ES&S Unity 3.2.0.0 Revision 1 Voting System Certification Test Report for DS200 Modifications to the EAC Certified ESSUNITY3200

Prepared for
Election System and Software
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Omaha, NE 68137
EAC Application ESS1002
Version 1.0

iBeta Report Number: (V)2010-30Jun-001(A)

This report has been submitted to the EAC for review and is pending their acceptance. No certification number has been issued. When iBeta receives notification that the report is accepted, a revised version of the report will be issued. The Certification number will appear here and in the page headers. Any other revisions will be noted in the version history.

Trace to Standards	
NIST Handbook 150-22	
Section 5.5, 5.10.1 through 5.10.3, 5.10.5, 5.10.6	
VVSG	
Vol. #	**Section(s) #**
1	1.4.1
1	2, 3, 4, 5, 6, & 7
2	1.8.3
2	2, 3, 4, 5, & 6
2	7.4 & 7.5.
2	Appendix B

Test Results in this report apply to the voting system configuration tested. Testing of voting systems that have been modified may or may not produce the same test results. This report shall not be reproduced, except in full. iBeta Quality Assurance is accredited for Voting System Testing:

EAC Lab Code: 0702 - Effective thru 7/16/11

NVLAP LAB CODE 200749-0

2675 South Abilene Street, #300, Aurora, Colorado, 80014

Version History				
Ver #	Description of Change	Author	Approved by	Date
v.1.0	Initial release	Carolyn Coggins Jenn Garcia Steve Brown	Steve Pearson and John Lento	6/30/10

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1   Introduction

This report is submitted to the Election Assistance Commission (EAC) by iBeta Quality Assurance summarizing the federal VSTL Certification Testing of the v.1.4.3.0 firmware and hardware engineering changes to the IntElect DS200 Precinct Count Scanner (DS200) in the certified ESSUNITY3200 voting system submitted in EAC application ESS 1002.. The changes submitted in Unity 3.2.0.0 Revision 1 are tested to the *EAC Voluntary Voting System Guidelines (VVSG 2005)*. The purpose of this document is to provide an overview of the certification testing and findings. The *EAC Certificate of Conformance ES&S Unity 3.2.0.0,* found on the EAC website, provides the official description of the ESSUNITY3200 baseline. It includes the complete list of the systems names, major subsystems, and interfacing devices. The Unity 3.2.0.0 Revision 1 test environment is found in Section 3 Voting System Identification. Details of the changes are identified in the Section 4 Voting System Overview (Changes to ESSUnity3200)

The DS200 v.1.4.3.0 changes submitted in Unity 3.2.0.0 Revision 1 have also been submitted to the Unity 3.2.1.0 certification test effort. In the instances where tests or reviews for these certification efforts were identical iBeta used the common results.

This certification test effort included a Physical Configuration Audit (PCA) of the changes to the DS200:

- Technical Data Package (TDP) documents and the DS200 source code;
- Preparation of a Trusted Build from the reviewed source code; and
- Assessment of the engineer changes orders submitted for the DS200 hardware.

Additionally a Functional Configuration Audit (FCA) included:

- Review of the test documentation submitted by ES&S of the DS200 changes
- Development of a test plan and test cases for Functional and Hardware Electrical Testing of the DS200 changes and test results analysis.
- Managing the changed DS200 and the unchanged ESSUnity3200 baseline test configuration.

Certification testing was performed in compliance with the requirements of *VVSG 2005*, *Volume II National Certification Testing Guidelines*. The test record included all test executions and reviews. These contained the record of requirements completed, deficiencies noted, reports to ES&S, software and manufacturing resolutions, validations and documentation of resolutions. iBeta provided ES&S with daily status reports during the test effort.

iBeta Quality Assurance, a limited liability company, is located in Aurora, Colorado. The company is a full service software testing laboratory providing Quality Assurance and Software Testing for the business and interactive entertainment communities. iBeta Quality Assurance accreditations for the testing of voting systems to the federal standards include

- National Voluntary Lab Accreditation Program (NVLAP) Voting System Test Lab (VSTL)
- Election Assistance Commission Voting Systems Test Lab (VSTL)

Testing of the DS200 firmware changes was conducted by iBeta in Aurora, Colorado. Non-core hardware environmental testing is outside iBeta's accreditation scope as a VSTL. Electrical testing of the engineering changes to the DS200 hardware was performed at Criterion Technology, Rollinsville, CO under iBeta's supervision. iBeta confirmed sub-contractor Criterion accreditation by the NVLAP for Electromagnetic Compatibility & Telecommunications (valid April 1, 2010 through March 31, 2011) of the *VVSG 2005* required test methods. (A list is found at the NVLAP linked page.)

1.1   Unity 3.2.0.0 Revision 1 Exclusions

The Unity 3.2.0.0 Revision 1 does not support elections in Illinois and Hawaii. All other exclusions from the certified ESSUNITY3200 voting system remain unchanged.

1.2   Internal Documentation

The documents identified below are iBeta internal documents used in certification testing

Table 1 Internal Documents

Version #	Title	Abbreviation	Date	Author (Org.)
v.07	Voting Certification Master Services Agreement Prepared for Election	MSA contract	11/15/08	iBeta Quality Assurance

Version #	Title	Abbreviation	Date	Author (Org.)
	Software & Services (ES&S)			
	Statement of Work 11	SOW 11		iBeta Quality Assurance
iBeta	VSTL Procedures			
v.3.0	Voting Deliverable Receipt Procedure		2/9/10	iBeta Quality Assurance
v.4.0	PCA Document Review Procedure		5/6/10	iBeta Quality Assurance
v.5.0	PCA Source Code Review Procedure		4/30/10	iBeta Quality Assurance
v.5.0	C and C++ Review Criteria		3/2/09	iBeta Quality Assurance
v.0.2	COBOL Review Criteria		3/3/09	iBeta Quality Assurance
v.1.0	Witness Build Procedure		4/07/08	iBeta Quality Assurance
v.3.0	Trusted Build Procedure		4/6/10	iBeta Quality Assurance
v.5.0	Test Case Preparation & Execution Procedure		2/9/10	iBeta Quality Assurance
v.6.0	Project Management Voting Procedure		4/12/10	iBeta Quality Assurance
v.5.0	VSTL Test Planning Procedure		2/9/10	iBeta Quality Assurance
v.5.0	VSTL Certification Report Procedure		4/6/10	iBeta Quality Assurance
iBeta	Project Documents			
4.0	Election Systems & Software Unity 3.2.0.0 Voting System VSTL Certification Test Report (V)2009-30Jun-001(D) *		7/22/09	iBeta Quality Assurance
	ES&S Unity 3.2.0.0 Revision 1 PCA and FCA Discrepancy Report		6/29/10	iBeta Quality Assurance
v.3.0	ES&S Unity 3.2.0.0 Revision. 1 Voting System Certification Test Plan for DS200 Modifications to the EAC Certified ESSUNITY3200		6/30/10	iBeta Quality Assurance
	DS200 Functional TC Unity 3.2.0.0 Revision 1		6/29/10	iBeta Quality Assurance
	FCA Environmental Test Case Unity 3.2.1.0		3/25/10	iBeta Quality Assurance
	Unity 3.2.0.0 Revision 1 DS200 Trusted Build Read Me		6/14/10	iBeta Quality Assurance
1.0	Trusted Build of the DS200 FW 1.4.3.0		2/12/10	iBeta Quality Assurance

* Public document found on the **EAC website**

1.3 External Documentation

The documents identified below are external resources used to in certification testing.

Table 2 External Documents

Version #	Title	Abbreviation	Date	Author (Org.)
	Help America Vote Act*	HAVA	Oct. 29, 2002	107th Congress
NIST Hdbk 150 2006	NVLAP Voting System Testing	NIST 150	Feb. 2006	NVLAP
NIST Hdbk 150-22	NVLAP Voting System Testing	NIST 150-22	Dec.2005	NVLAP
	Voluntary Voting System Guidelines*	VVSG	Dec. 2005	EAC
	EAC Certification of Conformance ES&S Unity 3.2.0.0 Election Systems and Software*	ESSUNITY3200 voting system	July 29, 2009	EAC
v.1.0	Testing and Certification Program Manual*		Jan. 1, 2007	EAC
v.1.0	Voting System Test Laboratory Program Manual*		July 2008	EAC
	Unity 3.2 Rev 1 Testing (Field Issue 2 EAC email)		6/21/10	EAC

Version #	Title	Abbreviation	Date	Author (Org.)
	DS200 (Field Issue 2 ES&S email)		6/21/10	ES&S
	EMC Qualification Test Report Election Systems and Software IntelElect Precinct Ballot Counter DS200 HW Rev. 1.2.1 Report Number: 090924-1464		12/3/09	Criterion Technology
	EMC Qualification Test Report Election Systems and Software IntelElect Precinct Ballot Counter DS200 HW Rev. 1.2.1 Report Number: 091130-1503R		3/31/2010	Criterion Technology
	Voting System Technical Advisory Intermittent Freeze/Shutdowns with EAC Certified ES&S Unity 3.2.0.0 System		6/25/2010	EAC
	EAC Email Response to Unity 3.2.0.0 Rev 1 Test Plan Status		6/30/2010	EAC
RFI & NOC				
	EAC Decision on Request for Interpretation 2007-01, Rev. 2 2005 VVSG Vol. 1 Section 3.2.2.1 (e)(AutoMARK Keypad)	Interpretation 2007-01	5/23/07	EAC
	EAC Decision on Request for Interpretation 2007-02, 2002 Voting Systems Standards, Vol. 1, Section 4.2.5* (Single character names)	Interpretation 2007-02	5/14/07	EAC
	EAC Decision on Request for Interpretation 2007-03, 2005 VVSG Vol. 1 Section 3.1.1*(usability test review)	Interpretation 2007-03	9/5/07	EAC
	EAC Decision on Request for Interpretation 2007-04, 2005 VVSG Vol. 1 Section 3.1.3*(Alternate language)	Interpretation 2007-04	10/29/07	EAC
	EAC Decision on Request for Interpretation 2007-05, 2005 VVSG Vol. 1 Section 4.2.1 (Testing Focus & Applicability)*	Interpretation 2007-05	11/6/07	EAC
	EAC Decision on Request for Interpretation 2007-06, 2005 VVSG Vol. 1 Section 4.1.1, 2.1.2c &f, 2.3.3.3o & 2.4.3c&d. (Recording and reporting undervotes) *	Interpretation 2007-06	11/7/07	EAC
	EAC Decision on Request for Interpretation 2008-01, 2002 VSS Vol. II, 2005 VVSG Vol. II, Section 4.7.1 & Appendix C* (Temp & power variation testing)	Interpretation 2008-01	2/6/08	EAC
	EAC Decision on Request for Interpretation 2008-02, Battery Backup for Optical Scan Voting machines*	Interpretation 2008-02	2/19/08	EAC
	EAC Decision on Request for Interpretation 2008-03 (Operating System Configuration) 2002 VSS Vol. 1: 2.2.5.3, 4.1.1, 6.2.1.1, Vol. 2:3.5; 2005 VVSG Vol. 1:2.1.5.2, 5.1.1, 7.2.1, Vol. 2:3.5*	Interpretation 2008-03	10/3/08	EAC
	EAC Decision on Request for Interpretation 2008-04, 2002 VSS Vol. I, Section 2.3.1.3.1a 2005 VVSG Vol. II, Section 2.2.1.3a Ballot Production*	Interpretation 2008-04	5/19/08	EAC
	EAC Decision on Request for Interpretation 2008-05 2002 VSS Vol. I, Section 3.4.2 2005 VVSG Vol. I, Section 4.3.2, Durability*	Interpretation 2008-05	5/19/08	EAC
	EAC Decision on Request for Interpretation 2008-06, 2002 VSS Vol. I, Sections 3.2.2.4c, 3.2.2.5 2005 VVSG Vol. I, V. 1.0, Sections 4.1.2.4c (Electrical Supply), 4.1.2.5 (Electrical Power Disturbance) *	Interpretation 2008-06	8/29/08	EAC
	EAC Decision on Request for Interpretation 2008-07; 2002 VSS Vol. I, Sections, 2.3.4, 2.3.5, 2.3.6, 2.4.1, 4.4.3, 9.4; 2002 VSS Vol. II, Sections, 3.3.1, 3.3.2; 2005 VVSG Vol. I, Sections, 2.2.4, 2.2.5, 2.2.6, 2.3.1, 5.4.3; 2005 VVSG Vol. II, Sections, 1.3, 3.3.1, 3.3.2*	Interpretation 2008-07	8/27/08	EAC
	EAC Decision on Request for Interpretation 2008-	Interpretation	8/1/2008	EAC

Version #	Title	Abbreviation	Date	Author (Org.)
	08 2002 VSS Vol. I, 2005 VVSG Vol. I, Glossary (Bar code readers)	2008-08		
	EAC Decision on Request for Interpretation 2008-09 (Safety Testing) 2002 VSS Vol. I, Section, 3.4.8 2005 VVSG Vol. I, Section 4.3.8*	Interpretation 2008-09	8/25/2008	EAC
	EAC Decision on Request for Interpretation 2008-10 (EFT) 2005 VVSG Vol. I, Sect. 4.1.2.6 2005 VVSG Vol. II, Sect 4.8*	Interpretation 2008-10	8/28/2008	EAC
	EAC Decision on Request for Interpretation 2008-12 (Ballot marking Device/ Scope of Testing) 2005 VVSG Vol. 1: 2.1.5. System Audit 2005 VVSG Vol. 1: 2.1.5.2 Shared Computing Platform*	Interpretation 2008-12	12/19/08	EAC
	EAC Decision on Request for Interpretation 2009-001 (VVPAT Accessibility) 2005 VVSG Volume1: 7.8.2, 7.9.7*	Interpretation 2009-01	6/25/09	EAC
	EAC Decision on Request for Interpretation 2009-02 (Alternate Languages) 2002 VSS Vol. I: 2.2.1.3a Ballot Production; 2005 VVSG Vol. I: 3.1.3 Alternate Languages*	Interpretation 2009-02	8/5/09	EAC
	EAC Decision on Request for Interpretation 2009-03 (Battery Back Up for Central Count): RFI 2008-06 (Battery Back Up for Central Count); 2002 VVSS Volume I, Sections 3.2.2.4c, 3.2.2.5; 2005 VVSG Volume I, Version 1.0, Sections 4.1.2.4c (Electrical Supply), 4.1.2.5 (Electrical Power Disturbance) *	Interpretation 2009-03	9/28/09	EAC
	EAC Decision on Request for Interpretation 2009-04 (Audit Log Events); 2002 VSS VoI: 2.2.4.1, Common Standards, 2.2.5.1 System Audit; 2005 VVSG VoI: 2.1.4 Integrity, 2.1.5 System Audit, 2.1.5.1 Operational Requirements, 5.4.3 In-Process Audit Records*	Interpretation 2009-04	9/29/09	EAC
	EAC Decision on Request for Interpretation 2009-05; 2002 VSS Vol. I, Sections, 2.2.7.2 c & d; 2005 VVSG Vol. I, Sections, 3.2.2.2 c ii & iii*	Interpretation 2009-05	10/5/09	EAC
	EAC Decision on Request for Interpretation 2009-06 (Temp & Power Variation Tests); 2002 VSS Vol. I, Sect. 3.4.3 2002 VSS Vol. II, Sect. 4.7.1, 4.7.2, Appx Sec. C.4 2005 VVSG Vol. I, Sect. 4.3.3 2005 VVSG Vol. II, Sect. 4.7.1, 4.7.3, Appx Sec. C.4 EAC Decision on RFI 2008-1*	Interpretation 2009-06	4/6/10	EAC
	EAC Decision on Request for Interpretation 2010-01; 2002 VSS Vol. I, Sections, 3.2.2.8; 2005 VVSG Vol. I, Sections, 4.1.2.8* (ESD Voltage Levels)	Interpretation 2010-01	3/16/10	EAC
	EAC Decision on Request for Interpretation 2010-02 2005 VVSG Vol. I, Section, 5.2.3 d, 5.2.5, 5.2.6, 5.2.7 b, c, d & e 2005 VVSG Vol. II, Section, 5.4.2 (Coding conventions)	Interpretation 2010-02	5/25/10	EAC
	EAC Decision on Request for Interpretation 2010-03; 2005 VVSG, Volume II, Section 5.4, Section 5.4.2.a - 5.4.2.v * (Database Coding Conventions)	Interpretation 2010-03	06/14/2010	EAC
	EAC Decision on Request for Interpretation 2010-04; 2002 VSS Volume I: 2.2.1 Security , 2005 VVSG Volume I: 2.1.1 Security * (Functional Requirements with Respect to Security)	Interpretation 2010-04	06/24/2010	EAC
	Notice of Clarification NOC 07-001: Timely Submission of Certification Application*	NOC 07-01	7/17/07	EAC
	Notice of Clarification NOC 07-002: VSTL Work with Manufacturers Outside of Voting System Certification Engagements*	NOC 07-02	7/24/07	EAC
	Notice of Clarification: NOC 07-003: State Testing Done in Conjunction with Federal Testing within the EAC Program*	NOC 07-03	8/6/08	EAC
	Notice of Clarification: NOC 07-004: Voting System Manufacturing Facilities*	NOC 07-04	9/5/07	EAC
	Notice of Clarification 07-05: Voting System Test Laboratory (VSTL) responsibilities in the	NOC 07-05	9/7/07	EAC

Version #	Title	Abbreviation	Date	Author (Org.)
	management and oversight of third party testing*			
	Notice of Clarification NOC 08-001: Validity of Prior Non-Core Hardware Environmental and EMC Testing*	NOC 08-001	3/26/08	EAC
	Notice of Clarification: NOC 08-002: Clarification of EAC Mark of Certification Requirement*	NOC 08-002	8/30/08	EAC
	Notice of Clarification NOC 08-003: Clarification of EAC Conformance Testing Requirements for VSTLs*	NOC 08-003	7/30/08	EAC
	Notice of Clarification: NOC 09-001 Clarification of the Requirements for Voting System Test Laboratories (VSTLs) Development and Submission of Test Plans*	NOC 09-001	5/1/09	EAC
	Notice of Clarification: NOC 09-002: Clarification of EAC Laboratory Independence Requirement*	NOC 09-002	5/4/09	EAC
	Notice of Clarification NOC 09-003: Clarification of De Minimis Change Determination Requirements*	NOC 09-003	9/19/09	EAC
	Notice of Clarification NOC 09-004: Development & Submission of Test Reports*	NOC 09-004	11/9/09	EAC
	Notice of Clarification NOC 09-005: Development and Submission of Test Plans for Modifications to EAC Certified Systems*	NOC 09-005	12/2/09	EAC

* **Public document found on the EAC website**

1.4 Technical Data Package Documents

The Technical Data Package Documents submitted for this certification test effort are listed in Section 3 System Identification.

1.5 Test Report Contents

The contents of this Test Report include:

- Section 1: The Introduction- identifies the scope of certification testing.
- Section 2 The Certification Test Background identifies the process for the Physical and Functional Configuration Audits.
- Section 3 The Voting System Identification identifies the system configuration including hardware, software and the Technical Data Package documentation.
- Section 4 The Voting System Overview identifies the overall design and functionality of voting system.
- Section 5 The Certification Review and Test Results are the methods and results of the testing effort.
- Section 6 The Opinions & Recommendations of the acceptability of the voting system.

Test Operations, Findings and Data Analysis are in the appendices.

- Appendix A: Certification Test Requirement
- Appendix B: Source Code Reviews
- Appendix C: TDP Document Reviews
- Appendix D: Test Results
- Appendix E: Discrepancy Report
- Appendix F: Warrant of Accepting Change Control Responsibility
- Appendix G: Trusted Build and Validation Tools
- Appendix H: Amended Test Plan'
- Appendix I: State Test Reports
- Appendix J: ES&S Unity 3.2.0.0 Implementation Statement r

2 Certification Test Background

The ESSUNITY3200 baseline was certified by the EAC in July of 2009. ES&S submitted DS200 v.1.4.3.0 firmware enhancements and bug fixes and hardware engineering changes. All other applications and hardware of the ESSUNITY3200 baseline are unchanged.

Additionally, two reports of field issues were identified by ES&S to the EAC for the DS200 certified in ESSUNITY3200.

Field Issue 1 is included in Unity 3.2.0.0 Revision 1.

1. The DS200 was sporadically reporting a mark present in row 44 and row 45 of column D on the back of the ballot when no actual mark was present. It was found that the specific ballot had been printed with a slight skew. Additionally the condition could only be reproduced when the ballot was inserted with a skew slight enough to not generate a rejection of the ballot. The abnormal skew revealed that the scanner tolerance was reading text slightly outside the channel as a mark.

Field Issue 2 is currently under examination by ES&S. It will be addressed in a subsequent certification. The EAC has issued a Voting System Technical Advisory on ESSUNITY3200 regarding a "power down" and "freeze". As the error messages following the restoration of function did not provide a clear report of the status of the equipment and ballots the EAC advisory provides handling instruction. For more information see: Voting System Technical Advisory Intermittent Freeze/Shutdowns with EAC Certified ES&S Unity 3.2.0.0 System posted on the EAC website

2. DS200 "power down" and "freeze" report was reviewed by iBeta. VSS 2002 error message requirements vol.1: 2.2.5.2.2.a and b are not being met. (VSS requirements are listed in Appendix A.) The presence of this issue shall be noted in the test report recommendation consistent with the requirements of VVSG Vol.2 section B.5. iBeta obtained email confirmation from the EAC and ES&S that there was no documented report of any loss or corruption of voting data.

As part of the EAC Certification application ES&S submitted an implementation statement for Unity 3.2.0.0. Unity 3.2.0.0 Revision 1 is a revision to the certified ESSUNITY3200 voting system. A copy of this statement is contained in the ESSUNITY3200 test report in Appendix J. Daily status reports were sent to ES&S Unity 3.2.0.0 Revision 1 certification management staff and iBeta project test staff. These reports included project activity status, issues, and other relevant information. Status calls were held with the EAC, EAC Reviewers and ES&S.

2.1 Terms and Definitions

The Terms and Definitions identified below are used in this test report. Other applicable Terms and Definitions are found in the certified ESSUNITY3200 Test Report.

Table 3 Terms and Definitions

Term	Abbreviation	Definition
Help America Vote Act	HAVA	Legislation enacted in 2002 which includes creation of the EAC, federal voting standards and accreditation of test labs
National Standard Reference Library	NSRL	Part of NIST that provides software escrow.
National Voluntary Laboratory Accreditation Program	NVLAP	Part of NIST that provides third-party accreditation to testing and calibration laboratories.
Technical Data Package	TDP	The documentation and code relating to the voting system, submitted by the vendor for review.
U.S. EAC	EAC	U.S. agency established by the Help America Vote Act of 2002 to administer Federal elections.
Voluntary Voting System Guidelines	VVSG	Federal voting system test standards created by the EAC. Eventually these will replace the VSS.
Voting System Standards	VSS	Federal voting system test standards, predecessor of the VVSG.
Voting System Test Lab	VSTL	Lab accredited by the EAC to perform certification testing of voting systems.
Voting Variations		Significant variations among state election laws incorporating permissible ballot content, voting options and associated ballot counting logic

2.2 Physical Configuration Audit

The Physical Configuration Audit (PCA) deals with the physical elements of the voting system, including the source code, documentation and system configuration reviews, in addition to the witness of the build and installation of the reviewed source code. The PCA was only conducted on the changes to the certified ESSUNITY3200 voting system.

2.2.1 PCA TDP Source Code Review

The PCA TDP Source Code Review of the changes to the DS200 in the ESSUNITY3200 voting system was performed to verify conformance to VVSG Vol. 1 Sect 5.2 and Vol. 2 Sect. 5. These same changes were submitted to the Unity 3.2.1.0 certification test effort. These common results were used in both projects. All results were stored in Unity 3.2.1.0. Reviewed results were recorded on Source Code Review sheets (Excel spreadsheets). Issues were identified in the review and logged on a Discrepancy Report, after completion of peer review. The Discrepancy Report was forwarded to ES&S for correction. At the end of the certification test effort a copy of all applicable reviews will be archived in the Unity 3.2.0.0 Revision 1 project

2.2.2 PCA TDP Document Review

An examination of the Unity 3.2.0.0 Revision 1 TDP was performed to assess any impacts to the ESSUnity3200 baseline PCA Document Review. This examination consisted of comparison and analysis of the new documents to the documents in the certified ESSUnity3200 voting system. It was determined that none of the changes impacted the PCA document review.

2.2.3 PCA System Configuration Review

The PCA System Configuration Review of ES&S Unity 3.2.0.0 Revision 1 was performed to verify conformance to VVSG Vol. 1 Sect 9.7.1. Reviewed results are recorded on PCA System Configuration Review sheets (Excel spreadsheets). No issues were identified in the review.

2.2.4 Witness Build and Installation

The Witness Build and Installation of the executable code ("trusted build") for the ES&S Unity 3.2.0.0 Revision 1voting system was performed using the reviewed source code per VVSG Vol. 2 Sect 1.8.2.4. Observation of the build was documented in the Witness of the Final Build and Code Comparison and contained in Appendix G.

2.3 Functional Configuration Audit

The Functional Configuration Audit was an examination of the hardware and software DS200 changes to the ESSUNITY3200 certified voting system. This included review of the ES&S Unity 3.2.0.0 Revision 1 submitted test documentation and execution of all required tests.

2.3.1 FCA Test Documentation Review

The FCA Test Documentation Review of the DS200 changes to the ESSUNITY3200 certified voting system assessed the level of vendor testing of the voting system to the VVSG Vol. 1 Sect. 2, 3, 4, 5, 6, 7 and 9 requirements. This assessment was used to define the extent of functional testing of the changes..

2.3.2 FCA Functional and System Level Tests

The DS200 changes submitted in Unity 3.2.0.0 Revision 1 have also been submitted to the Unity 3.2.1.0 certification test effort. The DS200 firmware updates address internal and field cosmetic and functional enhancements and issues. The changes were tested in a single functional test case with seven test scenarios. Appendix D details specific information on the Functional Testing. Issues encountered during testing were identified in the test record and logged on a Discrepancy Report, after completion of peer review. ES&S resolved all discrepancies which did not meet the requirements of the VVSG.

2.3.3 FCA Hardware Environmental Tests

ES&S submitted engineering changes (ECOs) for the ESSUNITY3200 DS200 precinct scanner and the plastic ballot box/case for certification in Unity 3.2.1.0 and Unity 3.2.0.0 Revision 1. All ECOs were reviewed and assessed. Those determined to be administrative or having no impact to electrical operation, storage and transportation were identified to the EAC as de minimus changes. Changes identified as impacting impact to electrical operation, storage and transportation were retested.

There were no changes submitted for the ESSUNITY3200 baseline AutoMARK VAT or M650.

3 Voting System Identification

The identification of the ES&S Unity 3.2.0.0 Revision 1 voting system submitted for certification is ultimately documented by the EAC. Per their instructions the system identification is found in the EAC Scope of Certification. The hardware, software and the Technical Data Package documentation used in the certification test environment are indentified in section 3.2.

3.1 Submitted Voting System Identification

Table 4 Voting System Name and Version

Voting System Name	Version
Identified in the EAC Scope of Certification	

Table 5 Voting System Polling Place and Central Count Hardware

Hardware	OS or Firmware & Version	Description
Identified in the EAC Scope of Certification		

Table 6 Voting System EMS Software

Software Applications	Version	EMS Function Description
Identified in the EAC Scope of Certification		

3.2 Voting System Test Environment

The Voting System Test Environment identifies the specific hardware and software that was used in the test environment. The Test Methods in Appendix D identify the specific ES&S 3.2.0.0 Rev 1 voting system software and firmware build installed for each test iteration.

Table 7 Voting System Hardware

Hardware	OS or Version	Manufacturer	Description (include functional purpose and condition of the equipment)
Election Management Hardware			
(1) Dell GX260 computer desktop with monitor, keyboard & mouse SN: Tower: 7D0WL21	Windows XP Professional Version 2002 SP3	Dell	Pre-Vote & Post-Vote: COTS Unity PC for the Unity election management system Condition: Good
Precinct Scanner			
ES&S intElect DS200 (S/N: 2093900001)	1.4.3.0	ES&S	Vote: A Unity Voting System precinct count optical scanner paper ballot tabulator including a 12-inch touch screen display providing clear voter feedback and poll worker messaging, Condition: Good
Steel Ballot Box (S/N: C4243)	P/N: 76246	ES&S	Vote: Precinct steel ballot box, with diverter to segregate ballots into multiple chambers as programmed in the EMS Condition: Good
(3) SanDisk 2.0 GB USBs		SanDisk	COTS: Media for installing election definition, recording and reporting votes and audit logs
Thermal paper rolls		NCR	COTS: DS200 reports
Paper Ballots	Paper Ballots - 14"		Supplied by ES&S: Ballots for DS200 with preprinted election content
Ballot Marker Pens	Marking Device	BIC	COTS: VL Ballot Pen to mark paper ballots
Other Test Hardware			**Used to test ECOs in Unity 3.2.1.0**
ES&S intElect DS200 SN: ES0107370025	ES&S	HW 1.2.1 FW 1.3.11.0	Precinct Count Digital Scanner (Modem removed in Unity 3.2.0.0)
Plastic Ballot Boxes (HW Rev.1.3) (1) Bin P/N 94050 (1) Carrying Case P/N 94051	ES&S	N/A	Precinct Plastic Ballot Boxes for DS200, No Diverter HW 1.3

Hardware	OS or Version	Manufacturer	Description (include functional purpose and condition of the equipment)
Emergency Ballot Bin P/N 94325 (P/N is not marked on the Emergency bin)			• Carrying Case: Adhesive & washer/rivets to secure foam in production process Removed the unused switch/bracket • Ballot Bin: Updated locks on the bin Replace a C/B PAR part Metal door instead of plastic door
Delkin Thumb Drives: 4GB & 8GB	Storage media for the DS200	Delkin	Delkin Thumb Drives: 4GB & 8GB COTS: Media for installing election definition, recording and reporting votes and audit logs

Table 8 Voting System Software

Software	Version	Manufacturer	Identify Hardware
Election Management Software			
Election Data Manager (EDM)	7.8.1.0	ES&S	EMS software for election definition and ballot preparation for M650, DS200, and M100
ES&S Ballot Image Manager (ESSIM)	7.7.1.0	ES&S	Unity election management system desktop publishing tool to layout and format paper ballots
Audit Manager (AM)	7.5.2.0	ES&S	A Unity election management system audit logging software application including security and user tracking for the Election Data Manager and Ballot Image Manager
Hardware Programming Manager (HPM)	5.7.1.0	ES&S	A Unity election management system software application to import, format, and convert an election file and create election definitions for ballot scanning equipment
Election Reporting Manager (ERM)	7.5.4.0	ES&S	A Unity central count software application to compile and report election results.
Log Monitor	1.0.0.0	ES&S	A software application that checks the status of the Windows Event Log feature and closes all ES&S applications if the Event Log feature is disabled or not configured properly.
Microsoft Windows XP SP3	SP3	Microsoft	COTS EMS Operating System
SQLXML	3.0 service pack 3	Microsoft	COTS: XML support for Unity
Windows Internet Explorer	7	Microsoft	COTS: AIMS & Unity PC ES&S does not want Internet Explorer to be run on the election System PCs. However, Internet Explorer must be resident on the PC to contain the latest security updates.
Adobe Acrobat v9	9.0	Adobe	COTS - Used with ESSIM
Adobe Type Manager 4.1	4.1	Adobe	COTS - Used with ESSIM
RM/COBOL v11.01 Runtime System	11.01	Liant	COTS interpreter software used in HPM & ERM
Norton AntiVirus 2005		Symantec Corporation	COTS Anti Virus protection for PCs and Servers
Optical Scanner			
DS200 Firmware DS200 Power Management	1.4.3.0 1.2.0.1	ES&S	Precinct count digital scanner paper ballot tabulator including a 12-inch

Software	Version	Manufacturer	Identify Hardware
Firmware DS200 Scanner Firmware	2.20.0.0		touch screen display providing voter feedback and poll worker messaging. DS200 scanner reads marks on both one- and two-sided ballots. Administrators can request custom ballot acceptance criteria, which ES&S programs onto the scanner's election definition.

Table 9 Voting System Technical Data Package Documents

Version #	Title	Abbreviation	Date	Author (Org.)
5.0	Election Systems & Software System Overview Unity v. 3.2.0.0 Revision 1	OVR	6/29/10	ES&S
2.0	Election Systems & Software System Limitations Unity v. 3.2.0.0 Revision 1		6/25/10	ES&S
3.0	Unity 3.2.0.0 Revision 1 System Change Notes		None	ES&S
None	Requirements of the 2005 VVSG Trace to Vendor Testing and Technical Data Package	TDP Trace	6/25/10	ES&S
3.0	Election Systems & Software ES&S Software Design Specifications DS200 Unity v. 3.2.0.0 Revision 1	DS200 SDS	6/25/10	ES&S
1.0	Election Systems & Software ES&S Software Design Specifications ERM Unity v. 3.2.0.0 Revision 1	ERM SDS	6/24/10	ES&S
1.0	Election Systems & Software ES&S System Functionality Description DS200 Unity v. 3.2.0.0 Revision 1	DS200 SFD	6/7/10	ES&S
1.0	Election Systems & Software ES&S System Functionality Description ERM Unity v. 3.2.0.0 Revision 1	ERM SFD	6/24/10	ES&S
1.0	Election Systems & Software ES&S System Hardware Specification DS200 Unity v.3.2.0.0 Revision 1	DS200 SHS	6/7/10	ES&S
None	DS 200 Part list		5/12/08	ES&S
None	ES&S DS200 System Maintenance Manual Hardware Version 1.2.1 Firmware Version 1.4.3.0		6/24/10	ES&S
None	ES&S DS200 System Operations Procedures Hardware Version 1.2.1 Firmware Version 1.4.3.0		6/24/10	ES&S
None	ES&S Election Reporting Manager System Operations Procedures Version Release 7.5.3.0		6/28/10	ES&S
None	DS200 Precinct Ballot Scanner Election Day Training Manual Version Number 1.4.x		6/7/10	ES&S
None	DS200 Precinct Ballot Scanner Pre-Election Day Training Manual Version Number 1.4.x		6/7/10	ES&S

Table 10 Other Software, Hardware and Materials

Material	Material Description	Use in the Voting System
Other		
Multiple desktop and laptop PCs	A variety of PCs running Microsoft operating systems	Supplied by iBeta: Preparation, management and recording of test plans, test cases, reviews and results
Repository servers	Separate servers for storage of test documents and source code, running industry standards operating systems, security and back up utilities	Supplied by iBeta: Documents are maintained on a secure network server. Source code is maintained on a separate data disk on a restricted server
Microsoft Office 2003 & 2007	Excel and Word software and document templates	Supplied by iBeta: The software used to create and record test plans, test cases, reviews and results
SharePoint 2003	TDP and test documentation repository	Supplied by iBeta: TDP and test documentation repository and configuration management tool
Other standard business application software	Internet browsers, PDF viewers email	Supplied by iBeta: Industry standard tools to support testing, business and project implementation

Material	Material Description	Use in the Voting System
Visual Studio 2003 v.7.1.3808 (Microsoft)	Build and source code review Integrated Development Environment	Supplied by iBeta: View source code review
RSM v.6.92 (M Squared Technologies)	C, C++, Java & C# static analysis tool	Supplied by iBeta: identify line counts and cyclomatic complexity
Beyond Compare 2 v.2.4.3 (Scooter Software)	Comparison utility	Supplied by iBeta: used to compare file/folder differences
WinDiff 5.1 (Microsoft)	Comparison utility	Supplied by iBeta: used to compare file/folder differences
Knoppix 5.1.0	Hash creation utility	Supplied by iBeta: used to generate hash signatures on DS200
Symantec Ghost v.11	Image capture tool	Supplied by iBeta: used to capture and test environments
Bart PE 3.1.10a	Image capture utility	Supplied by iBeta: used with Ghost process
Visual Studio 2008 v. 9.0.21022.8 (Microsoft)	Build and source code review Integrated Development Environment	Supplied by iBeta: View source code review

4 Voting System Overview (Changes to ESSUnity3200)

The changes to the voting system in Unity 3.2.0.0 Revision 1 identified a change to the DS200 firmware version, non-support of Illinois and Hawaii, and engineering change orders to the DS200 hardware and ballot box. There is no other change to the overview identified in the ESSUnity3200 Test Report.

4.1 DS200 Firmware Changes

ES&S submitted a list of firmware enhancements and bug fixes for Unity 3.2.0.0 Revision 1.

Table 11 –DS200 Functional Changes to ESSUNITY3200

ES&S Change ID	ES&S Category	DS200 Menu or Function	Change Description	Reason for Change	Documentation Changed
General					
BUG15827	Overvote handling	System	Resolved an issue where the scanner failed to divert overvoted write-in ballots when the Divert Write-ins option was selected	Fixed Issue	N/A – Bug Fix
BUG17375	Code	Source Code	Fix source code discrepancies per VSTL review.	Fixed Issue	N/A – Bug Fix
BUG17664	Code	Source Code	Fix source code discrepancies per VSTL review.	Fixed Issue	N/A – Bug Fix
BUG17666	Reports	Status Report	Added the protected count to the status report that prints automatically when a DS200 is re-opened for voting.	Fixed Issue	N/A – Bug Fix
ENH14725	Interface	Display	Remove Image Drive icon from DS200 if images are not being saved	System Enhancement	N/A
ENH14726	Interface	Display	Extend the time that "Thank you for voting" displays	System Enhancement	N/A
ENH14728	Interface	Display	Provide clear indication that modem transfer was successful	System Enhancement	*SOP – DS200*
ENH14729	Poll Opening	Reports	Allow multiple zeros tapes to be printed before first ballot cast	System Enhancement	*SOP – DS200*
ENH14730	Interface	Audio	Change alert beeping to just two beeps	System Enhancement	N/A
ENH14731	Interface	Audio	Issue audible alarm when ballot is accepted	System Enhancement	N/A
ENH14732	Reports	Results Reports	Repeat machine ID and poll number at end of results tape	System Enhancement	*SOP – DS200*
ENH14745	Exception Handling	Accept/Reject Ballots	Provide override for Overvote or blank ballot rejection	System Enhancement	*SOP – DS200*
ENH15287	Reports	Precinct Report	Add Early Voting Ballot Styles per Precinct Report	System Enhancement	*SOP – DS200* *System Functionality Description – DS200*
ENH15288	Interface	Display	Increase Font Size of Thank you for Voting message	System Enhancement	*SOP – DS200*
ENH15418	Tabulation	Scan Accuracy`	Small white dots "hickeys" causing read problems	System Enhancement	N/A
ENH15890	System	Firmware	Implement new scanner board firmware	System Enhancement	*System Overview – Unity 3.2.0.0 Rev1*
ENH15891	Security	Counterfeit	Implement new administration	System	*SOP – DS200*

ES&S Change ID	ES&S Category	DS200 Menu or Function	Change Description	Reason for Change	Documentation Changed
		Detection	function to calibrate counterfeit sensor	Enhancement	
ENH15892	System	Firmware	Update scanner client to work with new scanner board firmware	System Enhancement	N/A
ENH16085	Interface	Display	Install New Icons on Welcome Screen	System Enhancement	*SOP – DS200*
ENH16120	Interface	Display	Updated the Over Vote warning screen	System Enhancement	*SOP – DS200*
ENH16211	Reports	Reports	Print Machine ID & Poll Number in Audit Log and after report cancellations	System Enhancement	*SOP – DS200*
ENH16231	Audit	Admin Menu	Enhanced audit logging to log all user actions in the Administration menu and attempts to access the Administration menu.	System Enhancement	*SOP – DS200*
ENH16291	Interface	Display	DS200: Additional language translations for the Over Vote screen	System Enhancement	*SOP – DS200*
ENH16336	Interface	Display	DS200: Update language translations for the Over Vote screen	System Enhancement	*SOP – DS200*
ENH16382	Tabulation	System	Expanded support from a maximum of 10 Election Day precincts to 18 precincts.	System Enhancement	*SOP – DS200* *Unity 3.2.0.0 rev1 System Limitations*
ENH17266	Versioning	System	Update scanner board version	System Enhancement	System Overview – Unity 3.2.0.0 Revision 1 (U3200R1_OVR00)
ENH17268	Versioning	System	Promoted DS200 version implemented in Florida for use in Unity 3200r1.	System Enhancement	N/A - Versioning
ENH17538	Protected Count	System	Added a protected count to the DS200 firmware. The protected count resides on the compact flash card in the ES&S firmware partition. It will increment with every sheet accepted and dropped into the ballot box. The counter must appear in printed reports	System Enhancement	*SOP – DS200*
Field 1					
BUG16775	Tabulation	System	Resolved an issue that caused L&A test decks to yield incorrect vote totals-	Fixed Issue	N/A – Bug Fix
BUG16782	Scanning	System	Resolved an issue that caused scanned Logic and Accuracy ballot test decks to yield incorrect results.	Fixed Issue	N/A – Bug Fix
Withdrawn					
ENH15009	Security	Counterfeit Detection	ENH15009 Counterfeit ballot detection functionality has been withdrawn. ENH15890 to 15892 remain as settings for the Counterfeit Ballot Sensor are required.	System Enhancement	*SOP – DS200*

4.2 DS200 Engineering Changes

ES&S submitted engineering changes (ECOs) for the ESSUNITY3200 DS200 Precinct Count Scanner and the ballot box for certification in Unity 3.2.1.0 and Unity 3.2.0.0 Revision 1. These ECOs fell into two types.

1. The administrative or hardware changes that don't impact electrical, transportation or storage: Administrative ECOs covered documentation relevant to the manufacturing administrative process, label changes, production status changes, out of scope equipment, documentation updates and drawings. Along with hardware changes that don't impact electrical, transportation or storage, these ECO's were assessed and determined to require no hardware environmental testing.

2. The hardware changes that may impact electrical, transportation or storage: These ECOs submitted addressed end-of-life parts and second source suppliers that could impact electrical VVSG test requirements. They required a more in-depth assessment by a qualified electrical engineer.

Table 12 Submitted DS200 Engineering Change Orders

ECO	Unity 3.2.1.0 Description	ECO Type
Type 1		
000315	DS200 Ballot Box Carrying Case -Glue for foam	Type 1
000337	DS200 Ballot Bin status change Rev 1.3	Type 1
000342	DS200 Ballot Box BOM status change	Type 1
000366	Ballot Box - Retrofit Stock	Type 1
000375	Ballot box carrying case drawings & status change	Type 1
000423	Ballot Box -Shipping	Type 1
000466	DS200Ballot Box -Caster Bolt	Type 1
000523	Double-coated Tape	Type 1
000545	DS200 Image Scanner Cable labels	Type 1
000554	Mylar tab	Type 1
000562	DS200 Mounting knurling motor process	Type 1
000566	DS200 Labels, screw head & clamp size	Type 1
000570	DS200 Wire color and screw head changes	Type 1
000582	Printer door corner shape and drawings	Type 1
000618	Part Number Labels	Type 1
000628 & 000674	Plastic shield for power cord storage	Type 1
000665	DS200 Ballot Box Diverter Extender- field retro fit	Type 1
000669	DS200 Internal Ballot tub	Type 1
836	Steel Ballot Box -Security Pin	Type 1
837	COTS Thumb drive cover	Type 1
838	COTS Thumb drive controller	Type 1
839	DS200 -label for compact flash	Type 1
845	Steel Ballot Box -Caster inner bearing	Type 1
846	DS200 document part number	Type 1
851	USB Part Number	Type 1
Type 2		
000332	DS200 Ballot Box new lock	Type 2
000339	DS200 Ballot Box carry case- washer & rivet to hold foam	Type 2
000359	DS200 Adding metal bottom edge (BOM & engineering status change)	Type 2
841	DS200 EOL Sensor, Power Switch & Capacitor	Type 2
843	Steel ballot box -Diverter cable	Type 2
844	DS200 EOL parts - diode	Type 2
847	DS200 Alternate LCD Backlight Inverter	Type 2
000529	DS200 cable, switch, bracket	Type 2
000534	DS200 Clamp to chassis	Type 2
000535	DS200 Clamps Chassis Tape & holes	Type 2
000576	DS200 EOL SMT Power Inductors	Type 2

5 Certification Review and Test Results

The results and evaluations of the PCA and FCA reviews tests are identified below. Detailed data regarding the Acceptance/Rejection criteria, reviews and tests are found in the appendices.

- Appendix A identifies all certification test requirements traced to specific Test Cases
- Appendix B identified the PCA Source Code Review Acceptance/Rejection criteria
- Appendix C identifies the PCA TDP Document Review Acceptance/Rejection criteria
- Appendix D identifies all FCA Testing Acceptance/Rejection criteria
- Appendix E identifies the PCA and FCA Discrepancies reported during review and testing

5.1 PCA Source Code Review

iBeta Quality Assurance reviewed the changes to the DS200 to the VVSG Vol. 1 Sect 5.2 and Vol. 2 Sect. 5, interpreted for C/C++ conventions and standards. Source code review issues were identified in a discrepancy report delivered to ES&S. Issues identified included missing header and variable declaration comments and undefined constants. These issues were reported to ES&S on source code review discrepancy reports. All source code resolution resubmissions from ES&S (BUG 17375 and 17664 submitted to both Unity 3.2.0.0 Revision 1 and Unity 3.2.1.0) are reviewed and validated. iBeta confirms issues are addressed prior to closing the discrepancy.

5.1.1 C and C++ DS200 with Scanner_C85051 Source Code Review Results

Changes to the DS200 were limited to the C/C++ components. The ESSUnity3200 baseline was modified during the 3.2.1.0 test effort. The identical results of that review were used in Unity 3.2.0.0 Revision 1. There were a total of 279 changed files/functions. Each of the files/functions was 100% reviewed for conformance to the *VVSG 2005.* Eleven modules with instances of non-conformance were reported to ES&S. All discrepancies were comment related. None of the discrepancies were against any of the software related *VVSG 2005* requirements. ES&S submitted revised code and iBeta validated that all discrepancies were resolved.

The file function line count results identified:

- no files or functions exceeded 240 eLOCs
- 3.34% were between 60 and 120 lines
- .23% were between 120 and 240 lines
- the remaining 96.43% were less than 60 lines.

The source code was found to meet the requirements of the *VVSG 2005.* The data supporting this review are found in Appendix B.

5.2 PCA TDP Document Review

ES&S submitted documentation changes. iBeta Quality Assurance Identified the changes within the TDP to determine if there was any impact on the PCA Document Review performed in the ESSUnity3200 baseline or if the changes in the document require verification of a process or functional description of the voting system. It was found that the changes had no impact on the ESSUnity3200 baseline PCA Document Review results found in the certification test report. No additional review was required.

 FCA DS200 Functional and System Level Testing

Software changes to the DS200 Firmware were submitted to both Unity 3.2.1.0 and 3.2.0.0 Rev 1. The Unity 3.2.0.0 Revision 1 Election Management Software (EMS) is unchanged from the certified ESSUNITY3200.

ES&S submitted DS200 Firmware version 1.4.3.0 containing enhancements and a newer version of HPM and ERM in the Unity 3.2.1.0 test effort. These changes were tested in Unity 3.2.1.0. In that test effort a single test case was created with seven scenarios. The election database was created in 3.2.1.0 using the unchanged ESSUNITY3200 baseline versions of AM, EDM and ESSIM and tested with the updates to HPM and ERM.

In the Unity 3.2.0.0 Rev. 1 test effort iBeta restored a PC with the unchanged ESSUNITY3200 baseline EMS software. As the identical changes were submitted to both test efforts, the Unity 3.2.1.0 DS200 Functional Test Case and the election database were reused. The first three scenarios were repeated using the ESSUNITY3200 baseline HPM and ERM with the v1.4.3.0 DS200. Discrepancies 1 & 2 were encountered because the change in ERM submitted in Unity 3.2.1.0 addressed an Illinois Overvote reporting issue. The test case was designed to test the Illinois Overvote reporting issue within the ERM in Unity 3.2.1.0 by using an Illinois test election. ES&S submitted a revision to the System Overview which identified that Unity 3.2.0.0 Revision 1 voting system does not support elections in Illinois or Hawaii. As a result the election database was modified to Idaho. Scenarios 1, 2 and 3 with the modified election location passed and were accepted.

Scenarios 4, 5 and 7 were restricted to DS200 functionality and did not require an end to end test for verification. Those scenarios were reviewed against the Unity 3.2.1.0 test results and the passed results were accepted. Scenario 6 dealt with detection of counterfeit ballots. This optional function was withdrawn in both test efforts.

A Document Review was conducted of ES&S testing of Field Issue 1 to confirm sufficiency

The EAC has issued a Voting System Technical Advisory regarding a "power down" and "freeze" (Field Issue 2) which identifies handling recommendations. For more information see the Voting System Technical Advisory on ES&S Unity 3.2.0.0 posted on the EAC website

5.2.1 DS200 Functional and System Level Test Results

The test and review results of the DS200 changes were accepted. The testing was conducted on the system configuration identified in Section 3. Appendix D details specific information on the Functional Testing. Failures, errors, nonconformities and anomalies observed in testing are summarized in Appendix E. Documentation of corrections and verification of corrections is contained in each summary.

5.3 FCA Hardware Environmental Testing

The ES&S submitted engineering changes (ECOs) for the ESSUNITY3200 DS200 precinct scanner and the plastic ballot box/case for certification in Unity 3.2.1.0 and Unity 3.2.0.0 Revision 1. These changes fell into two groups:

1. The administrative or hardware changes that don't impact electrical, transportation or storage: Administrative ECOs covered documentation relevant to the manufacturing administrative process, label changes, production status changes, out of scope equipment, documentation updates and drawings. Along with hardware changes that don't impact electrical, transportation or storage, these ECO's were assessed and determined to require no hardware environmental testing. This included the ECOs 000315, 000337, 000340, 000342, 000366, 000375, 000423, 000466, 000523, 000545, 000554, 000562, 000566, 000570, 000582, 000618, 000628, 000665, 000669 000674, 836, 837, 838, 839, 845, 846, and 851.

2. The hardware changes that may impact electrical, transportation or storage: Generally addressed end-of-life parts and second source suppliers that could impact electrical, transportation or storage VVSG requirements. These changes required additional assessment by a qualified electrical engineer.

The results of the assessments and the required testing are identified in the table below.

Table 13 DS200 ECO Hardware Assessments and Required Testing.

ECO #	Description of DS200 ECOs	Operating- EMC	Non-operating Transportation & Storage
000332	DS200 Plastic Ballot Box new lock.	4.8.3 Electrostatic Disruption EN-61000-4-2	No testing required
000339	DS200 Ballot Box carry case add washer & rivet to hold foam during manufacturing	No testing required	No testing required
000359	DS200 Plastic Ballot Box adding metal bottom edge	4.8.3 Electrostatic Disruption EN-61000-4-2	No testing required
000529	DS200 Carry Case remove micro switch bracket and switch cable	No testing required	No testing required
000534	DS200 add clamps to chassis	No testing required	No testing required
000535	DS200 Tape and holes for attaching clamps, no change to wire routing	No testing required	No testing required
000576	DS200 End of life SMT Power Inductor	No testing required	No testing required
841	DS200 add Rod Lens Array, capacitor, and protected power switch	All EMC Tests	No testing required
843	Steel Ballot Box added a new diverter cable	All except 4.8.8 Magnetic Fields Immunity EN-61000-4-8	No testing required
844	DS200 end-of-life capacitors, resistors and diode	4.8.3 VSS Electro-static Disruption EN-61000-4-2	No testing required
847	DS200 alternate LCD Backlight Inverter	All except 4.8.8 Magnetic Fields Immunity EN-61000-4-8	No testing required

5.3.1 FCA Hardware Environmental Tests

The DS200 electrical retesting was successfully completed. All tests were passed. Appendix D details specific information on the Hardware Environmental Testing. No failures or anomalies were observed.

6 Opinions & Recommendations

iBeta Quality Assurance has completed the testing of ES&S Unity 3.2.0.0 Revision 1 voting system.

- Testing prescribed by the iBeta test plan or amended test plan was performed as identified. Documentation of any divergence from the test plan was included in the amended as run test plan (see Appendix H: Amended Test Plan).

- All identified anomalies or failures were reported and resolved (see Appendix E - Discrepancy Report).

- Questions with regard to iBeta's interpretation of the test scope were referred to the EAC. The EAC responses were incorporated into iBeta's verification of resolution.

- The information provided in this report is an accurate representation of the ES&S Unity 3.2.0.0 Revision 1voting system Certification test effort.

Based upon the findings identified in Section 5 Certification Review and Test Results, in our opinion the acceptance requirements of *Election Assistance Commission Voluntary Voting System Guidelines* December 2005 for the changes to the DS200 Precinct Count Scanner have been met. In stating this opinion, iBeta notes that the *VVSG 2005* Appendix B.5 identifies that "any *uncorrected deficiency that does not involved the loss or corruption of voting data shall not necessarily be cause for rejection. Deficiencies of this type may include failure to fully achieve the levels of performances specified in Volume 1*". Section 2 Certification Test Background identifies Field Report 2. The issue identified has been documented by the EAC in the Voting System Technical Advisory Intermittent Freeze/Shutdowns with EAC Certified ES&S Unity 3.2.0.0 System. iBeta determined that the uncorrected operational deficiency (see Appendix A - VVSG requirement 2.1.5.1.b.i and ii) was permitted for recommendation after emails from ES&S and the EAC confirmed that the documented field reports did not identify loss or corruption of vote data.

Based upon the test findings, it is our opinion that the acceptance requirements of the *VVSG 2005* have been met for the DS200 changes submitted for certification testing.

iBeta Quality Assurance recommends that the Election Assistance Commission certifies the DS200 changes submitted in the ES&S Unity 3.2.0.0 Revision 1 voting system.

See Appendix K for information regarding the EAC Certification number.
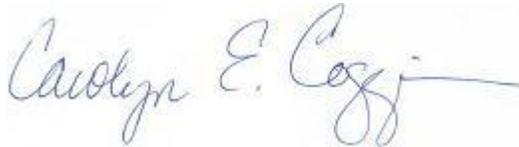
QA Director Voting

June 30, 2010

Note: The system configuration of the certified ESSUnity3200 explicitly excludes connection to any network (public or private). Modification of the hardware or operating system configuration to permit connection to a network invalidates the recommendations of this test report.

Unity 3.2.0.0 Revision 1 recommendation excludes Illinois and Hawaii because state specific overvote counting definitions prevented the upload of some precincts into this version of ERM during testing. There was no issue with the DS200 identifying overvotes.

7 APPENDICES: TEST OPERATION, FINDINGS & DATA ANALYSIS

7.1 Appendix A: Certification Test Requirements

Appendix A identifies the test results to the Certification Test Requirement in the original certified ESSUNITY3200 to the VSS 2002 of and the VVSG *2005* for the changes to the DS200 submitted in the Unity 3.2.0.0 Revision 1voting system. It is contained in the document *Appendix A, B, and G of the ES&S Unity 3.2.0.0 Revision 1 Voting System Certification Test Report for DS200 Modifications to the EAC Certified ESSUNITY3200.*

7.2 Appendix B: PCA Source Code Review

Appendix B identifies the findings of the source code review of the changes to the certified ESSUNITY3200 baseline. It is contained in the document *Appendix A, B, and G of the ES&S Unity 3.2.0.0 Revision 1 Voting System Certification Test Report for DS200 Modifications to the EAC Certified ESSUNITY3200.*

7.3 Appendix C: PCA TDP Documentation Review

A comparison of the TDP changes submitted in Unity 3.2.0.0 Revision 1 to the certified ESSUnity3200 voting system was performed. The comparison confirmed that the changes had no impact on the ESSUnity3200 baseline PCA Document Review results. No additional PCA TDP Documentation Review was needed for Unity 3.2.0.0 Revision 1 test effort. A functional review of the documentation changes was conducted during the DS200 Functional Testing.

7.4 Appendix D: FCA Testing

7.4.1 FCA Functional and System Level Testing

Testing was conducted on the system configuration referenced in the test method. The software and hardware configuration is identified in the individual test case document.

Date	Test Result	Issues Opened	Issues Closed	Notes
6/21/2010	Rejected	Disc # 1, 2 & 3		Scenario 1 Rev 0 - State code IL requires ERM update not submitted to Unity 3.2.0.0 Revision 1
6/22/2010	Rejected	Disc # 1, 2 & 3		Scenario 2 Rev 0 - State code IL requires ERM update not submitted to Unity 3.2.0.0 Revision 1
6/24/2010	Accepted			Scenario 1 Rev 1 - Retested with state code ID.
6/25/2010	Accepted			Scenario 2 Rev 1 - Retested with state code ID.
6/25/2010	Accepted			Scenario 4 - 7 Reuse testing in Unity 3.2.1.0
6/25/2010	Accepted			Scenario 3
6/29/2010	Accepted		Disc # 3	Document Review of ERM SOP identifying Error message "Import process error"
6/29/2010	Accepted		Disc # 1 & 2	EAC confirmed Unity 3.2.0.0 Revision 1 restriction of scope excluding IL and HI

Full description of the issues encountered in testing is found in Appendix E- Discrepancy Report.

iBeta Definition	DS200 Functional Test Method
Test Case Name	DS200 Functional TC
Scope - identifies the type of test	The changes to the DS200 submitted in Unity 3.2.0.0 Revision 1 have also been submitted in the Unity 3.2.1.0 certification test effort. Seven test scenarios are listed within this test method. Scenarios 1, 2 & 3 require execution in Unity 3.2.0.0 Revision 1 to confirm that the changes to the DS200 integrate with the ESSUNITY3200 Election Management System. Scenarios 4 through 7 require no additional testing because they are **isolated** to the DS200. The ES&S Unity 3.2.1.0 test results will be used. In Unity 3.2.1.0 the election creation was performed on a Peer-to-Peer configuration (multiple PCs). In Scenarios 1, 2 & 3 election data will be copied to the ESSUNITY3200 Election Management System Stand Alone configuration. New media will be burned, ballots will be scanned on the DS200 and election results will be read into ERM. Testing shall confirm the functional changes in the DS200 firmware v. 1.4.3.0: BUG15827, ENH14725, ENH14726, ENH14729, ENH14730, ENH14731, ENH14732, ENH14745, ENH15287, ENH15288, ENH15418, ENH15890, ENH15891, ENH15892, ENH16085, ENH16211, ENH16231, ENH16382, ENH15418, ENH17538, ENH17666, ENH16120, ENH16291, ENH16336, A Document Review was conducted of ES&S testing of BUG16775 & BUG16782 (Field Issue 1) to confirm sufficiency.

iBeta Definition	DS200 Functional Test Method
	(Note: Support of counterfeit ballot detection ENH15009 is withdrawn. Modem functionality is not supported in this certification effort (ENH14728); and Unity 3.2.0.0 Revision 1 does not support elections in Illinois and Hawaii.
Test Objective	The objective is to validate the ES&S functional changes to the DS200 from the ESSUNITY3200 certified baseline. These changes were submitted in Unity 3.2.1.0. Scenario 1 through 3 shall confirm that the same results from Unity 3.2.1.0 are observed. Unity 3.2.1.0 results from document reviews and testing conducted in Scenarios 4 through 7 shall be used.
Test Variables: Volume Stress Performance Error Recovery	**Scenario 1:** Reuse the Illinois Open Primary without Party Preference election defined in the Unity 3.2.1.0 test effort with the following settings: (This was modified to Idaho as a result of discrepancies 1 and 2) **ENH16382**•18 Precincts election day and 1 Polling Place 9 District Types (this does not including Countywide) 18 District Name (two contests to ac district name) 18 ballot style (each precinct has its own ballot style) 14" 36 "standard 14" ballot 2 Partisan contest per style 4 candidates per contest (2 candidates per party for the mayor contest, 4 candidates for the Senator contest (total of 216 candidates) Write-ins (1 for the Mayor and 2 for the Senator race) DEM and REP Parties **ENH14745 & BUG15827•The Scanner Options** •Diverter is set for "Overvoted Write-ins & Blank Ballots". •Ballot Control is set to Query for "Overvoted ballots, Cross voted ballots, Unreadable marks, Undervoted ballots and blank ballots" **ENH14725**•The DS200 scanner options are set to "Do not save any ballot images" Run Election set up reports in EDM **Scenario 2: Same as Scenario 1 except:** **ENH15287** •Changes "election day" to "early voting" in HPM by selecting the "Include all Precincts" option. The early voting option allows the Poll worker to view the Ballot Style Report. **ENH14725**• The DS200 scanner options are set to "save all ballot images" **Scenario 3:** Use Scenario 1 test results**:** **ENH16382**•DS200 18 precincts Election Day can exceed the declared System Limit of 10 precincts. **Scenario 4:** Reuse Unity 3.2.1.0 test results **ENG15418** •ES&S will provide ballots with speckling. Use the DS200 Functional S1 election. Each ballot will contain stray marks in the time track (left hand side of the ballot). Marks will emulate various levels of white speckling. Ballot will be read on DS200 with v. 1.3.10.0 and re-read on version 1.4.3.0 **ENH14726 & ENH15288** •After scanning a valid ballot, time how long the "Thank you for voting" screen displays. Note the time. Measure the font (text) on the "Thank you for voting" screen display. Note the size. Change firmware version and repeat test. Compare times and sizes. **Scenario 5:** Reuse Unity 3.2.1.0 test results **ENH17538 & 17666:** •Only testing the Protective Counter (for Maryland). Do not need the ballot box. ES&S will provide an "updated" test FW version that with a different version number. To test, begin scanning ballots. Upgrade the firmware with the test FW provided by ES&S. Continue with voting. When the voting is complete, Verify the counter did not reset or lose count and the counter appears in the printed reports. Restore the DS200 to the original firmware version. Verify the counter did not lose count. •Note the counter number from the DS200 and the Initial State report • Load the election and scan a few (2 to 5) ballots, close the polls and note the counter in the results report and audit log. •Upgrade the firmware; note the counter on the Initial State report. •Re-burn the media for the S1 election, load the election, and scan more ballots. •Close the polls. Examine the protected counter on the DS200, Audit log and the Results report. •Restore to the original firmware version. • Verify the protected counter did not lose count. **Scenario 6: ENH15009 (**ES&S has withdrawn counterfeit ballot detection functionality) **Scenario 7:** Use the Unity 3.2.1.0 test results In Regression REV01 TC Scenario 1 the Overvote translations match ENH16291/16336.
A description of the voting system type & operational environment	The Unity 3.2.0.0 Revision 1 EMS is a single PC • DS200 Precinct Count scanner • Steel ballot box with diverter
VVSG 2005 vol. 1	2.1.5.1.b l thru vii, c, 2.1.6, 2.1.7.2, 2.2.1, 2.2.1.3, 2.3.1 thru 2.3.1.2, 2.1.4.j, 2.2.4, 2.3.3.1.b,c,d, 2.3.3.2, 2.4.1.b, 2.4.3, 2.4.2 thru 2.4.3, 4.1.5.1.d, 4.1.6.1, 4.1.8 thru 4.1.8

iBeta Definition	DS200 Functional Test Method
VVSG 2005 vol. 2	6.2, 6.2.1, 6.2.2, 6.3, 6.6, 6.7 A4.3.5 Volume (maximum and exceeding more than the maximum number of precincts in a Polling Place) A4.3.5 Volume/Stress (Processing, storing and reporting data when overloading the number of precincts in a Polling Place) A4.3.5 Performance/Recovery (Ballot format handling capability-graceful shut down and recovery without loss of data) A4.3.5 Performance/Recovery (Processing rates-graceful shut down and recovery without loss of data)
Hardware, Software voting system configuration and test location	Test Location: iBeta, Aurora, CO The Unity 3.2.0.0 Revision 1 Voting System consists of the following: Audit Manger (AM), Election Data Manger (EDM), ES&S Ballot Image Manager (ESSIM), Hardware Program Manger (HPM), Model Election Reporting Manager (ERM), LogMonitor Service. 1 @ DS200 1-DS200 starting with version 1.3.10.0 and upgrade to version 1.4.3.0 (upgrade required for Scenario 5) 1 Steel ballot box with diverter
Pre-requisites and preparation for execution of the test case.	Complete the prerequisites: • Retrieve the election data databases archived from the DS200 Functional Test Case in Unity 3.2.1.0, Scenario 2 Rev 02 • Copy the Unity contents from the archive for scenario 1 into the Standalone PC. • Copy the Unity and Elecdata contents from the archive for scenario 2 & 3 into the Standalone PC.
Getting Started Checks	Getting Started: Complete the prerequisites; Check the voting system to: • Verify the test environment and system configuration is documented in the PCA Configuration and matches the system used in the 48 hr. temp & power variation test and vendor described configuration. Validate installation of the witnessed build. • Testers understand that no change shall occur to the test environment without documentation in the test record and the authorization of the project manager • During testing an operational readiness test was performed. • The environment is set up as a standalone configuration.
Documentation of Test Data & Test Results	Test Data: - Record all programmed & observed election, ballot & vote data fields and field contents on the corresponding tabs to provide a method to repeat the test. - Preserve all tabs for each instance the test is run. Test Results: - Enter Accept/Reject on the Test Steps. - In Comments enter any deviations, discrepancies, or notable observations. - Log discrepancies on the Discrepancy Report and insert the discrepancy number in the Comments field of Test Step.
Volume: Paper-based voting systems Processing	Ballot Prep: **Scenario 1)** Create DS200 media with the previously defined Test Variables for Scenario 1 **Scenario 2)** Same as scenario 1 except early voting and ballot images are saved **Scenario 3)** Use scenario 1 test results to confirm exceeding the declared system limit of 10 precincts do not cause system errors or if there are any system errors that cause the EMS ballot preparation applications to crash then verify the applications recover without any loss of data. If no error is given prior to leaving HPM continue the test through ERM; verify there are no system errors. **Scenario 4, 5 & 7)** Reuse of Unity 3.2.1.0 testing results **Scenario 6) ENH15009 (ES&S has withdrawn** counterfeit ballot detection functionality).
Volume:	**Scenario 3: ENH16382**•Use scenario 1 test results to confirm when exceeding the declared system limit of 10 precincts Overloading systems capacity to process, store, and report data.): • Overloading the HPM with more than the declared number of precincts in a single polling place.
Stress	**Scenario 3: ENH16382**•Use scenario 1 test results to confirm when exceeding the declared system limit of 10 precincts the system responses to overloading conditions
Performance	**Scenario 3: ENH16382**•Use scenario 1 test results to confirm when exceeding the declared system limit of 10 precincts there is no system degradation (Ballot format handling capability and Processing rates): • The system does not slow down throughout the testing
Error Recovery	Voting system gracefully shuts down (no crash) and recovers from errors caused by overloading

iBeta Definition	DS200 Functional Test Method
	the number of precincts and ballots styles. • Processing capabilities-graceful shut down and recover without loss of data • Critical Status Messages
Readiness Testing and Poll Verification	**Scenario 1:** Voting system is ready for the election: Verify the voting system is ready for the election: - The election is correctly installed (Election ID, polling place name, precincts) . - Test data (run a precinct to validate the system is ready) is segregated from voting data, with no residual effect'. Test confirmation that there are: - No hardware/software failures. - The device is ready to be activated to accept votes (No Identification of any failures & corrective action)•Run 1 precinct to validate the system is ready; confirm the test data is segregated from voting data, with no residual effect. Verify totals and audit logs. **ENH14729**•"Polls Opened Menu": Print the zero reports (first of 3 zero reports prior to opening of polls) **ENH16231**•a "Failure" error and a "Successful" message are displayed on the DS200; the audit log displays the Failure and Successful PW login attempts. **ENH14730**•2 beeps and a "successful" message displays once the scanner has been calibrated (Calibrate scanner option). **ENH14730 (15891, 15890, 15892)**•Calibrate the counterfeit sensor; 2 beeps and a "successful" message displays (testing that only the counterfeit sensor can be set up as required, a message is displayed as well as 2 beeps can be heard once the counterfeit sensor has been successfully calibrated). **ENH14729**•The zero report can be printed. (2nd of 3 zero reports prior to opening the polls) The report continually displays zeros for the contest, candidates, precincts (all 18), under/overvotes and Write-Ins. **ENH15287**•The "Polls Opened Menu" doesn't display a "Ballot Style Report" button. (this displays only for Early Voting) • Scan pre-election test ballots, **ENH14745** • Select the options to override Overvoted ballots and Blank ballots only, do not select any other options. Overvoted and Blank ballots will not prompt an "Accept" or "Reject" message to the voter. The ballots will automatically be accepted due to the override. The Cross voted, Undervoted and unreadable ballots will provide a prompt to "Accept" or "Reject" and the voter will be required to make a selection •Tally pre-election test ballots; ballots match the predicted results outlined in the test case **ENH14732 & ENH16211**•run the results tape; at the end of the Results tape and audit log they display the "Machine ID" and "Poll Number" **Scenario 2:** Reuse the same election as Scenario 1 except with the changes noted in the Scenario 2 Voting Variations **ENH15287**• Verify the Ballot Styles Report button on the "Open Polls Menu" screen displays in the upper right hand of the icon bar and the report is accurate. **ENH14745** Reset "Override" options: Selection the options to override (undervotes and crossover ballots) Verify ballots will automatically be accepted due to the override and "Overvoted W/I ballots", "Unreadable marks", and "Blank Ballots" will provide a prompt to "Accept" or "Reject" and the voter will be required to make a selection **ENH14730** • Unplug the DS200 from the ballot box verify 2 beeps are heard. Print a zero report and open printer door while printing is occurring. Verify printing will stop and DS200 will beep two times **Scenario 3:** •Verify scenario 1 is correctly handled by the system with 18 precincts (exceeding the declared system limit of 10 precincts). **Scenario4, 5 & 7** Reuse Unity 3.2.1.0 test results **Scenario 6: ENH15009 ES&S has withdrawn**, the detection of counterfeit ballots.
Pre- vote: Opening the Polls Verification	Verify the polling place voting system for scenario 1, 2 & 3: - Zero count report has no results. All test results have been zeroed out during readiness testing. - Election identification including, Election Name/ID, Precinct ID/Name, Firmware Version
Voting: Ballot Activation and Casting Verifications	**Scenario 1:** Using the predetermined vote pattern, reuse previously marked ballots from Unity 3.2.1.0 and scan ballots. **ENH16231** • attempt to reopen Polls using an incorrect and a correct password. Verify message appears on DS200 and in audit log. **ENH14729** •Clear pre-election readiness test totals and run another zero report **ENH14745** •Reset the "Override" options. Selecting the options to override Overvoted ballots and Blank ballots only, do not select any other options. Overvoted and Blank ballots will not prompt an "Accept" or "Reject" message to the voter. The ballots will automatically be accepted due to the

iBeta Definition	DS200 Functional Test Method
	override. The Cross voted, Undervoted and unreadable ballots will provide a prompt to "Accept" or "Reject" and the voter will be required to make a selection
	ENH14725 & ENH16085 •View the icon bar for each of the icons on the "Welcome screen". Verify an X appears on over the disk icon to indicate no images are being saved. Verify ballot status, power status, image status, election definition and open polls icons are displayed.
	ENH16382 •vote ballots for all 18 precincts and verify the ballots for all 18 precincts are accepted without a precinct error
	ENH14731 •Verify that there is a beep as each ballot is accepted
	ENH15288 • Measure and verify the "Thank you for voting" text is larger. (Compare using old v.1.3.10.0 and new v.1.4.3.0 DS200 firmware)
	ENH14726 •Time and verify the "Thank you for voting" screen displays 3 to 5 seconds longer. (Compare using old v.1.3.10.0 and new v.1.4.3.0 DS200 firmware)
	ENH14725 •The Welcome screen displays the Disk icon (on the icon bar) has a small red X (not saving ballot images)
	ENH16085 • Verify the Welcome screen displays the following on the icon bar, "Battery Status Indicator Icon, AC Power Status Indicator Icon, Image Saving Status Indicator Icon, Election Definition Status Icon"
	Scenario 2:
	ENH14725 •View the icon bar for each of the icons on the "Welcome screen". Verify no X appears on over the disk icon to indicate images are being saved.
	All early voting ballots can be scanned without error into the correct ballot bin
	Scenario 3:
	ENH16382•Use scenario 1 test results to confirm exceeding the declared system limit of 10 precincts
	Scenario 4: Reuse Unity 3.2.1.0 test results
	ENG15418 •ES&S will provide ballots with speckling. Each ballot will contain stray marks in the time track (left hand side of the ballot). Marks will emulate various levels of white speckling. Ballot will be read on DS200 with v. 1.3.10.0 and re-read on version 1.4.3.0.
	•Scan ballots
	ENH14726: After scanning a valid ballot, time how long the "Thank you for voting" screen displays. Note the time.
	ENH15288: After scanning a valid ballot, measure the font (text) on the "Thank you for voting" screen displays. Note the size.
	Change the firmware version on the DS200 and scan ballots
	ENH14726: After scanning a ballot, time how long the "Thank you for voting" screen displays. Note the time.
	ENH15288: After scanning a ballot, measure the font (text) on the "Thank you for voting" screen displays. Note the size.
Voting: Voting System Integrity, System Audit, Errors & Status Indicators	The system audit provides a time stamped, always available, report of normal/abnormal events found within the percentage of sampled test
	Error messages are. - Generated, stored and reported as they occur. - Errors requiring intervention by the voter or poll worker are clearly display issues and action instructions in easily understood non-technical text language or with indicators. - The text for any numeric codes is contained in the error or affixed to the inside of the voting system. - Incorrect responses will not lead to irreversible errors. - Nested conditions are corrected in the sequence to restore the system to the state before the error occurred
	Status Messages: - Display and report critical status messages are using unambiguous indicators or English language text. - Non-critical status messages are displayed but do not have to be at the time of occurrence and may be numerical codes for subsequent interpretation and reported in unambiguous text. - Status messages are part of the real-time audit record.
	Scenario 4: Reuse Unity 3.2.1.0 test results **ENH15418** •Using a ballot with an estimated 10% of the timing track scratched out. Scan each ballot of the older DS200 version (v. 1.3.10.0) and on the new version. The old version will display an error the new version will allow the scanning of the ballot. **ENH15418** •Using a ballot with an estimated 50% of the timing track scratched out. Scan each ballot of the older DS200 version (v. 1.3.10.0) and on the new version. The old version will display an error the new version will allow the scanning of the ballot. **ENH15418** •The white marks (speckles) in the ballot time track will display error "BALLOT

iBeta Definition	DS200 Functional Test Method
	DRAGGED/Turn Ballot Over and Try Again" on version 1.3.10.0. (Cause: The ballot did not enter the feed mechanism smoothly, which caused misalignment during scanning.) . End of Scenario 4 testing
	Scenario 5: Reuse Unity 3.2.1.0 test results. **ENH17538 & 17666:** . • Scan a few (2 to 5) ballot, close the polls and note the counter in the results report and audit log. •Upgrade the firmware and note the counter on the Initial State report. •Re-burn the media for the S1 election, load the election, and scan more ballots. •Close the polls. •Examine the protected counter on the DS200, Audit log and the Results report. •Restore to the original firmware version and verify the protected counter did not lose count. End of Scenario 5 testing
	Scenario 6: ENH15009 ES&S has withdrawn the detection of counterfeit ballots.
	Scenario 7 - Reuse results from Unity 3.2.1.0 to confirm **ENH16291/16336** Overvote translations have been updated. End of Scenario 7 testing**.**
	Document Review of ES&S Testing. **BUG16775 & BUG16782 (Field Issue 1)**
	Review the ES&S assessment, resolution and testing regarding the DS200's sporadic reporting of a mark in row 44 and row 45 of column D (back of the ballot) when no actual mark was present. Review the assessment of the issue on the DS200 FW (v.1.3.10.0) to confirm that it identified:
	• A very narrow set of specific variables required to generate the error. • ES&S demonstrated they were able to consistently and reliably repeat the error; and. • ES&S' resolution was consistent with the VSS. Review the resolution testing to confirm that the testing included all conditions and was sufficient to accept without additional testing by iBeta.
	Variables Identified: Location of the contest from the vertical timing tracks, proximity to the top or bottom of the ballot, left side of the column oval placement, extension of the text next to the oval the edge of the allowable print area specified in the print layout manuals, and insertion in a skewed fashion of ballots with no selection on the last contest in column D.
	Resolution: Tolerance adjustments such that ballots with these unique variables inserted in a skewed manner will be rejected and require reinsertion.
Post-vote: Closing the Polls	**Scenario 1:** Once the polls are closed the voting system • Printed reports of ballots counted by tabulator • Reported votes match predicted votes from tabulator with votes and undervotes. • In the polling place print the summary report with all of the 18 precincts in a single polling place. **ENH16211** •Cancel printing of audit log only and view the log displays for the "Machine ID" and "Poll Number". Print audit log • totals match the predicated reports (using the vote tab) **ENH16211** •Audit Log stops printing after cancellation and displays the "Machine ID" and "Poll Number" at the end of the Audit Log •the Audit Log can be re-printed. The audit log will display the history of this election. The pretest and the election day audit log matches the pre-election activities outlined above. **ENH15827** •Overvoted Write-in ballots and blank ballots were separated from the other ballots **Scenario 2** • Same as Scenario 1 excluding the listed enhancements **Scenario 3:** **ENH16382**•Use scenario 1 test results to confirm exceeding the declared system limit of 10 precincts **Scenario 6: ENH15009** (withdrawn counterfeit ballot detection),
Post-vote: Central Count	**Scenario 1:** ERM Zero report is printed and no totals display on the report prior to reading in the results. ERM: Vote Consolidation: **ENH14725** • attempt to upload DS200 ballot images and a message displays stating no images saved. Ballot images from the DS200 CANNOT be extracted/ viewed. The image was not saved in HPM. (Ballot images not saved was set in Test Variables) •Votes match predicted votes (compare to vote tab. Vote tab is what was used to create paper ballots) • reports will display election identification • EL30A - Precinct Report–Group Detail, individual precincts & contest results. • Precinct Report contains votes, undervotes & overvotes • EL45- Election Summary, total number of votes for each candidate/question • Verify DS200 SN is displayed in ERM, once the USB flash drive is read into ERM • Ensure audit logs are accurate & complete. **Scenario 2:** Same as Scenario 1 except **ENH14725** • Upload DS200 ballot images. Ballot images

iBeta Definition	DS200 Functional Test Method
	from the DS200 can be extracted. The image was saved in HPM. (Ballot images saved was set in Test Variables) **Scenario 3:** ENH16382•Use scenario 1 test results to confirm exceeding the declared system limit of 10 precincts
Expected Results are observed	Review the test result against the expected result: • Accept: the expected result is observed • Reject: the expected result of the test case is not observed • Not Testable (NT): rejection of a previous test step prevents execution of this step, or tested in another TC. • Not Applicable (NA): not applicable to test scope
Record observations and all input/outputs for each election;	All inputs, outputs, observations, deviations and any other information impacting the integrity of the test results will be recorded in the test case. • Any failure against the requirements of the EAC guidelines will mean the failure of the system. And shall be reported as such • Failures will be reported to the vendor as Defect Issues in the Discrepancy Report. • The vendor shall have the opportunity to cure all discrepancies prior to issuance of the Certification Report. • If cures are submitted the applicable test will be rerun. Complete information about the rerun test will be preserved in the test case. The cure and results of the retest will be noted in the - Discrepancy Report and submitted as an appendix of the Certification Report. • Operations which do not fail the requirements but could be deemed defects or inconsistent with standard software practices or election practices will be logged as Informational Issues on the Discrepancy Report. It is the vendor's option to address these issues. Open items will be identified in the report.

7.4.2 FCA Hardware Environmental Testing

The DS200 v.1.4.3.0 engineering changes submitted in Unity 3.2.0.0 Revision 1 have also been submitted to the Unity 3.2.1.0 certification test effort. As the changes are identical iBeta has used the common results. in both test efforts.

Date	Test Result	Issues Opened	Issues Closed	Notes - DS200 & Ballot Boxes
11/19/2009	Accept			**Assessment of ECO 000332:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. **• Operating Tests:** Change warrants repeating 4.8.3 VSS Electrostatic Disruption EN-61000-4-2
11/19/2009	Accept			**Assessment of ECO 000339:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. • **Operating Tests:** Change has no impact on Operating-EMC. Reuse Unity 3.2.0.0..
11/19/2009	Accept			**Assessment of ECO 000359:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. • **Operating Tests: :** Change warrants repeating 4.8.3 VSS Electrostatic Disruption EN-61000-4-2
11/20/2009	Accept			**Assessment of ECO 000529:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. • **Operating Tests:** Change has no impact on Operating-EMC. Reuse Unity 3.2.0.0..
11/11/2009	Accept			**Assessment of ECO 000843:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. • **Operating Tests: :** Change warrants repeating all EMC tests & 4.1.2.6 VVSG Electrical Fast Trans EN-61000-4-4.
11/20/2009	Accept			**Assessment of ECO 000841:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. • **Operating Tests: :** Change warrants repeating all EMC

Date	Test Result	Issues Opened	Issues Closed	Notes - DS200 & Ballot Boxes
				test except 4.8.8 VSS Magnetic Fields Immunity EN-61000-4-8 & 4.1.2.6 VVSG Electrical Fast Trans EN-61000-4-4.
11/20/2009	Accept			**Assessment of ECO 000844:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. **• Operation Tests: :** Change warrants repeating 4.8.3 VSS Electrostatic Disruption EN-61000-4-2
11/20/2009	Accept			**Assessment of ECO 000847:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. **• Operating Tests: :** Change warrants repeating all EMC tests & 4.1.2.6 VVSG Electrical Fast Trans EN-61000-4-4.
1/26/2010	Accept			**Assessment of ECO 000534:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. **Non-operating Tests:** Change has no impact on Operating- EMC. Reuse Unity 3.2.0.0.
1/25/2010	Accept			**Assessment of ECO 000535:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. **Non-operating Tests:** Change has no impact on Operating- EMC. Reuse Unity 3.2.0.0.
1/15/2010	Accept			**Assessment of ECO 000576:** **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. **Non-operating Tests:** Change has no impact on Operating- EMC. Reuse Unity 3.2.0.0.
8/11/2009 - 5/11/2010	Accept			**Assessment of ECO** 000315, 000337, 000342, 000366, 000375, 000423, 000466, 000523, 000545, 000554, 000562, 000566, 000570, 000582, 000618, 000628, 000665, 000669 000674, 836, 837, 838, 839, 845, 846, and 851 **• Non-operating Tests:** Change has no impact on transportation or storage. Reuse Unity 3.2.0.0. **Non-operating Tests:** Change has no impact on Operating- EMC. Reuse Unity 3.2.0.0.
12/15/2009	Accept			**4.8.1 VSS Power Disturbance EN-61000-4-11**-successfully executed for ECO#:841, 843, 847
12/11/2009	Accept			**4.8.2 VSS Electromagnet Radiated & Conducted Emissions FCC Part15B** successfully executed for ECO#:841, 843, 847
12/11/2009	Accept			**4.8.3 VSS Electrostatic Disruption EN-61000-4-2** successfully executed for ECO#:332, 359, 841, 843, 844, 847
12/12/2009	Accept			**4.8.4 VSS Electromagnetic Susceptibility EN-61000-4-3** successfully executed for ECO#:841, 843, 847
12/16/2009	Accept			**4.8.6 VSS Lightening Surge EN-61000-4-5** successfully executed for ECO#:843, 841, 847
12/15/2009	Accept			**4.8.7 VSS Conducted RF Immunity EN-61000-4-6** successfully executed for ECO#:843, 841, 847
12/16/2009	Accept			**4.8.8 VSS Magnetic Fields Immunity EN-61000-4-8** successfully executed for ECO#:843, 847
03/25/2010	Accept			**4.1.2.6 VVSG Electrical Fast Trans EN-61000-4-4** successfully executed for ECO#:841, 843, 847

The test method description incorporates the assessment, test conditions and details as it was set up in the *Unity 3.2.1.0 Environmental Hardware Test Case* and the engineering changes are listed in Section 4.2 DS200 Engineering Changes

Method Detail	Environmental Test Method
Test Case Name	Environmental Test Case
Scope - identifies the type of test	Assessment and testing of the hardware of the DS200 from ESSUNITY3200: Identify and assess hardware changes from the certified baseline and engineering change orders to determine the extent of testing required, including execution and the provision of test results as required. This set of hardware environmental test cases is outside the scope of iBeta's VSTL accreditation. Electrical testing was performed by Criterion Laboratories NVLAP #100396-0 (Electrical) with supervision of testing by iBeta. iBeta reviews and documents test records, results and reports to confirm testing was performed under an appropriate mode as a voting system and to determine acceptance or rejection of some or all testing
Test Objective	Validation of the Unity 3.2.0.0 Revision 1 (identical to Unity 3.2.1.0) DS200 hardware to meet the Non-Operating/Operating Environmental test standards of the EAC VSS 2002/*VVSG 2005* , including: **DS200** Assessment of the ECOs from the ESSUNITY3200 baseline to verify reuse of the Non-Operating Transportation and Storage test results from ESSUNITY3200 and test execution of the Operating Electrical tests.
Test Variables:	Use the test results from testing in Unity 3.2.1.0: **DS200** - Electrical ECOs from the ESSUNITY3200 baseline (identical to Unity 3.2.1.0) impact on operation • Power disturbance disruption - IEC 61000-4-11 (1994-06). • Electromagnetic radiation- FCC Part 15 Class B requirements - ANSI C63.4. • Electrostatic disruption - IEC 61000-4-2 (1995-01). • Electromagnetic susceptibility - IEC 61000-4-3 (1996). • Electrical fast transient protection - IEC 61000-4-4 (1995-01).(2004-02) • Lightning surge protection - IEC 61000-4-5 (1995-02). • RF immunity - IEC 61000-4-6 (1996-04). • AC magnetic fields RF immunity - IEC 61000-4-8 (1993-06). **DS200**, reuse the certified baseline in the Unity 3.2.0.0 Test Report- (ECOs have no impact) MIL-STD810-D: • High temperature method 501.2 Procedures I-Storage maximum 140 F degrees • Low temperature method 502.2, Procedure I-Storage minimum -4 F degrees • Temperature & power variations method 501.2 & 502.2 • Humidity method 507.2 • Vibration method 514.3-1 Category 1 Basic Transportation Common Carrier • Bench handling method 516.3 procedure VI • Safety OSHA CFR Title 29, part 1910
A description of the voting system type and the operational environment	Precinct Count scanner/tabulator: Model 200 (DS200)
VSS 2002 vol. 1	3.2.2 thru 3.2.2.14, 3.4.8
VSS 2002 vol. 2	4.6.1.5 thru 4.7.1 & 4.8 RFI 2008-01, 2008-05, 2008-06, 2008-09, 2008-10
Hardware, Software voting system configuration and test location	**DS200 Electrical Testing** Test Location: Criterion Labs, Rollinsville CO • iBeta provided Criterion with the environmental hardware test case outlining methods for preparation of their test plan; iBeta documented the configuration, test environment, lab accreditations, tester qualifications, and operational status check performance iBeta personnel execute the operational status checks and operate the equipment as a voting system during the EMI/EMC test execution.
Pre-requisites and preparation for execution of the test case.	**DS200 Electrical Testing:** Complete the prerequisites; • Validation and documentation of the subcontractor test labs' NVLAP accreditation in the specific test method identified in the Test Variables • Record the testers & date • System has been set up as identified in the user manual

Method Detail	Environmental Test Method

	• Gather any necessary materials or manuals.
	• Ensure customization of the test case template is complete
	• The iBeta approved Operational Status Check script is provided that includes:
	    o Checking the operation of all buttons, switches and lights
	    o Opening the polls & running a zero totals report
	    o Checking appropriate error conditions for correct prompts or responses. (Error conditions will depend upon the type of equipment being tested.)
	    o Accessibility features are operational.
	    o Power off and on with no loss of function.
	Close the polls and print all reports. (Totals & Audit Logs)

Getting Started Checks	**DS200 Electrical Testing:** Check the voting system to: • Verify the test environment and system configuration is documented in the PCA Configuration and matches the vendor described configuration. • Validate installation of the Trusted Build • Testers understand that no change shall occur to the test environment without documentation in the test record and the authorization of the project manager • Confirm the tester understands the recording requirements of the iBeta test case • Operational status check procedures are available and successfully run An automated script to loop system operation for use during the EMC operational tests exercises all necessary functionality.
Documentation of Test Data & Test Results	**DS200 Electrical Testing:** Test Results: • Enter Accept/Reject on the Test Steps • In Comments enter any deviations, discrepancies, or notable observations Log discrepancies on the Discrepancy Report and insert the number in the Comments
Standard Environmental Tests	**DS200 Electrical Testing:** Follow the test methods in all of the international electrical standards listed above to executed the EMC tests
Expected Results are observed	**DS200 Electrical Testing:** Review the test result against the expected result: • Accept: the expected result is observed • Reject: the expected result of the test case is not observed • Not Testable (NT): not testable; provide a reason in the comments • Not Applicable (NA): not applicable to test scope
Record observations and all input/outputs for each election;	**DS200 Electrical Testing:** All test results will be recorded in the test case Any failure against the requirements will mean the failure of the system and shall be reported as such. Failures will be reported to the vendor as Defect Issues in the Discrepancy Repot. The vendor shall have the opportunity to cure all discrepancies prior to issuance of the Certification Report. If cures are submitted the applicable test will be rerun. Complete information about the rerun test will be preserved in the test case. The cure and results of the retest will be noted in the Discrepancy Report and submitted as an appendix of the Certification Report • Operations which do not fail the requirements but could be deemed defects or inconsistent with standard software practices or election practices will be logged as Informational Issues on the Discrepancy Report. It is the vendor's option to address these issues. Open items will be identified in the report

7.5 Appendix E- Discrepancy Report

#	Date	Tester	Type	Status	Location	Issue Description	VVSG Requirement	Vendor Response	Validation of Resolution
1	6/21/10	K. Austin/ S. Brown	Functional Defect	Closed	ERM v.7.5.4.0 - Uploading DS200 (v.1.4.3.0) election results	An error occurs in ERM when attempting to upload Election results from 2 of 18 precincts. DS200 election results from 2 of 18 precincts failed to upload. When uploading precincts 2 and 5 ERM displayed: "Import process error. 0002-spp record contest totals are not correct. The results will not be used. Click OK to acknowledge". The other16 precincts imported successfully.	v.1: 5.4.4.a Voting systems shall meet these reporting requirements by providing software capable of obtaining data concerning various aspects of vote counting and producing printed reports. At a minimum, vote tally data shall include: Number of ballots cast, using each ballot configuration, by tabulator, by precinct, and by political subdivision	**SLM 06.29.10 -** See Revised System Overview • Updated the Notice of Unsupported Functionality appearing after the document copyright page and also the footer to indicate that the Unity 3200r1 voting system does not support elections for the states of Hawaii or Illinois.**SLM 06.25.10 -** ES&S does not support the State of IL in Unity 3200 Revision 1. This error occurred when the election was set with the state code of IL. This issue has been resolved in Unity 3.2.1.0.	**Accepted 06/29/10 KA -** Verified in ES&S Sys Overview ver. 5.0 dated 06/29/10, in the Notice of Uncertified Functionality and the footer, that HI and IL are listed as unsupported states.
2	6/23/10	K. Austin/ S. Brown	Functional Defect	Closed	ERM 7.5.4.0 - importing DS200 v.1.4.3.0 election results	ERM failed upload error message does not provide clear direction to the user. Error message "Import process error. 0002-spp record contest totals are not correct. The results will not be used. Click OK to acknowledge" received when attempting to upload Election results into ERM does not clearly state the action to be performed to recover and correct the problem.	V:1. 2.1.5.1.b.v The message cue for all voting systems shall clearly state the action to be performed in the event that voter or operator response is required.	**SLM 06.29.10 -** See Revised System Overview • Updated the Notice of Unsupported Functionality appearing after the document copyright page and also the footer to indicate that the Unity 3200r1 voting system does not support elections for the states of Hawaii or Illinois.**SLM 06.25.10 -** ES&S does not support the State of IL in Unity 3200 Revision 1. This error occurred when the election was set with the state code of IL. This issue has been resolved in Unity 3.2.1.0	**Accepted 06/29/10 KA -** Verified in ES&S Sys Overview ver. 5.0 dated 06/29/10, in the Notice of Uncertified Functionality and the footer, that HI and IL are listed as unsupported states.
3	6/23/20	K. Austin/ S. Brown	Document Defect	Closed	ERM SOP 7.5.4.0, 06/25/2009	ERM error message is not identified in the SOP. The error message "Import process error. 0002-spp record contest totals are not correct. The results will not be used. Click OK to acknowledge" is not identified in the ERM SOP (06/25/2009, ver 7.5.4.0) documentation for a user to research.	V:2 2.8.5.c Provides procedures that clearly enable the operator to intervene in system operations to recover from an abnormal system state	**20100625 MDN -** Updated the error and audit log listings in the ERM SOP, SDS and SFD with the specified message. The SOP includes the recommended user action.	**Accepted 06/29/10 KA -** Verified in ERM SOP 7.5.4.0 dated 06/28/10 that the error message is identified for user to research.
4	6/24/10	K. Austin/ S. Brown	Inform-ational	Open	DS200 v.1.4.3.0	"Thank you for voting" display is inconsistent. When scanning in ballots with Overvotes that include write-ins (contest XYZ, vote for 1, candidate AA and write-in BB are selected; query response to accept the ballot) the thank you for voting message is not displayed. The ballot is accepted and the screen displays for the next voter. This is inconsistent with the thank you display in other instances (accepted ballot with undervotes, no errors, overvotes with no write-ins, etc.)		**SLM 06.29.10 -** ES&S acknowledges this finding and will enter it into our tracking system to address it in a future release of the DS200.	

7.6 Appendix F: Warrant of Accepting Change Control Responsibility

ES&S' Unity 3.2.0.0 Revision 1 Warrant of Accepting Change Control Responsibility is submitted in a separate document.

7.7 Appendix G: Trusted Build & Validation Tools Unity 3.2.0.0 Revision 1

Appendix G provides documents the Trusted Build and Validation Tools for Unity 3.2.0.0 Revision. 1 It is contained in the document *Appendix A, B, and G of the ES&S Unity 3.2.0.0 Revision 1 Voting System Certification Test Report for DS200 Modifications to the EAC Certified ESSUNITY3200.*

7.8 . Appendix H: Amended Test Plan

The EAC emailed notice to iBeta that the *ES&S Unity 3.2.0.0 Rev. 1 Voting System Certification Test Plan for DS200 Modifications to the EAC Certified ESSUNITY3200* v.2.0 are found on the EAC website.

This test plan was amended during test execution. Version 3.0 of the test plan is submitted in a separate document with this test report. Changes are provided in red text for easy identification.

7.9 Appendix I: State Test Reports

There were no state test efforts.

7.10 Appendix J ES&S Unity 3.2.0.0 Implementation Statement

Unity 3.2.0.0 Revision 1 is a revision to the certified ESSUNITY3200 voting system. A copy of the ES&S Unity 3.2.0.0 implementation statement is attached as a separate document to the ESSUNITY3200 test report.