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CERTIFICATION TEST PLAN

Prepared for:

Manufacturer Name	ES&S
Manufacturer System	Unity 3.2.0.0 Rev 3
EAC Application No.	ESS1201
Manufacturer Address	11208 John Galt Boulevard Omaha, NE 68137

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APPENDICES

1.0 INTRODUCTION

The purpose of this National Certification Test Plan (Test Plan) is to document the strategy Wyle will follow to perform certification testing of the Election Systems and Software (ES&S) Unity 3.2.0.0 Rev 3 voting system. ES&S submitted the Unity 3.2.0.0 Rev. 3 system to Wyle Laboratories, Inc. for certification to the 2002 VSS. Per Section 4.4.2.3 of the EAC Testing and Certification Program Manual, all testing on the modifications to the system will be tested to the 2005 VVSG; however, pending successful completion of this test campaign, the system will only be granted a 2002 VSS certification since the system, as a whole, will not be tested to the 2005 VVSG.

The initial version of this system, Unity 3.2.0.0, has been fully tested to the FEC 2002 VSS. Modifications made since initial certification that resulted in the previous version of this system, Unity 3.2.0.0 Rev 1, have been tested to the EAC 2005 VVSG. As a result of this testing, the Unity 3.2.0.0 Rev 1 system was granted certification under EAC Certification No. ESSUnity3200Rev1. Since that time, the EAC has released a Formal Investigation Report on the Unity 3.2.0.0 system, dated December 20, 2011, which reports that three allegations of anomalies were identified.

The purpose of this modification is to provide resolution to the anomalies stated in the EAC Formal Investigation Report. To resolve the identified anomalies, ES&S submitted an update to the DS200 firmware (Version 1.6.1.0). This firmware version will be utilized in all functional testing for the DS200 for the duration of the campaign. Any updates or changes to the firmware shall be notated and verified to include any necessary regression testing.

1.1 Scope

The focus of this test campaign will be to test all additions and modifications made to the system's software, hardware and firmware since the last certification. Wyle will perform full-functional testing on the DS200 with the primary focus to test that the modifications of the DS200 firmware fix the anomalies addressed specifically in the EAC's Formal Investigation Report. These include:

- Intermittent screen freezes, the system lockups and shutdowns which prevents the voting system from operating in the manner in which it was designed.
- Failure to log all normal and abnormal voting system events.
- Skewing of the ballot resulting in a negative effect on system accuracy.

The DS200 with the 1.6.1.0 firmware has not been previously tested with the Unity 3.2.0.0 EMS. This test campaign will perform full-functional testing to include integration testing of the DS200 1.6.1.0 firmware and the Unity 3.2.0.0 EMS; therefore, resulting in the Unity 3.2.0.0 Rev 3 voting system.

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1.0 INTRODUCTION (Continued)

1.2 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
- U.S. Election Assistance Commission Formal Investigation Report on Election Systems and Software Unity 3.2.0.0 dated December 20, 2011.
- Election Assistance Commission Testing and Certification Program Manual, Version 1.0, effective date January 1, 2007
- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 1.0, effective date July 2008
- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2006 Edition, "NVLAP Procedures and General Requirements (NIST Handbook 150)," dated February 2006
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2008 Edition, "Voting System Testing (NIST Handbook 150-22)," dated May 2008
- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- Wyle Laboratories' Test Guidelines Documents: EMI-001A, "Wyle Laboratories' Test Guidelines for Performing Electromagnetic Interference (EMI) Testing," and EMI-002A, "Test Procedure for Testing and Documentation of Radiated and Conducted Emissions Performed on Commercial Products"
- Wyle Laboratories' Quality Assurance Program Manual, Latest Revision
- 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 www.eac.gov)
- EAC Notices of Clarification (listed on www.eac.gov)
- EAC Quality Monitoring Program residing on:

  http://www.eac.gov/testing_and_certification/quality_monitoring_program.aspx
- EAC Notices of Clarification (listed on www.eac.gov)
- EAC Requests for Interpretation (listed on www.eac.gov)

A listing of the Unity 3.2.0.0 Rev 3 System Technical Data Package (TDP) documents submitted for this certification test effort is listed in Section 3.4, Deliverable Materials.

1.0 INTRODUCTION (Continued)

1.3 Terms and Abbreviations

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

Table 1-1 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.
AutoMARK Management Information System	AIMS	A windows-based election management system software application to define election parameters for the VAT, including functionality to import election definition files produced by the Unity EMS and create VAT flash memory cards
Audit Manager	AM	System software that provides security and user tracking for Election Data Manager (EDM) and ES&S Ballot Image Manager (ESSIM).
Configuration Management	CM	---
Commercial Off the Shelf	COTS	---
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 Data Manager	EDM	Unity EMS data entry component.
Election Management System	EMS	Within the Unity 3.2.0.0 Rev 3 System, the EMS is comprised of eight components: AIMS, AM, EDM, HPM, ESSIM, ERM, Log Monitor Service, and VAT Previewer.
Election Reporting Manager	ERM	Unity EMS reporting component.
Election Systems and Software	ES&S	---
ESSIM	ESS Image Manager	A desktop publishing tool that allows users to design and print ES&S paper ballots.
Equipment Under Test	EUT	---
Functional Configuration Audit	FCA	Verification of system functions and combination of functions cited in the manufacturer's documentation.
Hardware Programming Manager	HPM	An election package primarily used for converting election files and creating and loading election parameters.

1.0 INTRODUCTION (Continued)

1.3 Terms and Abbreviations (Continued)

1.1

Table 1-2 Terms and Abbreviations (Continued)

Term	Abbreviation	Definition
Help America Vote Act	HAVA	Act created by United States Congress in 2002.
Intelligent Mark Recognition	IMR	Visible light scanning technology to detect completed ballot targets
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.
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	--
System Under Test	SUT	---
Technical Data Package	TDP	Manufacturer documentation related to the voting system required to be submitted as a precondition of certification testing.
Test Case Procedure Specifications	TCPS	Wyle-developed document that specifies test items, input specifications, output specifications, environmental needs, special procedural requirements, inter-case dependencies, and all validated test cases that will be executed during the area under test.
Uninterruptible Power Supply	UPS	---
Voter Assist Terminal	VAT	The electronic ballot marking device component is the ES&S AutoMARK
Voluntary Voting System Guidelines	EAC 2005 VVSG	Published by the EAC, the third iteration of national level voting system standards.
Wyle Laboratories, Inc.	Wyle	---
Wyle Operating Procedure	WoP	Wyle Test Method or Test Procedure.

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1.0 INTRODUCTION (Continued)

1.4 Testing Responsibilities

All testing will be performed at Wyle utilizing test procedures and test cases that will be documented in the test plan and test report.

Review of the test cases and results of developmental testing conducted by ES&S during the pre-certification process also allowed for assessment of ES&S' efforts to develop and test the system and to correct any known defects.

1.4.1 Project Schedule

This information is contained in a Wyle-generated Microsoft Project schedule. This schedule is presented in Appendix A "ES&S Project Schedule." The dates on the schedule are not firm dates but planned estimates presented for informational purposes.

1.4.2 Owner Assignments

This information is contained in a Wyle-generated Microsoft Project schedule. This schedule is presented in Appendix A "ES&S Project Schedule."

1.4.3 Test Case Development

Wyle will utilize the "Wyle Baseline Test Cases" for the Functional Configuration Audit (FCA). These will be augmented with specially designed test cases tailored to the ES&S Unity 3.2.0.0 Rev 3 System. Wyle has designed specific election definitions and test cases for the Operational Status Check and the Logic and Accuracy Tests. The "Baseline" functional test cases and the election definitions have been previously submitted to the EAC for review. Wyle has developed test cases specifically designed to test the issues identified in the DS200.

1.4.4 Test Procedure Development and Validation

Wyle will utilize the Wyle Operating Procedures (WoPs) during the duration of this test program. The validated WoPs have been previously submitted to the EAC for review.

1.4.5 Third-Party Tests

Wyle will not utilize any 3rd party testing during performance of the ES&S Unity 3.2.0.0 Rev 3 system test campaign.

1.4.6 EAC and Manufacturer Dependencies

This information is contained in a Wyle-generated Microsoft Project schedule. This schedule is presented in Appendix A "ES&S Project Schedule."

(The remainder of this page intentionally left blank)

1.0 INTRODUCTION (Continued)

1.4 Testing Responsibilities (Continued)

1.4.7 VVSG

The Unity 3.2.0.0 Rev 3 System test campaign will consist of testing all modifications (including all ECO's, firmware, and source code updates), and full-functional testing on the DS200 to the applicable EAC 2005 VVSG requirements.

Due to the prevalence of the DS200 component across the ES&S Unity line of products, and the fact that the DS200 was tested in part by three separate VSTLs, the EAC has requested that ES&S require Wyle to perform full regression testing on the DS200 for all functional requirements set forth in the EAC 2005 VVSG.

1.4.8 Beyond VVSG

Based on the scope of this modification, no additional test results have been submitted for consideration as part of this test campaign.

1.5 Target of Evaluation Description

The following sections address the design methodology and product description of the Unity 3.2.0.0 Rev 3 System as taken from the ES&S technical documentation.

1.5.1 System Overview

The ES&S Unity 3.2.0.0 Rev 3 Election System is a comprehensive suite of vote tabulation equipment and software solutions providing end-to-end election management. The Unity 3.2.0.0 Rev 3 voting system includes the following core system components detailed in Tables 1-2 and 1-3.

Table 1-2 Unity 3.2.0.0 Rev 3 System Hardware Components

Component	Hardware Version	Firmware Version
DS200	1.2	1.6.1.0
Model 650	1.1, 1.2	2.2.2.0
AutoMARK	1.0, 1.1, 1.3	1.3.2906

Table 1-3 Unity 3.2.0.0 Rev 3 System Software Components

Component	Version
Audit Manager (AM)	7.5.2.0
Election Data Manager (EDM)	7.8.1.0
ES&S Ballot Image Manager (ESSIM)	7.7.1.0
Hardware Programming Manager (HPM)	5.7.1.0
Election Reporting Manager (ERM)	7.5.4.0
Log Monitor Service	1.0.0.0
AIMS	1.3.157
VAT Previewer	1.3.2906

1.0 INTRODUCTION (Continued)

1.5 Target of Evaluation Description (Continued)

1.5.2 System Hardware

The ES&S Unity 3.2.0.0 Rev 3 System can be set up to support one or more of the following hardware components:

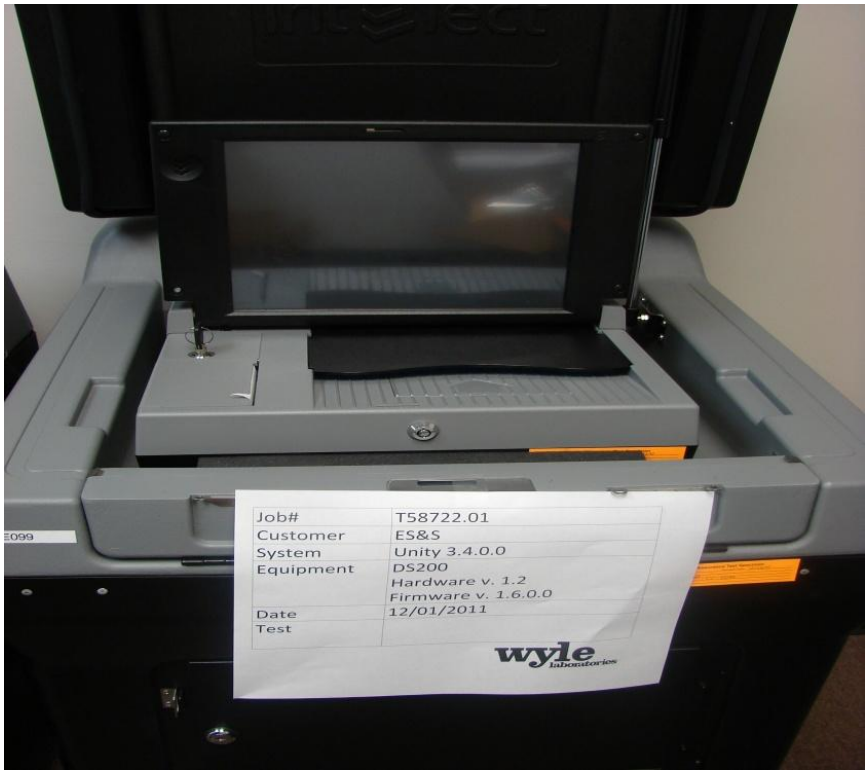
- DS200 Precinct Tabulator
- Model 650 Central Tabulator
- AutoMARK Voting Assist Terminal

Each of these components is described in the following paragraphs:

Precinct Ballot Tabulator: DS200

The DS200 is an optical scan paper ballot tabulator designed for use at the polling place level. After the voter marks a paper ballot, their ballot is inserted into the unit and immediately tabulated. The tabulator uses a high-resolution image-scanning device to image the front and rear of the ballot simultaneously. The resulting ballot images are then decoded by a proprietary recognition engine.

The system includes a 12-inch touch screen display providing voter feedback and poll worker messaging. Once a ballot is tabulated and the system updates internal vote counters, the ballot is dropped into an integrated ballot box. The DS200 includes an internal thermal printer for the printing of the zero reports, log reports, and polling place totals upon the official closing of the polls.



Photograph No. 1: DS200 (on plastic ballot box)

1.0 INTRODUCTION (Continued)

1.5 Target of Evaluation Description (Continued)

1.5.2 System Hardware (Continued)

Photograph No. 2: DS200 (on metal ballot box)

1.0 INTRODUCTION (Continued)

1.5 Target of Evaluation Description (Continued)

1.5.2 System Hardware (Continued)

Tabulator: Model 650

The Model 650 is a high-speed, optical scan central ballot counter. During scanning, the Model 650 prints a continuous audit log to a dedicated audit log printer and can print results directly from the scanner to a second connected printer. The scanner saves results to a Zip disk that officials can use to generate the results' reports from a PC running Election Reporting Manager. The Model 650 sorts write-in ballots, blank ballots, overvoted ballots and illegal ballots.

Photograph No. 3: M650

1.0 INTRODUCTION (Continued)

1.5 Target of Evaluation Description (Continued)

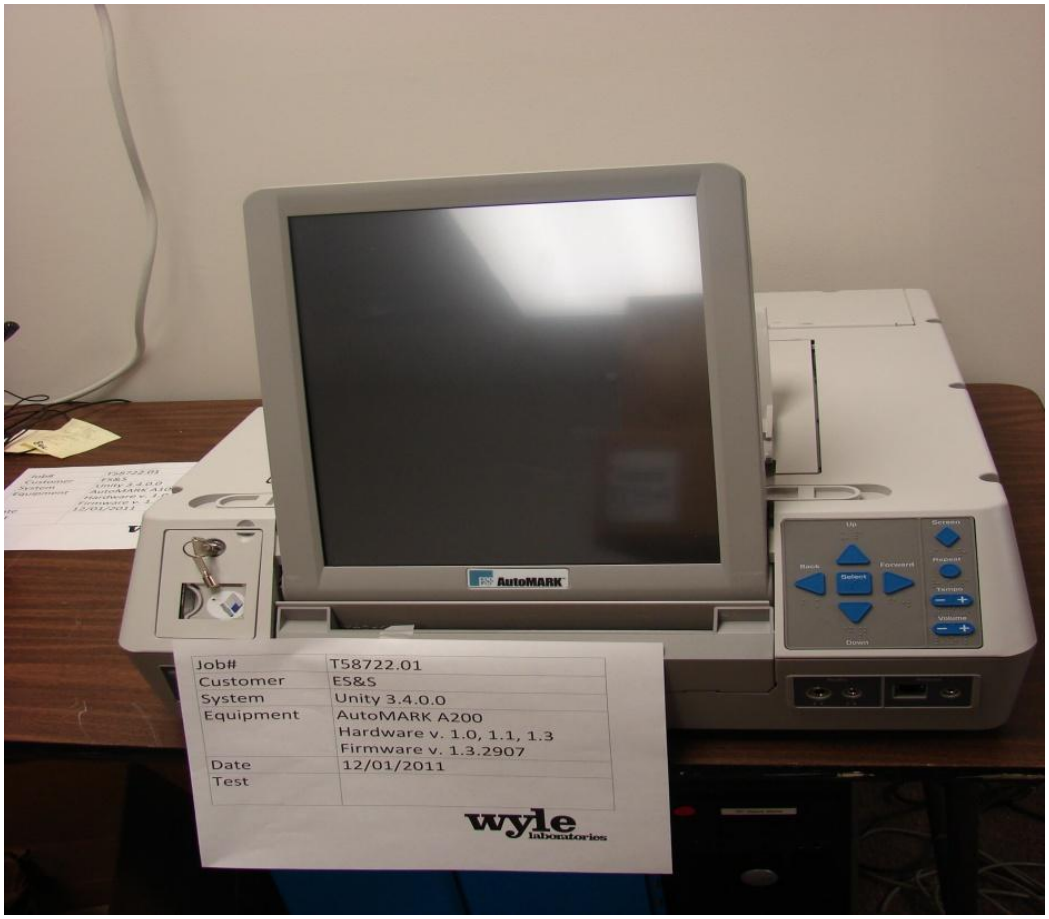
1.5.2 System Hardware (Continued)

Electronic Ballot Marking Device: AutoMARK Voter Assist Terminal (VAT)

The electronic ballot marking device component is the ES&S AutoMARK Voter Assist Terminal (VAT). The AutoMARK VAT assists voters with disabilities by marking optical scan ballots.

The AutoMARK VAT includes two user interfaces, to accommodate voters who are visually or physically impaired or voters who are more comfortable reading or hearing instructions and choices in an alternative language. The AutoMARK is equipped with a touch screen, and keypad. The touch-screen interface includes various colors and effects to prompt and guide the voter through the ballot marking process. Each key has both Braille and printed text labels designed to indicate function and a related shape to help the voter determine its use.

Regardless whether the voter uses the touch screen or other audio interface, changes can be made throughout the voting process by navigating back to the appropriate screen and selecting the change or altering selections at the mandatory vote summary screen that closes the ballot marking session.



Photograph No. 4: AutoMARK A200 VAT

1.0 INTRODUCTION (Continued)

1.5 Target of Evaluation Description (Continued)

1.5.2 System Hardware (Continued

Electronic Ballot Marking Device: AutoMARK Voter Assist Terminal (VAT) (Continued)

Photograph No. 5: AutoMARK A100 VAT

1.5.3 System Software

The Unity 3.2.0.0 Rev 3 Election Management System is an application suite comprised of eight components: AutoMark Information Management System, Audit Manager, Election Data Manager, ES&S Ballot Image Manager, Hardware Programming Manager, Election Reporting Manager, Log Monitor Service, and VAT Previewer.

AutoMark Information Management System (AIMS)

AIMS is a windows-based election management system software application used to define election parameters for the VAT, including functionality to import election definition files produced by the Unity EMS and to create VAT flash memory cards.

1.0 INTRODUCTION (Continued)

1.5 Target of Evaluation Description (Continued)

1.5.3 System Software (Continued)

VAT Previewer

The VAT Previewer is an application within the AIMS program that allows the user to preview audio text and screen layout prior to downloading election-day media for the AutoMARK.

Audit Manager (AM)

The Audit Manager (AM) utility provides security and user tracking for Election Data Manager and Ballot Image Manager. Audit Manager runs in the background of the other Unity programs and provides password security and a real-time audit log of all user inputs and system outputs. Election coders use Audit Manager to set Unity system passwords and track user activity.

Election Data Manager (EDM)

The Election Data Manager (EDM) is the entry point for the Unity Election Management System. The Election Data Manager is a single-entry database that stores precinct, office, and candidate information. The Data entered for an initial election is stored to a re-useable database to be recalled and edited for all elections that follow. The Election Data Manager is used in conjunction with other Unity software to format and print ballots, program ballot scanning equipment, and produce Election Day reports.

ES&S Ballot Image Manager (ESSIM)

The ES&S Ballot Image Manager (ESSIM) uses ballot style information created by the Unity Election Data Manager to display the ballots in a WYSIWIG design interface. The users can apply typographic formatting (font, size, attributes, etc.) to individual components of the ballot. Text and graphic frames can also be added to the ballot.

Hardware Programming Manager (HPM)

The Hardware Programming Manager (HPM) uses the election specific database created with Election Data Manager and Ballot Image Manager to program the appropriate media for ES&S tabulation devices. The Hardware Programming Manager converts the ballot layout data into the format required for each ES&S system. HPM then writes this data to the appropriate required media required for the DS200 using a USB flash drive, a CF card for the AutoMark, or a Zip disk for Model 650 tabulators.

Election Reporting Manager (ERM)

The Election Reporting Manager (ERM) generates paper and electronic reports for election workers, candidates, and the media. The Jurisdictions can use a separate ERM installation to display updated election totals on a monitor as ballot data is tabulated, and send the results' reports directly to the media outlets. The ERM support accumulation and combination of ballot results data from all ES&S tabulators. The precinct and accumulated totals' reports provide a means to accommodate candidate and media requests for totals and are available upon demand. The high-speed printers are configured as part of the system accumulation/reporting stations - PC and related software.

1.0 INTRODUCTION (Continued)

1.5 Target of Evaluation Description (Continued)

1.5.3 System Software (Continued)

Log Monitor Service

The Log Monitor Service is a Windows Service that runs in the background of any active ES&S Election Management software application to monitor the proper functioning of the Windows Event Viewer. The Log Monitor Service closes any active ES&S software application if the system detects the improper deactivation of the Windows Event Viewer.

1.5.4 System Operational Concept

The operational-flow and low-level system interfaces for the ES&S Unity 3.2.0.0 Rev 3 voting system are illustrated in Figure 1-1.

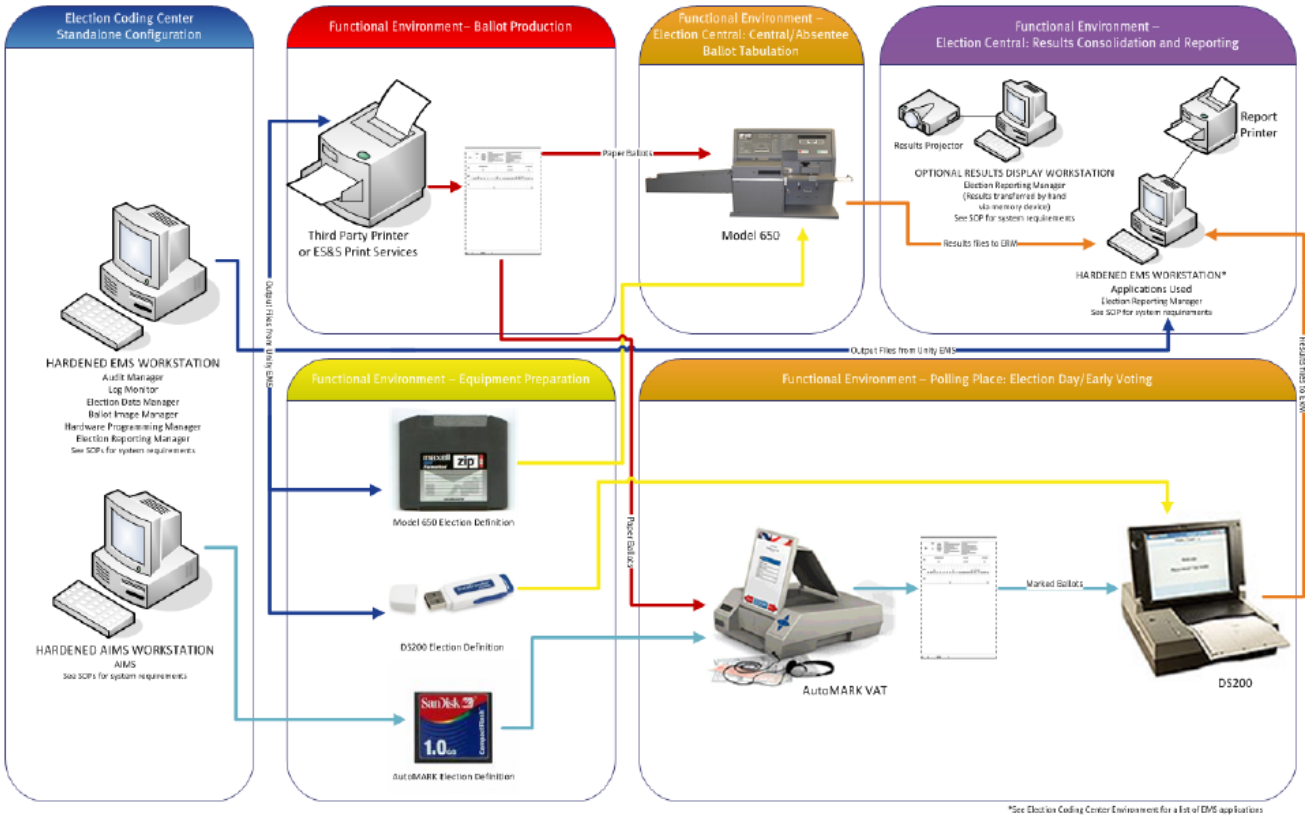


Figure 1-1 System Overview Diagram

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1.0 INTRODUCTION (Continued)

1.5 Target of Evaluation Description (Continued)

1.5.5 System Limits

The system limits and the ballot target limits that ES&S has stated to be supported by the Unity 3.2.0.0 Rev 3 System are compiled in the tables below.

Table 1-4 Unity 3.2.0.0 Rev 3 System Limits

Limit Description (Maximum)	Limit Value	Limiting Factor
Precincts allowed in an election	2900(1639 if using paper ballot coded by precinct)	HPM/ERM (ballot sequence code)
Precinct included per poll (reporting limit)	1900	ERM
Candidate/counters per election	21000	ERM
Maximum candidates	9900	HPM
Contest allowed in an election	Depends on election(limited by 21,000 maximum counters)	ERM
Candidates/Counters allowed per precinct	1,000	ERM Import
Ballot styles allowed per election	5500 (1639 if using paper ballot coded by style)	HPM (ballot sequence code)
Contests allowed per ballot style	200 or number of positions on a ballot	HPM
Precincts allowed per ballot style	1500	HPM
Candidates (ballot choices) allowed per contest	175	HPM
Count for any precinct element	500,000 (65,550 from any tabulator media)	ERM report (ERM results Import)
Number of parties allowed	18	HPM
'Vote for' per contest	90	HPM

Table 1-5 Unity 3.2.0.0 Rev 3 Ballot Target Limits

Ballot Size (ovals per inch Left or Right)	Positions per Column x Row
8½ x 11" (4 ovals per inch)	36 rows x 3 columns = 108/side
8 ½ x 14" (3 ovals per inch)	36 rows x 3 columns = 108/side
8 ½ x 14" (4 ovals per inch)	48 rows x 3 columns = 144/side
8 ½ x 17" (3 ovals per inch)	41 rows x 3 columns = 123/side
8 ½ x 17" (3 ovals per inch)	45 rows x 3 columns = 135/side
8 ½ x 17" (4 ovals per inch)	60 rows x 3 columns = 180/side
8 ½ x 19" (3 ovals per inch)	51 rows x 3 columns = 153/side
8 ½ x 19" (4 ovals per inch)	68 rows x 3 columns = 204/side

1.0 INTRODUCTION (Continued)

1.5 Target of Evaluation Description (Continued)

1.5.6 Supported Languages

The following languages have been stated by ES&S to be supported by the Unity 3.2.0.0 Rev 3 System:

- English
- Spanish

1.5.7 Supported Functionality

The Unity 3.2.0.0 Rev 3 is designed to support the following voting variations:

- General Election
- Open and Closed Primaries
- Partisan offices
- Non-Partisan offices
- Write-in voting
- Straight Party voting
- Cross-Party endorsement
- Split Precincts
- Ballot Rotation
- Recall Issue with Options
- Provisional or Challenged Ballots
- Vote for N of M
- Audio Ballot

The Unity 3.2.0.0 Rev 3 System does not include functions for Primary Presidential Delegation Nominations, Ranked Order Voting, or Cumulative Voting; therefore, testing will not be conducted on these functions.

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2.0 PRE-CERTIFICATION TESTING AND ISSUES

2.1 Evaluation of Prior VSTL Testing

Wyle will utilize reports and data from prior test campaigns, which include Unity 3.2.0.0, Unity 3.2.0.0 Rev 1, Unity 3.2.0.0 Rev 2, and Unity 3.2.1.0 to aide in the development of test cases and data sets for this program.

2.2 Known Field Issues

The EAC Formal investigation Report, dated December 20, 2011.

Two technical advisories have been issued by the EAC concerning known field issue of the DS200, each of which is summarized below:

The EAC Technical Advisory ESS2011-02: During local acceptance testing in a jurisdiction, multiple DS200 Ballot Scanners exhibited an anomaly where the touch-screen interface would stop responding to touches.

EAC Technical Advisory ESS2011-03: During local acceptance testing, a DS200 Ballot Scanner failed to count a marked ballot position resulting in a lost vote.

In response to the technical advisories, ES&S has published two Technical Bulletins (PRBDS2000013 and FYIDS2000021, both of which are dated 8/3/2011).

Additionally, as a result of the issues identified above, the prevalence of the DS200 component across the ES&S Unity line of products, and the fact that the DS200 was tested in part by three separate VSTLs, the EAC has instructed Wyle to perform full regression testing on the DS200 for all functional requirements set forth in the EAC 2005 VVSG. This testing will be performed as part of the ES&S Unity 3.2.0.0 Rev 3 testing campaign. The results of this test campaign must be evaluated and an analysis of impact on related systems be performed by Wyle prior to final approval.

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3.0 MATERIALS REQUIRED FOR TESTING

The materials required for certification testing of the ES&S Unity 3.2.0.0 Rev 3, which include software, hardware, test materials, and deliverable materials were shipped directly to Wyle by ES&S. Some of the equipment to be used during this test effort is the same equipment used during the original certification campaign performed by Wyle.

3.1 Software

This section defines the two types of software needed for testing:

- software used for the testing of hardware, software, and security
- supporting software required for the test environment (operating systems, compliers, assemblers, database managers, and any other supporting software)

The Unity 3.2.0.0 System Rev. 3 software and firmware submitted for review is identified in Table 3-1. Wyle will only be reviewing and building the source code pertaining to the DS200. Wyle will have a SHA1 hash made of the resulting software files or disc images.

The previously certified EMS (version 3.2.0.0) shall be used in conjunction with the updated DS200 Firmware (Version 1.6.1.0) for system integration testing of the two components. The EMS will be retrieved from the 'Trusted Builds' archive. This test campaign will not include any new builds for the EMS, but will rely on software from the previous test campaigns.

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3.0 MATERIALS REQUIRED FOR TESTING

3.1 Software (Continued)

Table 3-1 presents the software the manufacturer has submitted for testing.

Table 3-1 Unity 3.2.0.0 Rev 3 System Software and Firmware

Software/Firmware	Version	Description
AIMS	1.3.157	A windows-based election management system software application to define election parameters for the VAT, including functionality to import election definition files produced by the Unity EMS and create VAT flash memory cards
HPM	5.7.1.0	Hardware Programming Manager (HPM) uses the election specific database created with Election Data Manager and Ballot Image Manager to program the appropriate media for ES&S tabulation devices.
EDM	7.8.1.0	Election Data Manager (EDM) is the entry point for the Unity Election Management System. Election Data Manager is a single-entry database that stores precinct, office, and candidate information. Data entered for an initial election is stored to a re-useable database to be recalled and edited for all elections that follow.
ESSIM	7.7.1.0	ES&S Ballot Image Manager (ESSIM) uses ballot style information created by Unity Election Data Manager to display the ballots in a WYSIWIG design interface. Users can apply typographic formatting (font, size, attributes, etc.) to individual components of the ballot.
AM	7.5.2.0	The Audit Manager (AM) utility provides security and user tracking for Election Data Manager and Ballot Image Manager. Audit Manager runs in the background of the other Unity programs and provides password security and a real-time audit log of all user inputs and system outputs.
ERM	7.5.4.0	Election Reporting Manager (ERM) generates paper and electronic reports for election workers, candidates, and the media. Jurisdictions can use a separate ERM installation to display updated election totals on a monitor as ballot data is tabulated, and send results reports directly to media outlets.
VAT Previewer	1.3.2906	The VAT Previewer is an application within the AIMS program that allows the user to preview audio text, and screen layout prior to burning election day media for the AutoMARK.
Log Monitor Service	1.0.0.0	Log Monitor Service is a Windows Service that runs in the background of any active ES&S Election Management software application to monitor the proper functioning of the Windows Event Viewer.

3.0 MATERIALS REQUIRED FOR TESTING (Continued)

3.2 Equipment

This subsection categorizes the equipment that the manufacturer submitted for testing. Each test element is included in the list of the equipment required for testing of that element, including system hardware, general purpose data processing and communications equipment, and any required test instrumentation.

Every effort is made to verify that the equipment purposed to be COTS is in fact COTS, as defined by the VVSG, and that the COTS equipment has not been modified for use. Wyle will perform research using the COTS equipment manufacturers' websites based on the serial and service tag numbers for each piece of equipment and will evaluate COTS hardware, system software and communications components for proven performance in commercial applications other than elections. For PCs, laptops, and servers, the service tag information is compared to the system information found on each machine. An external and internal physical analysis is also performed to the best of Wyle's abilities when the equipment is easily accessible without the possibility of damage. Hard drives, RAM memory, and other components are examined to verify that the components match the information found on the COTS equipment manufacturers' websites.

The equipment that the manufacturer submitted for testing is listed in Table 3-2. Each test element is included in the list of the equipment required for testing of that element including system hardware, general purpose data processing, communications equipment, and any required test instrumentation.

Table 3-2 Unity 3.2.0.0 Rev 3 Test Equipment

Equipment	Description	Serial Numbers
DS200 • Hardware v. 1.2 • Firmware v. 1.6.1.0	An optical scan paper ballot tabulator designed for use at the polling place level.	ES0108340178, ES0107380927, ES0107360007
Model 650 • Hardware v. 1.1 and 1.2 • Firmware v. 2.2.2.0	A high-speed, optical scan central ballot counter. During scanning, the Model 650 prints a continuous audit log to a dedicated audit log printer and can print results directly from the scanner to a second connected printer.	2406 8013
AutoMARK A100 • Hardware v. 1.0 • Firmware v. 1.3.2906	ADA Ballot Marking Device	AM0105490825
AutoMARK A200 • Hardware v. 1.1, and 1.3 • Firmware v. 1.3.2906	ADA Ballot Marking Device	AM0208470644

3.0 MATERIALS REQUIRED FOR TESTING (Continued)

3.2 Equipment (Continued)

Table 3-2 Unity 3.2.0.0 Rev 3 Test Equipment (Continued)

Equipment	Description	Serial Numbers
Ballot Box Hardware v. 1.2 & 1.3	Plastic Ballot Box	E076, E089, E099
Ballot Box Hardware v. 1.0, 1.1, & 1.2	Metal Box with Diverter	E015, E017
Server PC	Dell Optiplex GX260	7DOWL21
Server PC	Dell Precision T3500	15TPMN1
Client PC	Dell Optiplex 760	2HF3CK1
Ballot on Demand Printer	OKI C9650	AF85027113A0
Report Printer	HP LaserJet 4050N	USQX074394
Zip Disk	Used to store Model 650 results data	---
Headphones	Avid FV 60	HP-57936-1, HP-57936-2, HP-57936-3, HP-57936-4, HP-57936-5, HP-57936-6, HP-57936-7, HP-57936-8 and HP-57936-9

In order to perform the software witness and trusted builds, the equipment in Table 3-3 will be used.

Table 3-3 Unity 3.2.0.0 Rev 3 Voting System Build Machine Description

Equipment	Description	Serial Numbers
Dell Optiplex 760	6DCKJG1	Windows XP SP3 or Vista
Dell Keyboard – Model L100	CN0RH659735716B402JS	N/A
Dell Mouse – Model XN966	HS847130DLE	N/A
ACER Monitor – Model AL1716 P/N: ET 1716B.012	ETL460C005609012DCPY11	N/A
Dell Precision T3500	15TNMN1	Windows 7
Dell Keyboard – Model L100	CN0RH65965890660029T	N/A
Dell Mouse – Model DHY933	F0N002Y1	N/A

3.0 MATERIALS REQUIRED FOR TESTING (Continued)

3.2 Equipment (Continued)

Table 3-3 Unity 3.2.0.0 Rev 3 Voting System Build Machine Description (Continued)

Equipment	Description	Serial Numbers
Dell Optiplex GX110	20PW10B	QNX 4.22A
CPU Intel inside Xenon DELL	Dell 0T7570	Linux 6.2.5
Logitec keyboard (white) - Y-ST39	BTD40203069	---
Microsoft Intellimouse 1.3A PS/2 compatible	63618-OEM-3189502-1	---
Corsair Orbit PC	1112719 (D72500343200710)	---
WhiteSanport 17" Monitor model: H996 BBM	GK0M03C317000657	---
Logitec keyboard (white) - Y-SG13	MCT02201651	---
Microsoft Intellimouse 1.2A PS/2 compatible	63618-OEM-4593581-6	---
Acer LCD Monitor AL1716 P/N: ET 1716B.012	ETL 480C00580900290PY11	---
CPU Intel inside Xenon DELL	Dell 0T7570	Linux
Dell Monitor	8176324	N/A
Keyboard	CN-OW7658-37172-584-06MV	None
Mouse	HCD45048365	None
Dell PC Monitor	500120	None
Dell Precision T3500	15TNMN1	Linux

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3.0 MATERIALS REQUIRED FOR TESTING (Continued)

3.3 Test Support Materials

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

The test materials listed in Table 3-4 are required to support the Unity 3.2.0.0 Rev 3 System certification testing.

Table 3-4 System Test Support Materials

Test Material	Quantity	Make	Model
Security Seals	5000	Intab	800-0038R
Security Locks	20	E. J. Brooks	86022
	25	E. J. Brooks	6024
	50	American Casting Corp.	00561-03
	50	A. Rifkin	RIFSI
ES&S Pens	20	BIC	Grip Roller
Security Sleeves	7	ES&S	PS-S7-936-XX(1-7)
CF Card Reader	1	SanDisk	018-6305
Magnifier	3	---	---
Headphone Covers	30	---	---
Paddles (yes/no)	3	---	---
Transport Media (USB Flash Drives)	Delkin	512 MB Capacity	Wyle-assigned numbers: TM-XXX
	Delkin	4.0 GB Capacity	Wyle-assigned numbers: TM-XXX
	Delkin	8.0 GB Capacity	Wyle-assigned numbers: TM-XXX
	SanDisk	2.0 GB Capacity	Wyle-assigned numbers: TM-XXX
Compact Flash	SanDisk	512 MB Capacity	Wyle-assigned numbers: CF-XXX
	SanDisk	1.0 GB Capacity	Wyle-assigned numbers: CF-XXX
	SanDisk	2.0 GB Capacity	Wyle-assigned numbers: CF-XXX
	Toshiba	1.0 GB Capacity	Wyle-assigned numbers: CF-XXX
PCMCIA	Vikant	512 KB Capacity	Wyle-assigned numbers: PCMCIA-XXX

3.0 MATERIALS REQUIRED FOR TESTING (Continued)

3.4 Deliverable Materials

The materials listed in Table 3-5 are to be delivered as part of the Unity 3.2.0.0 Rev 3 System to the users.

Table 3-5 Deliverable Materials

Deliverable Material	Version	Description
AM	7.5.2.0	EMS
EDM	7.8.1.0	EMS
ESSIM	7.7.1.0	EMS
HPM	5.7.1.0	EMS
ERM	7.5.4.0	EMS
Log Monitor Service	1.0.0.0	EMS
AIMS	1.3.157	EMS
VAT Previewer	1.3.2906	EMS
DS200	Firmware 1.6.1.0; Hardware 1.2	Precinct ballot scanner
AutoMARK	Firmware 1.3.2906; Hardware 1.0, 1.1 and 1.3	Voter Assist Terminal
Model 650	Firmware 2.2.2.0; Hardware 1.1 and 1.2	Central ballot scanner
Headphones	Avid FV 60	Stereo headphones
Voting System Overview Unity 3.2.0.0 Rev 3	1.0	TDP Document
ES&S DS200 System Operations Procedures	Firmware 1.6.1.0 HV 1.2	TDP Document
ES&S AM System Operations Procedures	7.5.2.0	TDP Document
ES&S EDM System Operations Procedures	7.8.1.0	TDP Document
ES&S ERM System Operations Procedures	7.5.4.0	TDP Document
ES&S ESSIM System Operations Procedures	7.7.1.0	TDP Document
ES&S HPM System Operations Procedures	5.7.1.0	TDP Document

3.0 MATERIALS REQUIRED FOR TESTING (Continued)

3.4 Deliverable Materials (Continued)

Table 3-5 Deliverable Materials (Continued)

Deliverable Material	Version	Description
ES&S LogMonitor Service System Operations Procedures	1.0.0.0	TDP Document
ES&S M650 System Operations Procedures	Firmware 2.2.2.0; Hardware 1.1 and 1.2	TDP Document
Voting System Security Specification Unity 3.2.0.0 Rev 3	3.2.0.0 Rev 3	TDP Document
Jurisdiction Security Practices Template	1.0.0.1	TDP Document
Hardening the EMS PC Guide	1.0	TDP Document

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4.0 TEST SPECIFICATIONS

The certification testing of the Unity 3.2.0.0 Rev 3 System is to the configuration submitted in the EAC application ESS1201.

The Wyle-qualified personnel involved with certification testing performed on the manufacturer's voting system will follow Wyle's procedures for testing. Results are used to determine if the system has met and passed the specific test cases associated with those procedures based on EAC 2005 VVSG and EAC Testing and Certification Program Manual.

This test campaign is based on the previous test campaigns conducted for the ES&S Unity 3.2.0.0 System, which include Unity 3.2.0.0 Rev 1 and 2, and Unity 3.2.1.0. These reports can be found on the e EAC website at www.eac.gov. During these test campaigns, the ES&S Unity Systems were tested to, and found to be in conformance with the United States Federal Election Commission (FEC) 2002 Voting System Standards (VSS) and all applicable EAC 2005 Voluntary Voting Systems Guidelines (VVSG). Per Section 4.4.2.3 of the EAC Testing and Certification Program Manual, all testing on the modifications to the system will be tested to the 2005 VVSG; however, pending successful completion of this test campaign, the system will only be granted a 2002 VSS certification since the system, as a whole, will not be tested to the 2005 VVSG.

Below is a list of EAC Request for Interpretations (RFI) and Notice of Clarifications (NOC) that will be incorporated in the test campaign:

Interpretations

2010-08 EAC Decision on Calling Sequence

2010-07 EAC Decision on Module Length

2010-06 EAC Decision on DRE Accessibility Requirements and Other Accessible Voting stations

2010-05 EAC Decision on Testing of Modifications to a Certified System

2010-04 EAC Decision on Functional Requirements with Respect to Security

2010-03 EAC Decision on Database Coding Conventions

2010-02 EAC Decision on Coding Conventions

2010-01 EAC Decision on Voltage Levels and ESD Test

2009-06 EAC Decision on Temperature and Power Variation

2009-05 EAC Decision on T-Coil Requirements

2009-04 EAC Decision on Audit Log Events

2009-03 EAC Decision on Battery Backup for Central Count Systems

2009-02 EAC Decision on Alternate Languages

2009-01 EAC Decision on VVPAT Accessibility New

2008-12 EAC Decision on Ballot Marking Device/Scope of Testing

2008-10 EAC Decision on Electrical Fast Transient

2008-09 EAC Decision on Safety Testing

2008-08 EAC Decision on Automatic Bar Code Readers

2008-07 EAC Decision on Zero Count to Start Election

4.0 TEST SPECIFICATIONS (Continued)

Interpretations (Continued)

2008-06 EAC Decision on Battery Backup for Central Count

2008-05 EAC Decision on Durability

2008-04 EAC Decision on Supported Languages

2008-03 EAC Decision on OS Configuration

2008-02 EAC Decision on Battery Backup for Optical Scan Voting Machines

2008-01 EAC Decision on Temperature and Power Variation

2007-06 EAC Decision on Recording and Reporting Undervotes

2007-05 EAC Decision on Testing Focus and Applicability

2007-04 EAC Decision on Presentation of Alternative Language

2007-03 EAC Decision on Summative Usability Testing

2007-02 EAC Decision on Variable Names

2007-01 EAC Decision on Accessible Design

Notice of Clarifications

NOC 2011-01 – Clarification of De Minimis Change Determination Requirements Related to Data

NOC 2009-005 – Development and Submission of Test Plans for Modifications to EAC Certified Systems

NOC 2009-004 – Development and Submission of Test Reports

NOC 2009-003 – De Minimis Change Determination Requirement

NOC 2009-002 - Laboratory Independence Requirement

NOC 2009-001 - Requirements for Test Lab Development and Submission of Test Plans

NOC 2008-003 - EAC Conformance Testing Requirements

NOC 08-002 - EAC Mark of Certification

NOC 2008-001 - Validity of Prior Non-core Hardware Environmental and EMC Testing

NOC 2007-005 - Voting System Test Laboratory Responsibilities in the Management and Oversight of Third Party Testing

NOC 2007-004 - Voting System Manufacturing Facilities

NOC 2007-003 - State Testing Done in Conjunction with Federal Testing within the EAC Program

NOC 2007-002 - VSTL Work with Manufacturers Outside of Voting System Certification Engagements

NOC 2007-001 - Timely Submission of Certification Application

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4.0 TEST SPECIFICATIONS (Continued)

4.1 Requirements (Strategy of Evaluation)

The strategy for evaluating ES&S Unity 3.2.0.0 Rev 3 is to review and test all the modifications that were made to the DS200 and to ensure that all the concerns listed in the EAC Formal investigation report have been addressed and corrected. The primary focus of functional testing will be on the following key areas:

- Intermittent screen freezes, the system lockups and shutdowns which prevents the voting system from operating in the manner in which it was designed.
- Failure to log all normal and abnormal voting system events.
- Skewing of the ballot resulting in a negative effect on system accuracy.

In an effort to verify the full functionality, the following tests shall be performed on the DS200:

- Technical Data Package review to ensure all modifications are documented as applicable.
- A Physical Configuration Audit
- A Logic & Accuracy Test with the results being tallied by the EMS
- Security Testing
- Usability Testing
- Accessibility Testing
- Maintainability
- Telecommunications
- Volume and Stress Testing
- Functional Configuration Audit
- System integration test to ensure the DS200 and EMS are interoperable

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4.0 TEST SPECIFICATIONS (Continued)

4.1 Requirements (Strategy of Evaluation) (Continued)

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 Volume I Sections, along with the strategy for evaluation, are described below:

- **Section 2: Functional Requirements** – The requirements in this section will be tested during the FCA utilizing the "Wyle Baseline Test Cases" along with test cases specially designed for the ES&S Unity 3.2.0.0 Rev 3 System. The data input during these tests will be the predefined election definitions submitted as part of the Test Plan Package.
- **Section 3: Usability and Accessibility** – The requirements in this section will be tested during TDP and FCA. A combination of TDP review and Functional testing will be performed to verify these requirements are met.
- **Section 4: Hardware Requirements** – The requirements in this section will be evaluated utilizing data obtained during prior VSTL test campaigns, which include the Unity 3.2.1.0. Maintainability tests will be performed on the DS200.
- **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 insure these requirements are met.
- **Section 6: Telecommunication** – The requirements in this section will be tested utilizing the Wyle Telecommunications Test Cases along with any necessary test cases specially designed for the Unity 3.2.0.0 Rev 3 system.
- **Section 7: Security Requirements** – The requirements in this section will be tested during source code review, FCA, and Security Tests.
- **Section 8: Quality Assurance (QA) Requirements** – The requirements in this section will be tested throughout the test campaign via various methods. TDP review will be performed on ES&S QA documentation to determine compliance to the EAC 2005 VVSG requirements and the requirements stated in the ES&S QA Program document. All source code will be checked to ensure that proper QA documentation has been completed. All equipment received for initial testing and follow up testing will be checked against ES&S documentation to ensure their QA process is being followed. Wyle personnel will complete the requirements of EAC 2005 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 ES&S's location or conduct an external evaluation utilizing equipment, documents and support information provided by ES&S during the test campaign.
- **Section 9: Configuration Management (CM) Requirements** – The requirements in this section will be tested throughout the test campaign. TDP review will be performed on the ES&S configuration management documentation to determine EAC 2005 VVSG compliance and to further determine whether ES&S is following its documented CM requirements within the TDP. Any anomalies will be formally reported to ES&S and the EAC. Wyle personnel will conduct an audit of the ES&S CM Program at the ES&S facility at the conclusion of the test campaign.

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4.0 TEST SPECIFICATIONS (Continued)

4.1 Requirements (Strategy of Evaluation) (Continued)

Wyle personnel shall maintain a test log of the procedure(s) employed. This log identifies the system and equipment by model and serial number.

In the event that the project engineer deems it necessary to deviate from requirements pertaining to the test environment, the equipment arrangement and method of operation, the specified test procedure, or the provision of test instrumentation and facilities, the deviation shall be recorded in the test log. (A discussion of the reasons for the deviation and the effect of the deviation on the validity of the test procedure shall also be provided and approved.)

The selected Wyle Operating Procedures (WoP's) for this project are listed below together with the identification and a brief description of the hardware and software to be tested and any special considerations that affect the test design and procedure.

The specific Wyle WoP's to be used for testing include the following:

- WoP 1 Operations Status Checks
- WoP 2 Receipt Inspection
- WoP 3 Technical Data Package Review (limited)
- WoP 4 Test Plan Preparation– ES&S Unity Version 3.2.0.0 Rev. 3 *(This document)*
- WoP 5a-d Source Code Review
- WoP 6 Security
- WoP 7 Trusted Build
- WoP 24 1-1g Usability
- WoP 24 2-2h Accessibility
- WoP 25 Physical Configuration Audit
- WoP 26 Functional Configuration Audit
- WoP 27 Maintainability
- Wop 28 Availability
- WoP 30 System Integration Test
- WoP 34 Test Report
- Wop 40 System Level Stress Test
- WoP 41 Logic & Accuracy

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4.0 TEST SPECIFICATIONS (Continued)

4.2 Hardware Configuration and Design

The ES&S Unity 3.2.0.0 Rev 3 System is a paper-based precinct voting system using touch-screen and scan technology to scan and validate ballots, provide voter-assisted ballots, and tabulate precinct results. The ES&S Unity 3.2.0.0 Rev 3 System consists of an election management system (an application suite consisting of AM, AIMS, EDM, ESSIM, HPM, ERM, Log Monitor Service, and VAT Previewer); the DS200 is a voting device that scans, validates and tabulates voter ballots at the precinct level; the AutoMARK Model A100 or A200 voter assisted terminal is used to facilitate special needs voters, and the M650 high-speed optical scan is a central ballot counter.

In the ES&S Unity 3.2.0.0 Rev 3 System all EMS functions are handled by proprietary software running on COTS PC/Laptops and Servers. Wyle has determined that these COTS PC/Laptops and Servers are not subject to the hardware test requirements per the EAC 2005 VVSG per "2007-05 Decision on Testing Focus and Applicability". The provided PC/Laptops documented in Section 3, Materials Required For Testing. all contained CE, UL, and FCC labeling.

4.3 Software System Functions

The strategy for this test campaign will be to test the modifications of the software incorporated into the system and ensure the full functionality of the DS200 and the interface with the previously certified EMS. As a result of the issues identified, the EAC has instructed Wyle to perform full regression testing on the DS200 for all functional requirements set forth in the EAC 2005 VVSG. All changes to the DS200 firmware from Unity 3.2.0.0 (baseline) to the final submission for 3.2.0.0 Rev 3 will be evaluated to determine that all modifications are in conformance with the VVSG and to ensure that all the updated functionality of the code is tested.

4.4 Test Case Design

Wyle 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." Wyle's test approach is to use both "Verification" and "Validation" to some degree. There are four basic levels of testing in the V-Model Life Cycle: Component, Integration, System, and Acceptance. Wyle will be evaluating the ES&S Unity 3.2.0.0 Rev 3 to all four levels.

4.4.1 Hardware Qualitative Examination Design

Wyle performed a hardware qualitative examination to assess if the testing was performed under the guidelines of the EAC program, if the tests were performed per the EAC 2005 VVSG and the scope of the engineering changes implemented since test performance. Based on this examination, Wyle is accepting these results and waiving all hardware testing.

ES&S submitted COTS PCs and Laptops to be used during the test campaign that were labeled CE, UL, and FCC compliant. The supporting documentation for this testing has not been submitted to Wyle at this time. During this test campaign, Wyle will review this documentation to ensure that it meets the requirements of the EAC 2005 VVSG.

4.4.1.1 Mapping of Requirements to Specific Interfaces

Please refer to the EAC online program requirements matrix.

4.0 TEST SPECIFICATIONS (Continued)

4.4 Test Case Design

4.4.2 Software Module Test Case Design and Data

Wyle implements Component Level Testing during the FCA for each component and subcomponent, exercising the functionality of each component and subcomponent as designed and documented. Wyle will utilize limited structural-based techniques (white-box testing) mainly in the area of Source Code Review, Compliance Builds, Security Testing and TDP Review. Wyle will depend heavily on specification-based techniques (black-box testing) for the individual software components. The most common specification-based techniques applied to the ES&S Unity 3.2.0.0 Rev 3 System during the software testing portion of testing will be "equivalence partitioning" and "boundary value testing."

- "Equivalence Partitioning" is a technique to select a value within a given range and at least one value outside the given range as applied to a software function. This technique will be used for numeric ranges as well as non-numeric ranges throughout FCA to test for normal and abnormal conditions.

- "Boundary Value Testing" is a techniques used to identify minimum and maximum boundary errors as applied to software functions. This technique will be used for numeric ranges as well as non-numeric ranges throughout FCA to test for normal and abnormal conditions.

Wyle will test all applicable test cases with known result for each test case. The Accept/Reject criteria for Component Level Testing will be based on the expected result. Results are accepted if no errors are detected or if an error is encountered but the system continues to operate and it is determined that the root cause does not affect testing. Results are rejected if an error is found and the system is too unstable to continue or engineering analysis determines the root cause could affect further system testing.

Wyle will document the error and track the error through resolution. Wyle will not continue to the next level of testing until all documented errors are resolved in order to minimize additional errors further along in the test campaign. Engineering analysis will be performed to determine what effect the resolution has on the component. Wyle shall make a determination whether regression testing will be sufficient or a complete re-test is necessary. Upon this determination all parties involved shall be advised of the supported decision prior to moving forward with testing.

4.4.3 Software Functional Test Case Design and Data

Wyle implements Integration Level Testing primarily focusing on the interface between components and applications. The test approach to be used for the ES&S Unity 3.2.0.0 Rev 3 System 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 Wyle at the Integration Level is "Use Case." The actors that have been identified to use the ES&S Unity 3.2.0.0 Rev 3 System are the following:

- Election Administrator – the actor with responsibility of entering the election definition with translation 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 DS200 and AutoMARK VAT units. This actor also runs diagnostic test and maintains the units.
- Poll Worker- the actor at the precinct location to set up and close down the DS200 and the AutoMARK VAT on Election Day.

4.0 TEST SPECIFICATIONS (Continued)

4.4 Test Case Design (Continued)

4.4.3 Software Functional Test Case Design and Data (Continued)

- 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 used 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.

If an error occurs between data interfaces or in the process flow, an engineering analysis will be performed to determine if the error is data, process, or tester error. The ACCEPT/REJECT criteria for Integration Level testing is whether the components and applications interface using the documented process for each actor. If there is an error interfacing between components, the error will be documented and tracked through resolution. 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.

4.4.4 System Level Test Case Design

During System Level Testing, Wyle will test the ability of proprietary software, proprietary hardware, proprietary peripherals, COTS software, COTS hardware, and COTS peripherals to function as a complete system in a configuration of the systems intended use. The ES&S Unity 3.2.0.0 Rev 3 System is intended to support both large and small jurisdictions. Wyle's approach for the ES&S Unity 3.2.0.0 Rev 3 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 is whether the system can continue in testing. The two scenarios are: Accept or Reject. 'Accept' is either 1) if no errors are found, or 2) if an error is encountered but the system continues to operate and engineering analysis determines that the root cause does not affect testing. 'Reject' is either 1) if the system is too unstable to continue or 2) engineering analysis determines the root cause could affect further testing. If an error occurs during System Level Testing, the error will be documented. If the ES&S Unity 3.2.0.0 Rev 3 System is able to recover and continue, the test will continue. If the error causes the system to become unstable, the test will be halted. All errors documented during System Level Testing will be tracked through resolution. Engineering analysis will be performed to determine what effect the resolution has on the system. A determination will be made by Wyle's senior engineering staff whether regression testing will be sufficient or a complete re-test is necessary.

4.0 TEST SPECIFICATIONS (Continued)

4.4 Test Case Design (Continued)

4.4.4 System Level Test Case Design (Continued)

Wyle implements 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 pre-testing, hardware testing, software testing, functional testing, security testing, volume testing, stress testing, telecommunication testing, usability testing, accessibility testing, and reliability testing activities will be combined to ensure all requirements that are supported by the ES&S Unity 3.2.0.0 Rev 3 System in the EAC 2005 VVSG have been tested. All requirements will be checked against the test data to ensure the EAC 2005 VVSG requirements are met. Items not supported by the ES&S Unity 3.2.0.0 Rev 3 System will be documented. Any issues documented during testing will be resolved or annotated in the test report.

Wyle will test every EAC 2005 VVSG requirement supported by the ES&S Unity 3.2.0.0 Rev 3 System. Wyle will report all issues discovered during this test campaign to ES&S and the EAC. The EAC has the final decision as to whether the system meets all the requirements for an EAC certified system. The ACCEPT/REJECT criteria for Acceptance Level testing is whether the data for the test campaign supports a recommendation for certification by the EAC or not. If Wyle determines there is not enough data to ensure a requirement was met, the test plan will be altered and further testing will be done.

4.5 Security Functions

The strategy for evaluating ES&S Unity 3.2.0.0 Rev 3 will be based on the following:

1. Verify that the changes to the DS200 do not affect security.

2. Wyle will utilize a combination of functional testing, system integration testing and source code review to evaluate the DS200 and EMS. The following areas are not applicable to the DS200 and; therefore, are not included in the scope of the security testing:

    - Use of Public Networks
    - Wireless Communication

3. Testing will be performed by Wyle personnel and a qualified-security expert. Wyle will report all findings to ES&S for comment and/or resolution. A report containing all findings will be issued to the EAC as an addendum to the final test report.

4.6 TDP Evaluation

Wyle-qualified personnel will perform a comprehensive review of the ES&S TDP to determine compliance to the EAC 2005 VVSG, EAC requirements, and ES&S-specific requirements. The focus of this review will be on any modifications made to the TDP documents due to the changes in firmware from 3.2.1.0 and 3.2.0.0 Rev 3.

4.0 TEST SPECIFICATIONS (Continued)

4.6 TDP Evaluation (Continued)

During the TDP review process, each document will be reviewed for completeness, clarity, and correctness, and continuity between the TDP documents. The review results will be formally reported to ES&S for resolution. If a revised document is received, it will be re-reviewed as discussed in this section. The TDP will be continuously 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, an Anomaly Report will be issued listing the non-compliant items on a document-by-document basis. A listing of all documents contained in the ES&S Unity 3.2.0.0 Rev 3 System TDP is provided in Table 4-1.

Table 4-1 TDP Documents

Unity 3.2.0.0 Rev 3 TDP Documents	Version	Doc #	Document Code
Voting System Overview	1.0	01-01	U3200r3_OVR00
System Functionality Description			
System Functionality Description – Audit Manager	1.0	02-01	U3200r3_SFD00_AM
System Functionality Description – Election Data Manager	1.0	02-02	U3200r3_SFD00_EDM
System Functionality Description – ES&S Ballot Image Manager	1.0	02-03	U3200r3_SFD00_ESSIM
System Functionality Description – Hardware Programming Manager	1.0	02-04	U3200r3_SFD00_HPM
Unity 3.2.0.0 Rev 3 TDP Documents	**Version**	**Doc #**	**Document Code**
System Functionality Description – Election Reporting Manager	1.0	02-05	U3200r3_SFD00_ERM
System Functionality Description – DS200	1.0	02-06	U3200r3_SFD00_DS200
System Functionality Description – Model 650	1.0	02-07	U3200r3_SFD00_M650
System Functionality Description – Log Monitor Service	1.0	02-08	U3200r3_SFD00_Log Monitor
System Hardware Specification			
System Hardware Specification – DS200	1.0	03-01	U3200r3_SHS00_DS200
System Hardware Specification – Model 650	1.0	03-02	U3200r3_SHS00_M650

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4.0 TEST SPECIFICATIONS (Continued)

4.6 TDP Evaluation (Continued)

Table 4-1 TDP Documents (Continued)

Software Design and Specification			
Software Design and Specification – Audit Manager	1.0	04-01	U3200r3_SDS00_AM
Software Design and Specification – Election Data Manager	1.0	04-02	U3200r3_SDS00_EDM
Software Design and Specification – ES&S Ballot Image Manager	1.0	04-03	U3200r3_SDS00_ESSIM
Software Design and Specification – Hardware Programming Manager	1.0	04-04	U3200r3_SDS00_HPM
Software Design and Specification – Election Reporting Manager	1.0	04-05	U3200r3_SDS00_ERM
Software Design and Specification – DS200	1.0	04-06	U3200r3_SDS00_DS200
Software Design and Specification – Model 650	1.0	04-07	U3200r3_SDS00_M650
Software Design and Specification – Log Monitor Service	1.0	04-09	U3200r3_SDS00_LogMonitor
System Security Specification			
System Security Specification	4.0.0.0	05-01	U3200r3_SSS00
SS Appendix – Jurisdiction Security Procedures Template	1.0.0.1	05-02	U3200r3_SSS01_JSP Template
SSS Appendix – System Hardening Procedures	1.0	05-02	U3200r3_SSS08_Hardening Procedures
System Test/Verification Specification			
Unity 3.2.0.0 Rev 3 System Test Plan	1.0	06-01	U3200r3_STP00
System Test Cases – Audit Manager	3.13.2009	06-02	U3200r3_TC00_AM
System Test Cases – Election Data Manager	3.31.2011	06-03	U3200r3_TC00_EDM
System Test Cases – ES&S Ballot Image Manager	3.31.2011	06-04	U3200r3_TC00_ESSIM
System Test Cases – Hardware Programming Manager	3.31.2011	06-05	U3200r3_TC00_HPM
System Test Cases – Election Reporting Manager	3.31.2011	06-06	U3200r3_TC00_ERM
System Test Cases – DS200	1.13.2011	06-07	U3200r3_TC00_DS200
System Test Cases – M650	10.17.2008	06-08	U3200r3_TC00_M650
System Test Cases – DS200 SanDisk USB Media	6.1.2009	06-09	U3200r3_TC00_DS20001_SanDisk USBMedia

4.0 TEST SPECIFICATIONS (Continued)

4.6 TDP Evaluation (Continued)

Table 4-1 TDP Documents (Continued)

Systems Operations Procedures			
System Operations Procedures – Audit Manager	1.13.2012	07-01	U3200r3_SOP00_AM
System Operations Procedures – Election Data Manager	1.13.2012	07-02	U3200r3_SOP00_EDM
System Operations Procedures – ES&S Ballot Image Manager	1.13.2012	07-03	U3200r3_SOP00_ESSIM
System Operations Procedures – Hardware Programming Manager	1.13.2012	07-04	U3200r3_SOP00_HPM
System Operations Procedures – Election Reporting Manager	1.13.2012	07-05	U3200r3_SOP00_ERM
System Operations Procedures – DS200	1.13.2012	07-06	U3200r3_SOP00_DS200
System Operations Procedures – Model 650	1.13.2012	07-07	U3200r3_SOP00_M650
Systems Operations Procedures-Log Monitor Service	1.13.2012	07-09	U3200r3_SOP00_LogMonitor
System Maintenance Manuals			
System Maintenance Manual – DS200	1.13.2012	08-01	U3200r3_SMM00_DS200
System Maintenance Manual – Model 650	1.13.2012	08-02	U3200r3_SMM00_M650
Personnel Deployment			
Personnel Deployment and Training Recommendations	1.0	09-01	U3200r3_TRN00_Training Requirements
Training Manual – Election Data Manager	2.20.2009	09-02	U3200r3_TRN00_EDM_TrainingManual
Training Manual – ES&S Ballot Image Manager	2.20.2009	09-03	U3200r3_TRN00_ESSIM_TrainingManual
Training Manual – Hardware Programming Manager	2.20.2009	09-04	U3200r3_TRN00_HPM_TrainingManual
Training Manual – Election Reporting Manager	6.22.2009	09-05	U3200r3_TRN00_ERM_ PreElection
Training Manual – Election Reporting Manager	6.22.2009	09-05	U3200r3_TRN00_ERM_ Election

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4.0 TEST SPECIFICATIONS (Continued)

4.6 TDP Evaluation (Continued)

Table 4-1 TDP Documents (Continued)

Configuration Management Plan			
ES&S Configuration Management Plan	2.0	10-1	U3200r3_CMP00
CM Plan Appendices	---	10-2	Multiple Documents
QA Program			
Quality Assurance Program - Manufacturing	1.0	11-01	U3200r3_QAP00_MNF
Quality Assurance Program – Software and Firmware	1.0	11-02	U3200r3_QAP00_SWF
QAP Program Appendices	---	11-03	Multiple Documents
System Change Notes			
Unity 3.2.0.0 Rev 3 System Change Notes	29.0	---	---
Other VSTL Reports			
ES&S Ballot Production Guide	12.06.2011	13-01	U3200r3_OVSTR_BallotProductionGuide

4.7 Source Code Review

The strategy for evaluating ES&S Unity 3.2.0.0 Rev 3 will be based on the three previously identified modifications to the system. All changes from Unity 3.2.1.0 (ESSUnity3210) will be reviewed to the EAC 2005 VVSG coding standards and the manufacturer-supplied coding standards.

This verification shall examine all functionality performed by the new modules; all functions performed by modified modules; functionality that is accomplished by using any interfaces to new modules or that shares inputs or outputs from new modules; all functionality related to vote tabulation and election results reporting; and all functionality related to audit trail maintenance. Wyle's senior level Project Engineer will then determine based upon the significance of any noted issues (individually or cumulatively) with existing software interfaces modules whether system integration testing with all components of the ES&S Unity 3.2.0.0 Rev 3 System may be required.

As the source code is received, an SHA1 hash value will be created for each source code file. The source code team will then conduct a visual scan of every line of source code for an initial review and every line of modified source code for a re-review for all languages other than Java. For applications written in Java, the vendor will have the option of choosing a traditional review or an automated source review. This is done to identify any violation of EAC 2005 VVSG coding standards or manufacturer-supplied coding standards. Each identified violation will be recorded by making notes of the standards violation along with directory name, file name, and line number. A technical summary report of all identified standards violations will be sent to ES&S for resolution. ES&S will then correct all standards violations and re-submit the source code for re-review. This process will be repeated as many times as necessary, until all identified standards violations are corrected. All reports will be included in an anomaly report for source code and submitted to the EAC and included in the final test report.

4.0 TEST SPECIFICATIONS (Continued)

4.7 Source Code Review (Continued)

A "Compliance Build" will be built by Wyle from the reviewed source code using the Compliance Build Procedure to build iterative builds throughout the test campaign. This process follows the documented procedure in the EAC Testing and Certification Program Manual, Version 1.0, effective date January 1, 2007 with two exceptions: The image products will not be submitted to the EAC, and no manufacturer representative will be required to be present or on-site for these builds. The final step in the source code review will be to create a "Trusted Build" from the reviewed source code.

The "Trusted Build" follows the steps below:

- Clean the build machine
- Retrieve the compliant source code
- Retrieve the installation media for OS, compilers, and build software
- Construct the build environment
- Create digital signatures of the build environment
- Load the compliant source code into the build environment
- Create a digital signature of the pre build environment
- Create a disk image of the pre-build environment
- Build executable code
- Create a digital signature of executable code
- Create a disk image of the post-build environment
- Build installation media
- Create a digital signature of the installation media
- Install executable code onto the system to validate the software/firmware
    - Deliver source code with digital signature, disk image of pre-build environment with digital signatures, disk image of post-build environment with digital signatures, executable code with digital signatures, and installation media with signatures to EAC Approved Repository.

The "Trusted Build" for the ES&S Unity 3.2.0.0 Rev 3 System includes source code, data, and script files, in clear text form. The build also includes COTS software on commercially available media, COTS software downloaded by the VSTL, COTS software verified by digital signature from the software supplier, and picture and sound files in binary format provided by ES&S. The first step of the process is to clean the hard drives by writing zeros to every spot on the hard drive, so the drive is cleared of existing data. The operating system will then be loaded and the applications from the VSTL reviewed source along with the VSTL verified COTS software will be built. The final step is installing the applications on the hardware.

4.0 TEST SPECIFICATIONS (Continued)

4.8 QA and CM System Review

Both the ES&S QA Plan and CM Plan will be reviewed to determine compliance with EAC 2005 VVSG Volume II Section 2, and Volume I Sections 8 and 9, EAC stated requirements, and with the requirements of the internal ES&S documentation. Also, the ES&S TDP documentation package will be reviewed to determine if the ES&S QA Plan and the CM Plan are being followed. The results of the TDP review will be entered on a spreadsheet as previously described in Section 4.6 of this test plan. The results of the TDP review, including the QA and CM compliance results will also be included in the final Test Report.

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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 will be listed on the Instrumentation Equipment Sheet for each test. The output test data will be recorded in an appropriate manner as to allow for data analysis. System logs will be analyzed during the test campaign to determine if any issues were recorded on the system that were not observed during the testing process. For source code and TDP reviews, results will be compiled in output reports and submitted to ES&S for resolution.

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

5.2 Test Data Criteria

Wyle will evaluate all test results against the ES&S-provided technical documentation for the Unity 3.2.0.0 Rev 3 System and the requirements set forth in the EAC 2005 VVSG. The Unity 3.2.0.0 Rev 3 System shall be evaluated for its performance against the EAC 2005 VVSG. The acceptable range for system performance and the expected results for each test case shall be derived from the Unity 3.2.0.0 Rev 3 System documentation and the 2005 VVSG. Per the EAC 2005 VVSG, these parameters shall encompass the test tolerances, 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, and 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 Wyle Operating Procedures and Test Cases. Results will also be recorded real-time in engineering log books.

5.4 Test Operation Procedures

Wyle personnel will apply specific test cases to be conducted on this project. Each test case is modified to meet the needs of a specific requirement and function for the ES&S Unity 3.2.0.0 Rev 2. All steps are outlined in this process to include critical test data. The real-time results during testing are recorded in a Wyle Test Control Record.

Any test failures shall be recorded on the Wyle Notice of Anomaly form (Wyle Form No. WH1066). These anomalies shall be reported to the manufacturer and the EAC.

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6.0 TEST PROCEDURES 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 Wyle Huntsville, AL facility unless otherwise annotated. Hardware environmental non-operating (storage) and operating testing will be conducted utilizing an adequately sized environmental test chamber or dynamic 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 Wyle Laboratories' 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: 25°C ± 10°C (77°F ± 18°F)
- Relative Humidity: 20 to 90%
- Atmospheric Pressure: Local Site Pressure

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

- Time ± 5%
- Temperature ± 3.6°F (2°C)
- Vibration Amplitude ± 10%
- Vibration Frequency ± 2%
- Random Vibration Acceleration
  - 20 to 500 Hertz ± 1.5 dB
  - 500 to 2000 Hertz ± 3.0 dB
- Random Overall grms ± 1.5 dB
- Acoustic Overall Sound Pressure Level +4/-2 dB

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6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.2 Test Set-Up

All voting machine equipment (hardware and software) shall be received and documented utilizing Wyle Receiving Ticket (WL-218, Nov'85) and proper QA procedures. When voting system hardware is received, Wyle Shipping and Receiving personnel will notify Wyle QA personnel. With Wyle 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, photographs shall be taken, and the ES&S Representative shall be notified. Wyle 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 ES&S Representative for resolution. TDP items, including all manuals, and all source code modules received will be inventoried and maintained by the Wyle Project Engineer assigned to testing.

For test setup, the system will be configured as would for normal field use. This includes connecting all supporting equipment and peripherals. Wyle personnel will properly configure and initialize the system, and verify that it is ready to be tested, by following the procedures detailed in the Unity 3.2.0.0 Rev 3 System technical documentation. Wyle will develop an Operational Status Check to be performed prior to and immediately following each hardware test. Wyle will develop the system performance levels to be measured during operational tests.

Wyle has developed eight election definitions that could 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.

Logic and Accuracy

The logic and accuracy test insures 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. For telecommunications the test must exercise that the DS200 can transmit results accurately to Election Reporting Manager (ERM). Ballots will be scanned into the DS200 and the results from both the results printout and the USB stick will be verified with received results in Election Reporting Manager (ERM). A variety of elections with different data and size will be transmitted.

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6.0 TEST PROCEDURES AND CONDITIONS (CONTINUED)

6.2 Test Set-Up (Continued)

General Election: GEN-01

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 fifteen 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.

- 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: 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

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. Test Pattern 8 was chosen for audio input in an alternative language because it is a basic voting pattern using an ADA device. Test pattern 9 was chosen for audio input to demonstrate support for write-in voting using an ADA device. Test Pattern 3 was chosen for Spanish language input because it is a basic vote pattern using Spanish. Test Pattern 10 was chosen for Spanish language input because it exercises write-in using Spanish.

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6.0 TEST PROCEDURES AND CONDITIONS (Continued))

6.2 Test Set-Up (Continued)

General Election: GEN-02

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.

- 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: Yes
- Provisional or challenged ballots: No
- Early Voting: Yes

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 election will be an early voting election with at least one machine running all precincts. Voting options for overvoting and undervoting will be exercised. Ballots 7 and 16 were selected for Spanish based language input. Ballots 13 and 17 were selected for casting of ballot using the ADA Audio capability.

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6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.2 Test Set-Up (Continued)

General Election: GEN-03

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 two languages, support for common voting variations, and audio support for at least three languages and an ADA binary input device.

- 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

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. Test patterns 3 and 4 were chosen for input in the Spanish language because they are a basic voting pattern with a write-in. Test patterns 5 and 6 were chosen for audio input using the Spanish language to demonstrate support for write-in voting using an ADA device with and alternative language. Test pattern 7 was chosen for character-based language input because it is a basic vote pattern using Chinese. Test pattern 8 was chosen for character-based language using an ADA device to demonstrate support for character-based ADA device support. Test pattern 9 was chosen for binary input to show support for ADA binary input device. Test pattern 10 was chosen for binary input using ADA audio deceive to show support for binary input and ADA support.

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6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.2 Test Set-Up (Continued)

Primary Election: PRIM-01

An open primary election in two precincts, containing thirty contests compiled into five ballot styles. Each ballot style contains six contests. This election was designed to functionally test an open primary with multiple ballot styles, support for two languages, and support for common voting variations.

- 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: 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

This election designed to functionally test an open primary with multiple ballot styles, support for two languages, and support for common voting variations. Test patterns 5 and 18 are input in an alternative language. Test patterns 8 and 18 are input using an ADA audio device. These patterns were select to exercise the write-in functionality in a primary election.

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6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.2 Test Set-Up (Continued)

Primary Election: PRIM-02

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.

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

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 election will be an open primary election with one machine running for each precinct. Voting options for Over-voting, Under-voting and write-in voting will be exercised. Ballots 5 and 18 were selected for Spanish based language input. Ballots 8 and 17 were selected for casting of ballot using the ADA Audio capability.

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6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.2 Test Set-Up (Continued)

Primary Election: PRIM-03

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 parties' ballots. 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 three languages and an ADA binary input device.

- 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

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. Test patterns 3 and 4 were chosen for input in the Spanish language because it is a basic voting pattern with a write-in. Test patterns 5 and 6 were chosen for audio input using the Spanish language to demonstrate support for write-in voting using an ADA device with and alternative language. Test pattern 7 was chosen for Ideographic based language input because it is a basic vote pattern using Chinese. Test pattern 8 was chosen for character based language using an ADA device to demonstrate support for Ideographic based ADA device support. Test pattern 9 was chosen for binary input to show support for ADA binary input device. Test pattern 10 was chosen for binary input using ADA audio deceive to show support for binary input and ADA support.

Wyle shall develop three special test cases and election definitions that will be used during the analysis phase of ballot skew, intermittent screen freeze, and logging requirements.

6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.3 Test Sequence

The components of the Unity 3.2.0.0 Rev 3 System will undergo all applicable tests in the EAC 2005 VVSG. The following sections provide a list of each test, a brief description of each, and a location of each test. Wyle will utilize a combination of functional testing, source code review, and TDP reviews to evaluate the system performance. The list of tests is not in a specific sequence.

6.3.1 Hardware Test Descriptions

The majority of the hardware tests have previously been performed during prior VSTL test campaigns. Maintainability will be performed as part of this test campaign due to the changes made within the DS200 firmware and TDP documentation.

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.

Table 6-1 Unity 3.2.0.0 Rev 3 System Hardware Test Sequence

Test	Description	Procedure	Test Level	Specimen
Maintainability	Tests the ease in which preventative and corrective maintenance actions can be performed based on design, software, and documentation.	WoP 27	Component & System	DS200

6.3.2 Software Test Description

The software tests include the following:

Source Code Compliance Review – Wyle Laboratories 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 Volumes I and II.

Compliance Build of the Unity 3.2.0.0 Rev 3 System Software, Firmware, and Utilities– Before testing can begin a compliance build of all the applications will be constructed by Wyle personnel using the build environment, build documentation and reviewed source code. This is to insure the software being tested is constructed from the same source code that was reviewed.

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6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.3 Test Sequence (Continued)

6.3.2 Software Test Description (Continued)

COTS Source Code Review – Unmodified, general purpose COTS non-voting software (e.g., operating systems, programming language compilers, data base management systems, and Web browsers) is not subject to the detailed examinations specified in this section. However, Wyle Laboratories personnel will examine such software to confirm the specific version of software being used against the design specification to confirm that the software has not been modified. The Portions of the COTS software that have been modified by the manufacturer in any manner are subject to review. Unmodified COTS software is not subject to code examination. However, source code generated by a COTS package and embedded in software modules for compilation or interpretation will be provided in human readable form to Wyle Laboratories. Wyle Laboratories personnel may inspect COTS source code units to determine testing requirements or to verify the code is unmodified.

Wyle Laboratories 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. Otherwise, the COTS source code is not subject to the full-code review and testing. For purposes of code analysis, the COTS units shall be treated as unexpanded macros.

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

Error Recovery Test – This will be tested to ensure that unit is capable of recovering from a non-catastrophic failure of a device, or from any error or malfunction that is within the operator's ability to correct and restoration of the device gracefully from the failures. Testing will include powering units off while operating, disconnecting various cables and components to ensure operation once restored.

Security Source Code Review – The security source code review is a detailed review of the functionality of the source code that has been submitted. A manual line by line review will be the utilized, which can be augmented by an automated analysis of the source code.

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.

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6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.3 Test Sequence (Continued)

6.3.2 Software Test Description (Continued)

Table 6-2 Unity 3.2.0.0 Rev 3 System Software Test Sequence

Test	Description	Procedure	Test Level	Specimen
Compliance Source Code Review (Pre-testing Activity)	Source code review for compliance	WHVS07.2 WOP 5a	Component	Source Code
Compliance Build	Using the build documents and source code to construct the EMS	WHVS07.3 WOP 25	Component	Source Code
Source Code COTS Review	Source code review to examine 3rd party products for modification and versions	WHVS07.2 WOP 5d	Component	COTS Source Code
Baseline OS	RFI 2008-03 OS Configuration	WHVS07.3 WOP 25	Component	NIST SCAP FDCC Checklist
Source Code Functional Review	Source code review for functionality and high level software design	WHVS07.2 WOP5b	Component & Integration	Source Code
Source Code Security Review (manual – automated)	Source code review for specific security concerns augmented by an automated review	WHVS07.2 WOP5d WOP 6a	Component & Integration	Source Code
Trusted Build	Creation and installation of the final system software	WHVS07.6 WoP 7 WoP 7a	Component	System software

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6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.3 Test Sequence (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
- Review drawings, specifications, technical data, and test data associated with system hardware, if non-COTS, 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 for the TDP. In addition to functioning according to the manufacturer's documentation, tests will be conducted to insure all applicable EAC 2005 VVSG requirements are met.

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.

Security Test – The security test is designed and performed to test the capabilities of the voting system against the requirements defined in Volume , Section 7. These procedures shall focus on the ability of the system to detect, prevent, log, and recover from a broad range of security risks identified. This test will also examine system capabilities and safeguards claimed by ES&S in the TDP to go beyond these risks. The range of risks tested is determined by the design of the system and potential exposure to risk.

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6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.3 Test Sequence (Continued)

6.3.3 System Testing (Continued)

Telecommunication Test – The telecommunication test focuses on system hardware and software function and performance for the transmission of data that is used to operate the system and report election results. This test applies to the requirements for Volume I, Section 6 of the EAC 2005 VVSG.

Volume/Stress/Reliability – Tests to investigate the system's response to conditions that overload the system's capacity to process, store, and report data. The test parameters will focus on the system 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.

Each sub-component will be subjected to the test as outlined in the EAC 2005 VVSG as follows:

- The EMS shall be subjected to overload conditions such as processing more than the expected number of ballots/voters per precinct and processing more than expected number of precincts.
- The DS200 shall be subjected to ballot processing at the high volume rates at which the equipment can be operated to evaluate software response to hardware-generated interrupts and wait states.

Wyle will verify the audit log records for error and exception activity to verify proper documentation and recovery action for all functional tests performed. A details listing of all audit log entries shall be provided by ES&S. During testing, audit log entries will be compared to this list to ensure that all expected events were 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.

Logic and Accuracy – The logic and accuracy test insures that each component of the voting system (DS200) 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 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.

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6.0 TEST PROCEDURES AND CONDITIONS (Continued)

6.3 Test Sequence (Continued)

6.3.3 System Testing (Continued)

System Integration – System Level certification test 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.

Regression Testing - Regression Testing will be performed on all system components to verify all firmware modifications.

Table 6-3 Unity 3.2.0.0 Rev 3 System Testing Sequence

Test	Description	Procedure	Test Level	Specimen	Election Data
Technical Data Package (TDP) Review	Documentation review for compliance, correctness, and completeness	WHVS07.1 WoP 3	Document	TDP package	---
Physical Configuration Audit	Audit hardware and software models and versions	WHVS07.3 WoP 25	Component & System	System hardware and software	---
Functional Configuration Audit	Functional testing to the system documentation and EAC 2005 VVSG requirements	WHVS07.4 WoP 26 WoP30a	Component & Integration	DS200	Gen-01 Prim-01
Telecommunication	Test of telecommunication technology of the system for accuracy and correctness	WHVS07.6 WoP 31	Integration & System	DS200	Gen-01 Volume & Stress
Volume, Stress, & Reliability Test	Test to investigate the system's response to larger amounts of data than it is expecting.	WoP 40	System	DS200	Volume and Stress Election
Security	Assess the system to the 2005 VVSG requirements and execute basic system security tests.	WHVS07.7 WoP 6 WoP 6a WoP 6b WoP 6c WoP 6d	Integration & System	DS200	Gen-01 Prim -01
Evaluation of DS200	Tests conducted to gain data for engineering analysis on skew, ballot marking and logging.	Wyle Test Cases	Component & System	System hardware and software	---
Logic and Accuracy	Test of accuracy to ~1.6 million ballot positions	WHVS07.9 WoP 41	System	DS200	L&A Election
System Integration Test	Test of all system hardware, software and peripherals.	WoP 30	System	System	Gen-01-03 Prim-01-03

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 the 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.

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APPENDIX A

TEST PROCEDURE DESCRIPTION

Test Procedure	Test Procedure Description
WoP 1 Operational Status Checks	When all tests, inspections, repairs, and adjustments have been completed, normal operation shall be verified by conducting an operational status check. During this process, all equipment shall be operated in a manner and under environmental conditions that simulate election use to verify the functional status of the system. Prior to the conduct of each of the environmental hardware non-operating tests, a supplemental test shall be made to determine that the operational state of the equipment is within acceptable performance limits.
WoP 2 Receipt Inspection	Documenting the receiving inspection of equipment.
WoP 3 Technical Data Package Review	Track all documentation changes through the technical data package.
WoP 4 Test Plan Preparation – ES&S Unity 3.2.0.0 Rev 2 (*This Document*)	Approval of this document shall fulfill the requirements of this procedure.
WoP 5 a-d Source Code Review	Wyle Laboratories 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 Volume I, Section 5.
WoP 6 a-d Security	The objectives of the security standards for voting systems are: • To protect critical elements of the voting system • To establish and maintain controls to minimize errors • To protect the system from intentional manipulation, fraud and malicious mischief • To identify fraudulent or erroneous changes to the voting system • To protect secrecy in the voting process Maintenance of a permanent record of original audit data that cannot be modified or overridden but may be augmented by designated authorized officials in order to adjust for errors or omissions (e.g., during the canvassing process).
WoP 7 a-c Trusted Build	To ensure that the system version tested is the correct version, Wyle Laboratories personnel will witness the build of the executable version of the system immediately prior to or as part of, the physical configuration audit. (Additionally, should components of the system be modified or replaced during the testing process, the accredited test lab shall require the manufacturer to conduct a new "build" of the system to ensure that the certified executable release of the system is built from tested components)
WoP 24 1-1g Usability	The requirements within this section are intended to set forth guidelines that will determine if a voting system can be used comfortably and efficiently by voters, and will provide voters with confidence that they have cast their votes correctly. Three broad principles motivate this section: 1. All eligible voters shall have access to the voting process without discrimination. 2. Each cast ballot shall accurately capture the selections made by the voter. 3. The voting process shall preserve the secrecy of the ballot.
WoP 24 2-2h Accessibility	The requirements within this section are intended to set forth guidelines that will determine if a voting system can be used comfortably and

Test Procedure	Test Procedure Description
	efficiently by voters, and will provide voters with confidence that they have cast their votes correctly. Three broad principles motivate this section: 1. All eligible voters shall have access to the voting process without discrimination. 2. Each cast ballot shall accurately capture the selections made by the voter. 3. The voting process shall preserve the secrecy of the ballot.
WoP 25 Physical Configuration Audit	The physical configuration audit will be limited to base lining the system to ensure all software and hardware used in testing is the software and hardware that was certified.
WoP 26 Functional Configuration Audit	There are various functional capabilities required of a voting system. Functional testing is performed to evaluate the effectiveness of a voting system to perform in its intended use and to determine if the voting system meets the minimum actions a voting system must be able to perform to be eligible for certification.
WoP 27 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 vendor and election officials have in place for preventing failures and for reacting to failures.
WoP 28 Availability	The availability of a voting system is defined as the probability that the equipment (and supporting software) needed to perform designated voting functions will respond to operational commands and accomplish the function.
WoP 30 System Integration Test	Test to ensure the DS200 firmware version 1.6.1.0 and the EMS Unity 3.2.0.0 Rev 3 components interface reliably and accurately.
WoP 34 Test Report	National Certification Test Report
WoP 40 Volume and Stress	Tests to investigate the system's response to transient overload conditions, processing more than the expected number of ballots/voter per precinct and processing more than expected number of precincts. Polling place devices shall be subjected to ballot processing at the high volume rates at which the equipment can be operated to evaluate software response to hardware-generated interrupts and wait states. Central counting systems shall be subjected to similar overloads, including, for systems that support more than one card reader, continuous processing through all readers simultaneously. This test is an attempt to overload the system's capacity to process, store, and report data.
WoP 41 Accuracy	The logic and accuracy test insures 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.