



Wyle Laboratories, Inc.  
 7800 Highway 20 West  
 Huntsville, Alabama 35806  
 Phone (256) 837-4411 • Fax (256) 721-0144  
[www.wylelabs.com](http://www.wylelabs.com)

REPORT NO.: T56285-01  
 WYLE JOB NO.: T56285  
 CLIENT P.O. NO.: 001834  
 CONTRACT: N/A  
 TOTAL PAGES (INCLUDING COVER NOT INCLUDING APPENDICES): 44  
 DATE: December 29, 2009

# TEST REPORT

REVISION A: January 7, 2010

**NATIONAL CERTIFICATION TEST REPORT  
 FOR  
 CERTIFICATION TESTING  
 OF THE  
 UNISYN VOTING SOLUTIONS, INC  
 OPENELECT VOTING SYSTEM VERSION 1.0**

for

Unisyn Voting Solutions, Inc.  
 2310 Cousteau Court  
 Vista, CA 92018

(sd)

**STATE OF ALABAMA }  
 COUNTY OF MADISON }**

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

SUBSCRIBED and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_

\_\_\_\_\_  
 Notary Public in and for the State of Alabama at Large

My Commission expires \_\_\_\_\_

Wyle shall have no liability for damages of any kind to person or property, including special or consequential damages, resulting from Wyle's providing the services covered by this report.

**PREPARED BY:** \_\_\_\_\_  
 Jack Cobb, Senior Project Engineer Date

**APPROVED BY:** \_\_\_\_\_  
 Frank Padilla, Voting Systems Supervisor Date

**WYLE Q. A.:** \_\_\_\_\_  
 Raul Terceno, Q. A. Manager Date



NVLAP LAB CODE 200771-0

COPYRIGHT BY WYLE LABORATORIES. THE RIGHT TO REPRODUCE, COPY, EXHIBIT, OR OTHERWISE UTILIZE ANY OF THE MATERIAL CONTAINED HEREIN WITHOUT THE EXPRESS PRIOR PERMISSION OF WYLE LABORATORIES IS PROHIBITED. THE ACCEPTANCE OF A PURCHASE ORDER IN CONNECTION WITH THE MATERIAL CONTAINED HEREIN SHALL BE EQUIVALENT TO EXPRESS PRIOR PERMISSION.

*Revisions*



REVISION     A      
REPORT NO.   T56285-01    
DATE     January 7, 2010    

REV.	DATE	PAGE OR PARAGRAPH AFFECTED	BY	APPL	DESCRIPTION OF CHANGES
A	1/7/2010	Test Report No. T56285-01			Changes indicated by "A".

TABLE OF CONTENTS

Page No.

**1.0 INTRODUCTION..... 1**

1.1 Scope ..... 1

1.2 Objective..... 1

1.3 Test Report Overview..... 1

1.4 Customer..... 2

1.5 References ..... 2

**2.0 SYSTEM IDENTIFICATION AND OVERVIEW ..... 2**

2.1 System Overview..... 2

2.2 System Identification..... 5

2.2.1 Hardware ..... 5

2.2.2 Software ..... 6

2.2.3 COTS Products..... 7

2.2.3.1 Hardware..... 7

2.2.3.2 Software ..... 8

2.3 Test Support Materials..... 13

2.4 Vendor Technical Data Package..... 14

2.5 Deliverable Materials..... 16

**3.0 CERTIFICATION TEST BACKGROUND..... 16**

3.1 General Information about the Certification Test Process..... 17

3.2 Certification Testing Scope ..... 17

3.3 Wyle Quality Assurance ..... 17

3.4 Test Equipment and Instrumentation..... 17

3.5 Terms and Abbreviations..... 18

**4.0 TEST FINDINGS AND RECOMMENDATIONS..... 19**

4.1 Summary Findings and Recommendation ..... 19

4.1.1 Hardware Testing ..... 19

4.1.2 System Level Testing ..... 20

4.1.2.1 Volume and Stress Test..... 22

4.1.2.2 System Integration Test..... 23

4.1.2.3 Security Test ..... 24

4.1.2.4 Telecommunications Tests..... 25

4.1.2.5 Usability and Accessibility Test..... 25

4.1.2.6 Data Accuracy..... 26

4.1.2.7 Physical Configuration Audit (PCA) ..... 28

4.1.2.8 Functional Configuration Audit (FCA)..... 28

4.1.3 Source Code Review ..... 30

4.1.4 Witnessed Build ..... 31

4.1.5 Technical Data Package Review ..... 31

4.1.6 Quality Assurance Requirements Review ..... 32

4.1.7 Configuration Management Requirements Review..... 33

4.2 Anomalies and Resolutions ..... 33

4.3 Deficiencies and Resolutions..... 35

4.4 Recommendation for Certification ..... 35

TABLE OF CONTENTS (continued)

Page No.

APPENDICES

APPENDIX A– ADDITIONAL FINDINGS ..... A-1

A.1 [NOTICES OF ANOMALY ..... A-1](#)

A.2 [HARDWARE TEST REPORT ..... A-2](#)

A.3 [FUNCTIONAL CONFIGURATION AUDIT TEST CASE PROCEDURE SPECIFICATIONS ..... A-3](#)

A.4 [SECURITY TEST CASE PROCEDURE SPECIFICATIONS ..... A-4](#)

A.5 [TELECOMMUNICATIONS TEST CASE PROCEDURE SPECIFICATIONS ..... A-5](#)

A.6 [USABILITY TEST CASE PROCEDURE SPECIFICATIONS ..... A-6](#)

A.7 [ELECTION DEFINITIONS ..... A-7](#)

A.8 [TECHNICAL DATA PACKAGE REVIEW REPORT ..... A-8](#)

A.9 [SOURCE CODE REVIEW REPORT ..... A-9](#)

A.10 [PHYSICAL CONFIGURATION AUDIT REPORT ..... A-10](#)

A.11 [SECURITY ASSESSMENT SUMMARY REPORT ..... A-11](#)

A.12 [DEFICIENCY REPORT ..... A.12](#)

A.13 [SUMMATIVE USABILITY REPORT ..... A.13](#)

APPENDIX B – [WARRANT OF ACCEPTING CHANGE CONTROL RESPONSIBILITY ..... B-1](#)

APPENDIX C – [WITNESS BUILD ..... C-1](#)

APPENDIX D – [WYLE LABORATORIES’ CERTIFICATION TEST PLAN NO. T56285-01 ..... D-1](#)

A

A

---

## 1.0 INTRODUCTION

### 1.1 Scope

This report presents the test results for Certification Testing of the Unisyn Voting Solutions, Inc. OpenElect Voting System (OVS), Version 1.0. The primary purpose of Certification Testing was to demonstrate that the system meets or exceeds the requirements of the Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG). The certification test procedure was intended to discover defects in software design and system operation which, should they occur in actual election use, could result in failure to complete election operations in a satisfactory manner. The tests were also intended to demonstrate system compliance with levels of design, performance, and quality claimed for them by manufacturers.

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

### 1.2 Objective

The objective of this test program was to ensure that the Unisyn Voting Solutions, Inc. OpenElect Voting System (OVS), Version 1.0, complied with the hardware and software requirements of the EAC 2005 VVSG.

The scope and detail of the requirements tested in certification were selected to correspond to the design and complexity of the system submitted by Unisyn Voting Solutions, Inc. for testing. The examination included selective in-depth examination of the voting system, the inspection and evaluation of system documentation and execution of functional tests to verify system performance and function under normal and abnormal conditions.

### 1.3 Test Report Overview

This test report consists of six main sections:

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

---

**1.0 INTRODUCTION (continued)**

**1.4 Customer**

Unisyn Voting Solutions, Inc.  
2310 Cousteau Court  
Vista, CA 92018

**1.5 References**

- Unisyn Voting Solutions, Inc. Purchase Order No. 001834
- Wyle Laboratories' Quotation No. 545/047092/MW
- Wyle Laboratories' Certification Test Plan No. T56285-01, Rev. C.
- 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
- United States Election Assistance Commission, "Testing and Certification Program Manual 2006, Ver. 1, January 1, 2007"
- United States 107<sup>th</sup> Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 22
- UL Standard for Safety for Information Technology Equipment, UL 60950-1, Second Edition, dated March 27, 2007
- Wyle Laboratories' Quality Assurance Program Manual, Revision 4
- MIL-STD-810D, "Military Standard Environmental Test Methods and Engineering Guidelines"
- 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 No.'s 2007-01 through 2009-05 (listed on [www.eac.gov](http://www.eac.gov))
- EAC Notices of Clarification No.'s 07-001 through 09-005 (listed on [www.eac.gov](http://www.eac.gov))

**2.0 SYSTEM IDENTIFICATION AND OVERVIEW**

**2.1 System Overview**

The OVS is a paper ballot precinct voting system using touch screen and scan technology to scan and validate ballots, provide voter assisted ballots to accommodate voters with special needs, and tabulate results. The OVS consists of:

- OpenElect Central Suite (OCS) System
- OpenElect Voting Optical (OVO)
- OpenElect Voting Interface (OVI)
- Open Elect Voting Central Scan (OVCS)

---

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (continued)

### 2.1 System Overview (continued)

The following paragraphs address the design methodology and product description of the OVS, Version 1.0, as taken from the Unisyn Voting Solutions, Inc., technical documentation:

The OCS serves as the election management system (EMS) and is provided to support elections on OVO, OVI, and OVCS systems. The OCS consists of Ballot Layout Manager (BLM), which defines the election and produces ballots; Election Manager (EM), which sets election options, handles audio capabilities and creates an election file; Election Server (ES), which supports the download of new election data created by EM; Tabulator Client (TC), which retrieves and transfers vote files to the Tabulator; Tabulator (TAB), to track uploads and consolidate results; and Tabulator Reports (TR), which reports consolidated results. In addition, the OCS includes the Software Server (SS), which updates and validates voting device application software.

The OpenElect Voting Optical (OVO) is a full-page, dual-sided optical scan ballot system which scans and validates voter ballots, and provides a summary of all ballots cast. The election is loaded from the OVS Election Server over a secure local network. On Election Day, an OVO at each poll location scans and validates voters' ballots, and provides precinct tabulation and reporting. The OVO consists of the following components: a Personal Computer (PC), Transport Media, Ballot Reader, Printer, and an Uninterruptible Power Supply (UPS).

The OpenElect Voting Interface (OVI) is a voter interface with 7-inch full-color touch screen display and presents the ballot selected to voters in visual and/or audio formats. The OVI voting device facilitates special needs voters by providing printed Voter Assisted ballots using audio assistance and a variety of input devices that include a touchscreen, ADA keypad, and Sip-n-Puff. The OVI consists of the following components: a Personal Computer (PC), Transport Media, Printer, and an Uninterruptible Power Supply (UPS).

The Open Elect Voting Central Scan (OVCS) resides at election headquarters. It is a bulk scanner designated to read absentee and provisional ballots, and to perform recounts. The OVCS also captures Write-In data images and produces a Write-In image report for manual processing upon request. The OVCS consists of the following components: a Personal Computer (PC) Desktop and Bulk Scanner.

The OVS, Version 1.0, is designed to support the following voting variations:

- General Elections
- Open and Closed primaries
- Early Voting
- Primary presidential delegation nominations
- Decline to State Primary Voting
- Partisan and Non-partisan offices
- Write-in voting
- Straight ticket voting
- Presidential-only voting
- Ballot rotation
- Split precincts

## 2.0 SYSTEM IDENTIFICATION AND OVERVIEW (continued)

### 2.1 System Overview (continued)

- Multiple selection contests: vote for N of M
- Recount tabulation
- Ranked Choice Voting (RCV)

The system also accounts for:

- Pennsylvania rule support
- Checking and notification of overvote and undervote conditions
- Ballots in multiple languages
- Procedures for and tabulation of Provisional or challenged ballots
- Procedures for and tabulation of Absentee ballots

A system overview diagram is presented in Figure 2-1.

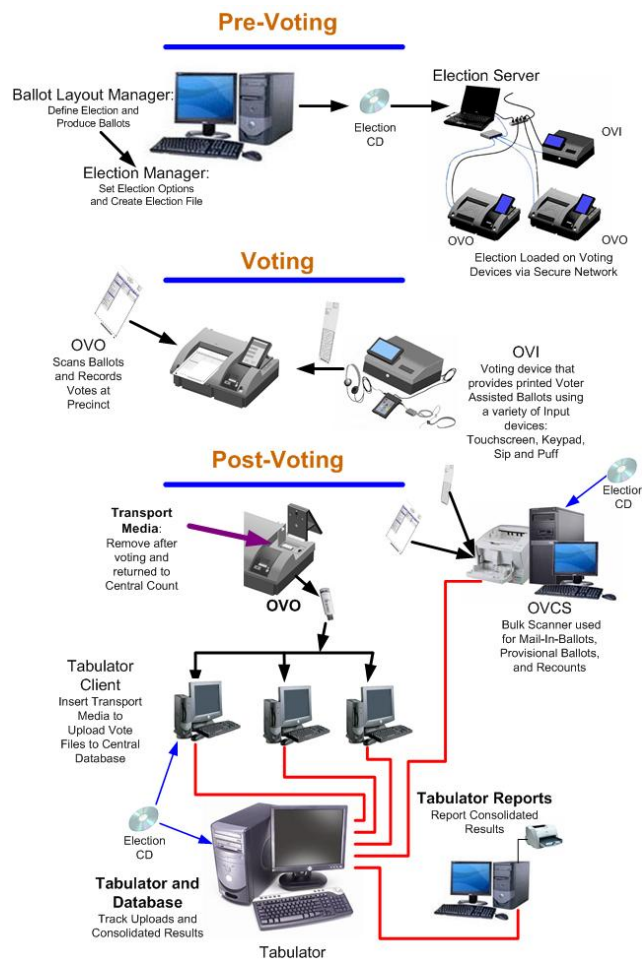


Figure 2-1 System Overview Diagram



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

**2.2 System Identification**

This section categorizes the equipment the vendor submitted for testing.

**2.2.1 Hardware**

The OVO and OVI units submitted for testing were divided into five units, referred to as Equipment Under Test (EUT's), during test performance. Each EUT consisted of, at a minimum, one OVO with UPS, one OVI with UPS, and one Ballot Box. Each EUT was also paired with accessories such as headphones, or a Sip-n-Puff device, when required.

Table 2-1 provides the serial numbers of the components which comprised each EUT.

**Table 2-1 OVO and OVI Equipment Configurations**

EUT	OVO	OVI	Ballot Box	Peripheral Equipment	
				Headphones	Sip & Puff
1	UNI000004	UNI150006	BB0001	56285-03	N/A
2	UNI000002	UNI150004	BB0004	56285-02	005954
3	UNI000003	UNI150005	BB0003	56285-01	N/A
4	UNI000001	UNI150003	BB0005	N/A	N/A
5	UNI000007	UNI150010	BB0002	N/A	N/A

The OVS hardware is identified in Table 2-2.

**Table 2-2 OVS OCS/OVCS Hardware Equipment Description**

Equipment	Manufacturer/ Model	Specifications	Serial Number	COTS /Non-COTS
PC 1	Dell Optiplex 755	Processor: Intel Core2Duo E7200 2.53Ghz Memory: 4x 1GB 800Mhz RAM Hard Drive Capacity: 250GB (Mirrored)	G5HW3J1	COTS
PC 2	Dell Optiplex 755	Processor: Intel Core2Duo E7200 2.53Ghz Memory: 4x 1GB 800Mhz RAM Hard Drive Capacity: 250GB (Mirrored)	F5HW3J1	COTS
PC 3	Dell Optiplex 755	Processor: Intel Core2Duo E7200 2.53Ghz Memory: 4x 1GB 800Mhz RAM Hard Drive Capacity: 250GB (Mirrored)	D5HW3J1	COTS
Laptop	Dell Latitude E5500	Processor: Intel Core2Duo T7250 2.0Ghz Memory: 2x 1GB 800Mhz RAM Hard Drive Capacity: 120GB	C9448J1	COTS
OVCS	Canon ImageFORMULA DR-X10C	OVCS Scanner	ED300224	COTS

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

**2.2 System Identification (continued)**

**2.2.1 Hardware (continued)**

To perform the software witness and trusted builds, two Personal Computers were utilized as build machines. The build machines are described in the Table 2-3.

**Table 2-3 OVS Build Machine Description**

Equipment and Operating System	Manufacturer	Version/Model	Serial Number	COTS/ Non-COTS
Application Build Machine Windows XP Professional, Version 2002 SP2 Product ID: 55274-011-9578427-22367	Dell Precision 340	Processor: Intel Pentium 4 1.8Ghz Memory: 768 Mb RAM Hard Drive Capacity: 203Gb Monitor: HP 7500 17" CRT	OVO309002	COTS
Operating System Build Machine CentOS 5.0	Dell Optiplex GX280	Processor: Intel Pentium 4 2.80Ghz Memory: 1Gb RAM Hard Drive Capacity: 80Gb	7HFWQ51	COTS

**2.2.2 Software**

All software installed on the OVS components was built by Wyle using reviewed source code. All software built by Wyle during the witness build process has a MD5 hash made of the resulting software files or disc images. The software built by Wyle includes: OCS Linux, OVCS Linux, OVO Linux, OVI Linux, OVO Firmware, OVI Firmware, the OCS software, OVCS Software, and the Windows XP and Linux Build Environments. Table 2-4 lists the software built, the version number of the software, the name of the created files or disc image, the date the witness build was performed, and the hash value calculated:

**Table 2-4 OVS Software Components**

Software	Version	Build Date	Filename	MD5 Hash Value
OCS Linux	1.0	12/16/09	CentOS-5.2-i386-bin-DVD.iso	5d2b5bf1c4de13fb3ec68a6ff59cdba8
OVCS Linux	1.0	12/17/09	CentOS-5.2-i386-bin-DVD.iso	18377e62db4587b439faf32ca28cd3e1
OVO Linux and Application	1.0	12/16/09	CentOS-5.0-i386-bin-1of6.iso	b139505ccee7a1372362a341c42e3bc3
OVI Linux and Application	1.0	12/17/09	CentOS-5.0-i386-bin-1of6.iso	a5211a95082472645122f56f90a37ff9
OVO Application	1.0	12/21/09	Release.zip TOC	b2e908509dc6c80fc50f3d3d99567cc9; 6a067054c5182c2f98b31f70c3e4d3e6
OVI Application	1.0	12/21/09	Release.zip TOC	23aeafaa9338d559e0838a473d345718; 4c30daebbca487ff1ea734eba940d395

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

**2.2 System Identification (continued)**

**2.2.2 Software (continued)**

**Table 2-4 OVS Software Components (continued)**

Software	Version	Build Date	Filename	MD5 Hash Value
OCS Applications	1.0	12/16/09	BallotLayout.zip ElectionManager.zip ElectionServer.zip SoftwareServer.zip TabulatorClient.zip TabulatorMonitor.zip TabulatorReports.zip TOC	98954e0d806adf2b6b5240db20f9cae9; 859d1887a805373567d83895747d7a41; c437f1fb8f29d1beaf73a262ac617d6; f1312cdcd0ed0db7bc1956e9bb28f9ac; 1fcd3542e57cead4439b7c470baf34e; 6b44813f931c205cd6ff27b785b81c69; eeb57476494786ecd762abf3d7f40268; aa22d69b411905127de1ee03219a8011
OVCS Application	1.0	12/17/09	OVCS.zip TOC	63f6696416db6974ca43e6531dad7779; 7322eedb2ba1697e2a265192ff22e8e7
OCS Installer	1.0	12/18/09	OCSInstaller.jar lib\common.jar lib\jh.jar lib\mysql-connector- java-5.1.7-bin.jar	2d5db995923fc6392cceb4fa69f76069; b8d8c473181dd900bd6b1d12c177e934; 8f6df2af8466bb23a4bc20845fed3e25; d093f86f49782b46311c34f395ccf381

**2.2.3 COTS Products**

**2.2.3.1 Hardware**

COTS equipment that is used by the OVS is listed in Table 2-5 with its make, model, and serial number.

**Table 2-5 OVS COTS Equipment Identification**

COTS Equipment	Make	Model	Serial Number
Headphones	Sony	MDR-210LP	56285-01
Headphones	Sony	MDR-210LP	56285-02
Headphones	Sony	MDR-210LP	56285-03
Sip & Puff 1	Origin Instruments	AirVoter	005954
Sip & Puff 2	Origin Instruments	AirVoter	005953
UPS 1	Minuteman	Entrust Series ETR1500	AE58080900407
UPS 2	Minuteman	Entrust Series ETR1500	AE58080900268
UPS 3	Minuteman	Entrust Series ETR1500	AE58090600124
UPS 4	Minuteman	Entrust Series ETR1500	AE580906PA114

**2.2 System Identification (continued)**

**2.2.3 COTS Products**

**2.2.3.1 Hardware (continued)**

**Table 2-5 OVS COTS Equipment Identification (continued)**

COTS Equipment	Make	Model	Serial Number
UPS 5	Minuteman	Entrust Series ETR1500	AE58090500284
UPS 6	Minuteman	Entrust Series ETR1500	AE58090500279
UPS 7	Minuteman	Entrust Series ETR1500	AE58090500280
UPS 8	Minuteman	Entrust Series ETR1500	AE58090500278
25x Transport Media	STEC	Thumb Drive (UFD) 1GB Capacity, P/N SLUFD1GU1U-A	TM100009, TM1000011-12, TM1000014-35
Network Switch	Linksys	SR2024 Business Series 24-Port 10/100/1000 Gigabit Switch	REM30H600558 GGR1807 JJ

To support the test program, Unisyn provided additional supporting hardware. A list of these items is provided in Table 2-6.

**Table 2-6 OpenElect Voting System Support Equipment Description**

Test Material	Make	Model	Serial Number
COTS Printer	Dell	1720dn	632VXOD
COTS Printer Stand/550 Sheet Drawer	Dell	N/A	62B68NP
COTS External DVD-RW Drive	LG Electronics	GP08LU10	901HKDJ095530
COTS External DVD-RW Drive	Pioneer	DVR-X162Q	IDFW002121UC
COTS 500GB Portable Hard Drive	Western Digital	My Passport Elite	WXN409862461

**2.2.3.2 Software**

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

The OCS Operating System included the following third-party software submitted by Unisyn for testing is listed in Table 2-7.

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

**2.2 System Identification (continued)**

**2.2.3 COTS Products (continued)**

**2.2.3.2 Software (continued)**

**Table 2-7 OCS Third-Party Software Descriptions**

Software Required For Testing	Software Version	Filename	Hash Value
Java SE Runtime Environment	Runtime Environment 6 Update 2	jre-6u2-linux-i586.bin	MD5: 0d30636b5cd23e161da5eda9409f02d5
Java Cryptography Extension	Jurisdiction Policy Files 6	jce_policy-6.zip	MD5: b20f9d6ed14e55d73a5ed204bca01e7a
Apache Tomcat	6.0.13	apache-tomcat-6.0.13.tar.gz	MD5: 50442a96332f0ec0cc1fba354f733ad6

The OVCS Operating System included the third-party software listed in Table 2-8, which was submitted by Unisyn.

**Table 2-8 OVCS Third-Party Software Descriptions**

Software Required For Testing	Software Version	Filename	Hash Value
Java SE Runtime Environment	Runtime Environment 6 Update 2	jre-6u2-linux-i586.bin	MD5: 0d30636b5cd23e161da5eda9409f02d5
Java Cryptography Extension	Jurisdiction Policy Files 6	jce_policy-6.zip	MD5: b20f9d6ed14e55d73a5ed204bca01e7a
Apache Tomcat	6.0.13	apache-tomcat-6.0.13.tar.gz	MD5: 50442a96332f0ec0cc1fba354f733ad6
Java SE Development Kit	Development Kit 6 Update 2 for Linux	jdk-6u2-linux-i586.bin	MD5: 6a488cb0a161a1c3a541a66e3b076f8e
PDI Scanner Driver and Libraries for OVCS	1.2.0, 1.1.3, 1.1.3, 2.1.0	visionx_2740_8430C.zip	MD5: 2cd18a9cdf2defcaae884615f82c75a4

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

**2.2 System Identification (continued)**

**2.2.3 COTS Products (continued)**

**2.2.3.2 Software (continued)**

The OVO Linux Operating System submitted by Unisyn includes the third-party software listed in Table 2-9.

**Table 2-9 OVO Third-Party Software Descriptions**

Software Required For Testing	Software Version	Filename	Hash Value
Java SE Development Kit	Development Kit 6 Update 2 for Linux	jdk-6u2-linux-i586.bin	MD5: 6a488cb0a161a1c3a541a66e3b076f8e
Java SE Runtime Environment	Runtime Environment 6 Update 2 for Linux	jre-6u2-linux-i586.bin	MD5: 0d30636b5cd23e161da5eda9409f02d5
Java Cryptography Extension	Jurisdiction Policy Files 6	jce_policy-6.zip	MD5: b20f9d6ed14e55d73a5ed204bca01e7a
Citizen Printer for OVO	1.0.0.6	jpos build ver1.0.0.6 11022009.zip	MD5: ae4bdba9a5f0ea788aab215a41e4b074
Apache Tomcat	6.0.13	apache-tomcat-6.0.13.tar.gz	MD5: 50442a96332f0ec0cc1fba354f733ad6
openChrome Video Driver	0.2.900-7.e15	xf86-video-openchrome-0.2.900.tar.gz	MD5: 3e36895eb4b4d61e21aa27d370f151c8
eGalax Touchscreen Driver	2.03.1712 (32-Bit) Kernel 2.6	TouchKit-2.03.1712-32b-k26.tar.gz	MD5: 83d042060a87295c8a90019a7df2141a
PDI Scanner Driver and Libraries for OVO	1.2.0, 1.1.3, 1.1.3, 2.1.0	visionx_2740_8430.zip	MD5: 080616f1eb1b23e7db2bdbfae866cf37
FVWM Desktop Window Manager	2.4.19	fvwm-2.4.19.tar.gz	MD5: a2fd2c07061303883d6bf89eb2b259ff

The OVI Linux Operating System submitted by Unisyn includes the third-party software listed in Table 2-10.

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

**2.2 System Identification (continued)**

**2.2.3 COTS Products (continued)**

**2.2.3.2 Software (continued)**

**Table 2-10 OVI Third-Party Software Descriptions**

Software Required For Testing	Software Version	Filename	Hash Value
Java SE Runtime Environment	Runtime Environment 6 Update 2 for Linux	jre-6u2-linux-i586.bin	MD5: 0d30636b5cd23e161da5eda9409f02d5
Java Cryptography Extension	Jurisdiction Policy Files 6	jce_policy-6.zip	MD5: b20f9d6ed14e55d73a5ed204bca01e7a
openChrome Video Driver	0.2.900-7.e15	xf86-video-openchrome-0.2.900.tar.gz	MD5: 3e36895eb4b4d61e21aa27d370f151c8
eGalax Touchscreen Driver	2.03.1712 (32-Bit) Kernel 2.6	TouchKit-2.03.1712-32b-k26.tar.gz	MD5: 83d042060a87295c8a90019a7df2141a
FVWM Desktop Window Manager	2.4.19	fvwm-2.4.19.tar.gz	MD5: a2fd2c07061303883d6bf89eb2b259ff
RXTX - Library and Jar for serial printer	2.1-7r2	rxtx-2.1-7-bins-r2.zip	MD5: 5f21ae633602a24fd3cdd096951476c2

The XP Build Machine Operating System includes the third-party software list in Table 2-11, which was submitted by Unisyn.

**Table 2-11 XP Build Machine Third-Party Software Descriptions**

Software Required For Testing	Software Version	Filename	Hash Value
Java Development Kit and Java Runtime Environment	Runtime Environment 6 Update 2	jdk-6u2-windows-i586-p.exe	MD5: 72a73e37d5e0724c7a3d9374a126e4cf
Java 2 Enterprise Edition	1.3.1	j2sdskee-1_3_01-win.exe	MD5: 621709dc888d9450918ccef05fcf6d1d
Java Cryptography Extension	Jurisdiction Policy Files 6	jce_policy-6.zip	MD5: b20f9d6ed14e55d73a5ed204bca01e7a
Apache Ant	1.7.0	apache-ant-1.7.0-bin.zip	MD5: ac30ce5b07b0018d65203fbc680968f5
Jasper Reports	2.0.5	jasperreports-2.0.5-project.zip	MD5: b80bd29e4f95f18bd15da65cfd45d1d2
SQL Connector	5.1.7	mysql-connector-java-5.1.7.zip	MD5: f9a8008367f5b25bdec045c54100d5b0
Apache Axis	1.4	axis-bin-1_4.zip	MD5: 9eda42bf82a274349f18c5affdd93608

2.0 SYSTEM IDENTIFICATION AND OVERVIEW (continued)

2.2 System Identification (continued)

2.2.3 COTS Products (continued)

2.2.3.2 Software (continued)

Table 2-11 XP Build Machine Third-Party Software Descriptions (continued)

Software Required For Testing	Software Version	Filename	Hash Value
Apache Commons Codec	1.3	commons-codec-current.zip	MD5: c30c769e07339390862907504ff4b300
Apache Commons Http	3.0	commons-httpclient-3.0.zip	MD5: 42d96b0c7d627a2170fd57280476c8fe
Apache Commons File Upload	1.2	commons-fileupload-1.2-bin.zip	MD5: 6fbe6112ebb87a9087da8ca1f8d8fd6a
Apache Commons IO	1.3.2	commons-io-1.3.2-bin.zip	MD5: ba31cc4a0d85842e4b0bdfd2472382ba
Apache Tag Library	1.1.2	jakarta-taglibs-standard-current.zip	MD5: f75c964f1b276b022c24a677ccc17d4d
Java Help	2.0_05	javahelp-2_0_05.zip	MD5: b9b12989471f5858c982154335e1cc96
Javazoom MP3	1.9.4	mp3spi1.9.4.zip	MD5: e259e7674d9b19e76f005cee2810e7f5
Citizen Printer for OVO	1.0.0.6	jpos build ver1.0.0.6 11022009.zip	MD5: ae4bdba9a5f0ea788aab215a41e4b074
PDI Scanner Driver and Libraries for OVO	1.2.0, 1.1.3, 1.1.3, 2.1.0	visionx_2740_8430.zip visionx_2740_8430C.zip	MD5: 080616f1eb1b23e7db2bdbfae866cf37; 2cd18a9cdf2defcaae884615f82c75a4
RXTX Serial Interface	2.1-7	rxtx-2.1-7-bins-r2.zip	MD5: 5f21ae633602a24fd3cdd096951476c2
Windows XP Service Pack 2 Update	KB835935	WindowsXP-KB835935-SP2-ENU.exe	MD5: 59a98f181fe383907e520a391d75b5a7
Microsoft .NET Framework	2.0	dotnetfx.exe	MD5: 93a13358898a54643adbca67d1533462
PDI Tool For Verification of Binary File	1.0	VisionX_11202008.EXE	MD5: af8905f015c7d7ff730b9f8b0811134b
Winzip	8.0	FILE_ID.DIZ LICENSE.TXT ORDER.TXT README.TXT SETUP.EXE SETUP.WZ VENDOR.TXT WHATSNEW.TXT WINZIP.TXT WS_FTP.LOG	MD5: fe37cc1787b04c9d58a6e24f7e1299f3; 93581079efe39103d03ba3de32f44de8; fe91de4103db77793929fc05827b6482; b2f38b759f2d9039262613499a387a05; de199014c1ec4523663614480489d60f; d1a411166bd430b01f4fc9b0453101d1; 7bff0f3a425b02fe12b0c8bb6b90cfbf; 62c26dd38a018d9195999d4b04b49b11; 31a531c7431cd53f7287379085b17dd0; acfee95d71fdf81a84ad955a011f2c28



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

**2.2 System Identification (continued)**

**2.2.3 COTS Products (continued)**

**2.2.3.3 Operating Systems**

Table 2-12 lists the COTS Operating Systems used in the Unisyn OVS Build Environments as well as the Operating systems used for the Unisyn OCS and OVCS Applications.

**Table 2-12 COTS Operating System Software Descriptions**

Software Required For Testing	Software Version	Filename	Hash Value
Microsoft Windows XP Service Pack 1	Version 2002 SP 1	Microsoft Windows XP Install Disc	N/A (used for build machine only)
Linux CentOS Distribution	5.0	CentOS-5.0-i386-bin-1of6.iso CentOS-5.0-i386-bin-2of6.iso CentOS-5.0-i386-bin-3of6.iso CentOS-5.0-i386-bin-4of6.iso CentOS-5.0-i386-bin-5of6.iso CentOS-5.0-i386-bin-6of6.iso	MD5: f749d7e17fa01604b9956304efba2333; 963258ceafda5c5e6f79be86028b6b3d; a08ec9ccfdc89c24f3d6567219f90c42; b31c239009b780d1c89c311c192e43be; 0c3990be2271bf44c1495aa0003b5552; 9e6f91a5292f46b02777133765fc03fe
Linux CentOS Distribution	5.2	CentOS-5.2-i386-bin-DVD.iso	SHA-1: c89db7f5294465d593e7b02c232e0e9070 111487

**2.3 Test Support Materials**

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

The test materials listed in Table 2-13 were required to support OVS Release 1.0 certification testing.

**Table 2-13 OVS Test Support Materials**

Test Material	Quantity	Make	Model
50 CD-R Spindle	2	Imation	1x-52x 700mb
50 DVD-R Spindle	1	Imation	16x 2 hr
8 ½" x 11" Paper in Speed Loading Box (2500 Sheets)	1	Boise	SP8420
Box of OVI Paper Rolls	3	Paper & Ribbon Co.	OVI Printer Paper
Box of OVO Paper Rolls (2.25" x 1.75")	3	Paper & Ribbon Co.	OVO Printer Paper
Box of OVO Paper Rolls (2.25" x 3")	5	Paper & Ribbon Co.	OVO Printer Paper

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

**2.3 Test Support Materials (continued)**

The test materials listed in Table 2-14 were provided by Unisyn and used during System Integration Testing and Usability Testing.

**Table 2-14 Voting Support Materials**

Test Material	Description	Quantity
Privacy Sleeve	Sleeve used to protect a voter's privacy during transportation of OVI Voter Assisted Ballots.	4
Provisional Envelope	Envelope used for transporting a Provisional Ballot.	7
Special Handling Envelope	Envelope used for special handling of Ballots that have been cast but require pollworker attention.	7
Absentee Envelope	Envelope used for handling of Absentee Ballots.	8
Magnifying Glass	Magnifying glass with integrated ruler and image distortion features that help to protect a voter's privacy.	1
Locking Security Seals	Individually numbered security seals shaped like a pad lock used for locking ballot box doors. (American Cast and Manufacturing)	1 Bag
Zip Tie Seals	Individually numbered zip ties seals. (American Cast and Manufacturing)	1 Bag
Sanitary Headphone Covers	Sanitary headphone covers provided to each voter using the OVI. (Pneumatic Medical Corporation)	2 Bags
Voting Booth	Standard voting booth used for marking paper ballots. (Election Data Corporation)	1
ADA Voting Booth	Accessible voting booth that has curved legs to provide clearance for voters with disabilities. (Election Data Corporation)	1

Table 2-15 lists test applications that are not part of the Unisyn OVS but were used during testing for development of election sounds. The table includes the application name, software version, filename, and Hash Value.

**Table 2-15 Test Applications Descriptions**

Software Required For Testing	Software Version	Filename	Hash Value
Audacity for Windows	1.2.6	audacity-win-1.2.6.exe	MD5: d59f24b86431eeb25281bce7817783f1
Switch Sound File Converter	2.03	switchsetup.exe	MD5: 9b0b28476fa3eca9277336a66d8a04b7

**2.4 Vendor Technical Data Package**

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

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

**2.4 Vendor Technical Data Package (continued)**

The documents listed in Table 2-16 comprise the OVS Technical Data package (TDP).

**Table 2-16 OVS TDP Documents**

OVS Release 1.0 Voting System TDP Documents	Release	Version	Document Number
<i>Documents describing overall system performance:</i>			
System Overview	1.0	1.12	04-00446
System Security Specification	1.0	1.8	04-00447
Configuration Management Plan	1.0	1.4	04-00448
Quality Assurance Plan	1.0	1.5	04-00454
Final Quality Assurance report	1.0	1.3	04-00469
System Test and Verification Plan	1.0	1.4	04-00453
Personnel Training and Deployment Requirements	1.0	1.3	04-00445
<i>Documents describing functionality, hardware, software design, maintenance, and operation:</i>			
Software and Design Specification	1.0	1.5	04-00464
System Coding Standards	1.0	1.3	04-00449
OVS Acronyms	1.0	1.2	04-00494
System Functionality Description	1.0	1.2	04-00444
System Maintenance Procedures	1.0	1.4	04-00459
System Hardware Specification	1.0	1.4	04-00458
Ballot Layout Manager User Guide	1.0	1.10	04-00428
Election Manager User Guide	1.0	1.7	04-00427
Election Server User Guide	1.0	1.6	04-00429
Software Server User Guide	1.0	1.5	04-00430
Tabulator Client User Guide	1.0	1.4	04-00431
Tabulator User Guide	1.0	1.5	04-00432
Tabulator Reports User Guide	1.0	1.2	04-00433
OVCS User Guide	1.0	1.4	04-00495
OVS Ballot Paper Specification	1.0	1.3	04-00503
System Operations Procedures: Election Day Pollworker's Guide	1.0	1.5	04-00463
Operations Procedures: Election Day Troubleshooter's Guide OVO and OVI	1.0	1.2	04-00462
System Operations Procedures: Warehouse Technician's Guide	1.0	1.3	04-00460

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

**2.5 Deliverable Materials**

The materials listed in Table 2-17 are identified by Unisyn to be delivered as part of the OVS to the users.

**Table 2-17 OVS Deliverables**

Deliverable Material	Version/Model	Description
OCS	1.0	EMS software suite
OVO	1.0	Precinct ballot scanner
OVI	1.0	Accessible voting station
Ballot Box	-----	OVO ballot receptacle
OVCS	1.0	Optional Central Scanner
Transport media	STEC 1 GB	USB Flash Drive ( 2)
Minuteman UPS	ETR1500	UPS (2)
Headphones (optional)	MDR-210LP	Stereo headphones
Sip and Puff (optional)	AirVoter	Binary input device
04_00446 System Overview.doc	1.12	TDP Document
04-00459 System Maintenance Procedures	1.4	TDP Document
04-00454 Quality Assurance Plan	1.5	TDP Document
04-00494 OVS Acronyms	1.2	TDP Document
04-00428 Ballot Layout Manager User Guide	1.10	TDP Document
04-00427 Election Manager User Guide	1.7	TDP Document
04-00429 Election Server User Guide	1.6	TDP Document
04-00430 Software Server User Guide	1.5	TDP Document
04-00431 Tabulator Client User Guide	1.4	TDP Document
04-00432 Tabulator User Guide	1.5	TDP Document
04-00433 Tabulator Reports User Guide	1.2	TDP Document
04-00495 OVCS User Guide	1.4	TDP Document (required for OVCS only)
04_00460 OVS System Operations Guide Warehouse	1.3	TDP Document
04_00462 OVS System Operations Guide EDay Troubleshooters	1.2	TDP Document
04_00463 OVS System Operations Guide EDay Pollworkers	1.5	TDP Document
04-00503 OVS Paper Specification	1.3	TDP Document

**3.0 CERTIFICATION TEST BACKGROUND**

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

- ISO-9001:2000
- Nationally Recognized Testing Laboratory (NRTL)
- OSHA Accredited

---

### 3.0 CERTIFICATION TEST BACKGROUND (continued)

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

### 3.1 General Information about the Certification Test Process

All testing performed as part of the test effort was performed at the Wyle Labs Huntsville, AL facility. Certification testing included: the inspection and evaluation of voting system documentation; tests of voting system under conditions simulating the intended storage, operation, transportation, and maintenance environments; and operational tests verifying system performance and function under normal and abnormal conditions. Qualification/Certification testing was limited to the Unisyn Voting Solutions, Inc. OpenElect Voting System, Version 1.0, which includes items listed in Section 2 of this report.

### 3.2 Certification Testing Scope

The OVS is a new voting system that has not been previously tested to applicable federal standards. Therefore, testing was conducted as an initial certification. To evaluate the system test requirements, each section of the EAC 2005 VVSG was analyzed to determine the requirements and tests that were applicable to the OVS. The OVS was then tested to all applicable requirements. The rationale for all 'Not Applicable' requirements and the strategy of evaluation of the OVS to Volume I of the EAC 2005 VVSG are reported in the Certification Test Plan No. T56285-01 contained in [Appendix D](#) of this report.

### 3.3 Wyle Quality Assurance

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

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

### 3.4 Test Equipment and Instrumentation

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

**3.0 CERTIFICATION TEST BACKGROUND (continued)**

**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
Ballot Layout Manager	BLM	Unisyn OVS application used to lay out ballot information.
Configuration Management	CM	---
Commercial Off the Shelf	COTS	---
Direct Record Electronic	DRE	---
United States Election Assistance Commission	EAC	Commission created per the Help America Vote Act of 2002, assigned the responsibility for setting voting system standards and providing for the voluntary testing and certification of voting systems.
Election Manager	EM	Utilizes the election definition file from the Ballot Layout Manager, adds jurisdiction voting device specific options and produces the CD used to load the election onto the voting devices and OVCS.
Election Management System	EMS	Within the OpenElect system, the EMS equivalent is OCS.
Election Server	ES	A component of the OCS, the ES updates the system clock and downloads new Election data to the voting devices prior to each election, typically at the warehouse.
Equipment Under Test	EUT	---
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.
OpenElect Central Suite	OCS	Set of applications supplied by Unisyn to run at the Election Headquarters to support elections on the OVO, OVI, and OVCS systems. Includes: Ballot Layout Manager, Election Manager, Election Server, Tabulator Client, Tabulator Server and Tabulator Reports. In addition, the OCS includes the Software Server (SS) system for updating and validating OVO and OVI (voting device) software.
OpenElect Voting Central Scan	OVCS	A bulk scanner solution at the Central Site, used for casting provisional and mail-in ballots; can also be used to perform recounts.
OpenElect Voting Interface	OVI	Used as an ADA solution and early voting device.
OpenElect Voting Optical Scan	OVO	Scanning and tabulating voting device located at the precinct and used during early voting.

**3.0 CERTIFICATION TEST BACKGROUND (continued)**

**3.5 Terms and Abbreviations (continued)**

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

Term	Abbreviation	Definition
OpenElect Voting System	OVS	The Unisyn voting system submitted for certification testing.
Physical Configuration Audit	PCA	Review by accredited test laboratory to compare voting system components submitted for certification testing to the manufacturer's technical documentation, and confirmation the documentation meets national certification requirements. A witnessed build of the executable system is performed to ensure the certified release is built from tested components.
Quality Assurance	QA	---
Software Server	SS	Updates and validates voting device client software.
Tabulator	TAB	The Tabulator receives and consolidates election results from the counted OVO and OVCS ballots that have been uploaded by the Tabulator Client (in the case of OVO results) and directly by the OVCS. The Tabulator stores the vote data in the database, provides a status for uploaded vote data and handles Rank Choice Voting functionality.
Tabulator Client	TC	Retrieves vote files from Transport Media devices and provides that data to the tabulator.
Tabulator Reports	TR	Accesses data from the Tabulator database to generate the necessary unofficial and official reports.
Technical Data Package	TDP	Manufacturer documentation related to the voting system required to be submitted as a precondition of certification testing.
Test Case Procedure Specification	TCPS	A document specifying a sequence of actions for execution of a test.
Uninterruptible Power Supply	UPS	---
EAC 2005 Voluntary Voting System Guidelines, Version 1.0	VVSG	Published by the EAC, the third iteration of national level voting system standards.
Wyle Operating Procedure	WoP	Wyle Test Method or Test Procedure

**4.0 TEST FINDINGS AND RECOMMENDATIONS**

**4.1 Summary Findings and Recommendation**

The Unisyn Voting Solutions, Inc. OVS, Version 1.0, as listed in Section 2 of this report, was subjected to the tests as summarized in the following paragraphs.

**4.1.1 Hardware Testing**

The following hardware tests were performed per the VVSG:

- Electrical Supply (Volume I, Section 4.1.2.4)
- Electrical Power Disturbance (Volume I, Section 4.1.2.5; Volume II, Section 4.8)
- Electrical Fast Transient (Volume I, Section 4.1.2.6; Volume II, Section 4.8)

---

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

#### 4.1 Summary Findings and Recommendation (continued)

##### 4.1.1 Hardware Testing (continued)

- Lightning Surge (Volume I, Section 4.1.2.7; Volume II, Section 4.8)
- Electrostatic Disruption (Volume I, Section 4.1.2.8; Volume II, Section 4.8)
- Electromagnetic Emissions (Volume I, Section 4.1.2.9; Volume II, Section 4.8)
- Electromagnetic Susceptibility (Volume I, Section 4.1.2.10; Volume II, Section 4.8)
- Conducted RF Immunity (Volume I, Section 4.1.2.11; Volume II, Section 4.8)
- Magnetic Fields Immunity (Volume I, Section 4.1.2.12; Volume II, Section 4.8)
- Environmental Control – Operating Environment (Temperature and Power Variation Test) (Volume I, Section 4.1.2.13; Volume II, Section 4.7.1) *Includes Data Accuracy and Reliability Test*
- Environmental Control – Transit and Storage (Volume I, Section 4.1.2.14a.-d.; Volume II, Sections 4.6.2, 4.6.3, 4.6.4, 4.6.5, and 4.6.6)
- Safety (Volume I, Section 4.3.8)
- Audio Test (Volume I, Section 3.2.2.2)
- Electrical Supply (Volume I, Section 4.1.2.4)
- Maintainability (Volume I, Section 4.3.4)
- Availability (Volume I, Section 4.3.5)

The procedures followed and the results obtained during the performance of the Hardware Testing are presented in [Appendix A.2](#) of this report.

##### 4.1.2 System Level Testing

System level tests were performed to evaluate the integrated operation of the voting system hardware and software as well as any telecommunications capabilities. These tests include: Volume and Stress Test, System Integration Test, Security Test, Telecommunications Tests, Usability and Accessibility Tests, Data Accuracy, as well as the Physical and Functional Configuration Audits.

As part of System Level Testing, the system limits that Unisyn Voting Solutions, Inc., has stated to be supported by the OVS as well as the tested values and the test performed to verify each limit are compiled in Table 4-1.



4.0 TEST FINDINGS AND RECOMMENDATIONS (continued)

4.1 Summary Findings and Recommendation (continued)

4.1.2 System Level Testing (continued)

Table 4-1 OVS System Limits

Limit (Max # of)	Declared Value*	Tested Value	Test Performed
Elections	8	9	FCA
Precincts	2000	2000	Volume and Stress
Splits per Precinct	9	10	FCA
Districts	400	400	Volume and Stress
Contest per District	20	21	FCA
Parties	34	34	Volume and Stress
Parties in Primary	12	12	FCA
Parties w/ Straight Ticket	12	11	Data Accuracy
District types	25	26	FCA
Languages	10	10	Volume and Stress
Ballot styles per Election	400	400	Volume and Stress
Contests per Election	150*	Verified Possible	FCA (81)
Measures per Election	30	31	FCA
Instruction Blocks per Election	5	6	FCA
Headers per Election	50*	81	FCA
Candidates per Contest	120	121	FCA
Vote for N of M	25	25	Volume and Stress
Ballots per OVO	10000	10000	Volume and Stress
Card Stock size	8.5 x 14 and 8.5 x 17 (Duplex)	8.5 x 14 and 8.5 x 17 (Duplex)	Volume and Stress/ Data Accuracy
Ballot positions (8.5 x 17) without Rank Choice Voting	348*	Verified Possible	Logic and Accuracy (184)
Ballot positions (8.5 x 17) with Rank Choice Voting	696*	Verified Possible	N/A
Ballot positions (8.5 x 14) without Rank Choice Voting	276*	Verified Possible	Volume and Stress (237)
Ballot positions (8.5 x 14) with Rank Choice Voting	552*	Verified Possible	N/A
Ballot style per OVO	30/9/10	30/9/10	Volume and Stress
Ballots processed (Ballot Box)	700	700	Volume and Stress
Units simultaneously loading	20	5	FCA
Precincts initialized per OVO	30	30	FCA
Precincts initialized per OVO in early voting	All	All	Volume and Stress

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

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

**4.1 Summary Findings and Recommendation (continued)**

**4.1.2 System Level Testing (continued)**

**4.1.2.1 Volume and Stress Test**

The OVS was subjected to a Volume and Stress Test in accordance with the requirements of Section 6.2.3 of Volume II of the VVSG. The purpose of the test was to investigate the system’s response to conditions that tend to overload the system’s capacity to process, store, and report data. The Volume Test parameters were dependent upon the maximum number of active voting positions and the maximum number of ballot styles that the TDP claims the system can support.

Testing was performed by exercising an election definition developed specifically to test for volume and stress (Election Definition: Volume and Stress, contained in [Appendix A.7](#)). The election definition parameters are summarized in Table 4-2.

**Table 4-2 Volume and Stress Election Definition Parameters**

Ballot Positions	237
Ballot Styles	400
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
Districts	400
Precincts	2000
Parties	34
Languages	English
Voting Pattern	A “Test Deck” was created from the OVI printing just the first ballot in the first 400 precincts. All OVI “Test Deck” ballots were scanned back into an OVO with the first 400 precincts initialized. Unisyn provided 2000 professional ballots on 14 inch card stock for the other selected precincts. These ballots were hand-marked ballots in a matrix pattern creating 991 ballot test deck. The OVI “Test Deck” was hand fed into 2 OVO units five times. The OVO “Test Deck” was hand fed two times to produce 1,982 cast ballots in another OVO. An additional 10,000 ballots were cast using “Shoe-shine” mode on another OVO. The OVI “Test Deck” was fed two times into the OVCS. The OVO “Test Deck” was fed into the OVCS twenty-five times.

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

**4.1 Summary Findings and Recommendation (continued)**

**4.1.2 System Level Testing (continued)**

**4.1.2.1 Volume and Stress Test (continued)**

**Table 4-2 Volume and Stress Election Definition Parameters (continued)**

Total Ballots Cast	System	# Ballots	# Machines	# Runs	Total
	OVI	400	2	5	4,000
	OVO	991	1	2	1,982
	OVO (shoe-shine)	10,000	1	1	10,000
	OVCS OVI	400	1	2	800
	OVCS OVO	991	1	25	24,775
	Total				41,557
	Total Ballots accurately marked by OVI: 400 Total Ballots scanned by OVCS: 25,575				

**Summary Findings:** At the conclusion of voting during the Volume and Stress test performance, the system failed to tally 10,000 ballots with maximum write-ins. An engineering analysis was performed to determine that the write-in images were being stored in the system memory causing a failure to tally error. A source code revision was performed and the test was restarted. During voting, it was noted that candidate counts were not being counted accurately on the OVO in “Shoe-shine” mode. An engineering analysis was performed and it was determined that the physical paper ballot was invalid and could not be read consistently. A total of 47,510 ballots were processed on the OVO unit with different paper ballots without issues. The test was then restarted and with no anomalies (Reference Notice of Anomaly No. 4 in [Appendix A.1](#) of this report for further details).

A

**4.1.2.2 System Integration Test**

System Integration Testing was performed to test all system hardware, software, and peripherals. System Integration Testing focused on the complete system including all proprietary software, proprietary hardware, proprietary peripherals, COTS software, COTS hardware, and COTS peripherals configured as a precinct count unit as described in the Unisyn-submitted TDP for the OVS, Version 1.0. To perform the System Integration Testing, Wyle developed specific procedures and test cases designed to test the system as a whole. These procedures demonstrated compliance of the OVS, Version 1.0, to Sections 2, 3, 4, 5, and 6 of Volume I of the VVSG.

The six election definitions exercised during the System Integration Testing are listed below and are presented in [Appendix A.7](#) for further reference:

A

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

---

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

#### 4.1 Summary Findings and Recommendation (continued)

#### 4.1.2 System Level Testing (continued)

#### 4.1.2.2 System Integration Test (continued)

**Summary Findings:** Through System Integration Testing, it was demonstrated that the system performed as documented with all components performing their intended functions. No anomalies were noted during testing. The individual requirements can be traced in the FCA documentation.

#### 4.1.2.3 Security Test

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

The Security Test was performed in three steps: running a security test suite to provide verification of the access controls and the physical controls documented by Unisyn and to gather the necessary documentation; performing an automated source code analysis using Fortify SCA and transmitting the results to Unisyn for review and remediation; and performing penetration and functional security testing.

The penetration and functional security testing was broken into two phases: discovery and exploratory. The discovery phase consisted of performing scans on different components of the OVS at different states targeting initialization, maintenance, and election states. These scans provided information about the ports, protocols, and hardware as well as simulated certain attacks on vulnerable areas of the system. The information gathered was provided to a certified security professional for analysis. The results of the analysis were used to determine the method of attack during the exploratory phase of testing. The exploratory phase was performed by a certified security professional at Wyle's facilities. A complete report of the exploratory testing results was provided to Unisyn and Wyle for review and is included in [Appendix A.11](#) of this report.

**Summary Findings:** After the initial security test findings were reported to Unisyn, they supplied Wyle with updated instructions to enable the BIOS password on all OCS and OCVS hardware configurations. Wyle followed these instructions as written and a regression test was performed on both the laptop and desktop configured as documented by Unisyn. Attempts were made to "backdoor", "by-pass" and "defeat" the BIOS password on both the laptop and desktop. Those attempts were unsuccessful. Additionally new Linux OS builds were released after the security tests were completed. Wyle performed regression scans of the new builds and found no new issues to report. In addition, security tie straps were provided and documented for the OCS and OCVS hardware. The security tie straps and their documented installation were analyzed and found to be adequate.

Wyle has determined the Unisyn OVS, Version 1.0, to be compliant with the security requirements of the EAC 2005 VVSG.

The test cases performed and the procedures followed during the Security Test are documented in Wyle Test Case Specification No. T25685-60, "Security Test Case Procedure Specification for Unisyn OpenElect Voting System V 1.0" included in [Appendix A.4](#) of this report.

---

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

#### 4.1 Summary Findings and Recommendation (continued)

#### 4.1.2 System Level Testing (continued)

#### 4.1.2.4 Telecommunications Tests

The OVS was subjected to Telecommunications Tests in accordance with the requirements of Section 6 of Volume I of the VVSG. The purpose of the Telecommunications Test was to verify that telecommunications technologies implemented in the OVS for the transmission of data during ballot definition, vote accumulation, and other pre-voting and post-voting activities perform as documented in the Unisyn-supplied technical documentation and that it meets the requirements of the VVSG.

Since all telecommunications hardware components were present during all phases of certification testing including hardware testing, the FCA, the PCA, and system integration testing and all ballots utilized throughout the test campaign were loaded with the telecommunications technology, it was determined that the OVS met the requirements for design, construction, and maintenance requirements for telecommunications (accuracy, durability, reliability, maintainability, availability, integrity, and confirmation). In addition, Wyle performed specific tests designed to test every telecommunications interface component.

The strategy Wyle employed in designing the telecommunication test was to take a digital signature of the data package being sent, transmit the package, and verify the digital signature of the data package on the receiving end.

**Summary Findings:** No anomalies or issues were discovered during Telecommunications Testing. All test procedures were executed with no anomalies noted.

The test cases performed and the procedures followed during the Telecommunications Test are documented in Wyle Test Case Specification No. T25685-50, "Telecommunications Test Case Procedure Specification for Unisyn OpenElect Voting System V 1.0" included in [Appendix A.5](#) of this report.

#### 4.1.2.5 Usability and Accessibility Test

Usability and Accessibility Testing of the OVS was performed in accordance with Section 3 of Volume I and Section 6.5 of Volume II of the VVSG. The purpose of this testing was to assess conformance to the usability and accessibility requirements in the VVSG. Conformance to these requirements should result in an improved quality of interaction between the voter and the voting system and the effectiveness with which the system provides a comfortable and efficient voting session that provides confidence to the voter that their votes are cast correctly. Additional requirements for task performance are independence and privacy: the voter should normally be able to complete the voting task without assistance from others and the voter selections should be private.

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

#### 4.1 Summary Findings and Recommendation (continued)

#### 4.1.2 System Level Testing (continued)

#### 4.1.2.5 Usability and Accessibility Test (continued)

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

The requirements for physical, sensory, or cognitive disabilities shall be followed according to HAVA (a) (3) (B). Alternative languages shall be in accordance to HAVA (a) (4) and privacy mandated by HAVA (a) (1) (C). In addition Common Industry Format (CIF) shall be used for testing purposes according to ANSI/INCITS 354-2001 and in accordance with the VVSG. To help meet this requirement, Unisyn submitted a summative usability test report compiled by the Vista Center for the Blind. The testing included in the report focused on the two components of the OVS that a voter would use to print ballots and cast votes: the OVO and the OVI. The test report was submitted to Wyle and the EAC for review and is included in [Appendix A.13](#) of this report.

**Summary Findings:** During test performance, ten issues were noted relating to usability of the voting system. Of these issues, two were related to text, seven were considered minor, and one was considered major. All issues were documented during real-time test performance and were compiled into a report (presented in the Deficiency Report contained in [Appendix A.12](#)) for resolution tracking. The report was sent to Unisyn for resolution. Unisyn then either corrected the issue and regression testing was performed or the issue was able to be resolved with no regression testing required. All regression tests were performed successfully with no new issues to report. Notice of Anomaly No.8 documents the successful resolution of all Usability and Accessibility Test anomalies presented in Appendix A.1. .

The test cases performed and the procedures followed during the Usability and Accessibility Test are documented in Wyle Test Case Specification No. T25685-70, "Usability and Accessibility Test Case Procedure Specification for Unisyn OpenElect Voting System V 1.0", included in [Appendix A.6](#) of this report.

#### 4.1.2.6 Data Accuracy

The OVS was subjected to a Data Accuracy Test in accordance with the requirements of Section 4.7.1.1 of Volume II of the VVSG. This test was initially performed during hardware testing in conjunction with the Temperature/Power Variation Test. It was later separated into an independent test following anomalies encountered during test performance (reference Notice of Anomaly No. 2 contained in [Appendix A.1](#) for further details).

Per the VVSG, data accuracy is defined in terms of ballot position error rate. This rate applies to the voting functions and supporting equipment that capture, record, store, consolidate, and report the selections (or absence thereof) made by the voter for each ballot position. To meet the requirements of this test, the voting system must be subjected to the casting of a large number of ballots to verify vote recording accuracy, i.e., at least 1,549,703 ballot positions correctly read and recorded.

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

**4.1 Summary Findings and Recommendation (continued)**

**4.1.2 System Level Testing (continued)**

**4.1.2.6 Data Accuracy (continued)**

During the Data Accuracy Test, the OVS was subjected to the marking (via the OVI) and scanning (via the OVO and the OVCS) of 8,611 ballots containing 184 possible ballot positions resulting in a total of 1,584,424 ballot positions correctly marked, read, and recorded to verify vote recording accuracy. Testing was performed by exercising an election definition developed specifically to test for logic and accuracy (Election Definition: L & A-01, contained in [Appendix A.7](#)). The election definition parameters are summarized in Table 4-3.

**Table 4-3 Data Accuracy Election Definition Parameters**

Ballot Positions	184 possible
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	1
Parties	12
Languages	English, Spanish
Voting Pattern	OVI Test Deck (79 ballots cast per hour)
Total Ballots Cast	Total Ballots accurately marked by OVI: 8,611 Total Ballots scanned by OVO: 8,611 Total Ballots scanned by OVCS: 8,611 Resulting in 1,584,424 positions marked and scanned accurately

**Summary Findings:** The OVS successfully met the requirements of the Data Accuracy Test by scanning and marking 1,584,424 ballot positions accurately, therefore exceeding the minimum requirement and passing the 26,997 consecutive ballot positions read correctly threshold.

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

#### 4.1 Summary Findings and Recommendation (continued)

#### 4.1.2 System Level Testing (continued)

#### 4.1.2.7 Physical Configuration Audit (PCA)

A Physical Configuration Audit (PCA) of the OVS was performed as part of the pre-testing activities in accordance with Section 6.6 of Volume II of the VVSG. The PCA compares the voting system components submitted for certification with the vendor's technical documentation and confirms that the documentation submitted meets the requirements of the Guidelines. The purpose of the PCA is to: establish a configuration baseline (both hardware and software) of the system to be tested; verify that the reviewed source code conforms to the vendor's specification; and assess the adequacy of user acceptance test procedures and data.

The PCA performed on the OVS consisted of inspecting the following: The OpenElect Central Suite (OCS) software, the OpenElect Voting Optical Scan unit (OVO), the OpenElect Voting Interface (OVI), the OpenElect Voting Central Scan (OVCS), and all accessories, equipment and documentation used with the OVS system.

**Summary Findings:** An initial baseline PCA was performed prior to commencement of the test campaign and is included in the Certification Test Plan contained in [Appendix D](#). The initial PCA was revised during testing. The final PCA is presented in [Appendix A.10](#) of this report. No discrepancies were noted during the PCA.

#### 4.1.2.8 Functional Configuration Audit (FCA)

A Functional Configuration Audit (FCA) of the OVS was performed in accordance with Section 6.7 of Volume II of the VVSG. The purpose of the FCA was to verify that the OVS performs as documented in the Unisyn-supplied technical documentation during pre-voting, voting, and post-voting activities and validate that the OVS it meets the requirements of the EAC 2005 VVSG. A

To perform the FCA, the OVS was subjected to a series of tests to simulate Election Day activities. These tests were performed to ensure compatibility of voting machine functions at the precinct level using the referenced firmware. During the FCA, both normal and abnormal data was input into the system to attempt to introduce errors and test for error recovery. The activities simulated were: A

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



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

#### 4.1 Summary Findings and Recommendation (continued)

#### 4.1.2 System Level Testing (continued)

#### 4.1.2.8 Functional Configuration Audit (FCA) (continued)

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

##### 1. Pre-Voting

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

- Ballot Layout Manager (BLM)
- Election Manager (EM)
- Software Server (SS)
- Election Server (ES)

##### 2. Voting

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

- OpenElect Voting Interface (OVI)
- OpenElect Voting Optical scanner (OVO)

##### 3. Post-Voting

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

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

#### 4.1 Summary Findings and Recommendation (continued)

#### 4.1.2 System Level Testing (continued)

#### 4.1.2.8 Functional Configuration Audit (FCA) (continued)

- Tabulator Monitor
- Tabulator Client
- Tabulator Reports
- Election Manager

**Summary Findings:** There were deficiencies and anomalies noted during this test. All deficiencies were documented during real-time test performance and were compiled into a report (presented in the Deficiency Report contained in [Appendix A.12](#)) for resolution tracking. The system successfully recovered from all abnormal and error conditions unless noted in the deficiency report. All deficiencies noted were corrected prior to the conclusion of the test campaign. Notice of Anomaly No. 6 documenting successful resolution of all discrepancies noted during testing is presented in [Appendix A.1](#).

A

The test cases performed and the procedures followed during the FCA are documented in Wyle Test Case Specification No.'s T25685-20, "Pre-Voting Test Suite Test Case Procedure Specification for Unisyn OpenElect Voting System V 1.0", T25685-30, "Voting Test Suite Test Case Procedure Specification for Unisyn OpenElect Voting System V 1.0", and T25685-40, "Post-Voting Test Suite Test Case Procedure Specification for Unisyn OpenElect Voting System V 1.0", which are included in [Appendix A.3](#) of this report.

#### 4.1.3 Source Code Review

The Unisyn Voting Solutions, Inc., OpenElect Voting System (OVS) source code was reviewed for conformance with the requirements set forth in Section 5.4 of the VVSG coding standards and the vendor supplied coding standards. The review was conducted as part of the pre-testing activities and was performed per the guidelines described in the following paragraphs.

As the source code was received, an MD5 hash value was created for each source code file. The source code team then conducted a visual scan of every line of source code for an initial review and every line of modified source code for a re-review. This was done to identify any violation of 2005 VVSG coding standards or vendor supplied coding standards. Each identified violation was recorded by making notes of the standards violation along with directory name, file name, and line number.

For the initial review, the source code team performed a peer-review of 10 % of the code. This was done to evaluate the correctness of the review and look for standards violations that may have been missed or violations that were noted in error. Any standards violations that the team concluded were recorded in error or missed were then corrected in the code review notes.

**Summary Findings:** Other than the coding standards noted in the technical summary reports, no other deficiencies or significant problems were found during the source code review.

---

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

#### 4.1 Summary Findings and Recommendation (continued)

##### 4.1.3 Source Code Review (continued)

A technical summary report of all identified standards violations was sent to Unisyn for resolution. Unisyn then corrected all standards violations and re-submitted the source code for re-review. This process was repeated as many times as necessary, until all identified standards violations were corrected. The source code review report that summarizes the discrepancies noted is included in [Appendix A.9](#) of this report. The Notice of Anomaly (NOA No. 5) documenting that discrepancies were found is included in [Appendix A.1](#) of this report.

##### 4.1.4 Witnessed Build

A Witnessed Build of the software was created using Unisyn's trusted build documents. The build included source code, data, and script files, in clear text form. The build also includes COTS software on commercially available media, COTS software downloaded by the VSTL, COTS software verified by MD5's from the software supplier, and picture and sound files in binary format provided by Unisyn.

To perform the Witnessed Build, one Linux build machine, in four configurations (hard drives) was used to make the Linux OS installation CD's. An XP build machine was used to make the application installation CD's. Each build machine had its own build document and COTS software along with ILTS provided scripts, data, and source which were used to create the installation CD's.

**Summary Findings:** Wyle performed a Witnessed Build for each software component of the Unisyn OVS from Dec. 16 2009 through Dec 18 2009. Unisyn's On-site Technical Representative for the Witnessed Build was Mr. McDermot Coutts. The products from the Witness Build have been supplied to the EAC as part of the certification effort.

The detailed steps followed during the performance of the Witnessed Build are presented in [Appendix C](#).

##### 4.1.5 Technical Data Package Review

The Unisyn Voting Solutions, Inc., OpenElect Voting System (OVS) Technical Data Package (TDP) was reviewed to the VVSG. This review was performed as part of the pre-testing activities. The documents included in the TDP review are listed in Section 2.4 of this document.

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

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

---

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

#### 4.1 Summary Findings and Recommendation (continued)

#### 4.1.5 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. Unisyn corrected each nonconformance observation and resubmitted the associated documents for review. This process continued until the TDP complied with all TDP Standards.

The technical data review report that documents the discrepancies noted is included in [Appendix A.8](#) of this report. The Notice of Anomaly (NOA No. 7) summarizing that discrepancies were noted is included in [Appendix A.1](#) of this report.

#### 4.1.6 Quality Assurance Requirements Review

Throughout the test campaign, the Unisyn Voting Solutions, Inc., Quality Assurance (QA) Program (as documented in Unisyn document No. 04-00454, "Quality Assurance Plan") was subjected to a review of the requirements of Section 8 of Volume I and Section 2 of Volume II of the VVSG via the following methods: a TDP review to determine compliance of the Unisyn documentation to the 2005 VVSG requirements and the requirements stated in the Unisyn QA Program document; a source code review to verify compliance to the VVSG and ensure that the correct methods were followed and proper QA documentation has been completed; and a PCA to verify that all equipment received for initial testing and follow up testing complies with the guidelines set forth in the Unisyn documentation to ensure their QA process is being followed.

Additionally, the Unisyn documentation states that the Unisyn Quality Management System is in compliance with ISO 9001:2000 and that all procedures listed in the Unisyn Quality Assurance Plan document are ISO certified and subjected to an annual Internal Audit in addition to the annual or bi-annual external UL Audit.

The requirements of VVSG Vol. 2 Section 7, Quality Assurance Testing and Section 1.3.1.5, Focus of Vendor Documentation that requires Wyle personnel to physically examine documents at vendors' location. The EAC Test and Certification Program Manual, Section 8.0, and the EAC Laboratory Accreditation Program Manual, Version 1.0, Section 2.11.6, VSTL personnel are excluded from conducting testing at the vendors' location; therefore, this responsibility will be assumed by the EAC. Wyle conducted a remote audit of the QA Program.

**Summary Findings:** Wyle conducted a remote audit of Unisyn's QA Program, during which Wyle requested artifacts from Unisyn's documented QA Program. Wyle provided Unisyn an artifact checklist targeting the following areas:

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

Unisyn was allowed an 8-hour business day to provide the requested artifacts. Wyle reviewed the received artifacts against Unisyn's documented procedures. During the review, one inconsistency was discovered relating to the inspection of prototype parts. The date seemed to be out of sync with the rest of the dates in this process. Wyle then requested a second artifact and accepted the artifact as compliant with Unisyn's procedures.

---

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

#### 4.1 Summary Findings and Recommendation (continued)

##### 4.1.7 Configuration Management Requirements Review

Throughout the test campaign, the Unisyn Voting Solutions, Inc., Configuration Management (CM) Plan (as documented in Unisyn's Document No. 04-00448, "Configuration Management Plan") was subjected to a review of the requirements of Section 9 of Volume I and Section 2 of Volume II of the 2005 VVSG via the following methods: a TDP review to determine compliance of the Unisyn documentation to the 2005 VVSG requirements and the requirements stated in the Unisyn CM Plan document; a source code review to verify compliance to the VVSG and ensure that the CM requirements were met; and a PCA to verify that all equipment received for initial testing and follow up testing complies with the guidelines set forth in the Unisyn documentation to ensure their CM process is being followed.

Additionally, the Unisyn documentation states that the Unisyn Configuration Management Plan for the OVS is part of the overall Quality Management Plan which in compliance with ISO 9001:2000 and that all procedures listed in the Unisyn Quality Assurance Plan document are ISO certified and subjected to an annual Internal Audit in addition to the annual or bi-annual external UL Audit.

**Summary Findings:** Wyle conducted a remote audit of Unisyn's CM Program, during which Wyle requested artifacts from Unisyn's documented CM Program. Wyle provided Unisyn an artifact checklist targeting the following areas:

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

Unisyn was allowed an 8-hour business day to provide the requested artifacts. Wyle reviewed the received artifacts against Unisyn's documented procedure. Wyle accepted these artifacts as being compliant with Unisyn's documented procedures.

#### 4.2 Anomalies and Resolutions

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

1. Notice of Anomaly No. 1: Lightning Surge Test

Initial testing was performed with an APC manufactured UPS rated at 1200VA/120V (Model BR1200). During the application of the +2 kV lightning pulse at 0°, line to line, the UPS would switch to battery backup, the audio would switch off, and the ballot reader would stop processing ballots in the "shoeshine" mode used for testing. The UPS was replaced with another UPS (Minuteman Model ETR 1500) with an increased surge rating of 1500VA. The test was then repeated with no anomalies.

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

**4.2 Anomalies and Resolutions (continued)**

2. Notice of Anomaly No. 2: Temperature/Power Variation Test/Data Accuracy/Reliability Test

Anomalies occurred during the first three test runs. The anomalies consisted of multifeeds, ballot handling issues, and unexpected results encountered by the tester. The addition of a gate to prevent multifeeds and tighter control on ballot handling allowed the test to be successfully performed on the fourth run.

3. Notice of Anomaly No. 3: Audio Noise Test

Test performance revealed the initial volume level provided to the user exceeded the maximum accepted level of 50 dB. A source code revision was performed to adjust the initial volume setting and the test was repeated successfully.

4. Notice of Anomaly No. 4, Rev. A: Volume Test

At the conclusion of voting during test performance, the system failed to tally 10,000 ballots with maximum write-ins. An engineering analysis was performed to determine that the write-in images were being stored in the system memory causing a failure to tally error. A source code revision was performed and the test was restarted. During voting, it was noted that candidate counts were not being counted accurately on the OVO in "Shoe-shine" mode. An engineering analysis was performed and it was determined that the physical paper ballot was invalid and could not be read consistently. A total of 47,510 ballots were processed on the OVO unit with different paper ballots without issues.

A

5. Notice of Anomaly No. 5: Source Code Review

Review of the submitted source code modules comprising the OpenElect Voting System revealed deviations from the standard as well as issues with the commenting. A technical summary report of all identified standards violations was sent to the Unisyn for resolution. Unisyn then corrected all standards violations and re-submitted the source code for re-review. This process was repeated as many times as necessary, until all identified standards violations were corrected.

6. Notice of Anomaly No. 6: Functional Configuration Audit (FCA)

During performance of the FCA, issues were noted related to system functionality. A report of all identified issues was sent to Unisyn for resolution. Unisyn then corrected all noted issues and the tests were repeated with no anomalies.

7. Notice of Anomaly No. 7: Technical Data Package (TDP) Review

Review of the submitted TDP documents revealed discrepancies related to their accuracy, completeness, and compliance to the VVSG. Functional testing also identified text in the TDP that conflicted with the actual operation of the system. These discrepancies were reported to Unisyn and tracked as test exceptions until verified that the applicable documents had been corrected. Unisyn corrected each nonconformance observation and resubmitted the associated documents for review. This process continued until the TDP complied with all the requirements of the VVSG.

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

**4.2 Anomalies and Resolutions (continued)**

8. Notice of Anomaly No. 8, Rev. A: Usability Test

During test performance, ten issues were noted relating to usability of the voting system. Of these issues, two were related to text, seven were considered minor, and one was considered major. A report of all identified issues was sent to Unisyn for resolution. Unisyn then either corrected the issue or the issue was able to be resolved with no retesting required. When retesting was required, no anomalies were noted.

**4.3 Deficiencies and Resolutions**

During the test campaign, deficiencies were noted that were related to system functionality and usability. The deficiencies were discovered as part of the FCA, during hardware test performance, system integration testing, usability testing, volume and stress testing, or were noted during the general test campaign and not linked to a specific test or VVSG requirement. All deficiencies were documented during real-time test performance and were compiled into a report (presented in the Deficiency Report contained in [Appendix A.12](#)) for resolution tracking. All deficiencies noted were corrected prior to the conclusion of the test campaign. A summary of the noted deficiencies is presented in Table 4-1.

**Table 4-1 Summary of Deficiencies**

OVS Component	Number of Deficiencies	Where Noted
Ballot Layout Manager (BLM)	29	28 FCA, 1 Usability
Election Manager (EM)	10	8 FCA, 1 Usability, 1 System Integration
OpenElect Voting Optical (OVO)	6	3 FCA, 2 Volume & Stress, 1 Misc.
OpenElect Voting Interface (OVI)	17	4 FCA, 7 Usability, 3 System Integration, 3 Misc.
Open Elect Voting Central Scan (OVCS)	5	2 FCA, 2 Hardware Testing, 1 Volume & Stress
Software/Server Hardware (SS)	1	1 Misc.
Tabulator Client (TC)	1	1 System Integration
Tabulator Monitor (Tab)	5	5 FCA
Tabulator Monitor/Election Manager	1	1 FCA

**4.4 Recommendation for Certification**

Wyle performed conformance/specification testing on the Unisyn Voting Solutions, Inc. OpenElect Voting System (OVS), Version 1.0, to the EAC 2005 VVSG (Version 1.0). During the test campaign, all data from pre-testing, hardware testing, software testing, functional testing, security testing, volume testing, stress testing, telecommunication testing, usability testing, accessibility testing, and reliability testing activities was combined to ensure all VVSG requirements that are supported by the OVS had been tested. During successful test performance (not including regression testing, usability, or FCA), Wyle-qualified personnel executed ten elections, casting 81,852 ballots, with a system operational time in excess of 268 hours. Wyle also used discretion as granted by the VVSG to design and exercise FCA Test Cases, perform automated source code reviews, and perform Security Tests.

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

**4.4 Recommendation for Certification (continued)**

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

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

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



APPENDIX A  
ADDITIONAL FINDINGS

- A.1 [NOTICES OF ANOMALY](#)
- A.2 [HARDWARE TEST REPORT](#)
- A.3 [FUNCTIONAL CONFIGURATION AUDIT TEST CASE PROCEDURE SPECIFICATIONS](#)
- A.4 [SECURITY TEST CASE PROCEDURE SPECIFICATIONS](#)
- A.5 [TELECOMMUNICATIONS TEST CASE PROCEDURE SPECIFICATIONS](#)
- A.6 [USABILITY TEST CASE PROCEDURE SPECIFICATIONS](#)
- A.7 [ELECTION DEFINITIONS](#)
- A.8 [TDP REVIEW REPORT](#)
- A.9 [SOURCE CODE REVIEW REPORT](#)
- A.10 [PHYSICAL CONFIGURATION AUDIT REPORT](#)
- A.11 [SECURITY ASSESSMENT SUMMARY REPORT](#)
- A.12 [DEFICIENCY REPORT](#)
- A.13 [SUMMATIVE USABILITY REPORT](#)

**APPENDIX B**

**WARRANT OF ACCEPTING CHANGE CONTROL RESPONSIBILITY**

[UNISYN WARRANTY OF ACCEPTANCE CHANGE CONTROL](#)

**APPENDIX C**

**WITNESS BUILD**

**[WITNESS BUILD RECORD](#)**

**APPENDIX D**

**WYLE LABORATORIES' CERTIFICATION TEST PLAN NO. T56285-01**

[UNISYN OPENELECT VOTING SYSTEM TEST PLAN REV C](#)