Continued)

### 1.7.1 System Overview (Continued)

- EMS File System Service – A stand-alone service that runs on client machines, enabling access to low level operating system API for partitioning CF cards and reading raw partition data on the ICP CF card.

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

The Dominion Democracy Suite ImageCast Evolution System employs a precinct-level optical scan ballot counter (tabulator) in conjunction with ImageCast compatible ballot storage boxes. 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 optionally an external LCD display, or audibly via integrated headphones), and upon the voter's acceptance, deposit the ballots into the ballot box. The unit also features an 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.



**Figure 1-1: ImageCast Evolution (ICE) on Plastic Ballot Box**

## 1.0 INTRODUCTION (Continued)

### 1.7.1 System Overview (Continued)

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

The Dominion Democracy Suite 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 store and tabulate each vote from each paper ballot. The ICP contains a small touch-screen LCD to allow the poll worker to access diagnostic and configuration settings.

In addition, enhanced accessibility voting may be accomplished via optional accessories connected to the ImageCast unit. The ICP utilizes an ATI device to allow voters with disabilities to navigate and submit a voted ballot. This is accomplished by presenting the ballot to the voter in an audio format. The ATI is connected to the tabulator and allows the voter to listen to an audio voting session consisting of contest and candidate names. The ATI also allows a voter to adjust the volume and speed of audio playback. The cast vote record is recorded electronically when the ATI is used to cast a ballot. There is no contemporaneous paper ballot or paper record produced when the ATI is utilized for voting. A ballot arising from the voter's choices may be printed from the EMS at a later time.



Figure 1-2: ImageCast Precinct (ICP) on Metal Ballot Box

## 1.0 INTRODUCTION (Continued)

### 1.7.1 System Overview (Continued)

#### Central Tabulator: ImageCast Central Ballot Counter (ICC)

The Dominion ImageCast Central Ballot Counter system is a central ballot scan tabulator coupled with custom-made ballot processing application used for accurate, and reliable centralized scanning and counting applications of paper ballots.

The ImageCast Central is typically utilized to process absentee ballots, but an entire election can be processed through it. Mail-in ballot elections are an example of a type of election in which the ImageCast Central can be utilized to process the entire population of ballots for that election. The election definition is taken from EMS, using the same data and database that is utilized to program any precinct scanners for a given election. Multiple ImageCast Central scanners can be programmed for use in an election. The ImageCast Central software application is installed and later initialized on a computer attached to the central count scanner.

Ballots are processed through the central scanner(s) in batches based on jurisdictional preferences and requirements. Regardless of these preferences, the ImageCast Central stores ballot images by scanning batches. The scanned ballot images are migrated to EMS Adjudication and/or EMS RTR through computer networking or by removable media. EMS Results Transfer and Reporting is the application which processes the results from ICC (and Adjudication), and provides the results reports to the jurisdiction. Batches can be appended, deleted, and processed in a number of ways to suit typical election workflows, intake of ballots before, during, and after Election Day, jurisdiction requirements surrounding absentee ballot tabulation, and Canvassing needs. Note: Optionally, results can be processed by the EMS Adjudication system prior to sending to EMS RTR.

Central scanning system hardware consists of a combination of two COTS devices used together to provide the required ballot scanning processing functionality:

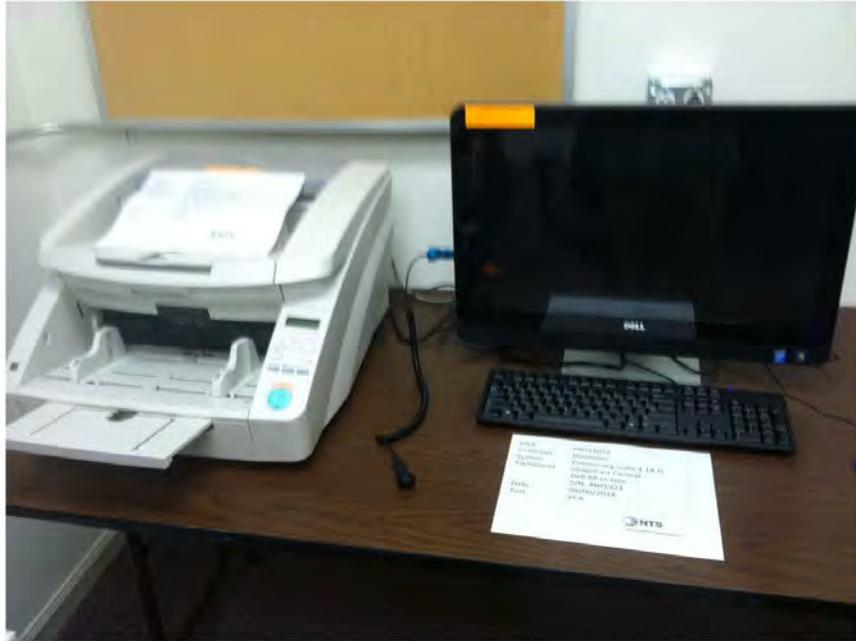
- The Scanner: used to provide accurate ballot scanning and image transfers to the local ImageCast Central Workstation.
- ImageCast Central Workstation PC: used for ballot image and election rules processing and results transferring to the EMS Datacenter. The ImageCast Central Workstation is a Dominion pre-approved PC workstation hardware which executes the image processing and election rules software application.

Two scanners are available for use with Democracy Suite: the Canon DR-X10C and Canon DR-G1130. When using the scanners, the following commercially available software applications and tools are used in order to provide the required ballot scanning processing functionality:

- OpenSSL: A FIPS-compliant security library
- Kofax VRS: An image processing tool

**1.0 INTRODUCTION (Continued)**

**1.7.1 System Overview (Continued)**



**Figure 1-3: Canon DR-G-1130 Scanner and ImageCast Central Workstation**

(The remainder of this page intentionally left blank)



**2.0 PRE-CERTIFICATION TESTING AND ISSUES**

NTS has conducted a pre-certification review, and findings indicate that all system changes are consistent with the change items documented in the EAC Application DVS1402.

**2.1 Evaluation of Prior VSTL Testing**

NTS will reutilize all testing from the previously-certified systems submitted by Dominion Voting Systems. The testing of these systems was conducted by NTS in accordance with the EAC 2005 VVSG, and the EAC Certification Numbers are DVS-40-G-10, DemSuite-4-14, DVS-DemSuite-4-14-A, DVS-DemSuite4.14B, and DVS-DemSuite4.14-A.1.

**2.2 Known Field Issues**

This system is a modification to previously-certified systems. There were no systemic or significant issues traceable to any of the previously certified systems.

**3.0 MATERIALS REQUIRED FOR TESTING**

The materials required for certification testing of the Democracy Suite 4.14-D Voting System include software, hardware, test materials, and deliverable materials. These items were or shall be shipped directly to NTS by Dominion Voting Systems to enable the test campaign to occur.

**3.1 Software**

Table 3-1 lists the software the manufacturer must submit for testing. This section lists all software required for operation and testing of the voting system being certified. This includes the software used for functional and hardware testing. All software utilized in the test campaign is listed in Appendix C, Software Tables.

**Table 3-1 Software Utilized for Testing**

Software Required For Testing	Software Version
Election Event Designer (EED)	4.14.37
Results Tally and Reporting (RTR)	4.14.37
File System Service (FSS)	4.14.37
Audio Studio (AS)	4.14.37
Data Center Manager	4.14.37
Application Server	4.14.37
Results Tally and Reporting (RTR)	4.14.37
EMS Adjudication Service	2.4.1.3201
EMS Database Server	4.14.37
EMS Election Data Translator (EDT)	4.14.37
EMS NAS Server	4.14.37
ImageCast Evolution	4.14.21
ImageCast Precinct	4.14.17
ImageCast Central	4.14.17

**3.0 MATERIALS REQUIRED FOR TESTING (Continued)**

**3.2 Equipment**

This subsection categorizes the tools and materials the manufacturer submitted for testing listed in Tables 3-2, 3-3, 3-4, 3-5, 3-6, and 3-7. Each test element is included in the list of equipment required for testing of that element, including system hardware, general purpose data processing and communications equipment, and any required test instrumentation.

**Table 3-2 Voting Equipment**

Equipment	Manufacturer	Model	Serial Number
ICE	Dominion	PCOS 410-A	AAFEBDZ0068
ICE	Dominion	PCOS 410-A	AAFEBEC0097
ICE	Dominion	PCOS 410-A	CAFEBDC0015
ICE	Dominion	PCOS 410-A	AAFEBEP0003
ICP	Dominion	PCOS 320-C	WLDAFBH0018
ICP	Dominion	PCOS 320-A	AANAGCP0265
ICP	Dominion	PCOS 320-A	WLDAFBH0023
ICE Ballot Box	Dominion	Plastic	AAUCBEJ0120
ICE Ballot Box	Dominion	Plastic	AAUCBEG0018
ICE Ballot Box	Dominion	Plastic	AAUCBEA0043
ICP Ballot Box	Dominion	Metal	57381-012
ICP Ballot Box	Dominion	Metal	57381-014
ICP Ballot Box	Dominion	Metal	57381-011

**Table 3-3 ICC Equipment**

Equipment	Manufacturer/Model	Specifications	Serial Number
ICC Workstation	Dell OptiPlex 9020	Processor: Intel Core i7-4770S@3.1 GHz Memory: 8GB 1333 MHz DDR3 Hard Drive Capacity: 500 GB	4NPL9Z1
ICC Workstation	Dell OptiPlex 9030	Processor: Intel Core i5-4590S@3.0 GHz Memory: 8GB 1333 MHz DDR3 Hard Drive Capacity: 500 GB	FYNTY12
COTS Scanner	Canon DR-G1130	N/A	GF301677
COTS Scanner	Canon DR-G1130	N/A	GF300207

3.0 MATERIALS REQUIRED FOR TESTING (Continued)

3.2 Equipment (Continued)

Table 3-4 COTS Equipment

Equipment	Manufacturer / Model	Hardware Specifications	Serial Number
PC 1	Dell Precision T1700	Processor: Intel Core i5-4570 @ 3.20 GHz Memory: 8 GB 1600Mhz RAM Hard Drive Capacity: 500GB	4QGQY12
Laptop 1	Dell Latitude E6540	Processor: Intel Core i7-4810MQ @ 2.80 GHz Memory: 8 GB 1600Mhz RAM Hard Drive Capacity: 500GB	FRB8H12
PC2	Dell PowerEdge T620	Intel Xeon CPU E-52640v2 @ 2.00 GHz Memory: 32 GB 1600Mhz RAM Hard Drives: (6) 1 TB (PERC H710 RAID Controller)	J8H9H02

Table 3-5 Democracy Suite COTS Equipment

Test Material	Make	Model	Quantity	Serial Number
iButton (SHA-1) with USB Reader/Writer	Maxim	USB R/W: DS9490R iButton: DS1963S	3	4D027C, 4C9CF5, 514DFD
iButton (SHA-1)	Maxim	DS1963S	2	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, 10203JII, LZ.A30491960, 438027372

3.0 MATERIALS REQUIRED FOR TESTING (Continued)

3.2 Equipment (Continued)

Table 3-5 Democracy Suite COTS Equipment (Continued)

Test Material	Make	Model	Quantity	Serial Number
Mouse	Microsoft	USB w/rollerball	1	X800898
Keyboard	Kensington	USB	1	D0713000487
Keyboard	Microsoft	USB	1	6968200717217
ICE external LCD monitor	AOC	E1649FWU	3	D2RE4HA020348, D2RE4HA017467, D2RE4HA017592
Compact Flash Reader	SanDisk	USB	3	0171618, 0201833, 0171631
Card Reader	GGI Gear	Compact Flash Card Reader	4	CFRW-57381-001 thru 004
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	--	Kinesis	4	FS-57381-001 thru 004
#970 Armrest Sip & Puff Attachment	--	Enabling Devices	6	AR-57381-001 thru 006
Universal Power Supply (UPS)	APC	C1000	1	3S1427X00085
Universal Power Supply (UPS)	APC	C1500	1	3S1425X06415
Compact Flash	RiData	CFC-14A	50	NTS-assigned numbers: CF-XXX
Compact Flash	RiData Industrial	RDCF8G-233XMCB2-1	2	NTS-assigned numbers: CF-XXX
Compact Flash	RiData Industrial	RDCF16G-233XMCB2-1	2	NTS-assigned numbers: CF-XXX
Compact Flash	RiData Industrial	RDCF32G-233XMCB2-1	2	NTS-assigned numbers: CF-XXX
Compact Flash	SanDisk Extreme	SDCFX-016G	2	NTS-assigned numbers: CF-XXX
Compact Flash	SanDisk Extreme	SDCFX-032G	2	NTS-assigned numbers: CF-XXX

**3.0 MATERIALS REQUIRED FOR TESTING (Continued)**

**3.2 Equipment (Continued)**

**Table 3-6 Software Build Equipment**

Equipment and Operating System	Manufacturer	Version/Model	Serial Number	COTS /Non-COTS
Build 1	Super Micro	SuperServer	BM-57381-001	COTS

**3.3 Test Tools/Materials**

This subsection enumerates any and all test materials needed to perform voting system testing in Table 3-7. The scope of testing determines the quantity of a specific material required.

**Table 3-7 Test Tools/Material**

Test Tool/Material	Quantity
Black Privacy Panels (set of 2 pieces)	as required
Security Keys	as required
Thermal Printer Rolls	as required
Dominion Cleaning Kit	as required
Sharpie Permanent Markers	as required
Ballots	as required

(The remainder of this page intentionally left blank)

**3.0 MATERIALS REQUIRED FOR TESTING (Continued)**

**3.4 Deliverable Materials**

The materials listed in Table 3-8 are to be delivered as part of the Democracy Suite 4.14-D voting system to the users:

**Table 3-8 Deliverable Materials**

<b>Deliverable Material</b>	<b>Version</b>	<b>Description</b>
Election Event Designer	4.14.37	EMS client application
Results Tally and Reporting	4.14.37	EMS client application
File System Service	4.14.37	EMS client application
Audio Studio	4.14.37	EMS client application
Application Server	4.14.37	EMS server application
Datacenter Manager	4.14.37	EMS server application
Adjudication	2.4.1.2.4.1.3201	EMS client application
Adjudication Service	4.14.37	EMS server application
Database Server	4.14.37	EMS server application
Election Data Translator	4.14.37	EMS client application
NAS Server	4.14.37	EMS server application
ImageCast Evolution (with optional external monitor)	410A w/Firmware version 4.14.21	Precinct ballot scanner and ADA accessible voting device
ImageCast Precinct	320A w/Firmware version 4.14.17	Precinct ballot scanner and ADA accessible voting device
ImageCast Central Count (Central Count Scanners listed are all options and dependent upon the vendor contract on which is included)	Canon DR-X10C with ICC software version 4.14.17	Central ballot scanner
	Canon DR-G1130 with ICC software version 4.14.17	
ImageCast Evolution Plastic Ballot Box	BOX-410A	ICE Plastic Ballot box
ImageCast Precinct Metal Ballot Box	BOX-310A	ICP Metal Ballot box

(The remainder of this page intentionally left blank)

3.0 MATERIALS REQUIRED FOR TESTING (Continued)

3.4 Deliverable Materials (Continued)

Table 3-8 Deliverable Materials (Continued)

Deliverable Material	Version	Description
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
Gigabit Network Switch	D-Link DGS-2208 8-Port Switch	Network switch for standard or enterprise configuration
ICE/ICP Headphones	Cyber Acoustics	Headphones used for audio voting
Sip/Puff Device	Origin Instruments Air Voter	Binary input device for disabled voters
ICP System Operation Procedures	4.14.D::197	TDP Document
EMS System Operation Procedures	4.14.D::534	TDP Document
ICE System Operation Procedures	4.14.D::155	TDP Document
ICC System Operation Procedures	4.14.D::122	TDP Document
ICP System Maintenance Manual	1.1.0::66	TDP Document
ICE System Maintenance Manual	1.1.0::115	TDP Document
EMS System Maintenance Manual	1.0.0::50	TDP Document
Election Event Designer User's Guide	4.14.D::233	TDP Document
Results Tally and Reporting User's Guide	4.14.D::153	TDP Document
Audio Studio User's Guide	4.14.D::49	TDP Document
ImageCast Adjudication User's Guide	4.14.D::41	TDP Document

(The remainder of this page intentionally left blank)

#### 4.0 TEST SPECIFICATIONS

Modification testing of the Democracy Suite 4.14-D will be performed on the configuration submitted in the EAC application DVS1402. NTS' qualified personnel will ensure that all certification testing performed on the manufacturer's voting system follows NTS' procedures for testing, and the specific test cases developed for this campaign meet the requirements of the EAC 2005 VVSG and EAC Testing and Certification Program Manual.

All Requests for Interpretation (RFIs) and Notices of Clarification (NOCs) applicable as of the date of this document shall apply to this test campaign unless otherwise noted.

#### 4.1 Requirements (Strategy of Evaluation)

To evaluate the system test requirements, each section of the EAC 2005 VVSG will be analyzed to determine the applicable tests. The EAC 2005 VVSG requirements, along with the strategy for evaluation, are described below:

**Section 2: Functional Requirements** – The requirements in this section will be tested during the FCA and System Integration tests utilizing the “NTS Baseline Test Cases” along with test cases specially designed for the Democracy Suite 4.14-D.

**Section 3: Usability and Accessibility** – The requirements in this section will be tested during this test campaign on the ICE with an optional COTS external monitor. During this test campaign, the ICE with an optional COTS external monitor will be verified that it meets the Usability and Accessibility requirements of the 2005 VVSG.

**Section 4: Hardware Requirements** – The requirements in this section will be tested and/or evaluated by trained NTS personnel per section 4.4 and table 4-1.

**Section 5: Software Requirements** – The requirements in this section will be tested during source code review, TDP review, and FCA. A combination of review and functional testing will be performed to ensure these requirements are met.

**Section 6: Telecommunication** – The requirements in this section will not be tested during this test campaign because no changes were included in this modification to the Standard Networking Configuration from the Democracy Suite 4.14-A-1 EAC-certified system.

**Section 7: Security Requirements** – The requirements in this section were reviewed to determine the impact of the modification. It was determined that a SCAP review was required.

(The remainder of this page intentionally left blank)

#### 4.0 TEST SPECIFICATIONS (Continued)

##### 4.1 Requirements (Strategy of Evaluation) (Continued)

- **Section 8: Quality Assurance (QA) Requirements** – The QA requirements will be spot checked and limited to only the changes included within this modification. The following documents were utilized during the limited review process:
  - 2.12 Quality Assurance Plan
- **Section 9: Configuration Management (CM) Requirements** – The CM requirements will be spot checked and limited to only the changes included within this modification. The following documents were utilized during the limited review process:
  - 2.11 - Democracy Suite Configuration Management Process

(The remainder of this page intentionally left blank)

**4.0 TEST SPECIFICATIONS (Continued)**

**4.1 Requirements (Strategy of Evaluation) (Continued)**

The specific NTS OPs to be used during testing include the following:

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| OP 1 Operational Status Checks       | OP 21 Temperature Power Variation  |
| OP 2 Receipt Inspection              | OP 24-1 Usability                  |
| OP 3 Technical Data Package Review   | OP 24-2 Accessibility              |
| OP 4 Test Plan Preparation           | OP 25 Physical Configuration Audit |
| OP 5a-d Source Code Review           | OP 26 Functional Requirements      |
| OP 7 & 7a Trusted Build              | OP 27 Maintainability              |
| OP 7b & 7c Compliance Build          | OP 29 Electrical Supply            |
| OP 9 Electromagnetic Emissions       | OP 30 System Integration Test      |
| OP 10 Electrostatic Disruption       | OP 34 Test Report                  |
| OP 11 Electromagnetic Susceptibility | OP 41 Logic and Accuracy           |
| OP 14 Conducted RF Immunity          |                                    |

(The remainder of this page intentionally left blank)

#### 4.0 TEST SPECIFICATIONS (Continued)

#### 4.2 Hardware Configuration and Design

The Democracy Suite system consists of four major components: the EMS, ICE precinct scanner and ballot marking device, ICP precinct scanner, and ICC central count scanner. The Democracy Suite is comprised of two proprietary pieces of hardware (ICE and ICP) and one piece of COTS hardware (ICC). All EMS functions are handled by proprietary software running on COTS PCs/laptops/servers. NTS has determined that these COTS PC/laptops/servers are not subject to hardware testing per the EAC 2005 VVSG. The provided PC/laptops/servers documented in "Section 3 - Materials Required For Testing" contain CE, UL, and FCC labeling.

ICP – A PCA was performed on the ICP component to verify the changes and effects caused by the changes to the unit. No additional hardware testing will be required based on the findings of the evaluation. Wyle Laboratories previously performed testing to the EAC 2005 VVSG during the Democracy Suite 4.0 approved certification testing (EAC CERTIFICATION NUMBER – DVS-40-G). NTS will be utilizing the data obtained during that test effort to satisfy requirements for this modification test campaign.

ICE – The tabulators will be mounted on the ballot box to simulate the actual election configuration. During operational tests the unit will be in auto-feed mode ("Shoe-Shine") and scan test ballots for the duration of the operational test.

Each unit will be loaded with the Operational Status Check Hardware election definition configured for early voting. This will allow all the data generated for the Pre-operational, Operational, and Post-operational test to be further analyzed, compiled, and included in the Reliability and Availability Test results.

ICC – This tabulator consists of the following COTS scanners and COTS workstation PCs: The Canon DR-X10C and Canon DR-G1130 scanners, and the Dell OptiPlex 9020 and Dell OptiPlex 9030 workstation PCs. Workstation PCs contain CE, UL, and FCC labeling. The Canon DR-G1130 will be submitted for Temperature and Power Variation testing during this test campaign, and the hardware testing for the Canon DR-X10C scanner will be accepted from the original Democracy Suite 4.0 (EAC CERTIFICATION NUMBER – DVS-40-G).

(The remainder of this page intentionally left blank)

### 4.3 Software System Functions

The Dominion Democracy Suite 4.14-D system software is written in the C, C++, C# (C Sharp) programming languages. The system software is broken into three areas: EMS, precinct tabulator software acting as firmware, and central count application running on a COTS workstation.

The Democracy Suite EMS software consists of the eleven components listed below:

- Election Event Designer
- Results Tally and Reporting
- Audio Studio
- Adjudication
- Adjudication Service
- Election Data Translator
- File System Service
- Datacenter Manager
- Application Server
- Network Attached Storage Server
- Database Server

The Democracy Suite 4.14-D contains two precinct tabulators, the ICE and ICP. Both tabulators run Dominion-proprietary software that is treated as firmware. The software applications are ICP and ICE.

The Democracy Suite 4.14-D also includes a COTS PC workstation running Dominion-proprietary software called the ICC application. This software provides the central tabulation function for the system.

### 4.4 Test Case Design

NTS uses the V-Model Life Cycle as defined by the Institute of Electrical and Electronics Engineers (IEEE). The IEEE definition of the V-Model Life Cycle uses two concepts "Verification" and "Validation." NTS' test approach is to incorporate the use of both "Verification" and "Validation." There are four basic levels of testing in the V-Model Life Cycle: Component, Integration, System, and Acceptance. NTS will be evaluating the Dominion Democracy Suite 4.14-D to all four levels.

#### 4.4.1 Hardware Qualitative Examination Design

Dominion submitted the results of previous testing in the form of the following test reports:

- Certification Testing of the Dominion Voting Systems Democracy Suite 4.0, Wyle Laboratories Test Report No. T57381-01
- Certification Testing of the Dominion Voting Systems Democracy Suite 4.14, Wyle Laboratories Test Report No. T70251-01
- Certification Testing of the Dominion Voting Systems Democracy Suite 4.14-A, Wyle Laboratories Test Report No. T71120-01

#### 4.0 TEST SPECIFICATIONS (Continued)

##### 4.4.1 Hardware Qualitative Examination Design (Continued)

- Certification Testing of the Dominion Voting Systems Democracy Suite 4.14-B, Wyle Laboratories Test Report No. T71372-01
- Certification Testing of the Dominion Voting Systems Democracy Suite 4.14-A.1, NTS Test Report No. T71615-01

NTS personnel performed a hardware qualitative examination to 1) assess if the testing was performed under the guidelines of the EAC program, 2) assess if the tests were performed per the EAC 2005 VVSG, and 3) determine if the scope of the engineering changes were implemented since test performance. The results from this examination deemed that the hardware testing performed under the Democracy Suite 4.0, 4.14, 4.14-A, 4.14-B, and 4.14-A.1 campaigns were tested to the EAC 2005 VVSG and in accordance with the EAC Testing and Certification Program Manual. NTS recommends that reuse be approved for all test requirements in Tables 4-1, 4-2, and 4-3 labeled as "Accept" underneath the component being tested.

##### ICP Testing

A PCA was performed on the ICP component to verify the changes and effects caused by the changes to the unit therefore no additional hardware testing will be required based on the findings of the evaluation. Wyle Laboratories previously performed testing to the EAC 2005 VVSG during the Democracy Suite 4.0 approved certification testing (EAC CERTIFICATION NUMBER – DVS-40-G). NTS will be utilizing the data obtained during that test effort to satisfy requirements for this modification test campaign.

(The remainder of this page intentionally left blank)

4.0 TEST SPECIFICATIONS (Continued)

4.4.1 Hardware Qualitative Examination Design (Continued)

The summary of acceptable testing is provided in the table below. The details of those tests are presented in Section 6.0.

Table 4-1 ICP Hardware Test Examination Results

Test/EAC 2005 VVSG Section	Procedure/Description	Configuration Tested	Status
<i>Usability/3.1</i>	Measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users	ICP	Accept
<i>Accessibility/3.2</i>	Tests the voting system to ensure accessibility for individuals with disabilities to include, but not limited to visually impaired voters by providing the same access and participation opportunity.	ICP	Accept
<i>Security/7</i>	Tests the ability of the system to detect, prevent, log, and recover from a broad range of security risks identified.	ICP	Accept
<i>Maintainability/4.3.4</i>	Tests the ease in which preventative and corrective maintenance actions can be performed based on design, software, and documentation.	ICP	Accept
<i>Availability/4.3.5</i>	Tests the voting system to help ensure the probability that the equipment will be operational and accomplish set functions. This shall be calculated using the following formula at a 99% availability rate: $A_i = (MTBF) / (MTBF + MTTR)$	ICP	Accept
<i>Safety/4.3.8</i>	UL 60950-1 product safety review	ICP	Accept*
<i>Electrical Supply/4.1.2.4</i>	Meets voltage and power requirements of EAC 2005 VVSG Vol. 1 Section 4.1.2.4	ICP	Accept
<i>Electromagnetic Radiation/4.1.2.9</i>	FCC Part 15 Class B for both radiated and conducted emissions	ICP	Accept
<i>Electromagnetic Susceptibility/4.1.2.10</i>	IEC 61000-4-3 electromagnetic field of 10V/m modulated by a 1kHz, 80% AM modulation at 80MHz to 1000MHz frequency	ICP	Accept
<i>Temperature/Power Variation/4.1.2.13</i>	MIL-STD-810D, Method 502.2 and Method 501.2 163 hours at 50 degrees to 95 degrees	ICP	Accept
<i>High Temperature/4.1.2.14</i>	MIL-STD-810D, Method 501.2 maximum temperature shall be 140 degrees F	ICP	Accept
<i>Low Temperature/4.1.2.14</i>	MIL-STD-810D minimum temperature shall be -4 degrees F	ICP	Accept

4.0 TEST SPECIFICATIONS (Continued)

4.4.1 Hardware Qualitative Examination Design (Continued)

Table 4-1 ICP Hardware Test Examination Results (Continued)

<i>Bench Handling</i>	MIL-STD-810D, Method 516.3 Procedure VI six 4" drops on each edge totaling 24 drops	ICP	Accept
<i>Vibration/4.1.2.14</i>	MIL-STD-810D, Method 514.3 physical shock and vibration during handling and transport	ICP	Accept
<i>Humidity Test/4.1.2.14</i>	MIL-STD-810D, Method 501.2 ten 24 hour humidity cycles	ICP	Accept
<i>Electrical Power Disturbance/4.1.2.5</i>	IEC 61000-4-11 (1994-06) power surges and dips	ICP	Accept
<i>Electrical Fast Transient/4.1.2.6</i>	IEC 61000-4-4 (1995-01)	ICP	Accept
<i>Lightning Surge/4.1.2.7</i>	IEC 61000-4-5 (1995-02)	ICP	Accept
<i>Electrostatic Disruption/4.1.2.8</i>	IEC 61000-4-2 (1995-01) 15kV air discharge and 8kV contact discharge	ICP	Accept
<i>Conducted RF Immunity/4.1.2.11</i>	IEC 61000-4-6 (1996-04) conducted radio frequency energy	ICP	Accept
<i>Magnetic Fields Immunity/4.1.2.12</i>	IEC 61000-4-8 (1993-06) AC magnetic fields of 30 A/m at 60Hz	ICP	Accept

\*Safety testing was witnessed by Wyle Laboratories at a third party laboratory

ICE Testing

The Dominion Democracy Suite 4.14-D ICE hardware will be tested by the NTS Laboratories' EMI, Dynamics, and Environmental test facilities for testing to the hardware requirements in accordance with NTS A2LA certifications 845.01-.03. All EMI testing will be performed per the following NTS Test Guidelines Documents: EMI-001A, "Test Guidelines for Performing Electromagnetic Interference (EMI) Testing", and EMI-002A, "Test Procedure for Testing and Documentation of Radiated and Conducted Emissions Performed on Commercial Products". These proprietary documents shall be submitted under separate cover for reference.

All hardware testing will be performed per the guidelines of ANSI/NCSL Z540-1, "Calibration Laboratories and Measuring and Test Equipment, General Requirements", and ISO 10012-1, "Quality Assurance Requirements for Measuring Equipment" and the governing MIL-STD to which the test is required. All hardware testing will be conducted by NTS-qualified personnel at NTS facilities.

A PCA was performed on the ICE component to verify the changes and effects caused by the changes to the unit.

4.0 TEST SPECIFICATIONS (Continued)

4.4.1 Hardware Qualitative Examination Design (Continued)

NTS previously performed testing to the EAC 2005 VVSG during the Democracy Suite 4.0 approved certification testing (EAC CERTIFICATION NUMBER – DVS-40-G). NTS will be utilizing a portion of the data obtained during that test effort to satisfy requirements for this modification test campaign. Additional testing as documented in table 4-2 will be required based on the introduction of a new COTS external monitor.

The summary of acceptable testing is provided in the table below. The details of those tests are presented in Section 6.0.

Table 4-2 ICE Hardware Test Examination Results

Test/EAC 2005 VVSG Section	Procedure/Description	Configuration Tested	Status
<i>Usability/3.1</i>	Measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users	ICE	Reject
<i>Accessibility/3.2</i>	Tests the voting system to ensure accessibility for individuals with disabilities to include, but not limited to visually impaired voters by providing the same access and participation opportunity.	ICE	Reject
<i>Security/7</i>	Tests the ability of the system to detect, prevent, log, and recover from a broad range of security risks identified.	ICE	Reject
<i>Maintainability/4.3.4</i>	Tests the ease in which preventative and corrective maintenance actions can be performed based on design, software, and documentation.	ICE	Reject
<i>Availability/4.3.5</i>	Tests the voting system to help ensure the probability that the equipment will be operational and accomplish set functions. This shall be calculated using the following formula at a 99% availability rate: $A_i = (MTBF) / (MTBF + MTTR)$	ICE	Reject
<i>Safety/4.3.8</i>	UL 60950-1 product safety review	ICE	Accept*

\*Safety testing was witnessed by Wyle Laboratories at a third party laboratory

(The remainder of this page intentionally left blank)

4.0 TEST SPECIFICATIONS (Continued)

4.4.1 Hardware Qualitative Examination Design (Continued)

Table 4-2 ICE Hardware Test Examination Results (Continued)

<i>Electrical Supply/4.1.2.4</i>	Meets voltage and power requirements of EAC 2005 VVSG Vol. 1 Section 4.1.2.4	ICE	Reject
<i>Electromagnetic Radiation/4.1.2.9</i>	FCC Part 15 Class B for both radiated and conducted emissions	ICE	Reject
<i>Electromagnetic Susceptibility/4.1.2.10</i>	IEC 61000-4-3 electromagnetic field of 10V/m modulated by a 1kHz, 80% AM modulation at 80MHz to 1000MHz frequency	ICE	Reject
<i>Temperature/Power Variation/4.1.2.13</i>	MIL-STD-810D, Method 502.2 and Method 501.2 163 hours at 50 degrees to 95 degrees	ICE	Reject
<i>High Temperature/4.1.2.14</i>	MIL-STD-810D, Method 501.2 maximum temperature shall be 140 degrees F	ICE	Accept
<i>Low Temperature/4.1.2.14</i>	MIL-STD-810D minimum temperature shall be -4 degrees F	ICE	Accept
<i>Bench Handling</i>	MIL-STD-810D, Method 516.3 Procedure VI six 4" drops on each edge totaling 24 drops	ICE	Accept
<i>Vibration/4.1.2.14</i>	MIL-STD-810D, Method 514.3 physical shock and vibration during handling and transport	ICE	Accept
<i>Humidity Test/4.1.2.14</i>	MIL-STD-810D, Method 501.2 ten 24 hour humidity cycles	ICE	Accept
<i>Electrical Power Disturbance/4.1.2.5</i>	IEC 61000-4-11 (1994-06) power surges and dips	ICE	Accept
<i>Electrical Fast Transient/4.1.2.6</i>	IEC 61000-4-4 (1995-01)	ICE	Accept
<i>Lightning Surge/4.1.2.7</i>	IEC 61000-4-5 (1995-02)	ICE	Accept
<i>Electrostatic Disruption/4.1.2.8</i>	IEC 61000-4-2 (1995-01) 15kV air discharge and 8kV contact discharge	ICE	Reject
<i>Conducted RF Immunity/4.1.2.11</i>	IEC 61000-4-6 (1996-04) conducted radio frequency energy	ICE	Reject
<i>Magnetic Fields Immunity/4.1.2.12</i>	IEC 61000-4-8 (1993-06) AC magnetic fields of 30 A/m at 60Hz	ICE	Accept

\*Safety testing was witnessed by Wyle Laboratories at a third party laboratory

(The remainder of this page intentionally left blank)

4.0 TEST SPECIFICATIONS (Continued)

4.4.1 Hardware Qualitative Examination Design (Continued)

ICC Testing

The ImageCast Central system consisting of COTS scanners and COTS Workstation PCs will be submitted for the following hardware tests during this test campaign: Maintainability, Electrical Supply, and Temperature and Power Variation. These hardware tests were successfully performed on the Canon DR-X10C scanner and the results of those tests will be accepted for the current test campaign.

Table 4-3 ICC Hardware Test Examination Results

Test/EAC 2005 VVSG Section	Procedure/Description	Configuration Tested	Status
<i>Maintainability/4.3.4</i>	Tests the ease in which preventative and corrective maintenance actions can be performed based on design, software, and documentation.	ICC	Accept for Canon DR-X10C only
<i>Electrical Supply/4.1.2.4</i>	Meets voltage and power requirements of EAC 2005 VVSG Vol. 1 Section 4.1.2.4	ICC	Accept for Canon DR-X10C only
<i>Temperature/Power Variation/4.1.2.13</i>	MIL-STD-810D, Method 502.2 and Method 501.2 163 hours at 50 degrees to 95 degrees	ICC	Accept for Canon DR-X10C only
<i>Availability/4.3.5</i>	Tests the voting system to help ensure the probability that the equipment will be operational and accomplish set functions. This shall be calculated using the following formula at a 99% availability rate: $A_i = (MTBF) / (MTBF + MTTR)$	ICC	Accept for Canon DR-X10C only

COTS Equipment

NTS has determined that the Democracy Suite 4.14 System's COTS PCs/laptops/servers are not required to undergo the hardware tests required per the EAC's "2007-05 Decision on Testing Focus and Applicability" based on the CE, UL, and FCC labeling of the equipment.

#### 4.0 TEST SPECIFICATIONS (Continued)

##### 4.4.2 Software Module Test Case Design and Data

NTS implements Component Level Testing during the FCA for each component and subcomponent exercising the functionality of each as designed and documented. NTS will utilize limited structural-based techniques (white-box testing) mainly in the area of Source Code Review, Compliance Builds, and Security Testing and Review. NTS will depend heavily on specification-based techniques (black-box testing) for the individual software components. The most common specification-based techniques applied to the Dominion Democracy Suite 4.14-D during software testing will be “equivalence partitioning” and “boundary value testing.”

- “Equivalence partitioning” will be used to evaluate specific software functions and data entry points of the Democracy Suite 4.14-D for valid and invalid data during the FCA. For software functions and data entry points, an entry will be made for a valid data requirement and at least one invalid data requirement to test for normal and abnormal conditions.
- “Boundary Value Testing” will be used to evaluate specific software functions and data entry points for minimums and maximums during the FCA. For software functions and data entry points, an entry will be made for all minimum and all maximum documented requirements to test for normal and abnormal conditions. This technique will be used for numeric ranges as well as non-numeric ranges.

NTS personnel will develop an expected result for each test. The PASS/FAIL criteria at the Component Level will be based on the expected result. If the System Under Test (SUT) meets the expected results, the test will be considered passed. If the SUT does not perform as expected, the test will be evaluated for tester errors, test procedure errors, or test equipment errors. If it is determined there was no tester error, the test will be repeated in an attempt to reproduce the results. If the results can be reproduced and the expected results are not met, the SUT will have failed the test. If the results cannot be reproduced, the manufacturer will be responsible for determining the root cause of the error. Upon correction of the failure a regression test will be performed. If the issue is found to be resolved, then the test will be considered passed, else the test will be considered failed until regression testing finds the issue resolved.

NTS personnel will document the error and track the error through resolution. NTS personnel will not move to the next level of testing until all documented errors are resolved to try and minimize errors that might occur farther along in the test campaign. Engineering analysis will be performed to determine what effect the resolution has on the component. A determination will be made whether Regression Testing will be sufficient or a complete re-test is necessary.

(The remainder of this page intentionally left blank)

#### 4.0 TEST SPECIFICATIONS (Continued)

##### 4.4.3 Software Functional Test Case Design and Data

The test approach to be used for the Dominion Democracy Suite 4.14-D will be a bottom-up approach where the lower-level components will be tested first and then used to facilitate the testing of higher-level components. The specification-based technique used by NTS personnel at the Integration Level is "Use Case." The actors that have been identified to use the Dominion Democracy Suite 4.14-D are:

- Election Administrator – The actor with responsibility of entering the election definition including alternative languages and audio. This actor is also responsible for maintaining EMS users and the election database.
- Warehouse Technician – The actor responsible for loading the election definition onto the ICE and ICP units. This actor also runs diagnostic tests and maintains the units.
- Poll Worker – The actor at the precinct location to set up and close down the ICE and ICP units on Election Day.
- Voter – The actor who physically casts the ballot on Election Day.
- ADA Voter – The actor with special needs who has to vote unassisted on Election Day.
- Election Official – The actor who reports and audits the election result post-election day.

"Use Case" will be utilized during the FCA with a single pass through each component using only valid data. This pass will be considered the "Master Copy" of data to be passed between interfacing points of applications during integration level testing. If a component downstream in the test process needs data from previous processes, the "Master Copy" of data can be used or altered to accelerate the test process. Known tests that will utilize the "Master Copy" of data at the Integration Level are Security and Usability. Where applicable, NTS testers will introduce negative testing to ensure that submitted system either prevents the negative actions or handles the action in an appropriate manner.

If an error occurs between data interfaces or in the process flow, an engineering analysis will be performed to determine if the result of the error is caused by data, the process, or tester error. The ACCEPT/REJECT criteria for Integration Level testing is dependent on whether the components and applications interfaces follow the vendor's documented process for each actor. If there is an error interfacing between components, the error shall be documented and tracked through resolution. An engineering analysis shall be performed to determine what effect the resolution has on the component. A determination will be made whether regression testing will be sufficient or a complete re-test is necessary.

(The remainder of this page intentionally left blank)

#### 4.0 TEST SPECIFICATIONS (Continued)

##### 4.4.4 System Level Test Case Design

During system level testing, NTS personnel will test the ability of proprietary software, hardware, and peripherals in addition to the COTS software, hardware, and peripherals as a complete system in a configuration of the systems for intended use. The Democracy Suite 4.14-D voting system is intended to support both large and small jurisdictions. NTS personnel's approach for the Democracy Suite 4.14-D voting system will be to execute System Level Testing with a variety of elections that include various combinations of jurisdictions, parties, and ballot styles.

The ACCEPT/REJECT criteria for system level testing determines whether the system can continue in testing. The two conditions for ACCEPT include 1) no errors are observed, or 2) an error is observed and the system continues to operate, and an engineering analysis determines that the root cause does not affect the functionality of the system. The REJECT criteria applies to error conditions that are encountered causing the system to become unstable or unusable, and/or an engineering analysis of an error condition is determined to negatively affect further testing. If an error occurs during System Level testing, the error shall be documented. If the Democracy Suite 4.14-D voting system is able to recover and continue, the test will continue. If the error causes the system to become unstable or unusable, the test shall be halted. All errors documented during System Level Testing shall be tracked through resolution.

An engineering analysis shall be performed to determine what effect the resolution has on the system. A determination shall be made by NTS senior-level engineers whether Regression Testing shall be sufficient or a complete re-test is necessary.

NTS personnel will implement Acceptance Level testing focusing on all the data collected during the entire test campaign along with performing the "Trusted Build" for the system. All data from hardware testing, software testing, functional testing, security testing, volume testing, stress testing, usability testing, accessibility testing, and reliability testing activities will be reviewed to ensure all functions supported by the Democracy Suite 4.14-D voting system have been tested. The EAC 2005 VVSG requirements will be checked against the test data to ensure all applicable requirements are met. Items not supported by the Democracy Suite 4.14-D voting system will be documented. All issues identified during testing will be resolved and annotated in the Test Report prior to its issuance.

NTS personnel will test every EAC 2005 VVSG requirement impacted by the Democracy Suite 4.14-D voting System modification. NTS personnel will report all issues discovered during this test campaign to Dominion and the EAC. If NTS determines there is not enough data to ensure a requirement was met, the test plan will be altered and further testing will be done. The EAC has the final decision as to whether the system meets all the requirements for an EAC-certified system. NTS will either recommend approval, if the system meets all applicable sections of the VVSG, or recommend disapproval if the system does not meet all applicable sections of the VVSG.

(The remainder of this page intentionally left blank)

#### 4.0 TEST SPECIFICATIONS (Continued)

#### 4.5 TDP Evaluation

NTS qualified personnel will perform a comprehensive review of the Dominion TDP to determine compliance to the EAC 2005 VVSG requirements and Dominion specific requirements.

NTS qualified personnel utilize a TDP Review Matrix which lists every EAC 2005 VVSG requirement pertaining to TDP review. NTS qualified personnel will record the results of the review of each document to the applicable requirements listed in the TDP Review Matrix.

During the TDP review process, each document will be reviewed for completeness, clarity, correctness, and continuity. The review results will be formally reported to Dominion. If a revised document is received, it will be re-reviewed as discussed in this section. The TDP will be continued to be reviewed during the entire testing process as these documents will be utilized to set up the systems, verify correct operational results and numerous other tests. At the end of the TDP review process, a Discrepancy Report will be issued listing the non-compliant items on a document-by-document basis, if applicable. A listing of all documents contained in the Democracy Suite 4.14-D voting system TDP is provided in Table 4-4.

(The remainder of this page intentionally left blank)

4.0 TEST SPECIFICATIONS (Continued)

4.5 TDP Evaluation (Continued)

Table 4-4 Democracy Suite 4.14-D TDP Documents

Democracy Suite 4.14-D Voting System TDP Documents	Version	Date	Document Number
System Overview	4.14.D:301	10/17/14	2.02
System Security Specification	4.14.D:374	10/15/14	2.06
Configuration Management Plan	4.14.D:205	10/22/14	2.11
Quality Assurance Program	1.2.0:80	10/16/12	2.12
System Test and Verification Plan	1.1.0:104	10/16/12	2.07
System Test and Verification Suites	4.14.D:1	8/21/14	2.07
Personnel Training and Deployment Requirements	1.1.0:53	4/9/13	2.10
EMS Functionality Description	4.14.D:251	7/22/14	2.03
ICE Functionality Description	4.14.D:80	10/2/14	2.03
ICP Functionality Description	4.14.D:125	10/20/14	2.03
ICC Functionality Description	4.14.D:88	10/17/14	2.03
ICE System Hardware Specification	1.2.0:305	10/20/14	2.04
ICP System Hardware Specification	1.1.0:98	10/20/14	2.04
ICE System Hardware Characteristics	1.2.0:95	10/20/14	2.04.1
ICP System Hardware Characteristics	1.1.0:56	10/20/14	2.04.1
EMS Software Design and Specification	4.14.D:219	7/22/14	2.05
ICE Software Design and Specification	4.14.D:112	7/28/14	2.05
ICP Software Design and Specification	4.14.D:112	10/20/14	2.05
ICC Software Design and Specification	1.0.0:34	11/30/12	2.05
Adjudication Software Design and Specification	4.14.D:25	7/22/14	2.05
ICP System Operation Procedures	4.14.D:197	7/28/14	2.08
EMS System Operation Procedures	4.14.D:538	10/22/14	2.08
ICE System Operation Procedures	4.14.D:155	7/22/14	2.08
ICC System Operation Procedures	4.14.D:122	10/16/14	2.08
ICP System Maintenance Manual	1.1.0:66	10/16/12	2.09
ICE System Maintenance Manual	1.1.0:115	10/16/12	2.09
EMS System Maintenance Manual	1.0.0:50	10/16/12	2.09
Adjudication System Maintenance Manual	4.14.D:9	7/27/14	2.09
EMS Election Event Designer User's Guide	4.14.D:233	10/8/14	N/A
EMS Results Tally & Reporting User's Guide	4.14.D:153	9/23/14	N/A
EMS Audio Studio User's Manual	4.14.D:49	10/1/14	N/A
Adjudication User's Manual	4.14.D:41	7/28/14	N/A
EMS Build and Install	2.1.0:18	8/11/14	N/A
ICP Device Configuration Files	4.14.D:26	7/30/14	N/A
ImageCast Election Definition Files	3.0.13	4/9/14	N/A
ICP Firmware Build and Install	4.2.14	10/3/12	N/A
ICP Firmware Update Procedure	1.0.0:15	8/14/14	N/A
ICP Technical Guide	1.0.0:9	10/17/12	N/A
ICE Technical Guide	1.0.0:60	10/17/12	N/A
ICE Build Procedure	4.14.D:49	7/21/14	N/A
ICE Firmware Installation Procedure	4.14.D:41	8/26/14	N/A
Dominion Voting C C++ Coding Standard	1.0.0:8	7/27/12	N/A
Dominion Voting Usability Study - ICP	1.0.0:26	7/27/12	N/A
Dominion Voting Usability Study - ICE	1.0.0:36	7/13/12	N/A

#### 4.0 TEST SPECIFICATIONS (Continued)

#### 4.6 Source Code Review

As part of the testing activities, the Dominion Democracy Suite 4.14-D source code will be reviewed to the EAC 2005 VVSG coding standards and the manufacturer supplied coding standards. The reviews will be conducted to identify any violation of EAC 2005 VVSG coding standards or manufacturer supplied coding standards. These reviews will be performed per the guidelines described in the following paragraphs by means of either a manual code review, or by utilizing an automated source code review tool.

##### Manual Source Code Review

The source code team will conduct a visual scan of every line of source code. Each identified violation will be recorded by identifying the standards violation, file location within the source code package, file name, and specific line number.

##### Automated Source Code Review

For the portion of source code that is written in C#, an automated source code review will be performed on 90% of the code along with a manual review of 10%. Each identified violation will be recorded by identifying the standards violation, file location within the source code package, file name, and specific line number.

Upon receipt of the source code, a SHA256 hash value will be created for each file. The initial review will include an NTS peer-review on all of the discrepancies identified within the code prior to being returned to the manufacturer. This shall be done to evaluate the correctness of the initial review, along with ensuring all standards violations were identified.

Afterwards, a report of all identified violations will be sent to Dominion for resolution. Once the revised source code has been verified for correctness, a discrepancy report detailing all code-related violations will be issued to the EAC and Dominion. This report will also be included in the final Test Report.

The "Trusted Build" for the Dominion Democracy Suite 4.14-D 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 with SHA256 values from the software supplier, and picture and sound files in binary format provided by Dominion Voting Systems.

The final step of the Source Code Review process includes the creation of a "Trusted Build" from the verified source code. The "Trusted Build" will be performed by completing the following tasks in the order listed:

#### 4.0 TEST SPECIFICATIONS (Continued)

##### 4.6 Source Code Review (Continued)

- Scrub the build machine's hard drive
- Retrieve the compliant source code
- 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
- Create installation media
- Create a digital signature of the installation media
- Install and verify executable software/firmware on the designated hardware
- 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 the EAC-Approved Repository.

(The remainder of this page intentionally left blank)

#### **4.0 TEST SPECIFICATIONS (Continued)**

##### **4.7 QA and CM System Review**

Both the Dominion QA Plan and CM Plan will be reviewed. The review will be limited to only the changes within this modification 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 documentation. Also, the Dominion TDP documentation package will be reviewed to determine if the Dominion QA Plan and the CM Plan are being followed. The results of the TDP review shall be entered on a spreadsheet as previously described in Section 4.5 of this test plan. The results of the TDP review, including the QA and CM compliance results of the Technical Data Package Review, will be included in the final test report.

#### **5.0 TEST DATA**

##### **5.1 Test Data Recording**

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

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

##### **5.2 Test Data Criteria**

NTS personnel will evaluate all test results against the Dominion provided technical documentation for Democracy Suite 4.14-D and the requirements set forth in the EAC 2005 VVSG. The acceptable range for system performance and the expected results for each test case shall be derived from the Democracy Suite 4.14-D documentation. Per the EAC 2005 VVSG, these parameters shall encompass the test tolerances and samples to define the minimum number of combinations or alternatives of input and output conditions that can be exercised to constitute an acceptable test of the parameters involved. The parameters will also include events with criteria defining the maximum number of interrupts, halts, or other system breaks that may occur due to non-test conditions (excluding events from which recovery occurs automatically or where a relevant status message is displayed).

##### **5.3 Test Data Reduction**

Test data shall be processed and recorded in the relevant NTS Operating Procedures and Test Cases. Results will also be recorded real-time in engineering log books.

## 6.0 TEST PROCEDURE AND CONDITIONS

The following subsections describe test procedures and a statement of the criteria by which readiness and successful completion shall be indicated and measured.

### 6.1 Facility Requirements

All testing will be conducted at the NTS Huntsville, AL, facility unless otherwise annotated. Environmental non-operating (storage) and operating hardware testing will be conducted utilizing an adequately sized environmental test chamber or dynamic vibration (shaker) system equipped with the required data gathering support equipment. All remaining operating hardware tests will be conducted at the appropriate test site with the required support equipment. All instrumentation, measuring, and test equipment used in the performance of this test program will be listed on the Instrumentation Equipment Sheet for each test and shall be calibrated in accordance with NTS Quality Assurance Program, which complies with the requirements of ANSI/NCSL Z540-1 and ISO 10012-1.

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

Unless otherwise specified herein, all remaining tests, including system level functional testing, shall be performed at standard ambient conditions:

- Temperature: 68 to 75 degrees Fahrenheit ( $\pm 4^{\circ}\text{F}$ )
- Relative Humidity: 20 to 90%
- Atmospheric Pressure: Local Site Pressure

Unless otherwise specified herein, the following tolerances shall be used:

- Time  $\pm 5\%$
- Temperature  $\pm 3.6^{\circ}\text{F}$  ( $2^{\circ}\text{C}$ )
- Vibration Amplitude  $\pm 10\%$
- Vibration Frequency  $\pm 2\%$
- Random Vibration Acceleration
  - 20 to 500 Hertz  $\pm 1.5\text{ dB}$
  - 500 to 2000 Hertz  $\pm 3.0\text{ dB}$
- Random Overall grms  $\pm 1.5\text{ dB}$
- Acoustic Overall Sound Pressure Level  $\pm 4/-2\text{ dB}$

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

(The remainder of this page intentionally left blank)

## 6.0 TEST PROCEDURE AND CONDITIONS (Continued)

### 6.2 Test Set-Up

All voting machine equipment (hardware and software), shall be received and documented utilizing NTS' Receiving Ticket (WL-218, Nov 1985) and proper QA procedures. When voting system hardware is received, NTS personnel will notify NTS QA personnel. With NTS QA personnel present, each test article will be unpacked and inspected for obvious signs of degradation and/or damage that may have occurred during transit. Noticeable degradation and/or damage, if present, shall be recorded, photographed, and the Dominion Representative shall be notified. NTS QA personnel shall record the serial numbers and part numbers. Comparison shall be made between those numbers recorded and those listed on the shipper's manifest. Any discrepancies noted shall be brought to the attention of the Dominion Representative for resolution. All TDP and source code modules received will be inventoried and maintained by the NTS Project Engineer assigned to testing.

For test setup, the system will be configured as it would for normal field use. This includes connecting all supporting equipment and peripherals. NTS personnel will properly configure and initialize the system, and verify that it is ready to be tested by following the procedures detailed in the Democracy Suite 4.14-D voting system technical documentation. NTS personnel will develop an Operational Status Check to be performed prior to and immediately following each hardware test. NTS personnel will develop the system performance levels to be measured during operational tests.

NTS personnel have developed eight election definitions that shall be used during this test campaign:

#### Operational Status Check

This election definition will exercise the operational status of the equipment during the operational tests and prior to and immediately following the non-operational hardware tests.

#### Accuracy

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

(The remainder of this page intentionally left blank)

## 6.0 TEST PROCEDURE AND CONDITIONS (Continued)

### 6.2 Test Set-Up (Continued)

#### General Election: GEN-01

The Gen-01 is a basic election held in four precincts, one of which is a split precinct, containing nineteen contests compiled into four ballot styles. Five of the contests are in all four ballot styles. The other fourteen contests are split between at least two of the precincts with a maximum of four different contests spread across the four precincts. This election was designed to functionally test the handling of multiple ballot styles, support for at least two languages, support for common voting variations, and audio support for at least two languages.

The parameters of this election are listed below:

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

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

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

## 6.0 TEST PROCEDURE AND CONDITIONS (Continued)

### 6.2 Test Set-Up (Continued)

#### General Election: GEN-02

The Gen-02 is a basic election held in three precincts. This election contains fifteen contests compiled into three ballot styles. Ten of the contests are in all three ballot styles with the other five split across the three precincts. This election was designed to functionally test the handling of multiple ballot styles, support for ballot rotation, support for two languages, support for complex voting variations, and audio support for multiple languages.

The parameters of this election are listed below:

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

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

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

## 6.0 TEST PROCEDURE AND CONDITIONS (Continued)

### 6.2 Test Set-Up (Continued)

#### General Election: GEN-03

The Gen-03 is a basic election held in two precincts. This election contains eight contests compiled into two ballot styles. Four of the contests are in both ballot styles. The other four contests are split between the two precincts. This election was designed to functionally test the handling of multiple ballot styles, support for at least three languages including a character-based language, support for common voting variations, and audio support for at least three languages and an ADA binary input device.

The parameters of this election are listed below:

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

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

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

## 6.0 TEST PROCEDURE AND CONDITIONS (Continued)

### 6.2 Test Set-Up (Continued)

#### Primary Election: PRIM-01

The Prim-01 is a closed primary election in two precincts (one precinct is a split), containing thirty contests compiled into five ballot styles. Each ballot style contains six contests. This election was designed to functionally test a closed primary with multiple ballot styles, support for two languages, and support for common voting variations.

The parameters of this election are listed below:

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

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

- Alternative language utilized with a write-in option
- ADA audio device utilized with a write-in option

## 6.0 TEST PROCEDURE AND CONDITIONS (Continued)

### 6.2 Test Set-Up (Continued)

#### Primary Election: PRIM-02

The Prim-02 is a basic election held in two precincts. This election contains thirteen contests compiled into three ballot styles. One contest is in all three ballot styles and all other contests are independent. This election was designed to functionally test the handling of multiple ballot styles, support for Primary presidential delegation nominations, support for two languages, support for complex voting variations, and audio support for multiple languages.

The parameters of this election are listed below:

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

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

- Over-voting
- Under-voting
- Write-in voting
- Spanish language
- Casting of ballots using the ADA Audio capability

## 6.0 TEST PROCEDURE AND CONDITIONS (Continued)

### 6.2 Test Set-Up (Continued)

#### Primary Election: PRIM-03

The Prim-03 is a basic election held in two precincts. This election contains ten contests and is compiled into two ballot styles. Two of the contests are in both ballot styles. The other eight contests are split between the two party ballots. This election was designed to functionally test the handling of multiple ballot styles, support for at least three languages including an Ideographic based language, support for common voting variations, and audio support for at least three languages and an ADA binary input device.

The parameters of this election are listed below:

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

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

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

## 6.0 TEST PROCEDURE AND CONDITIONS (Continued)

### 6.3 Test Sequence

The components of the Democracy Suite 4.14-D voting system will undergo testing to verify that the modification performs as described by Dominion and meets the requirements of the 2005 VVSG. The following sections provide a list of each test and a brief description of each test. NTS personnel will utilize a combination of functional testing and TDP reviews to evaluate the system performance. (The tests are not in a specific sequence.)

#### 6.3.1 Hardware Test Descriptions

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

The Operating tests include the following:

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

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

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

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

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

6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.3.1 Hardware Test Descriptions (Continued)

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

Electrical Supply – This requirement addresses the battery power source for providing electrical supply during a power failure.

Table 6-1 Democracy Suite 4.14-D Hardware Test Sequence

Test	Description	Procedure	Test Level	Specimen
Electromagnetic Radiation	FCC Part 15 Class B for both radiated and conducted emissions	OP 9	Component	ICE w/optional external monitor
Electrostatic Disruption	IEC 61000-4-2 (1995-01) 15kV air discharge and 8kV contact discharge	OP 10	Component	ICE w/optional external monitor
Electromagnetic Susceptibility	IEC 61000-4-3 electromagnetic field of 10V/m modulated by a 1kHz, 80% AM modulation at 80MHz to 1000MHz frequency	OP 11	Component	ICE w/optional external monitor
Conducted RF Immunity	IEC 61000-4-6 (1996-04) conducted radio frequency energy	OP 14	Component	ICE w/optional external monitor
Temperature Power Variation	MIL-STD-810D, Method 502.2 and Method 501.2 163 hours at 50 degrees to 95 degrees	OP 21	Component	Canon DR-G1130

6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.3.1 Hardware Test Descriptions (Continued)

Table 6-1 Democracy Suite 4.14-D Hardware Test Sequence (Continued)

Maintainability	The ease with which preventive maintenance actions can be performed	OP 27	Component & Document	ICE w/optional external monitor, Canon DR-G1130, & TDP
Electrical Supply	Meets voltage and power requirements of 2005 VVSG Vol. 1 Section 4.1.2.4	OP 29	Component	ICE w/optional external monitor, Canon DR-G1130

6.3.2 Software Test Descriptions

The software tests include the following:

Source Code Compliance Review – NTS qualified personnel will compare the source code to the manufacturer's software design documentation to ascertain how completely the software conforms to the manufacturer's specifications. Source code inspection shall also assess the extent to which the code adheres to the requirements in Section 5 of the EAC 2005 VVSG Volumes I and II.

Compliance Build of the System Software, Firmware, and Utilities – Before testing can begin, compliance builds of all the applications will be constructed by NTS personnel using the build environment, build documentation, and reviewed source code. This is to ensure the software being tested is constructed from the same source code that was reviewed.

## 6.0 TEST PROCEDURES AND CONDITIONS (Continued)

### 6.3.2 Software Test Descriptions (Continued)

COTS Source Code Review – Unmodified, general purpose COTS non-voting software (e.g., operating systems, programming language compilers, database management systems, and web browsers) are not subject to the detailed examinations specified in this section; however, NTS personnel will examine such software to ensure that the specific version of software being used is identical to the design specification in order to confirm that the software has not been modified. NTS will verify by downloading the software directly from the manufacturer site, verifying against NRSL, or by being provided original OEM discs.

NTS qualified personnel may inspect the COTS generated software source code in preparation of test plans and to provide some minimal scanning or sampling to check for embedded code or unauthorized changes. For purposes of code analysis, the COTS units shall be treated as unexpanded macros.

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

Baseline of EMS Operating and Build Machine OS – NTS personnel will review the submitted NIST SCAP FDCC checklist for the EMS Operating System and Build Machine OS. The review will be performed for completeness, clarity, and consistency.

Security Source Code Review – The security source code review is a detailed review of the functionality of the source code that has been submitted. Both automated and manual reviews of the source code will be performed.

Trusted Build – The trusted build is a process of converting the reviewed source code into machine-readable binary instructions for a computer. This test will follow Section 5.6 of the EAC Testing and Certification Program manual.

(The remainder of this page intentionally left blank)

6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.3.2 Software Test Descriptions (Continued)

Table 6-2 Democracy Suite 4.14-D Software Test Sequence

Test	Description	Procedure	Test Level	Specimen
Compliance Source Code Review	Source code review for compliance	NTSHVS14.2 OP 5a	Component	Source Code
Compliance Build	Using the build documents and source code to construct the EMS	NTSHVS14.3 OP 7b, OP 7c	Component	Source Code
Source Code COTS Review	Source code review to examine 3 <sup>rd</sup> party products for modification and versions	NTSHVS14.2 OP 5d	Component	COTS Source Code
Baseline OS	RFI 2008-03 OS Configuration	NTSHVS14.3 OP 25	Component	NIST SCAP FDCC Checklist
Source Code Functional Review	Source code review for functionality and high level software design	NTSHVS14.2 OP 5b	Component & Integration	Source Code
Source Code Security Review (manual)	Source code review for specific security concerns augmented by an automated review	NTSHVS14.2 OP 5c OP 6a	Component & Integration	Source Code
Trusted Build	Creation and installation of the final system software	NTSHVS14.6 OP 7, OP 7a	Component	System software

(The remainder of this page intentionally left blank)

## 6.0 TEST PROCEDURES AND CONDITIONS (Continued)

### 6.3.3 System Testing

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

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

Functional Configuration Audit – 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 in the TDP. In addition to functioning according to the manufacturer's documentation, tests will be conducted to ensure all applicable EAC 2005 VVSG requirements are met. This testing is accomplished through a process called sequencing.

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

## 6.0 TEST PROCEDURES AND CONDITIONS (Continued)

### 6.3.3 System Testing (Continued)

In addition to verifying the functional modifications being introduced, the ICE with optional external monitor will be subjected to a functional reliability test. This test will be designed to mimic the ballot requirements of the Temperature and Power Variation test, except the test will be conducted outside of chamber environment, and the ballots will be cast continually instead of on an hourly basis.

TDP Review – The technical data package must be submitted as a precondition of national certification testing. These items are necessary to define the product and its method of operation; to provide technical and test data supporting the manufacturer's claims of the system's functional capabilities and performance levels; and to document instructions and procedures governing system operation and field maintenance. Any information relevant to the system evaluation shall be submitted to include source code, object code, and sample output report formats.

Usability – The usability test is a measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users with a given product in the performance of specified tasks. This test applies to the requirements for Volume I, Section 3 of the EAC 2005 VVSG. Usability testing shall take place on the ICE with optional external monitor being introduced into the system configuration.

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

The central count scanners shall be subjected to the test as outlined in the EAC 2005 VVSG as follows:

- The ICC shall be subjected to overload conditions

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

(The remainder of this page intentionally left blank)

## 6.0 TEST PROCEDURES AND CONDITIONS (Continued)

### 6.3.3 System Testing (Continued)

In an effort to achieve this and to verify the proper functionality of the units under test, the following methods will be used to test components of the voting system:

The accuracy requirements for the ICE with external monitor will be met by the execution of the standard accuracy test.

- Stand-Alone Precinct Scanner – Tested by utilizing a combination of hand marked (70%) and pre-marked (30%) ballots to achieve accuracy rate greater than 1,549,703 correct ballot positions.

The accuracy requirements for Canon DR-G1130 will be met by the execution of the standard accuracy test.

- Central Count Scanner – Tested per model by utilizing a combination of hand-marked (70%) and pre-marked (30%) ballots to achieve accuracy rate greater than 1,549,703 correct ballot positions.

System Integration – System Level certification tests address the integrated operation of both hardware and software, along with any telecommunication capabilities. Compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment, shall be determined through functional tests integrating the voting system software with the remainder of the system.

Additionally, the system shall be configured exactly as it would for normal field use. This includes connecting all supporting equipment and peripherals including ballot boxes, voting booths (regular and accessible), and any physical security equipment such as locks and ties. NTS personnel will properly configure and test the system by following the procedures detailed in the Democracy Suite 4.14-D voting system technical documentation.

Regression Testing – Regression Testing will be performed on all system components to verify all functional and firmware modifications made during the test campaign did not adversely affect the system and its operation.

NTS will verify the audit log records for error and exception activity to verify proper documentation and recovery action for all functional tests performed. A detailed listing of all audit log entries shall be provided by Dominion in the TDP submitted. During testing, audit log entries will be compared to this list to ensure that all expected events are recorded. To ensure the system's ability to gracefully shutdown and recover from error conditions, negative test cases will be performed to introduce such error conditions. The error conditions introduced will be based on the system limits specified within the vendors TDP documentation.

(The remainder of this page intentionally left blank)

6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.3.3 System Testing (Continued)

Table 6-3 Democracy Suite 4.14-D System Test Sequence

Test	Description	Procedure	Test Level	Specimen
Physical Configuration Audit	Audit hardware and software models and versions	NTSHVS14.3 OP 25	Component & System	System hardware and software
Functional Configuration Audit	Functional testing to the system documentation and EAC 2005 VVSG requirements	NTSHVS14.4 OP 26	Component & Integration	EMS, ICC, ICE with optional external monitor
Technical Data Package (TDP) Review	Documentation review for compliance, correctness, and completeness	NTSHVS14.1 OP 3	Document	TDP package
Accuracy	Test of accuracy to ~1.6 million ballot positions per system component.	NTSHVS14.9 OP 41	System	System
System Integration	Test of all system hardware, software and peripherals.	OP 30	System	System
Usability/ Accessibility	Testing to the system documentation and EAC 2005 VVSG requirements	OP 22 OP 24-1a-g OP 24-2 a-f	Integration	ICE with optional external monitor
Volume & Stress	Test to investigate the system's response to larger amounts of data than it is expecting.	OP 26 OP 30	System	Canon DR-G1130

7.0 TEST OPERATIONS PROCEDURES

7.1 Proprietary Data

All proprietary data that is marked will be distributed only to those persons that the manufacturer or EAC identifies as needing the information to conduct qualification testing. The manufacturer is required to mark all proprietary documents as such. All organizations and individuals receiving proprietary documents will ensure those documents are not available to non-authorized persons.

**APPENDIX A**  
**PROJECT SCHEDULE**

Task Name	Duration	Start	Finish
EAC Application and Approval	3 days	7/14/2014	7/16/2014
NTS Receive Equipment	6 days	7/17/2014	7/24/2014
<b>Test Plan</b>	<b>45 days</b>	<b>7/28/2014</b>	<b>9/29/2014</b>
Test Plan Development	10 days	8/4/2014	8/15/2014
Test Plan to Dominion for Review	3 days	8/18/2014	8/20/2014
Test Plan Update	1 day	8/21/2014	8/21/2014
EAC Review	20 days	8/22/2014	9/19/2014
NTS Review and Update	2 days	9/22/2014	9/23/2014
EAC Approval of Test Plan	10 days	9/24/2014	10/8/2014
Source Code Review	16 days	7/23/2014	8/13/2014
Compliance Builds	2 days	8/14/2014	8/15/2014
Network Setup And Software Installation	3 days	8/18/2014	8/20/2014
TDP Review	15 days	7/24/2014	8/13/2014
Physical Configuration Audit	7 days	7/25/2014	8/4/2014
Electrical Supply	1 day	8/21/2014	8/21/2014
Hardware - EMC Testing for ICE Monitor	5 days	8/18/2014	8/22/2014
Temperature and Power Variation - Central Count	4 days	8/20/2014	8/25/2014
Reliability Test - New ICE Monitor	5 days	9/24/2014	9/30/2014
Maintainability	1 day	8/22/2014	8/22/2014
Functional Testing - Central Count, EMS, ICP, ICE with monitor	20 days	8/26/2014	9/23/2014
Usability	2 days	9/24/2014	9/25/2014
Accessibility	2 days	9/26/2014	9/29/2014
Accuracy	4 days	9/15/2014	9/18/2014
Volume and Stress	3 days	9/19/2014	9/23/2014
System Integration	6 days	9/30/2014	10/7/2014
Trusted Builds	5 days	10/8/2014	10/14/2014
Regression Testing	3 days	10/15/2014	10/17/2014
Build and Tool Validation	5 days	10/15/2014	10/21/2014
<b>Test Report</b>	<b>47 days</b>	<b>10/8/2014</b>	<b>12/15/2014</b>
Test Report Development	11 days	10/8/2014	10/22/2014
Test Report to Dominion for Review	2 days	10/23/2014	10/24/2014
Test Report Update	1 day	10/27/2014	10/27/2014
EAC Review	20 days	10/28/2014	11/24/2014
NTS Review and Update	3 days	11/25/2014	12/1/2014
EAC Approval of Test Report	10 days	12/2/2014	12/15/2014

APPENDIX B  
CHANGE NOTES

Item	Description	Product
1	Introduction of Adjudication 2.0	Adjudication
2	Added ability to override global settings for visual elements on the level of contrast. Added ability to print graphics in candidate cell, next to candidate name, on selected contests. Added basic control of the layout and content of Write-in cells.	EED
3	Added ability to generate printer calibration sheet. Added ability to render crop marks on ballots.	EED
4	Changes in code to support FW changes to the battery voltage table	ICP
5	Extended election files for ICP with list of audio languages per Ballot Manifestation. Support for languages without textual representation, i.e. audio-only languages (Navajo)	EED
6	MBS enhancements are improved in the following ways: 1. Reports multiple write-in positions separately on zero and result tape 2. Total cast and Total Voters numbers are available on the results transfer tape	ICE
7	Override functionality enables improved configurability in the following ways: New translation adding, Translation files overriding, Static audio files overriding	ICE
8	Improvements regarding presentations of voting rules errors	ICE
9	Ability to Manage Reporting Profiles on SOVC, ESR, Cards Cast. Ability to Import/Export Reporting Profiles	RTR
10	Added DCF Option to Format Zero Totals Tape Separate From Format of Results Tape.	ICP
11	Support for audio notification when voting error occurs in Standard session only. Added MBS option enables/disables audio. Added MBS option supports volume adjustment.	ICE

Item	Description	Product
12	The following logos are updated: Boot Startup Logo, Linux Startup Logo, Application Startup Logo, Verification Screen displays the new logo and a new monochrome hourglass widget	ICE
13	Ability to Use Canon DR-G1130 with ICC application	ICC
14	Open Primary including the Pick-A-Party variant as required for WI	ICP
15	Added ability to respond to cross-over ballot errors. New MBS options introduced: - Show/hide Partisan contests on the reports - Show/hide Elector Groups on the reports  Ballot Review improvements: - If there are no votes on entire Open Primary ballot, for the contest that belongs to an Elector Group, report it as NO VOTES CAST	ICE
16	New Office Type Party Preference. Added ability to render Party Preference Contests on ballot. Added ability to pass Party Preference Contest Information to tabulators via election files	EED
17	Support for Party Preference rule in Standard and AVS. Added ability to report Party Preference Contest on the tape	ICE
18	Added ability to handle Party Preference Contest Results	RTR
19	Added support for Cross-Over rule for Open Primaries into the spreadsheet.	EDT

Item	Description	Product
20	Added support for Undeclared Open Primaries into election files for tabulators. Added ability to apply Cross-Over rule to Elector Groups. Added support for creation of audio for Electoral Groups.	EED
21	Ability to apply Open Primary voting rules (e.g. Stop on Cross Votes)	ICC
22	Support for Open Primaries including a DCF option to group per election group on the report tape	ICP
23	Added support for Undeclared Open Primary voting rules.	RTR
24	Adjudication PDF reports are digitally signed: Reports exported from the Adjudication system are digitally signed so that the user is assured that the reports are authentic.	Adjudication
25	Adjudication User choices logged during installation: Items are logged for each choice made by a user during the installation process so that the options chosen are available for troubleshooting.	Adjudication
26	All report timestamps updated to ISO 8601 format: All reports(activity and log) adhere to ISO 8601 format ex. yyyy-mm-ddTHH:mm:ss-7:00	Adjudication
27	Bug Fix: Resolved issue resulting in BallotPreparer using incorrect calculation when setting vote marks based on marginal mark threshold, causing discrepancies when bringing results into RTR.	Adjudication

APPENDIX C  
SOFTWARE TABLES

**Democracy Suite 4.14-D EMS Software Platform Components**

Software Required For Testing	Software Version	Filename
Democracy Suite EMS EED Client Application	4.14.37	setup.exe, EED_FED_CERT.Setup_64b.msi
Democracy Suite EMS RTR Client Application	4.14.37	setup.exe, RTR_FED_CERT.Setup_x64.Setup.msi
Democracy Suite EMS File System Service Client Application	4.14.37	setup.exe, DemocracySuiteEMS_FSS_Setup.msi
Democracy Suite EMS Audio Studio Client Application	4.14.37	setup.exe, EMSAS2010Setup.msi
Democracy Suite EMS Data Center Manager	4.14.37	DemocracySuiteEMS_DCM.exe
Democracy Suite EMS Application Server	4.14.37	setup.exe, EMSApplicationServer_FED_CERT.Setup_x64.Setup.msi

**Democracy Suite 4.14-D ImageCast Precinct Software Components**

Software Required For Testing	Software Version	Filename
Election Firmware	4.14.17-US	cf2xx.sig
Firmware Updater	4.14.17-US	firmUp.enc
Firmware Extractor	4.14.17-US	FirmwareExtract.enc
Kernel (uClinux)	4.14.17-US	Image.bin.gz
Boot Loader (COLILO)	20040221	colilo.bin

**Democracy Suite 4.14-D ImageCast Evolution Software Components**

Software Required For Testing	Software Version	Filename
Voting Machine	4.14.21	GApplication-4.14.21.vhd.7z
Election Application	4.14.21	dvs
Linux Kernel	2.6.30.9-dvs-21.3	uImage
Linux Device File	1.3	mpc8347dvs.dtb

**Democracy Suite 4.14-D ImageCast Evolution Software Components (Continued)**

Software Required For Testing	Software Version	Filename
Root File System	1.0.21	rfs
Ram Disk	1.0.1	initrd.img
Boot Startup Logo	5.0.0	logo_platform.bmp
Linux Startup Logo	5.0.0	logo_os.bmp
Boot Loader	1.3.4.29	u-boot.bin
Motherboard FPGA	1.1.5	ice2_mc_p1.bit
Scanner Board FPGA	1.1.2	ice2_scb_p2.bit
Logger Controller	1.0.11	logger.bin
Power Controller	2.0.7	power.bin
Integrated Printer	4.1.6	integratedPrinter.hex, printerFont.hex

**Democracy Suite 4.14-D ImageCast Central Software Components**

Software Required For Testing	Software Version	Filename
ImageCast Central Application	4.14.17	ImageCast Central.exe
Image-Analysis DLL	4.14.4	ImgProc.dll
Windows 7	COTS	Operating System for COTS ICC computer when using Canon DR-X10C and DR-G1130 scanners

**Democracy Suite 4.14-D EMS Software Platform Third Party Software Components**

Software Required For Testing	Software Version	Filename
Infragistics NetAdvantage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_2011.msi
TX Text Control Library for .NET	16.0	TX Text Control.NET for Windows Forms 16.0.exe

**Democracy Suite 4.14-D EMS Client Application Software Components**

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
Adobe Reader	10.1.1	AdbeRdr1011_en_US.exe
Microsoft .NET Framework 4.0	4.0	dotNetFx40_Full_x86_x64.exe
Microsoft SQL Server 2008 R2 x64	10.0	Microsoft DVD provided
Microsoft SQL Server 2008 Express R2 x64	10.50.4000.0	SQLEXPRADV_x64_ENU.exe
Microsoft SQL Server 2008 R2 SP1x64	10.51.4000.0	SQLServer2008R2SP1-KB2528583-x64-ENU.exe
Microsoft Visual J# 2.0 Redistributable Package – Second Edition (x64)	2.0	vjredist64.exe
1-Wire Driver version 4.0.3b x64	4.0.3	install_1_wire_drivers_x64_v403beta.msi
Java Runtime Environment 6.0 x64	6.0.290	jre-6u29-windows-x64.exe
Microsoft Visual C++ 2010 SP1 Redistributable Package(x86)	10.0.40219	veredist_x86.exe
Microsoft Access Database Engine 2010 Redistributable	1 (published 12/16/2010)	AccessDatabaseEngine.exe AccessDatabaseEngine_x64.exe

**Democracy Suite 4.14-D EMS Software Platforms Unmodified COTS Components**

Software Required For Testing	Software Version	Filename
Infragistics NetAdvantage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi (for details see document Components_3rdParty_1.0.xlsx)
TX Text Control Library for .NET	16.0	TX Text Control.NET for Windows Forms 16.0.exe (for details see document Components_3rdParty_1.0.xlsx)
Microsoft.Net Framework Library	4.0	dotNetFx40_Full_x86_x64.exe (for details see document Components_3rdParty_1.0.xlsx)
Sox	14.3.1	sox.exe,libgomp-1.dll,pthreadc2.dll,zlib1.dll (for details see document Components_3rdParty_1.0.xlsx)

**Democracy Suite 4.14-D EMS Software Platforms Unmodified COTS Components (Continued)**

Log4net	1.2.10	log4net.dll, log4net.xml (for details see document Components_3rdParty_1.0.xlsx)
NLog	1.0.0.505	NLog.dll (for details see document Components_3rdParty_1.0.xlsx)
iTextSharp	5.0.5.0	itextsharp.dll (for details see document Components_3rdParty_1.0.xlsx)
OpenSSL	1.2.3	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	3.99.4	lame.exe (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	9.04	gsdll32.dll – both 32-bit and 64-bit (for details see document Components_3rdParty_1.0.xlsx)
PdfToImage	1.2	PdfToImage.dll (for details see document Components_3rdParty_1.0.xlsx)
SharpSSH package	1.1.1.13	Tamir.SharpSSH.dll, Diffie.Hellman.dll, Org.Mentalis.Security.dll (for details see document Components_3rdParty_1.0.xlsx)
One Wire API for .NET	4.0.2.0	OneWireAPI.NET.dll (for details see document Components_3rdParty_1.0.xlsx)
Avalon-framework-cvs-20020806	20020806	avalon-framework-cvs-20020806.jar (for details see document Components_3rdParty_1.0.xlsx)
Batik	0.20-5	batik.jar (for details see document Components_3rdParty_1.0.xlsx)

**Democracy Suite 4.14-D EMS Software Platforms Unmodified COTS Components (Continued)**

Software Required For Testing	Software Version	Filename
Fop	0.20-5	fop.jar (for details see document Components_3rdParty_1.0.xlsx)
Microsoft Visual J# 2.0 Redistributable Package – Second Edition (x64)	2.0	vjc.dll,vjsjbc.dll,vjslibcw.dll,vjsnativ.dll,vjssupuiilib.dll,vjsvwaux.dll (for details see document Components_3rdParty_1.0.xlsx)

**Democracy Suite 4.14-D ImageCast Precinct Unmodified COTS Software Components**

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

**Democracy Suite 4.14-D ImageCast Evolution Unmodified COTS Software Components**

Software Required For Testing	Software Version	Filename
busybox	1.20.2	busybox-1.20.2.tar.bz2
e2fsprogs	1.42.4	e2fsprogs-1.42.4.tar.gz
expat	2.1.0	expat-2.1.0.tar.gz
fontconfig	2.9.0	fontconfig-2.9.0.tar.gz
freetype	2.4.9	freetype-2.4.9.tar.bz2
i2c-tools	3.1.0	i2c-tools-3.1.0.tar.bz2
libjpeg	v8d	jpegsrc.v8d.tar.gz
libogg	1.3.0	libogg-1.3.0.tar.gz
libpng	1.5.10	libpng-1.5.10.tar.gz
libusb	1.0.8	libusb-1.0.8.tar.bz2
libusb-compat	0.1.3	libusb-compat-0.1.3.tar.bz2
linux	2.6.30.9	linux-2.6.30.9.tar.bz2
openssl-fips	1.2.3	openssl-fips-1.2.3.tar.gz
ppp	2.4.5	ppp-2.4.5.tar.gz
qt-everywhere	4.7.3	qt-everywhere-opensource-src-4.7.3.tar.gz
skell	1.19	skell-1.19.tar.gz

**Democracy Suite 4.14-D ImageCast Evolution Unmodified COTS Software Components  
(Continued)**

soundtouch	1.6.0	soundtouch-1.6.0.tar.gz
speex	1.2rc1	speex-1.2rc1.tar.gz
sqlite	3.7.13	sqlite-autoconf-3071300.tar.gz
sysfsutils	2.1.0	sysfsutils-2.1.0.tar.gz
tiff	4.0.1	tiff-4.0.1.tar.gz
tzcode	2012b	tzcode2012b.tar.gz
tzdata	2012c	tzdata2012c.tar.gz
usb-modeswitch	1.2.4	usb-modeswitch-1.2.4.tar.bz2
usb-modeswitch-data	20120815	usb-modeswitch-data-20120815.tar.bz2
zlib	1.2.7	zlib-1.2.7.tar.bz2
log4cplus	1.0.4.1	log4cplus-1.0.4.1.tar.bz2
quazip	0.5	quazip-0.5.tar.gz

**Democracy Suite 4.14-D ImageCast Central Build Environment Software Build Components  
(Unmodified COTS)**

Software Required For Build	Software Version	Filename
Windows 7	Home Premium	OEM installed, or full CD from Microsoft
Windows XP	Professional	OEM installed, or full CD from Microsoft
Visual Studio	2005	Full CD from Microsoft

**Democracy Suite 4.14-D ImageCast Central Build Environment Setup Software Utilities  
(Unmodified COTS)**

Software Required For Build	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
Nasm	2.09.07	nasm-2.09.07-win32.zip

**Democracy Suite 4.14-D ImageCast Central Software Build Library Source Code  
(Unmodified COTS)**

Software Required For Build	Software Version	Filename
OpenSSL	FIPS 1.2.3	openssl-fips-1.2.3.tar.gz

**Democracy Suite 4.14-D 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
Kofax VRS	4.50	Full CD from Kofax
VCredist	4/10/2006	vcredist_x86.exe

**Democracy Suite 4.14-D ImageCast Precinct Modified COTS Software Components**

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

**Democracy Suite 4.14-D ImageCast Evolution Modified COTS Software Components**

Software Required For Testing	Software Version	Filename
Kernel	2.6.30.9-dvs-21.3	uImage
U-BOOT	1.3.4.29	u-boot.bin

**Democracy Suite 4.14-D EMS Software Build Environment Components**

Software Required For Testing	Software Version	Filename
Microsoft Windows Server 2008 R2 x64	6.1	Microsoft DVD provided
7-Zip	9.20	7z920-x64.msi
Microsoft Visual Studio 2010	10.0	Microsoft DVD provided
Microsoft SDK for Windows 7	7.1	GRMSDKX_EN_DVD.iso
Microsoft .NET Framework Library	4.0	
Microsoft Visual Studio 2010 Service Pack 1	10.0 SP1	VS2010SP1dvd1.iso
Microsoft patch KB2286556	N/A	VS10-KB2286556-x86.exe
ImgBurn	2.5.7.0	SetupImgBurn_2.5.7.0.exe
Infragistics NetAdvantage Win Forms 2011.1	2011 Vol.1	NetAdvantage_WinForms_20111.msi
TX Text Control Library for .NET	16.0	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 Redistributable Package – Second Edition (x64)	2.0	vjredist64.exe
ActivePerl	5.12.4	ActivePerl-5.12.4.1205-MSWin32-x64-294981.msi

**Democracy Suite 4.14-D ImageCast Precinct Election Firmware Compiler**

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

**Democracy Suite 4.14-D ImageCast Evolution Election Firmware Compiler**

Software Required For Testing	Software Version	Filename
g++ (GNU C++ compiler)	gcc-4.5.38- eglibc-2.11.38	freescale-powerpc-linux-gnu-2011.03-38.i686.rpm

**Democracy Suite 4.14-D ImageCast Precinct Firmware Build Environment Components**

Software Required For Testing	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

**Democracy Suite 4.14-D ImageCast Evolution Firmware Build Environment Components**

Software Required For Testing	Software Version	Filename
Ubuntu	10.04 LTS	ubuntu-10.04.3-desktop-i386.iso
LTIB	10.1.1a	ltib-10-1-1a-sv.tar.gz
g++ (GNU C++ compiler)	gcc-4.5.38- eglibc-2.11.38	freescale-powerpc-linux-gnu-2011.03-38.i686.rpm

**APPENDIX B – TECHNICAL DATA PACKAGE (TDP) ISSUES REPORT**

Documentation Issues Report - Dominion 4.14-D					
Issue Number	Status (Open/Closed/On Hold)	Document Name	Document Section	Document Version	Description
1	closed	2.11 - Democracy Suite Configuration Management Plan			CM document does not give details of how the modified TDP will be managed (e.g. baseline established, baseline conflicts, how modified TDP labeled, folders setup, etc.)
2	closed	Dominion Voting C/#! Automated Code Review Guidelines and Configuration			document is listed as v8 on the spreadsheet but we have v7
3	closed	2.10 Personnel Training and Development Requirements			The spreadsheet list "2.10 Personnel Training and Development Requirements" as part of the D-Suites (top section of the spreadsheet), but it is missing from that Unchanged folder and "2.06 System Security Specification" is there instead.
4	closed	User's Guide Folder			3. The Unchanged Users Guides folder includes BMD, AIMS, Mobile Ballot, and WinEIS documents but the spreadsheet shows these blacked out for 4.14-D.
5	closed	Change Notes			The 4.14-D Change Notes also seem to incorporate 4.14-D5 changes.
6	closed	RMS Election Event Designer Users Guide	Section 2.1, Step 4		This step has "Election Data Translator". Should this be "Election Event Designer". If so, check other EDT references in this document.
7	closed	Attestation Letter			Need Attestation Letter for 4.14-D.
8	closed	2.02 - Democracy Suite System Overview	Introduction		The Introduction reads in part, "Dominion Voting Systems' Democracy Suite RI 4.14 platform expands on the following EAC-verified components from the Democracy Suite RI 4.6 platform."  This should have 4.14-D as an expansion of 4.14-B
9	closed	TDP			Need 4.14-D Test Cases
10	closed	TDP			Need SCAP information for 4.14-D

Documentation Issues Report - Dominion 4.14-D					
Issue Number	Status (Open/Closed/On Hold)	Document Name	Document Section	Document Version	Description
11	closed	2.08 - EMS System Operation Procedures	pg. 9, Section 3.2.3, Software Installation		Bullet Point 1 reads in part, "with the latest service pack installed."  Only the certified SPs or updates are allowed.
12	closed	2.08 - EMS System Operation Procedures	pg. 9, Section 3.2.3, Software Installation		Bullet Point 4 reads in part, "[or higher - EED/RTR workstations only]"  Need to remove as only the tested version is allowed.
13	closed	2.08 - EMS System Operation Procedures	pg. 9, Section 3.2.3, Software Installation		Bullet Point 6 reads in part, "[or higher - EED/RTR workstations only]"  Need to remove as only the tested version is allowed.
14	closed	2.08 - EMS System Operation Procedures	pg. 10, Section 3.2.3, Software Installation		Bullet Point 9 (1st on page) reads, "Anti-Virus Software (optional)"  Only optional if other "anti virus" methods are present.
15	closed	2.08 - EMS System Operation Procedures	pg. 67, Steps 30 & 31		Steps 30 and 31 caused issues with the build. The FDP needs to mirror the fixes applied.  AS 8-26-2014: The PE asked reports that in Step 31 the word "under" caused confusion during the build and should be replaced with "in". Ronald of Dominion agreed.  FMP 10-19-2014: Don't see any changes
16	closed	EMS Audio Studio User's Guide	pg 3, Step 4		Step 4 reads, "Select EMS Audio Studio from the list of client applications, and click its arrow to expand the options listed under it. Select either the 32 bit version. NOTE: There is no 64 bit version of Audio Studio available."  "either" is not needed as there is only one choice.
17	closed	EMS Audio Studio User's Guide	pg 6, Step 14		Step 14 reads in part, "When prompted, click Yes to restart the computer immediately, or No to restart manually at a later time and proceed to the next step."  There was no prompt to restart.
18	closed	EMS Results Tally and Reporting Users Guide	pg 6, Step 14		Step 14 reads in part, "When prompted, click Yes to restart the computer immediately, or No to restart manually at a later time and proceed to the next step."  There was no prompt to restart.
19	closed	EMS Election Event Designer Users Guide	pg 7, Step 14		Step 14 reads in part, "When prompted, click Yes to restart the computer immediately, or No to restart manually at a later time and proceed to the next step."  There was no prompt to restart.
20	closed	EMS Election Data Translator Users Guide	pg 7, Step 14		Step 14 reads in part, "When prompted, click Yes to restart the computer immediately, or No to restart manually at a later time and proceed to the next step."  There was no prompt to restart.
21	closed	ImageCast Central Build Environment Setup	pg. 3, Bullet Point 3		Percent is mentioned on this page and does not seem to be part of this build any more.
22	closed	ImageCast Central Build Environment Setup	pg. 37, section 3.2		7zip lists an entry for 7z920-654.msi which is not a part of the build any more.
23	closed	ImageCast Central Build Environment Setup	pg 37, last sentence		Percent is mentioned on this page and does not seem to be part of this build any more.
24	closed	ImageCast Central Build Environment Setup	pg 37, Section 3.6		1-Wire needs to have the hash entry for the 32-bit installer for the 1-wire driver added. This is something within the build that needs to be here.
25	closed	TreeViewEx-Build-4.14-2.xv01	PDF pg 3  NO PAGE NUMBERS		Build Reviewed Code section: after opening TreeViewEx.in there is an unmentioned dialog box "Choose Default Environment Settings". A choice needs to be made here to be able to proceed. This happens because this is the first time we are opening Visual Studio 2010 and it needs to know what default environment to set up. We need instruction on which option to choose.
26	closed	ImageCast-Adjudication-Build-4.14-2.x.v11	pg 24		Step 5 is confusing because it makes reference to a C:\Builds\Adjudication\Reporting\License.txt which does not exist at this point because it is later in the document that we extract it from the source code delivery to that spot along with all of the rest of the source code.

Documentation Issues Report - Dominion 4.14-D					
Issue Number	Status (Open/Closed/On Hold)	Document Name	Document Section	Document Version	Description
27	closed	2.08 - EMS System Operation Procedures	pg 158, Section C.2.2.5, Step 1		Step 1 reads, "Open Start menu, Control Panel and finally Power Options. In the newly opened window click on Change plan settings."  The instructions need to match the screenshot. The screenshot shows which change plan to use but the text does not say.
28	closed	2.08 - EMS System Operation Procedures	pg 167, Section C.3.2, Step 3		Step 3 reads, "The 'Add Printer' dialog appears. Select 'Add a local printer as an administrator' and click 'Next'."  The option on these system is "add a local printer". The next step is not necessary.
29	closed	2.08 - EMS System Operation Procedures	pg 167, Section C.3.2, Step 5		Step 3 reads, "The 'Install the printer driver' screen appears. This screen lists manufacturers and printers. Under the Manufacturer list, select 'HP', and under the Printers list, select 'HP Deskjet 6940 Series'. NOTE: If the printer is not listed, click 'Windows Update' to update the list of printers. This update may take a few minutes."  Action is not allowed.
30	closed	2.08 - EMS System Operation Procedures	pg 167, Section C.3.2, Step 7		Step 7 reads, "A confirmation screen appears. Confirm the printer by clicking 'Next'."  No confirmation screen appears.
31	closed	2.08 - EMS System Operation Procedures	pg 191, Section C.3.2, Step 8		Section header reads, "Optional avast! Anti-Virus Software".  This is only an option if another method of anti-virus is used.
32	closed	2.08 - EMS System Operation Procedures	pg 199, Step 8		Step 8 reads, "On the Operating System Selection page, select the appropriate operating system, as per the license, and click on Next."  This step is not needed.
33	closed	2.08 - EMS System Operation Procedures	pg 216, Step 15		Step 15 reads, "Right-click on the 'Administrator' account and select Properties. Ensure that the combo-box for User must change password at next log on has been deselected."  There is a missing step to close the new account properties.  The PE went back and checked his notes and they did not contain any additional information more specific to this observation. As such we can close this issue based upon your review.
34	closed	2.08 - EMS System Operation Procedures	pg 216, Step 16 NOTE		The note reads in part, "Figure D.2.2.5".  Should be Section D.2.2.5.
35	closed	2.08 - EMS System Operation Procedures	pg 221, Step 8		Step 8 reads, "In the dialog that appears, type a static IP address for the server (the number represented in figure are only for presentational purposes)."  Its should be provided.
36	closed	2.08 - EMS System Operation Procedures	pg 223, Step 6		Step 6 reads, "In the 'Change Settings' dialog, select 'Never check for updates from the drop-down menu and click OK."  The screenshot has the "Give me recommended update the same way I receive updates."
37	closed	2.08 - EMS System Operation Procedures	pg 225, Section D.2.8, Adding Fonts		This is not an optional step.
38	closed	2.08 - EMS System Operation Procedures	pg 237, Step 3		Step 3 instructions are not clear and do not match the screenshot.
39	closed	2.08 - EMS System Operation Procedures	pg 239, Step 6		Guidance should be provided.  AS 10-17-14: in response to a question by Ian J. said: Since the DNS is "configured by DNS for use with adjudicator" - NTS was unsure as to what NTS should place in this field because NTS did not know its relation to the Dominion software. Also recent updates to the Security Document may have addressed the DNS.
40	closed	2.08 - EMS System Operation Procedures	pg 253, Section D.3.2, Printer Installation, Step 3		The user does not have to click next and the dialog response for "What type of printer do you want to install" is missing.
42	closed	2.08 - EMS System Operation Procedures	pg 253, Section D.3.2, Printer Installation, Step 5, NOTE		Note reads, "NOTE: If the printer is not listed, click 'Windows Update' to update the list of printers. Note that this update may take a few minutes."  Windows updates are not allowed.

Documentation Issues Report - Dominion 4.14-D					
Issue Number	Status (Open/Closed/On Hold)	Document Name	Document Section	Document Version	Description
42	closed	2.0B - EMS System Operation Procedures	pg. 258, Step 12, NDT E, 2nd Bullet-point		2nd bullet point reads "If a warning about Windows Firewall appears, ignore it and go to the next step."  Per RM, if the server is not connected to the Internet then a warning will appear for the .net as well.
43	closed	2.0B - EMS System Operation Procedures	pg. 271, Step 15		An example of a Reporting Service instance needs to be provided and the name of the configuration file needs to be added here.
44	closed	2.0B - EMS System Operation Procedures	pg. 271, Step 16		Step 16 reads, "Under the runtime section, add the following line, and save the configuration files."  Clarify "under". Should read be "within" the runtime section.
45	closed	2.0B - EMS System Operation Procedures	pg. 281, Step 6		Step 6 reads in part, "Figure E.148".  Should be "Figure D.150"
46	closed	2.0B - EMS System Operation Procedures	pg. 285, Screenshot		The screenshot needs updating
47	closed	2.0B - EMS System Operation Procedures	pg. 286, Screenshot		The screenshot needs updating
48	closed	2.0B - EMS System Operation Procedures	pg. 288, Step 13		Missing prompt for emsdbuser password
49	closed	2.0B - EMS System Operation Procedures	pg. 290, Step 2		Need to click connect first.
50	closed	2.0B - EMS System Operation Procedures	pg. 295, Step 18		No license agreement. The "Confirm Installation" prompt appears.
51	closed	2.0B - EMS System Operation Procedures	pg. 295, Step 18		Step 18 reads in part, "Figure E.170 appears."  Should read "Figure D.174"
52	closed	2.0B - EMS System Operation Procedures	pg. 296, Step 20		Step 20 reads in part, "Figure E.171".  Should read "Figure D.175"
53	closed	2.0B - EMS System Operation Procedures	pg. 298, Step 1		Step 1 reads, "After installing the EMS Application Server, click on Start, All Programs, DVS, Application Server Manager, Application Server Manager."  Needs EMS Application Server.
54	closed	2.0B - EMS System Operation Procedures	pg. 300, Step 11		The correct path is C:\Program Files\Capsul\bin
55	closed	2.0B - EMS System Operation Procedures	pg. 300 screenshot		Screenshot needs to include printer name.
56	closed	2.0B - EMS System Operation Procedures	pg. 303, Step 20		This is a mandatory step. Also need to click "ok" before upload
57	closed	2.0B - EMS System Operation Procedures	pg. 308, Step 6		Step 6 reads in part, "Figure E.195".  Should read "Figure E.190"
58	closed	2.0B - EMS System Operation Procedures	pg. 309, Step 10		Step 10 reads in part, "Figure E.198".  Should read, "Figure E.192"
59	closed	2.0B - EMS System Operation Procedures	pg. 313, Step 5		Step 5 reads in part, "Figure E.194".  Should read, "Figure D.198"
60	closed	2.0B - EMS System Operation Procedures	pg. 314, Step 11		Step 11 reads in part, "Figure E1.96".  Should read "Figure D.205"
61	closed	2.0B - EMS System Operation Procedures	pg. 320, Step 7		Step 7 reads in part, "Figure E2.06".  Should read "Figure D.210"
62	closed	2.0B - EMS System Operation Procedures	pg. 321, Step 12		Step 12 reads "From Application Pool combo box select EMSApplicationPoolV4."  There is no combo box. Default is EMSApplicationPoolV4
63	closed	2.0B - EMS System Operation Procedures	pg. 321, Step 14		Step 14 reads in part, "Figure E2.08".  Should read "Figure D.213"

Documentation Issues Report - Dominion 4.14-D					
Issue Number	Status (Open/Closed/On Hold)	Document Name	Document Section	Document Version	Description
64	closed	2.08 - EMS System Operation Procedures	pg. 323, Step 19		Step 19 reads "For SQL server username, keep the default value emsadminn."  There is no default value
65	closed	2.08 - EMS System Operation Procedures	pg. 324, Step 24		Step 24 reads, "Click Close to exit the EMS Adjudication Service Installation Wizard."  Click Finish
66	closed	2.08 - EMS System Operation Procedures	pg. 330, Step 10		Step 10 reads, "On the \User Account Control\ dialog, click Yes to proceed."  Program name is SbcceOsUser
67	closed	2.08 - EMS System Operation Procedures	pg. 560, Additional System Security Hardening Procedure		There are no instructions in the other installation sections that refer to this appendix as required or needed.  AS 10.21-2014: Did not add recent Appendix H revision to the Revision History.
68	closed	2.08 - EMS System Operation Procedures	pg. 565, Additional SQL Server and Database Security Procedures		There are no instructions in the other installation sections that refer to this appendix as required or needed.  FMP 10.20-2014: Removed Appendix I, but did not remove from table of contents.
69	closed	2.02 - Democracy Suite System Overview	pg. 40, 4th Bullet Point		Document says, "Modem (Optional) - Part of the ImageCast Evolution Main Controller and provides connectivity for standard Serial Modems (contains a built-in universal modem socket to support standard embedded Socket Modem modules)."  According to Jan the ICE does not have a built-in modem.
70	closed	2.13 - Democracy Suite System Change Notes			Individual modifications are losing control numbers - How are individual modifications traced in accordance with the QA process?
71	closed	2.04 - ICE System Hardware Specification	pg. 1, Section 1.2 Relevant Disclaimers		These disclaimers need to be updated to reflect those found in the System Overview
72	closed	2.04.1 - ImageCast Evolution System Hardware Characteristics	pg. 1, Section 1.2 Relevant Disclaimers		These disclaimers need to be updated to reflect those found in the System Overview  10/02/2014: These disclaimers need to be updated to reflect All of those found in the System Overview
73	closed	2.03 - ImageCast Central Functionality Description	pg. 1, Section 1.2 Relevant Disclaimers		These disclaimers need to be updated to reflect those found in the System Overview
74	closed	2.04 - ICP System Hardware Specification	pg. 1, Section 1.2 Relevant Disclaimers		These disclaimers need to be updated to reflect those found in the System Overview
75	closed	2.04.1 - ImageCast Precinct System Hardware Characteristics	pg. 1, Section 1.2 Relevant Disclaimers		These disclaimers need to be updated to reflect those found in the System Overview  FMP 10.19-14: All other manuals have new sheet with all disclaimers this one does not.
76	closed	2.08 - EMS System Operation Procedures	pg. 558-559, Section H.1.2		The steps in this section are numbered 7.8.3, are out of order in this section.
77	closed	2.08 - EMS System Operation Procedures	pg. 559, Section H.1.2		Step 6 reads, "Type "cd Windows7" and press Enter."  This step should read something like, "Type "cd Windows7 or Windows 2008 R2" and press Enter."
78	closed	TDR			NTS could not locate the ICE error condition in the documentation related to the fast beeps observed when the battery is at 0%  This was also entered at Mantis issue #15
79	closed	2.08 - EMS System Operation Procedures	pg. 561, Appendix I		Dominion is modifying the document so that the EQL procedures in Appendix I are not used.
80	closed				Searching for language profiles under the Precinct creation dialog causes error message to display
81	closed				Application Server Installation - Report Service will not initialize. This issue was due to a step in the TDR that was obscure. Once that step was performed the installation was completed.

Documentation Issues Report - Dominion 4.14-D					
Issue Number	Status (Open/Closed/On Hold)	Document Name	Document Section	Document Version	Description
82	closed				When deleting a report profile, if you make no other changes and click Modify, the previously deleted profile reappears in the list.
83	closed				Unable to generate election with Audio-Only language Description: Unable to link the audio files to actual filenames in Audio Studio due to encryption of filenames when exporting from EED. Tags No tags attached.
84	closed	2.13 - Democracy Suite System Change Notes	pg 8		The DRS Scanner has been withdrawn from 4.14-D. As such the modification needs to also be removed from the Change Notes.
85a	closed	2.02 - Democracy Suite System Overview			The DRS Scanner has been withdrawn from 4.14-D. As such the TDP needs to be updated to reflect this withdrawal.
85b	closed	2.03 - ImageCast Central Functionality Description			The DRS Scanner has been withdrawn from 4.14-D. As such the TDP needs to be updated to reflect this withdrawal.
85c	closed	ImageCast Central DRS PhotoScribe System Maintenance Manual			The DRS Scanner has been withdrawn from 4.14-D. As such the TDP needs to be updated to reflect this withdrawal.
85d	closed	PhotoScribe P5900 Series Maintenance Manual			The DRS Scanner has been withdrawn from 4.14-D. As such the TDP needs to be updated to reflect this withdrawal.
85e	closed	PhotoScribe P5900 User Guide			The DRS Scanner has been withdrawn from 4.14-D. As such the TDP needs to be updated to reflect this withdrawal.
85f	closed	2.08 - ImageCast Central Operations Procedures			The DRS Scanner has been withdrawn from 4.14-D. As such the TDP needs to be updated to reflect this withdrawal.
86	closed	2.13 - Democracy Suite System Change Notes	pg 8		The Change Note on the bottom of the page has the TDP references as "TBC"
87	closed	2.04.1 - ImageCast Evolution System Hardware Characteristics	pg iii, Revision History		This document was updated to Version 1.2.0:92 but the revision history does not indicate any changes since 01-05-2014
88	closed	EMS Results Tally & Reporting User's Guide			No Revision History
89	closed	2.08 - ImageCast Central System Operation Procedures	pg 2, section 2.1 pg 5, section 3.4.5		Redefine UPS selection and clarify load operations on UPS
90	closed	ICE			Setup for ICE Second Monitor. - (reference 10-0-2014 email from Ian to Stevenson)
91	closed	2.05 - ImageCast Proinct Software Design and Specification	Revision History	Version: 4.14.D:110	No Revision History
92	closed	2.11 - Democracy Suite Configuration Management Plan	Revision History	Version: 4.14.D:196	No Revision History
93	closed	2.03 - ImageCast Proinct Functionality Description	Revision History	Version: 4.14.D:123	No Revision History
94	closed	2.05 - ImageCast Proinct Software Design and Specification	Revision History	Version: 4.14.D:110	No Revision History
95	closed	2.05 - Security Specifications	6.1.2	4.14.D:368	"Using the appropriate gold disk images, operating systems with the latest updates (service packs) are installed on the target system components. Below this statement is a listing of the install software but I think it would be clearer if you state say something like "as listed below".
96	closed	2.05 - Security Specifications	6.1.2	4.14.D:368	"The system is tested to the latest operating system service pack available prior to starting the certification process." Once again just state the version that is certified.
97	closed	2.05 - Security Specifications	6.1.2	4.14.D:368	"For a summary of the recommended security policies, see below." These cannot be recommended. If this is the policy that you want certified then these have to be required.
98	closed	2.05 - Security Specifications	6.1.2	4.14.D:368	Need to Harmonize the compliance packages with appendix B. For example, IE 8 is installed and is in appendix B but not represented in the list. Also need to make it clear that all of the IE compliance scripts need to be executed. This is not clear from Appendix B of section 6.1.2.
99	closed	2.05 - Security Specifications	Appendix B	4.14.D:368	Images B16 and B17 are broken.
100	closed	2.06 - Security Specifications	Appendix B.0.5	4.14.D:368	There are not any steps that describe removing the Microsoft Security Compliance Manager (SCM) 3.0. Leaving this on the system is a potential security vulnerability
101	closed	2.08 - EMS System Operation Procedures	3.2.3	4.14.D:532	"All workstations are installed with the Microsoft Windows 7 Professional operating system and are updated with the latest service packs." Just state that they are install with Microsoft Windows 7 Professional SP1. The same for the bullet.
102	closed	2.08 - EMS System Operation Procedures	Multiple	4.14.D:532	"Cepral Voices is commercial software for which a license must be purchased. Cepral installations are not present on EMS DVD because of frequent updates to the software. The Cepral installation files can be downloaded from the Internet or can be provided by Dominion Voting Systems. (Please contact Dominion Voting Systems staff for support)." I would remove the option of downloading, and leave the part where dominion will provide.

Documentation Issues Report - Dominion 4.14-D					
Issue Number	Status (Open/Closed/On Hold)	Document Name	Document Section	Document Version	Description
103	Closed	2.08 - EMS System Operation Procedures	Multiple Pg 139, 199, 350, 489, and 551	4.14.D:532	"For your protection, an anti-virus program should be installed on all servers and client machines." This cannot be a should. Also step one states "the link for downloading Avast End-point Protection Suite will be supplied to you by company from whom you obtained the anti-virus software." This needs to be changed to Dominion will supply the certified version.
104	Closed	2.08 - EMS System Operation Procedures	Multiple Pg 144, 199, 355, 491, and 556	4.14.D:532	Need to clarify that updating the virus definitions may not be allowed on an EAC certified system. Also I think that Appendix H is superseded by appendix B of 2.06 Security Specifications
105	Closed	2.08 - EMS System Operation Procedures	E.3.2	4.14.D:532	"NOTE: If the printer is not listed, click the 'Windows Update' button to update the list of printers. Note that this update may take a few minutes." Cannot use windows update
106	Closed	2.11 - Democracy Suite Configuration Management Plan	pg 37-39	4.14.D:203	Need to add the versions of Avast, Cepstral, and Microsoft Security Compliance Manager.
107	closed	2.08 - EMS System Operation Procedures	3.1.4	4.14.D:534	"Each server is installed with the Microsoft Windows Server 2008 R2 operating system. All machines have to be updated with the latest service packs." Needs to state the SP.
106	closed	2.11 - Democracy Suite Configuration Management Plan	pg 37-39	4.14.D:204	Microsoft Security Compliance Manager need to be 3.0.60  Cepstral Voices should have version number 6.2.3.801

**APPENDIX C - DISCREPANCY REPORT**

ID <sup>2</sup>	Summary	Resolutions
06	During the initial install of Application Server, the Report Service would not initialize after adding the settings as described in the TDP.	This issue was due to a step in the TDP that was obscure. The updated TDP, 2.08 EMS System Operations Procedures, was submitted with steps removed that prevented the Report Service from initializing. The discrepancy was re-tested and the issue was found to be resolved.
07	Running the ICP firmware update caused an application failure when selecting Complete mode.	It was determined that this was a bug in the firmware update process. Dominion submitted an updated release of the ICP software. The discrepancy was re-tested and the issue was found to be resolved.
08	ICE Unit froze after completing Accessible Voting Session using external monitor.	It was determined that this was a bug in the hot plugability functionality. Dominion addressed this discrepancy by removing the ICE firmware source code responsible for the hot plugability of the ICE external monitor. The discrepancy was re-tested and the issue was found to be resolved.
09	When adding a second contest for an office that already exists and closing that window, EED crashed.	This issue was seen only one time and testers were unable to reproduce it. The same steps have been attempted with no errors. Based on repeat efforts without being able to reproduce the item has been closed.
10	Within EED under Election Event->Choices, the column headers "Lang. Profiles" and "Not Rotatable" are not completely visible.	The Column Header display is dependent on the PC's screen resolution. If the screen resolution does not allow for the columns to be fully displayed, the user can drag to resize the columns in order to fully display the text. This discrepancy is closed.
11	Within EED under Tabulation->Tabulators, the tabulator Number is a required field but is not in red.	Dominion submitted an update to the EED User's Guide that provided a "work around" to this issue. NTS and the EAC accepted this under the condition that the issue is corrected in the next release of the Democracy Suite. This discrepancy is closed.
12	Within EED under Localization->Templates->Ballot Header/Footer Template->Template the font sizes are not visible.	Dominion submitted an update to the EED User's Guide that provided a "work around" to this issue. NTS and the EAC accepted this under the condition that the issue is corrected in the next release of the Democracy Suite. This discrepancy is closed.
13	In the Options category, for ICP tabulator specific to Results Tape Printout Options: The option for grouping contests together by electoral group for the Results Tape is a Read-Only setting. This should be a read-write setting. Note: The same setting for the Zero Tape is correctly set to read-write. The DCF version is 4141702.	Dominion submitted an updated DCF file (version 4141703) to address this issue. The discrepancy was re-tested and the issue was found to be resolved.
14	Searching for Language Profiles under the Precinct creation dialog causes error message to display	Dominion submitted an update to the EED User's stating the requirements for searching for Language Profiles, and the error condition that is displayed if the user attempts to add a language profile after all available language have been previously added. This discrepancy is closed.

<sup>2</sup> The discrepancy tracking system that is utilized by NTS creates unique ID numbers based on overall entries within the database and not within individual projects. Thus, the ID numbers may not be sequential.

ID <sup>2</sup>	Summary	Resolutions
15	Could not locate the ICE error condition in the 2.08 ICE System Operating Procedures related to the fast beeps observed when the battery is at 0%.	Dominion submitted an update to the ICE System Operating Procedures to include the stated error condition. This discrepancy is closed.
16	In Results Tally & Reporting, if a report profile is deleted and confirmed, and then the Modify button is pressed, the previously deleted profile reappears in the list.	The RTS TDP section 11.5 states: "When no profile is selected, the 'Modify' button acts as the 'Add' button." Dominion stated that this process creates a new profile based on the parameters of the last profile that was generated. This discrepancy is closed.
17	The Zero Tape DCF options are required to mirror the Results Tape DCF options in order to comply with the VVSG requirements on reportable election elements.	Dominion submitted an updated DCF file (version 4141703) to address this issue. The discrepancy was re-tested and the issue was found to be resolved.
19	For Adjudication, the version number "2.4" is briefly displayed when the application is launched, however this does not match the software build version (2.4.1.3201). Once the user is in the application, the software version is not available to be verified by or displayed to the user.	<p>This discrepancy was addressed by Dominion Voting by adding the following options to the TDP (System ID Guide). These are the processes by which a user is able to verify the correct installation version of the Adjudication application:</p> <p>To verify the integrity of the software installed on a voting system, the recommended method should be to calculate the hash values of the installed files and compare them against a trusted list of hash values. Anytime chain of custody has been broken for a piece of voting equipment, that is the recommended method for performing that verification. Other than that method, below are two methods for determining the version number of the Adjudication software that is installed on the COTS computer.</p> <p>a. From the file system:</p> <ol style="list-style-type: none"> <li>1. Navigate to the installation folder.</li> <li>2. Right click on the Adjudication Client executable (.exe) file, and choose 'Properties'</li> <li>3. Open the 'Details' tab</li> <li>4. Verify the property 'Product version'</li> </ol> <p>b. While running the application:</p> <ol style="list-style-type: none"> <li>1. Open Task Manager (Press Ctl + Alt + Del -&gt; Choose '* Task Manager')</li> <li>2. Select 'ImageCast Adjudication' on the Applications tab</li> <li>3. Right-click 'ImageCast Adjudication' and choose 'Go to process...'</li> <li>4. Right-click on the selected process and choose 'Properties...'</li> <li>5. Verify the property 'Product version'</li> </ol> <p>This discrepancy is closed.</p>
20	Unable to link the audio files to actual file names in Audio Studio due to encryption of filenames when exporting from EED.	Dominion submitted an update to the EED documentation to clarify the method to link the files. The discrepancy was re-tested and the issue was found to be resolved.

ID <sup>2</sup>	Summary	Resolutions
21	<p>When a USB cable is plugged in to the USB port on the ICE unit, the connection is loose causing the screen of the external monitor to flicker.</p>	<p>Dominion’s investigation revealed an issue with the 15ft USB cable provided with the external LCD monitor. The root cause was determined to be the voltage drop across the 15ft USB cable that was sufficient enough to cause the backlight switching power regulators in the USB LCD monitor to intermittently go out of regulation. A replacement cable was provided, the TE Connectivity 1496476-4 (10ft, 22AWG), as a solution. The discrepancy was re-tested and the issue was found to be resolved.</p>
24	<p>The volume and stress test was completed on the Canon DR-G1130 central count scanner (ICC). During the review and verification of results it was determined that candidate Gerald Thompson received 1 less vote than expected. The results expected were 1500 per candidate position and Gerald Thompson received only 1499. The test decks were run multiple times (12-13) with multiple candidate selections being made on each ballot in which all other votes were verified accurate. The information has been provided to Dominion Voting for research and investigation at this time. No additional testing on the Canon DR-G1130 is being conducted at this time.</p>	<p>The direct cause of the error was unable to be determined and additional internal testing by Dominion was unable to reproduce the incident. It was decided that the Max Candidate portion of the volume test would be retested. A second ICC (DR-G1130) unit was added to the testing. The Max Candidate election was reprocessed on the original scanner and duplicated in parallel on the second unit in an effort to expand number of ballots processed. The testing did not reproduce the original issue. Since the VVSG allows for target error rate of 1 in 10,000,000 ballot positions the ICC was found to meet the requirements. This discrepancy is closed.</p>
30	<p>During scanning on the ICC utilizing build 4.14.17 and Canon DR-G1130 scanner, the following error was observed twice while scanning a batch of ballots</p> <p>Error 920393 after 2 pages. Unknown ISIS error. Please resubmit the entire batch.</p> <p>Error 920393 after 13 pages. Unknown ISIS error. Please resubmit the entire batch.</p>	<p>This error was diagnosed as an improper booting sequence. Dominion updated the TDP to include appropriate language for resolution if this error presents itself. The discrepancy was re-tested and the issue was found to be resolved.</p>
31	<p>When powering up ICE S/N: AAFEBDZ0068, the LCD screen was not functioning, although the sounds heard during a normal power up sequence can be heard.</p> <p>The tester checked the battery level and confirmed it was at 100% charged. The unit had been plugged in to AC power the entire duration.</p>	<p>It was determined that the ICE had a bad motherboard. The motherboard was swapped out and the unit functioned without further issue. This discrepancy is closed.</p>

**APPENDIX D – INSTRUMENTATION SHEETS**

### Temperature Power Variation



### INSTRUMENTATION EQUIPMENT SHEET

DATE: 8/29/2014      JOB NUMBER: PR031072      TYPE OF TEST: TEMP VARIATION  
 TECHNICIAN: D RISINGER      CUSTOMER: DOMINION      TEST AREA: ENV CHAMBER 51B

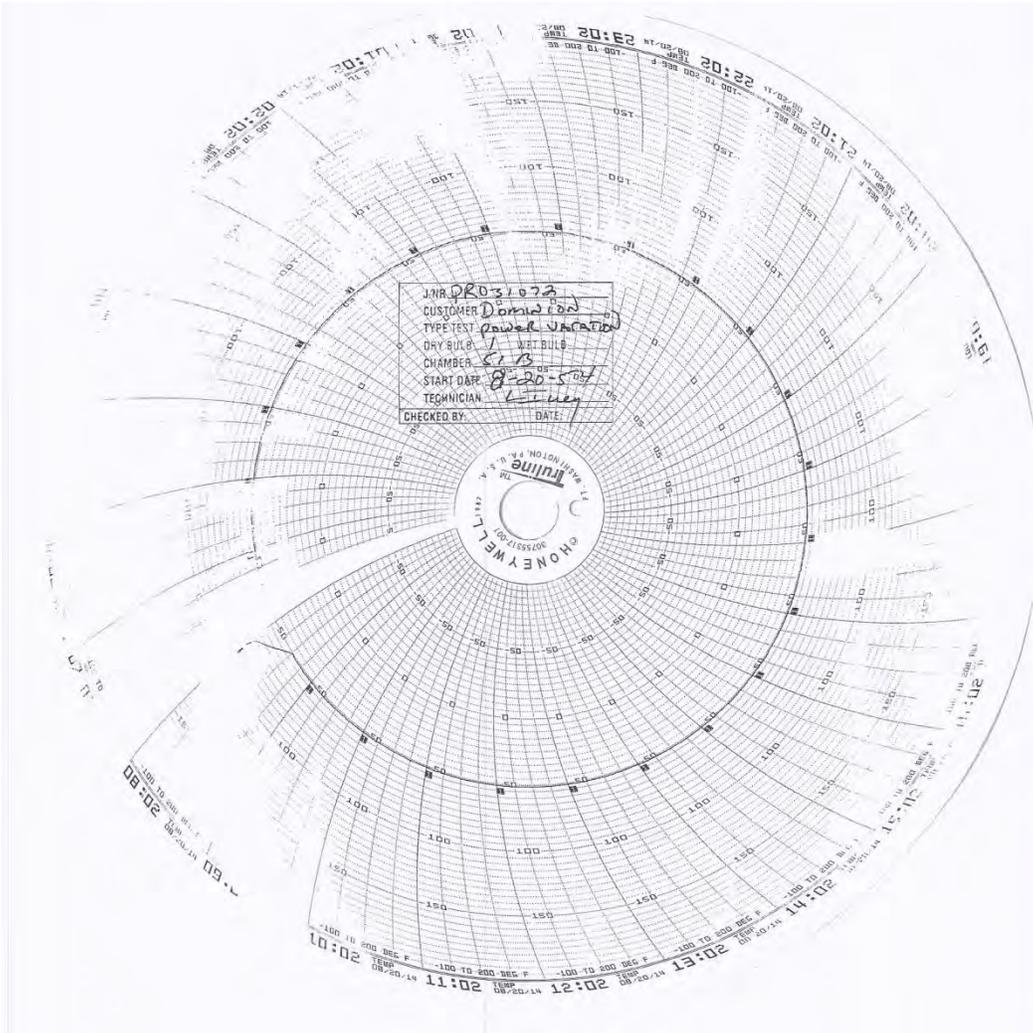
No.	Description	Manufacturer	Model	Serial #	Asset #	RANGE	ACCURACY	Cal Date	Cal Due
1	ALARM LIMIT	NEWPORT	Q2001TC	NSN	105434	-184 - 59°C	1.5%RD	11/18/2013	11/18/2014
2	CONTROLLER	MICRISTAR	828-D10	10172	108420	-400-700°F	.1%FS	11/18/2013	11/18/2014
3	MULTIMETER	FLUKE	87V	10000197	02494	MFG	MFG	2/27/2014	2/27/2015
4	TEMP RECORDER	HONEYWELL	DR4500	45Y943960600	115916	-200 - 600°F	4°F	11/18/2013	11/18/2014

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

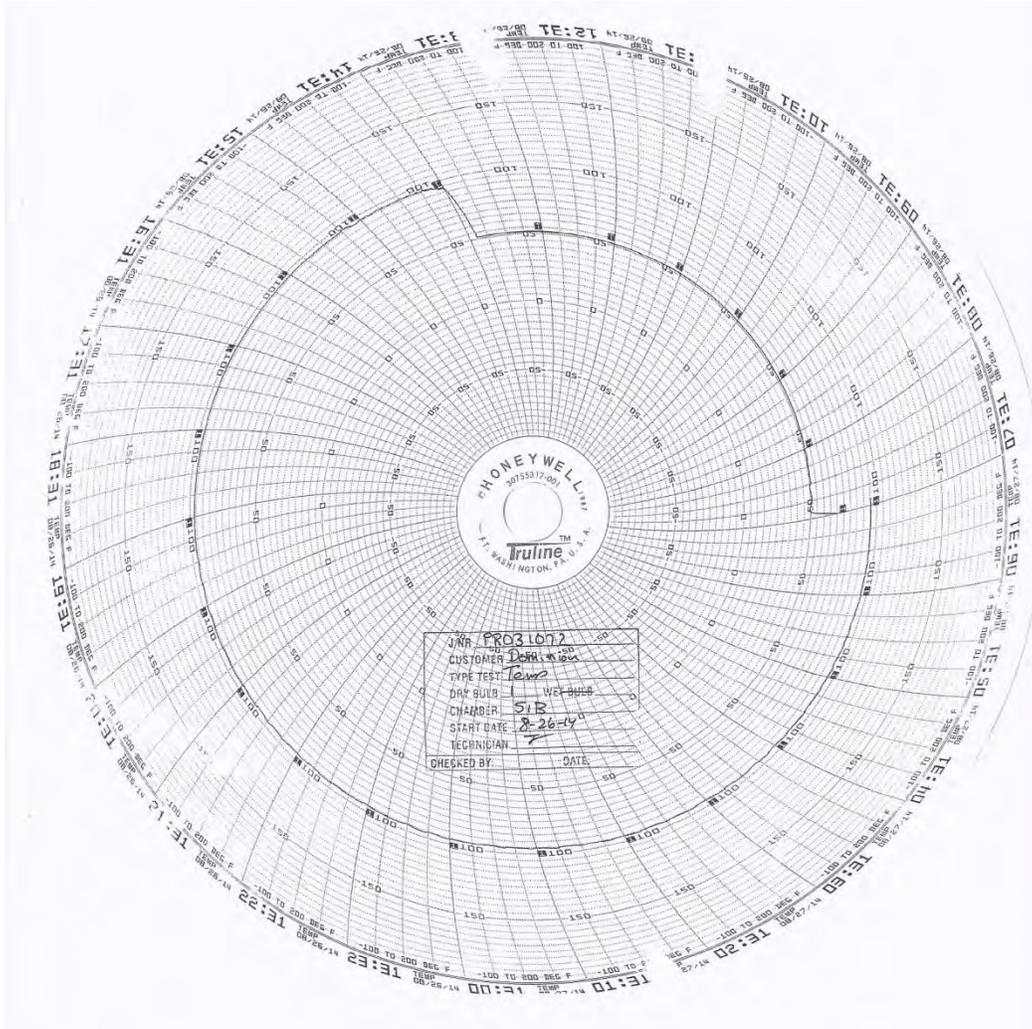
INSTRUMENTATION: *Trance Turner 9/2/14*      CHECKED & RECEIVED BY: *Steph Co 9/2/14*

Q.A.: *Michael Cooper 9/2/14*

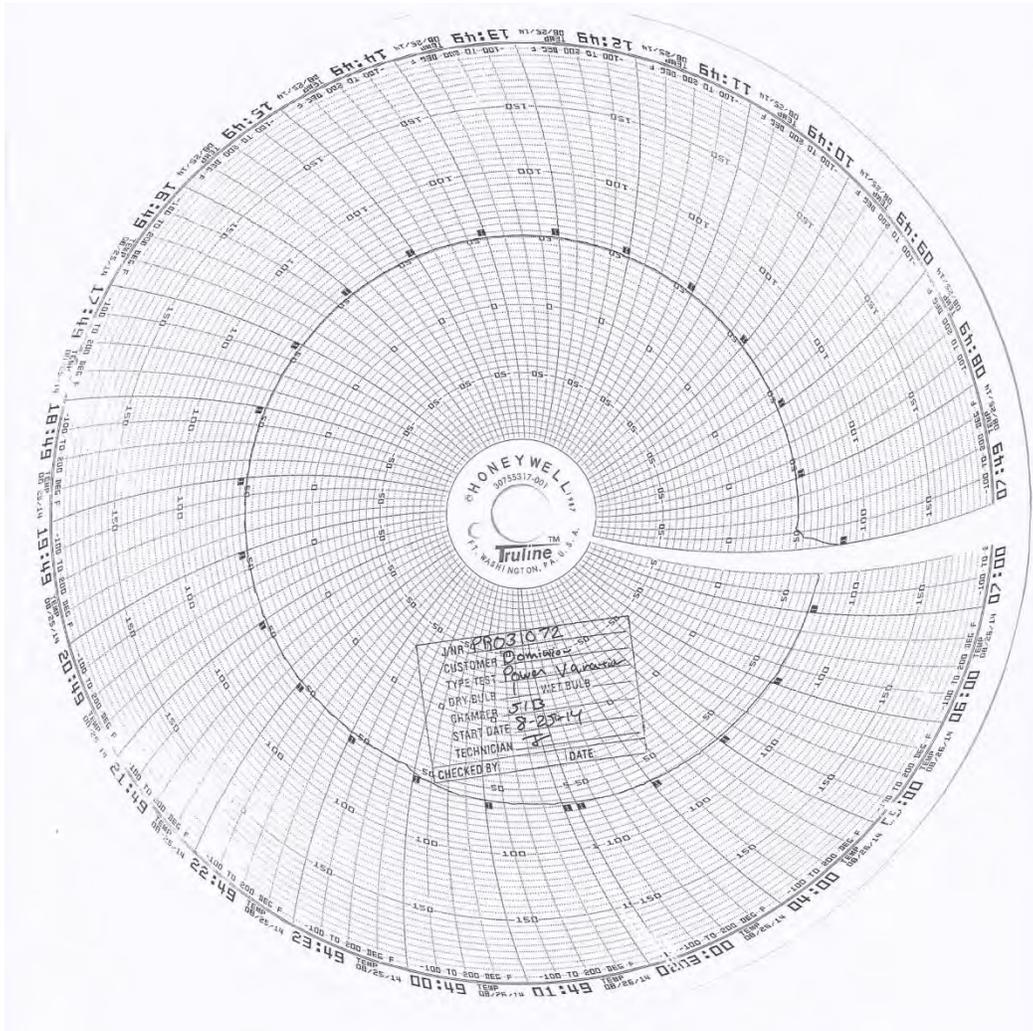
### Temperature Power Variation (Continued)



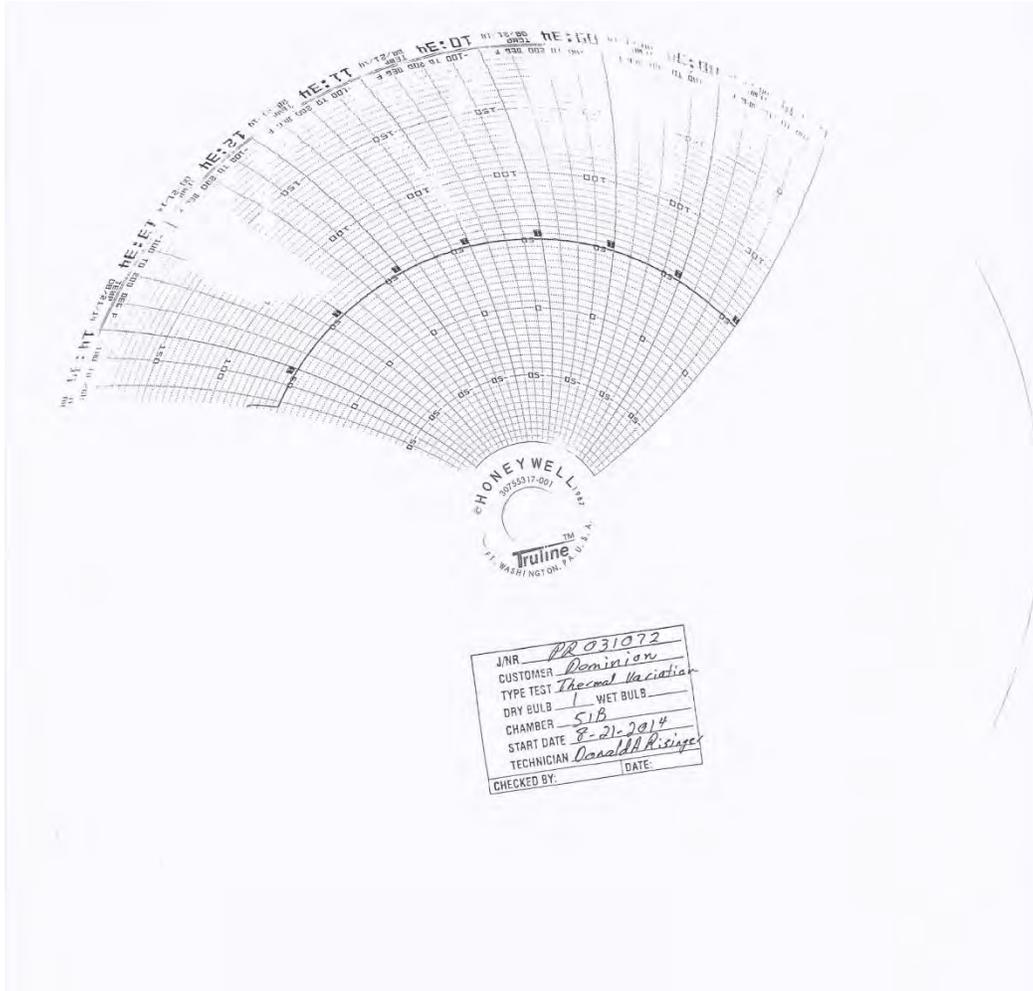
### Temperature Power Variation (Continued)



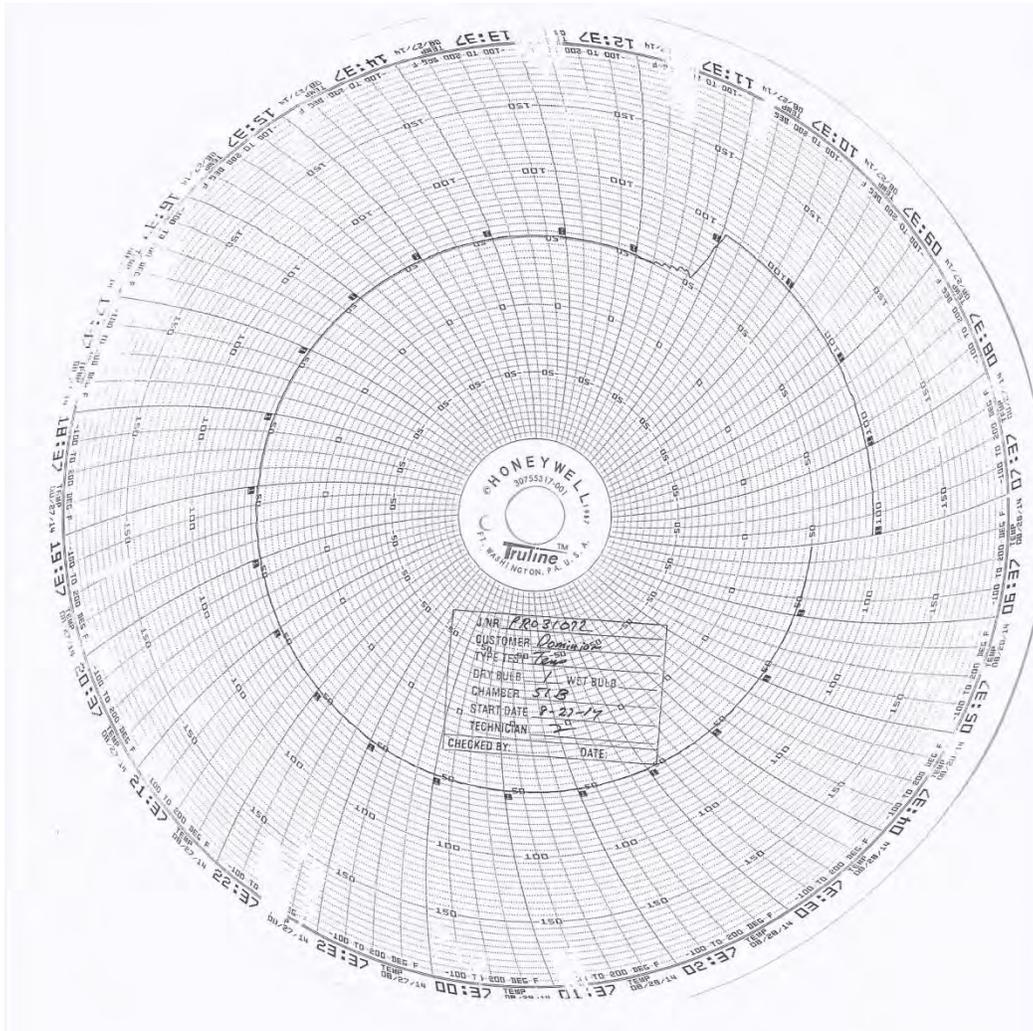
### Temperature Power Variation (Continued)



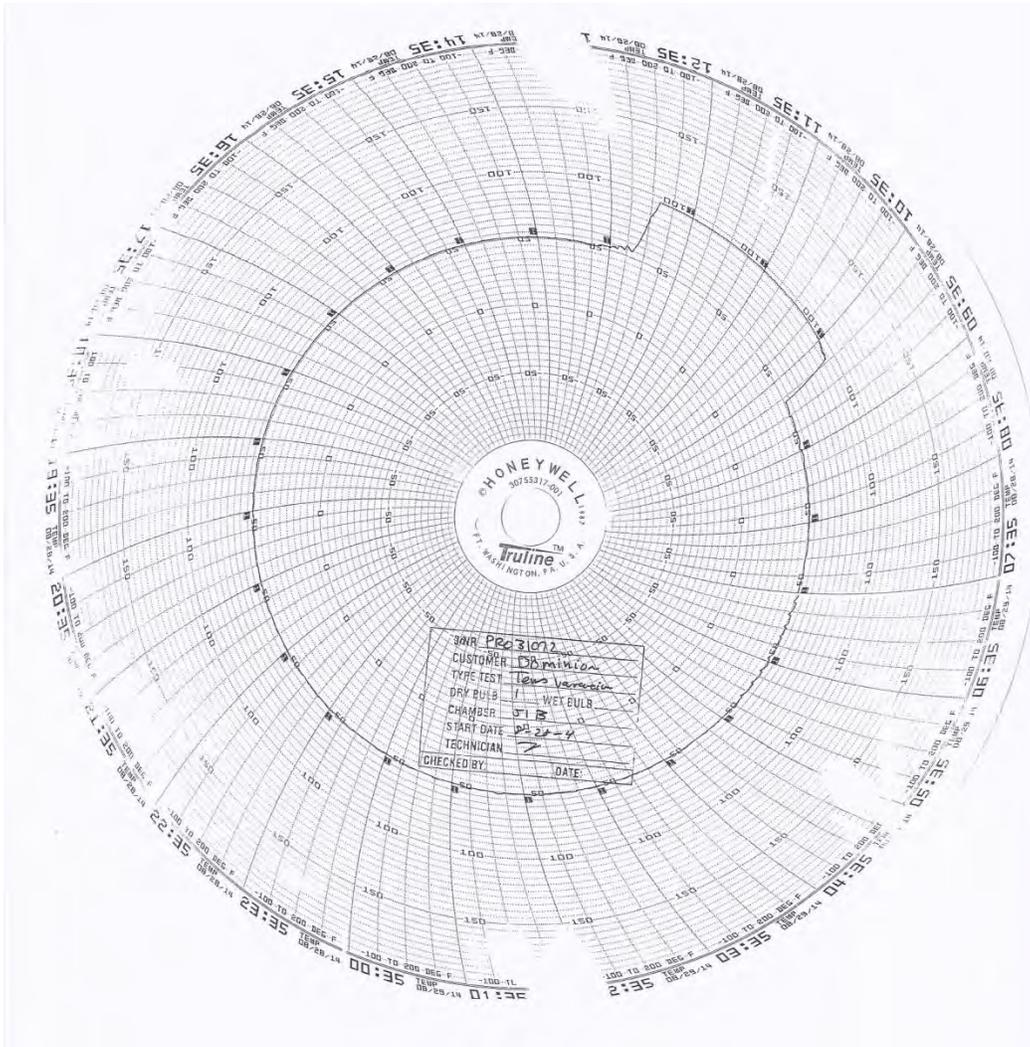
### Temperature Power Variation (Continued)



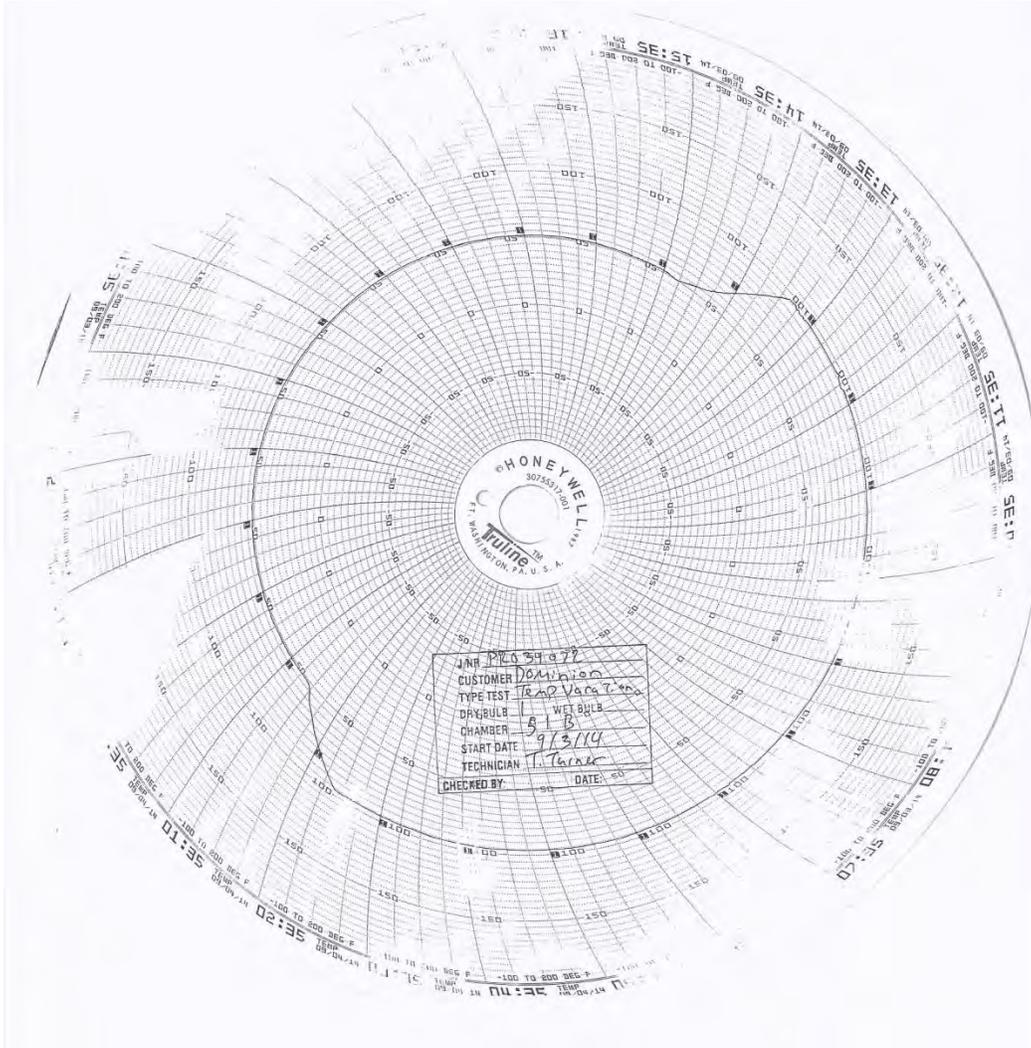
### Temperature Power Variation (Continued)



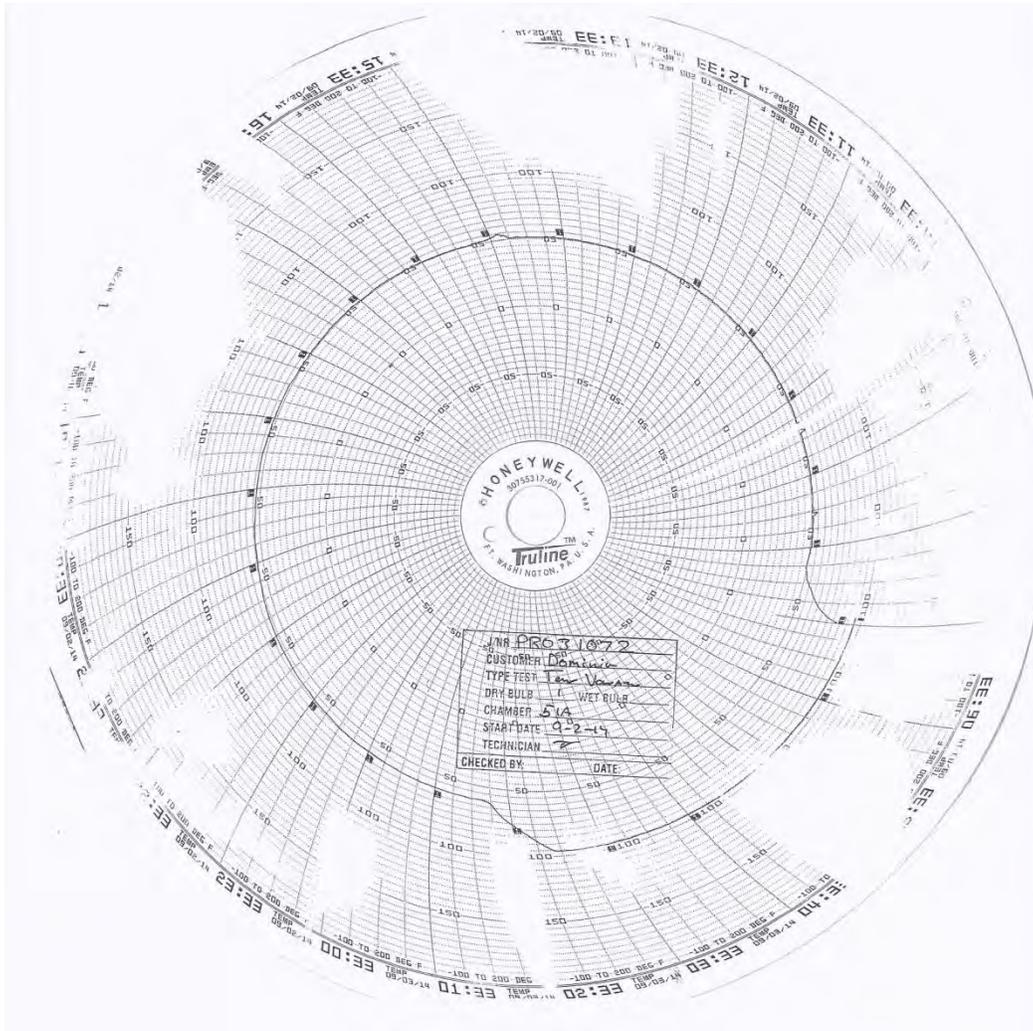
### Temperature Power Variation (Continued)



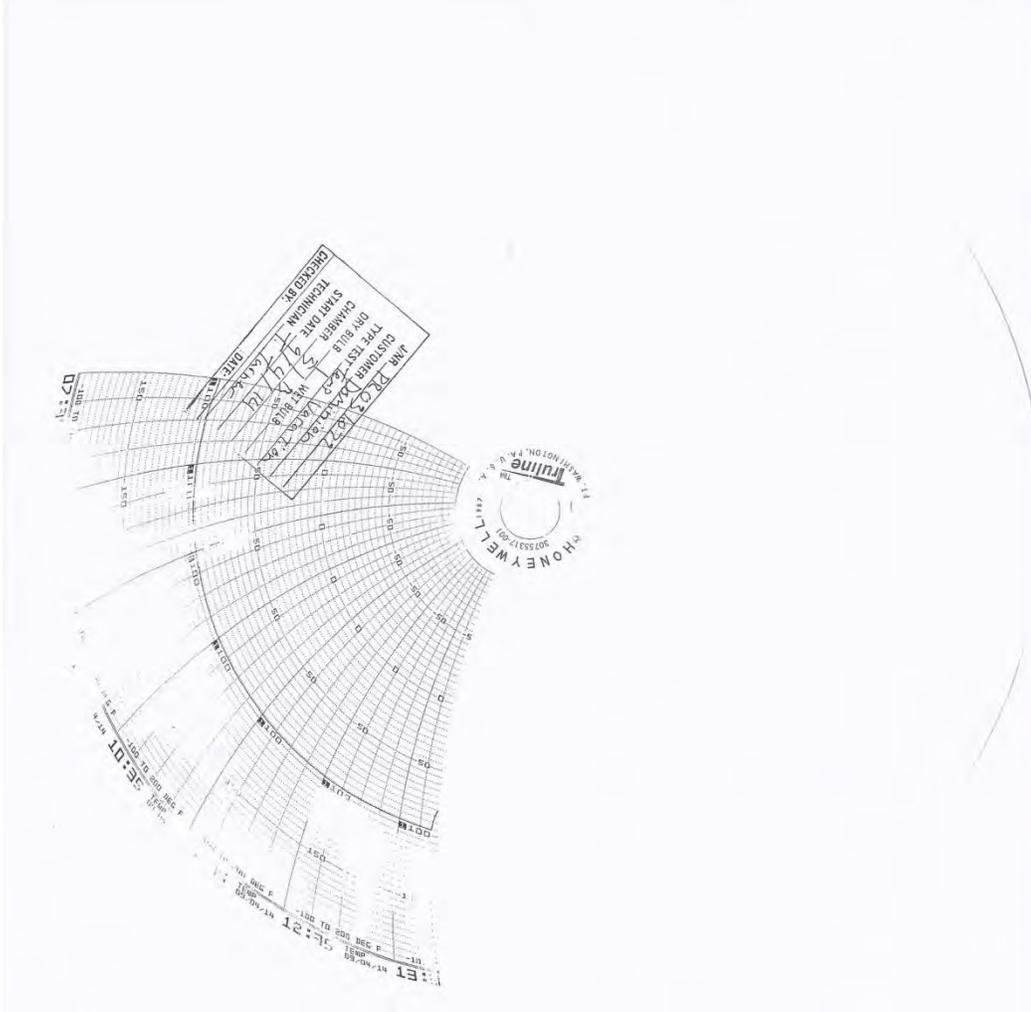
### Temperature Power Variation (Continued)



Tempature Power Variation (Continued)



### Temperature Power Variation (Continued)



### Conducted RF Immunity



### INSTRUMENTATION EQUIPMENT SHEET

DATE: 9/22/2014      JOB NUMBER: PR031072      TYPE OF TEST: CONDUCTED RF IMMUNITY  
 TECHNICIAN: J. GALEONE      CUSTOMER: DOMINION      TEST AREA: EMI LAB CHAMBER 1

No.	Description	Manufacturer	Model	Serial #	Asset #	RANGE	ACCURACY	Cal Date	Cal Due
1	AMPLIFIER	AMP RESEARCH	500A100A	0324951	04816	10kHz-100MHz	NCR	8/25/2014	8/25/2015
2	ATTENUATOR	NARDA	769-6	03180	04860	DC to 6GHz	MFG	4/7/2014	4/7/2015
3	LOAD	BIRD	8080	22438	04678	50ohm/25watt	mfg	5/10/2013	5/10/2015
4	PASS IMP ADAPT	FISHER CC	FCC-801-150-50-CD	9785	116853	150KHz-230MH	MFG	7/14/2014	7/14/2015
5	PASS IMP ADAPT	FISHER CC	FCC-801-150-50-CD	9784	116854	150KHz-230MH	MFG	7/14/2014	7/14/2015
6	PASSIVE	FISHER CC	FCC-801-M3-25A	04044	110405	150KHZ - 230M	MFG	9/3/2014	9/3/2016
7	SIG GEN	AEROFLEX	2023A	202306/068	03704	9KHz-1.2GHz	MFG	8/21/2014	8/21/2015
8	SPECTRUM	HP	8566B	2747A05517/2	01695	100HZ-22GHZ	MFG	10/23/2013	10/23/2014
9	SPECTRUM	HP	8566B	3014A06704	117093	100HZ-22GHZ	CERT	8/4/2014	8/4/2015

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION:

*[Signature]*  
9/22/14

CHECKED & RECEIVED BY:

*[Signature]* 9/22/14  
Q.A.: *[Signature]* 9/22/14



### Electrical Supply



### INSTRUMENTATION EQUIPMENT SHEET

DATE: 9/17/2014      JOB NUMBER: PR031072      TYPE OF TEST: ELECTRICAL SUPPLY  
 TECHNICIAN: T HARDMAN      CUSTOMER: DOMINION      TEST AREA: VOTING AREA

No.	Description	Manufacturer	Model	Serial #	Asset #	RANGE	ACCURACY	Cal Date	Cal Due
1	STOPWATCH	EXTECH	365510	NSN	04955	MFG	5 sec/day	7/17/2014	7/17/2015

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION: T Hardman 9-17-14 CHECKED & RECEIVED BY: [Signature] 9/17/14

Q.A.: [Signature] 9/17/14

### Electromagnetic Radiation



### INSTRUMENTATION EQUIPMENT SHEET

DATE: 10/8/2014      JOB NUMBER: PR031072      TYPE OF TEST: FCC PART 15  
 TECHNICIAN: J.SMITH      CUSTOMER: DOMINION VOTING      TEST AREA: OATS 2

No.	Description	Manufacturer	Model	Serial #	Asset #	RANGE	ACCURACY	Cal Date	Cal Due
1	ANTENNA	ELECTROMETRIC	EM-6917A-1	124116	114415	30MHZ - 3GHZ	SEE DATA	9/11/2013	9/11/2015
2	ATTENUATOR	NARDA	766-20	740580	01443	DC-4 GHz	MFG	4/7/2014	4/7/2016
3	DMM	FLUKE	87	64440152	112518	MULTI	±0.1%+1	6/12/2014	6/12/2015
4	EMI TEST	ROHDE SCHWARZ	ESCI	100386	117803	MULTI	MFG	5/16/2014	5/16/2015
5	LISN	FISHER CC	FCC-LISN-50/250-25	01008	116634	9 KHz - 100 MH	MFG	7/3/2014	7/3/2015

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION:

*[Signature]* 10/8/14

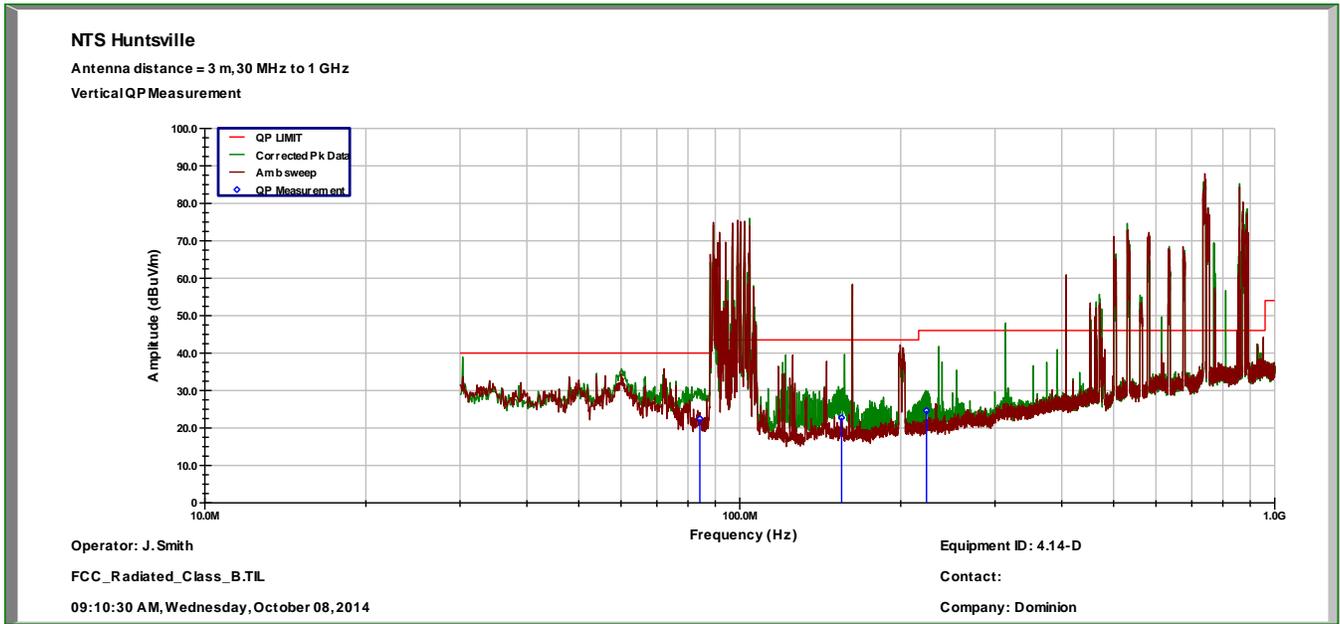
CHECKED & RECEIVED BY:

*[Signature]* 10/8/14

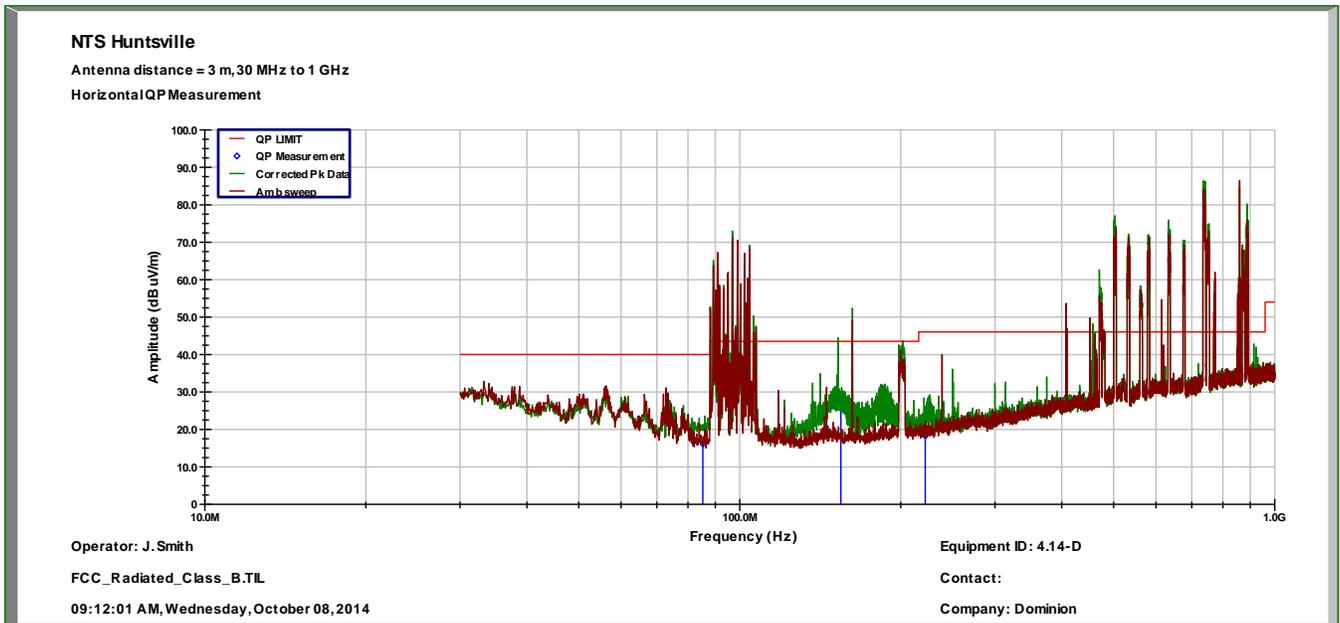
Q.A.:

*[Signature]* 10/08/2014

### Electromagnetic Radiation (Continued)

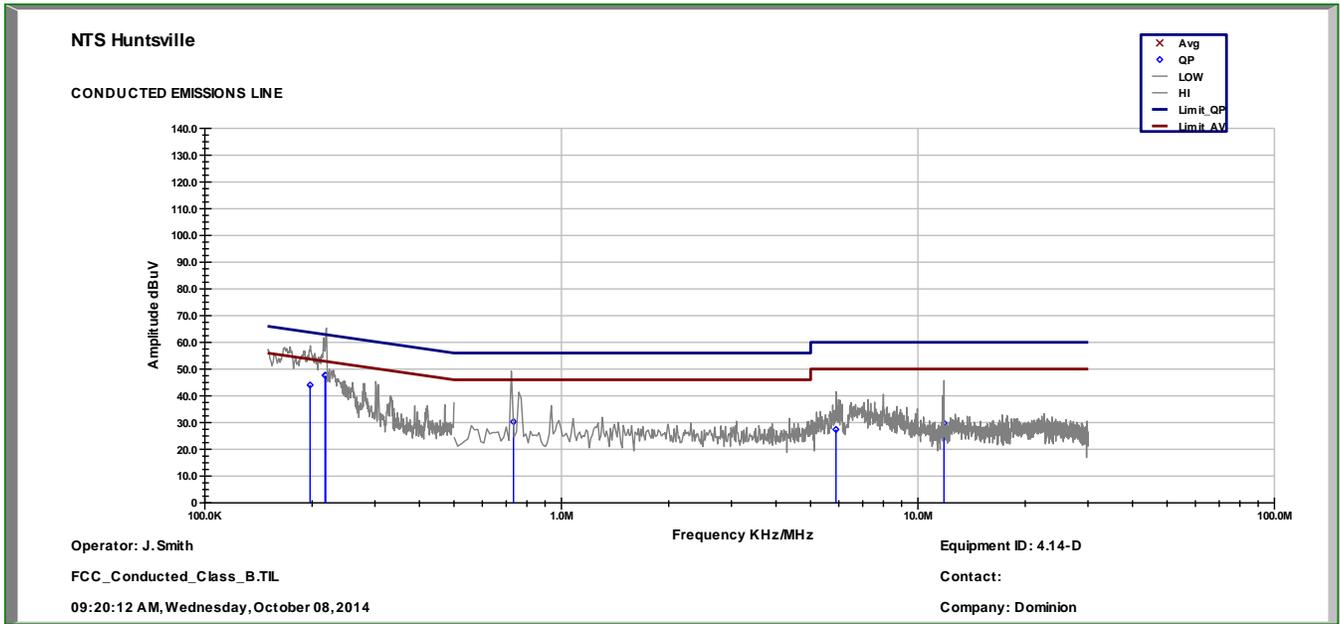


### FCC Part 15, Radiated Emissions – Vertical

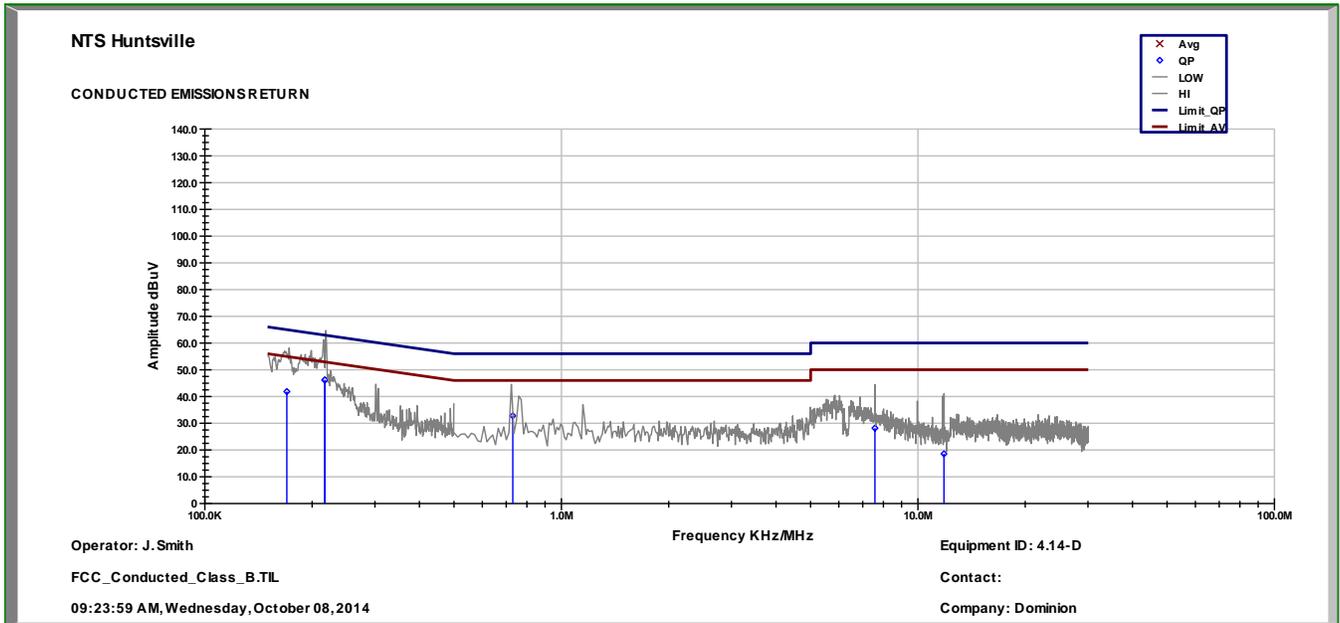


### FCC Part 15, Radiated Emissions – Horizontal

### Electromagnetic Radiation (Continued)



### FCC Part 15, Conducted Emissions - Line



### FCC Part 15, Conducted Emissions - Neutral

### Electrostatic Disruption



### INSTRUMENTATION EQUIPMENT SHEET

DATE: 9/10/2014      JOB NUMBER: PR031072      TYPE OF TEST: ESD  
 TECHNICIAN: J. GALEONE      CUSTOMER: DOMINION      TEST AREA: ESD ROOM

No.	Description	Manufacturer	Model	Serial #	Asset #	RANGE	ACCURACY	Cal Date	Cal Due
1	DISCHARGE	EMC-PARTNER	ESD3000DMI	049	03229	150pF	MFG	7/30/2014	7/30/2015
2	ESD GUN	EMC-PARTNER	ESD3000	059	04446	16.5 KV	±10%	10/16/2013	10/16/2014
3	ESD TARGET	HAEFELY TRENCH	2520311	152461	110794	15KV	±5%	1/14/2014	1/14/2016
4	OSCILLOSCOPE	TEKTRONIX	DPO5104	C012091	01737	MFG	MFG	10/25/2013	10/25/2014
5	TEMP/HUM/BAR	EXTECH	SD700	Q590477	01539	MULTI	MFG	3/18/2014	3/18/2015

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION: [Signature]      CHECKED & RECEIVED BY: [Signature] 9/10/14  
 Q.A.: Benda      [Signature] 9/10/14



**Electrostatic Disruption (Continued)**



**INSTRUMENTATION EQUIPMENT SHEET**

**HUNTSVILLE OPERATIONS**

DATE: 8/18/2014      JOB NUMBER: PR031072      TYPE OF TEST: ESD (EN61000-4-2)  
 TECHNICIAN: R. WILSON      CUSTOMER: DOMINION VOTING      TEST AREA: ESD LAB

No.	Description	Manufacturer	Model	Serial #	Asset #	RANGE	ACCURACY	Cal Date	Cal Due
1	DISCHARGE	EMC-PARTNER	ESD3000DM1	049	03229	150pF	MFG	7/30/2014	7/30/2015
2	ESD GUN	EMC-PARTNER	ESD3000	059	04446	16.5 KV	±10%	10/16/2013	10/16/2014
3	ESD TARGET	HAEFELY TRENCH	2520311	152461	110794	15KV	±5%	1/14/2014	1/14/2016
4	OSCILLOSCOPE	TEKTRONIX	DPO5104	C012091	01737	MFG	MFG	10/25/2013	10/25/2014
5	TEMP/HUM/BAR	EXTECH	SD700	Q590477	01539	MULTI	MFG	3/18/2014	3/18/2015

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION: R. Wilson 8/18/14      CHECKED & RECEIVED BY: W. Bush 8/18/14

Q.A.: Brenda Moss 8/18/14

### Electrostatic Disruption (Continued)



## ESD DATA SHEET

Job No.: PR031072

Start Date: 8/18/2014

Customer: Dominion Voting Systems Temperature: 70°F Humidity: 48.5%  
 EUT: ICE w/ External Monitor Atmospheric Pressure: 29.18 mm/hg  
 Model No.: ImageCast Evolution Measurement Point: See Test Points Below  
PCOS 410-A F/W Ver. 4.14.19 Interference Signal: See Applied Signal  
 Serial No.: AAFEBEC0097 Frequency Range: N/A

Test Title Electrostatic Disruption

Test Points	Meets Limit		Applied Level (kV)	Discharge Type	Times Tested	Comments
	Yes	No				
Front Keyhole	X		±8	Contact	20	No Discharges
Right Front Retainer Clip on Ballot Box	X		±8	Contact	20	No Discharges
Main Monitor Right Center Edge	X		±2, ±4, ±8, ±15	Air	80	One Discharge @ -15kV
Main Monitor Lower Left Corner	X		±2, ±4, ±8, ±15	Air	80	Two Discharges @ +15kV (1) and -15kV (1)
Paper Insert Slot Center	X		±2, ±4, ±8, ±15	Air	80	No Discharges
Cast Button Front of Unit	X		±2, ±4, ±8, ±15	Air	80	No Discharges
Front Right Ballot Box Handle	X		±2, ±4, ±8, ±15	Air	80	No Discharges
ATI Volume Up Button	X		±2, ±4, ±8, ±15	Air	80	No Discharges
"X" Select Button	X		±2, ±4, ±8, ±15	Air	80	No Discharges
External Monitor Left Edge	X		±2, ±4, ±8, ±15	Air	80	No Discharges
External Monitor Right Side Bezel Center	X		±2, ±4, ±8, ±15	Air	80	No Discharges
Vertical Coupling Plane (Front)	X		±8	Contact	20	10 Discharges @ +8kV, 10 Discharges @ -8kV
Vertical Coupling Plane (Right)	X		±8	Contact	20	10 Discharges @ +8kV, 10 Discharges @ -8kV
Vertical Coupling Plane (Left)	X		±8	Contact	20	10 Discharges @ +8kV, 10 Discharges @ -8kV
Vertical Coupling Plane (Back)	X		±8	Contact	20	10 Discharges @ +8kV, 10 Discharges @ -8kV
Horizontal Coupling Plane - External Monitor - (Front)	X		±8	Contact	20	10 Discharges @ +8kV, 10 Discharges @ -8kV
Horizontal Coupling Plane - External Monitor - (Right)	X		±8	Contact	20	10 Discharges @ +8kV, 10 Discharges @ -8kV
Horizontal Coupling Plane - External Monitor - (Left)	X		±8	Contact	20	10 Discharges @ +8kV, 10 Discharges @ -8kV
Horizontal Coupling Plane - External Monitor - (Back)	X		±8	Contact	20	10 Discharges @ +8kV, 10 Discharges @ -8kV

Notice of Anomaly: N/A

Witness: N/A

Tested By: [Signature] Date: 10/19/14

Technician

Approved: [Signature] Date: 10/19/14

Project Engineer

### Accessibility



### INSTRUMENTATION EQUIPMENT SHEET

#### HUNTSVILLE OPERATIONS

DATE: 10/7/2014      JOB NUMBER: PR031072      TYPE OF TEST: ACCESSIBILITY  
 TECHNICIAN: J.STEVENSON      CUSTOMER: DOMINION VOTING      TEST AREA: VOTING

No.	Description	Manufacturer	Model	Serial #	Asset #	RANGE	ACCURACY	Cal Date	Cal Due
1	RULER	PRODUCTS ENGIN	TEMPERED	NSN	04468	48"	±1/32NDS	6/18/2014	6/18/2016

This is to certify that the above instruments were calibrated using state-of-the-art techniques with standards whose calibration is traceable to the National Institute of Standards and Technology.

INSTRUMENTATION:

J. Stevenson 10/17/14

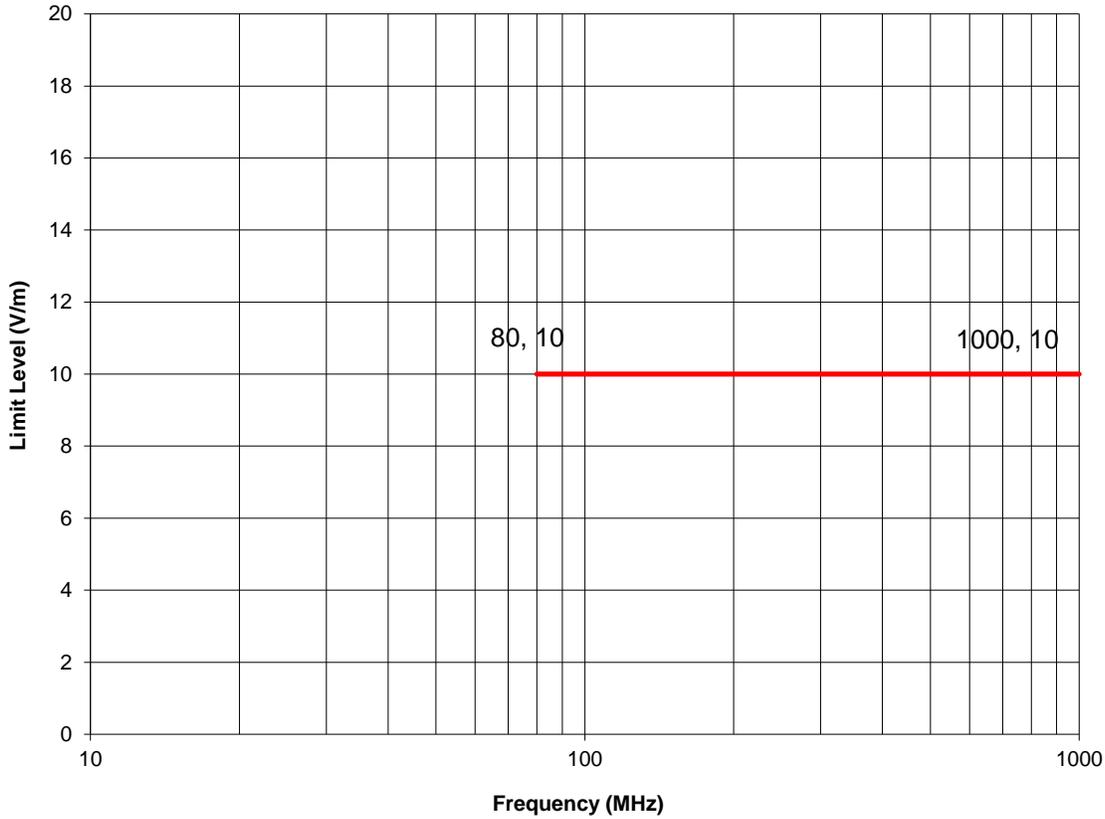
CHECKED & RECEIVED BY:

J. Stevenson 10/17/14

Q.A.:

Banda Mize 10/17/14

### Electromagnetic Susceptibility



<b>EUT Power Input:</b>	<b>120 VAC</b>					
<b>EN61000-4-3 Radiated Immunity</b>						
<b>Temperature: 23C</b>	<b>Humidity: 45%</b>			<b>Barometric Pressure: 992mbars</b>		
<b>Frequency (Hz)</b>	<b>Polarity</b>				<b>Angle (Degree)</b>	<b>Comments</b>
	<b>Vertical Results</b>		<b>Horizontal Results</b>			
80MHz - 1GHz	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	0	
80MHz - 1GHz	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	90	
80MHz - 1GHz	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	180	
80MHz - 1GHz	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	270	

**APPENDIX E – DURABILITY ATTESTATION**



1201 18TH STREET, SUITE 210 DENVER, CO 80202

October 3, 2014

Mr. Jon Stevenson  
Project Manager  
NTS Laboratories  
7800 Madison Blvd  
Huntsville, AL 35806  
Email: Jon.Stevenson@nts.com

*sent via electronic transmission*

**RE: LETTER OF ATTESTATION REGARDING VOTING SYSTEM DURABILITY**

Dear Mr. Stevenson:

This is the Attestation of Dominion Voting Systems relative to VVSG 1.0 Volume I clause 4.3.2 regarding the durability of the voting system in keeping with the conclusion of EAC RFI 2008-05. Dominion Voting Systems attests that the Democracy Suite 4.14-D voting system under test was designed to withstand normal use without deterioration and without excessive maintenance cost for a period of ten years.

If there are any questions regarding this Attestation, please contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Ian S. Piper".

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