iBeta Quality Assurance

MicroVote General Corporation
Election Management System (EMS)
Voting System v. 4.0.0
VSTL Certification Test Plan

EAC Application # MVT0701

Prepared for
MicroVote General Corporation
6366 Guilford Ave.
Indianapolis IN 46220
Version 3.0

Trace to Standards			
NIST Handbook 150-22			
4.2.3, 5.3.5, 5.3.6, 5.4.2, 5.4.6, 5.5.1, 5.7 thru 5.7.3			
HAVA			
301			
VVS		VVSG	
Vol. #	Section(s) #	Vol. #	Section(s) #
1	2, 3, 4, 5, & 6	1	2, 3, 4, 5, 6, & 7
1	9.6.2.1	2	1.8.2.1
2	2, 3, 4, 5, & 6	2	2, 3, 4, 5, & 6
2	Appendix A	2	Appendix A

iBeta Quality Assurance, an EAC VSTL, is accredited for Voting System Testing under:

U.S. Election Assistance Commission
EAC Lab Code: 0702
Effective thru 2/28/2009

NVLAP Lab Code 200749-0

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Version History			
Ver #	Description of Change	Author	Approved by & Date
v.1.0	Initial release for the EAC	C Coggins & M Ricketts	C Coggins, Todd Behler & Bernie Hirsch 8/14/07
v.1.1	Accuracy Test OMR- modified the ballot configuration numbers.	C Coggins & M Ricketts	C Coggins, Todd Behler & Bernie Hirsch 8/21/07
v.2.0	Per EAC Review Comments: Section 1: added detail for Wyle Qualifications & Exclusion of Ballot Rotation; Table 2 -added NIST Hdbk 150; Section 7.2 Scope: added confirmation of HW testing performed under an appropriate mode as a voting system; Table 6 – added "supplied by iBeta" and additional tools Removed the "Confidential –Draft"	C Coggins	C Coggins 9/27/07
v.3.0	Items in *italics* address EAC Conditional Acceptance issues Section 7.1.1 General 1 Pre & Post Security inserted: Vote Security Operating systems *audit logs* are enabled General 2 – Correction: Straight party auto crossover is supported Section 7.1.2- Primary 1 validate Ballot Rotation *is not supported* *Added accessibility testing with audio, non-manual input and Spanish ballots* Table 10 – System maximums added Section 7.1.3 – Accuracy added validation of 502 maximum locations on the Infinity panel; increased ballots cast to 3,719	C Coggins	C Coggins 10/23/07

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1 Introduction

This Test Plan identifies iBeta Quality Assurance's (iBeta) approach to VSTL Certification Testing of the MicroVote General Corporation Election Management System voting system to the US Election Assistance Commission Voluntary Voting System Guidelines (VVSG 2005). The purpose of this Plan is to document the scope and detail of the requirements of certification testing tailored to the design and complexity of software being tested and the type of voting system hardware.

The MicroVote General Corporation Election Management System voting system includes the Election Management System ballot preparation and central count software, the Infinity Voting Panel Direct Recording Electronic (DRE) push button polling place device with an audio ballot mode, the Infinity Voting Panel firmware and two dual sided paper ballot optical scanners. The Election Management System ballot preparation and central count software are developed by MicroVote General Corporation (MicroVote). The Infinity Voting Panel and the Infinity firmware are manufactured/developed by Carson Manufacturing Company, Inc. The Chatsworth ACP2200 and OMR-9200 dual-sided optical mark reader (scanners) are manufactured by Chatsworth Data Corporation

The MicroVote Election Management System voting system has been submitted to iBeta for testing to the VVSG 2005. This testing is supporting MicroVote's application to the US Election Assistance Commission (EAC) for their certification of the MicroVote Election Management System voting system to the VVSG 2005.

Non-core hardware environmental testing is outside iBeta's test accreditation scope as a VSTL. Non-core hardware environmental assessments and testing are subcontracted to Wyle Laboratories, 7800 Highway 20 West, Huntsville, AL, 35806. iBeta verified Wyle's qualifications. They are accredited to perform all VVSG 2005 identified environmental test methods by the American Association of Laboratory Accreditation under Certificate Numbers 845.01 (Electrical) and 845.02 (Acoustics and Vibration). The accredited test methods are traced to the applicable VVSG 2005 requirement for:

Accredited Test Method A2LA No. 845.01, expiration date: 12/31/07	VVSG 2005 Vol.2 Requirement
MIL-Std 810 M 516 Transportation Shock	4.6.2 Bench Handling Test
MIL-Std 810 M 514 Road Transport (Bounce- Loose Cargo)	4.6.3 Vibration Test
MIL-Std 810 M 502 Low Temperature	4.6.4 Low Temperature Test 4.7.1 Temperature & Power Variation Test
MIL-Std 810 M 501 High Temperature	4.6.5 High Temperature Test 4.7.1 Temperature & Power Variation Test
MIL-Std 810 M 507 Humidity (Temperature /Humidity)	4.6.6 Humidity Test

Accredited Test Method A2LA No. 845.02, expiration date: 12/31/07	VVSG 2005 Vol.2 Requirement
EN 61000-4-11 Testing and Measurement Techniques-Section 11: Voltage Dips, Short Interruptions and Voltage Variations Immunity Test	4.8.a Power Disturbance Disruption
FCC Class B Requirements per ANSI C63.4	4.8.b Electromagnetic Radiation
EN 61000-4-2 Electrostatic Discharge Susceptibility	4.8.c Electrostatic Disruption
EN 61000-4-3 Radiated Susceptibility, 80 MHz to 1 GHz, Electric Field	4.8.d Electromagnetic Susceptibility
EN 61000-4-4 Conducted Susceptibility, Electrical Fast/Burst Transients, Signal and Power lines and Cables	4.8.e Electrical Fast Transient Protection
EN 61000-4-5 Testing and Measurement Techniques-Section 5: Surge	4.8.f Lightning Sure Protection

Accredited Test Method A2LA No. 845.02, expiration date: 12/31/07	VVSG 2005 Vol.2 Requirement
Immunity Test	
EN 61000-4-6 Conducted Susceptibility, Common Mode Cable Injection, 150 kHz to 80 MHz	4.8.g Conducted RF Immunity
EN 61000-4-8 Testing and Measurement Techniques-Section 18: Power Frequency Magnetic Field Immunity Test	4.8.h AC Magnetic Fields RF Immunity

A Physical Configuration Audit (PCA) of the MicroVote Election Management System voting system will include a review of the documentation and source code submitted in the Technical Data Package (TDP).

A Functional Configuration Audit (FCA) of the MicroVote Election Management System voting system will include a review of testing performed by MicroVote to:

- The requirements of VVSG 2005;
- The MicroVote Election Management System voting system specifications of the MicroVote TDP; and
- The voting system requirements of section 301 of the Help American Vote Act (HAVA).

The FCA also includes identification of the scope of testing, a test plan, customization of test cases, system configuration management, test execution, and analysis of the test results

This test plan includes:

- The submitted voting system and the scope of certification testing;
- The pre-certification test approach and methods;
- The certification test hardware, software, references and other materials for testing;
- The certification test approach and methods;
- The certification test tasks and prerequisite tasks; and
- The certification resource requirements.

Exclusions: The MicroVote Election Management System voting system does not support ballot rotation, contain wireless technology or use of the public networks. The Infinity Voting Panel does not include a voter verified paper audit trail or electronic dexterity equipment. The Chatsworth Optical Mark Recorders are not precinct based paper counters. Any activities in these areas are limited to documentation that the functions are not applicable to this voting system.

1.1 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.1.0	Voting Certification Master Services Agreement- MicroVote	MSA contract		iBeta Quality Assurance
	FCA Test Document Review_EMSv.4_0_0		June 1, 2007	iBeta Quality Assurance
	PCA Document Review-EMSv_4_0_0		July 17, 2007	iBeta Quality Assurance
	Test Method_EMSv_4_0_0		July 27, 2007	iBeta Quality Assurance

1.2 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	October 29, 2002	107th Congress
NIST Handbook 150 2006 Edition	NVLAP Voting System Testing	NIST 150	February 2006	National Voluntary Lab Accreditation Program
NIST Handbook 150-22	NVLAP Voting System Testing	NIST 150-22	December 2005	National Voluntary Lab Accreditation Program
	Voluntary Voting System Guidelines	VVSG	December 2005	Election Assistance Commission
	Testing and Certification Program Manual		January 1, 2007	Election Assistance Commission

1.3 Technical Data Package Documents

The Technical Data Package Documents submitted for this certification test effort are listed in Table 7.

1.4 Terms and Definitions

The Terms and Definitions identified below are used in this test report.

Table 3 Terms and Definitions

Term	Abbreviation	Definition
Activations		The method by which ballot displays are programmed for precincts, precinct splits or party.
Ballot Cards or Official Ballot Cards	C312, C402, C256 or 312, 402, 256 OMR Ballot Cards	Paper ballot cards read with the OMR and ACP scanners. The digits refer to the number of locations on the card.
Ballot Objects		Ballot objects group items that will go on the ballot, including: ballot text, offices straight party locations on the ballot.
Candidate Sorting – By Name		A candidate name sort, alphabetically by last name
Candidate Sorting – By Name within Party		A candidate name sort, alphabetically by last name within each party
Candidate Sorting – None		Candidate names are listed in the order they are filed.
Candidate Stacking - Always		Ballot formatting option: Stacks all names on the entire ballot regardless of candidate name length.
Candidate Stacking - On entire ballot when required		Ballot formatting option: Stacks the names on the entire ballot if one of the candidates' names is too long to fit on one line.
Candidate Stacking - Only within race when required		Ballot formatting option: Stacks the names within a race if one of the candidate's names is too long to fit on one line.
Carson Manufacturing Company, Inc.	Carson	The manufacturer of the Infinity Voting Panel and developer of the Infinity firmware
Chatsworth ACP2200 dual-sided optical mark reader	OMR or ACP scanner	Optical scanner for reading and transferring votes from both sides of a paper ballot card to the EMS
Chatsworth OMR-9002 Dual-Sided Optical Mark Reader	OMR	Optical scanner for reading and transferring votes from both sides of a paper ballot card to the EMS
Direct Recording Electronic	DRE	A voting system that records votes by means

Term	Abbreviation	Definition
		of a ballot display provided with mechanical or electro-optical components that can be actuated by the voter; that process the data by means of a computer program; and that records voting data and ballot images in internal and/or external memory components. It produces a tabulation of the voting data stored in a removable memory component and in printed copy.
Doubletalk (Audio Ballot)	Doubletalk	Required for an audio ballot; a voice synthesis/sound system, connected to the Infinity Voting Panel, used to convert text to speech
Election Database		A mode of the EMS that limits changes to the current open election; changes made appear in only the current opened election. Default settings of the Installation Mode are not changed
Election Management System v 4.0.0	EMS v.4.0.0	The release version of the ballot preparation and central count software of the Election Management Software voting system.
Election Management System software	EMS software	The ballot preparation and central count software of the Election Management Software voting system. It is used to program an election on the Infinity Voting Panel and paper ballots; and to consolidate and report results from the voted ballots.
Election Management System voting system	EMS voting system	The MicroVote voting system integrating the hardware and software of the EMS v.4.0.0 ballot preparation and central count software, the Infinity Voting Panel, the Infinity firmware, and the OMR ballot reader.
Escrow Agency		EAC identified repository that retains the file signature of the trusted build.
GEMPLUS Smart Card Reader/Writer	GEMPLUS	COTS hardware for reading and writing the Start, Vote and Tally Smartcards
Help America Vote Act	HAVA	Legislation enacted in 2002 which includes creation of the EAC, federal voting standards and accreditation of test labs
Infinity Voting Panel	Infinity	Direct Recording Electronic (DRE) polling place device of the MicroVote Election Management System voting system
Infinity Voting Panel firmware	Infinity firmware	The software that runs the Infinity Voting Panel
Installation Database		A mode of the EMS for definition of default settings that are present in every new election created.
Manual Vote Entry – in central count reports		Method to enter votes that are not recorded on Tally Cards or optical scan cards. Votes may be entered as a single vote, by selected precinct, or by machine serial number.
MicroVote General Corporation	MircoVote	The manufacture submitting the Election Management System voting system.
Secondary Vote Limit		A voting variation outside the VVSG, which is supported by an additional vote limit that can be placed on grouped contests, so that

Term	Abbreviation	Definition
		multiple limits are placed on the vote.
Start Card (Green)	Start card	For initializing the Infinity Voting Panel
Tally Card (Red)	Tally card	For transferring votes from the Infinity Voting Panel to the Tally card, to the EMS voting system.
Technical Data Package	TDP	The documentation and code relating to the voting system, submitted by the manufacturer for review.
U.S. Election Assistance Commission	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.
Vote Card (Blue)	Vote card	For ballot selection and activation of ballot
Vote N Card		Vote N cards are used only by Election Administrators in early voting situations. Vote N Cards facilitates retraction of challenged ballots.
Voting System Standards	VSS	Federal voting system test standards, VVSG predecessor
Voting System Test and Certification Authority	VSTCA	If used it should be read as VSTL. This is a term used in the NIST Handbook 150-22 that was not implemented by the EAC
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 Pre-certification Tests

2.1 Pre-certification Test Activity

A review of the test documentation provided by MicroVote was performed to assess the scope of testing and conformance with the VVSG 2005 vol. 1 sect. 2, 3, 4, 5.3, 5.4, 6 and 7, Functional, Usability, Accessibility, Hardware, Software, Telecommunication and Security requirements.

The VVSG 2005 vol.1 sect. 5.2 and vol. 2 sect. 5.4 source code review criteria was customized to reflect the applicable programming languages (C, VB.Net and SQL) and the MicroVote and Carlson software coding standards. This customization included confirmation that the manufacturer specific coding standards were accepted best practices as documented by an industry recognized source. Applications identified in Table 4 as COTS were exempted from review.

A gap analysis of the differences between the VVSG 2005 and Voting System Standards 2002 (VSS 2002) was performed by iBeta. The analysis found that environmental requirements were essentially unchanged between VSS 2002 and VVSG 2005. In 2006 the Infinity Voting Panel was subjected to environmental testing to the VSS 2002. This testing was performed by Wyle Laboratories. Wyle Laboratories performed an assessment of the prior testing to confirm that the system was unchanged from the system tested in 2006. As part of this assessment Wyle Laboratories provided a recommendation for the appropriate use of the 2006 test data and results in testing to the VVSG 2005.

The Chatsworth OMR-9002 and ACP-2200Dual-Sided Optical Mark Reader have been submitted as COTS central count card readers. Marked paper data card ballots are read into the MicroVote EMS software for vote conversion by the software. An examination of the readers and a review of the Chatsworth system specifications was performed to assess if the equipment is unmodified COTS and contained a documented record of performance under the conditions defined in the VVSG 2005 vol.2 sect. 4.1.1.

An initial review of the submitted TDP Documentation was performed in the PCA TDP Documentation Review to assess compliance with the requirements of VVSG 2005 vol. 2 sect. 2.

2.2 Pre-certification Test Results

A review of the test documentation provided by MicroVote was found to incorporate testing of the voting system to the requirements of the VVSG 2005 and the Election Management System voting system requirements.

Customization of source code review criteria for the language and manufacture coding standards was completed. Documentation by an industry recognized source of applicable manufacturer specific coding standards was confirmed. The customized criteria were incorporated into the source code review sheets, where the acceptance or rejection of each reviewed module will be captured.

Wyle Laboratories' personnel reviewed and assess all past test results. They found that the Infinity hardware had not changed since testing in both 2002 and 2006. Wyle recommended that three hardware tests be repeated:

- VSS 2002 V.1:3.4.8 (WSG 2005 V.1: 4.3.8 – Safety) – The Safety Standard the unit was tested to is obsolete.
- VVS 2002 V.1:3.2.2.9 (WSG 2005 V.1: 4.1.2.9 Electromagnetic Emissions) – FCC standards have been updated since the unit was tested.
- VVS 2002 V.1:3.2.2.4 (WSG 2005 Volume 1, Section 4.1.2.4.c – Electrical Supply) - This test should be repeated since any previous raw data was not available showing prior completion.

Based upon the VVS 2002 and VVSG 2005 gap analysis performed by iBeta, validation of Wyle's accreditation status at the time of testing and Wyle's validation that the systems were unchanged since their prior testing, iBeta will accept the use of the reviewed test data and test results in the issuance of a VVSG 2005 hardware environmental test report by Wyle laboratories.

- VVSG V.1: 4.1.2.4.a & b Electrical Supply

- VVSG V.1: 4.1.2.5 Electrical Power Disturbance
- VVSG V.1: 4.1.2.6 Electrical Fast Transit
- VVSG V.1: 4.1.2.7 Lightning Surge
- VVSG V.1: 4.1.2.8 Electrostatic Disruption
- VVSG V.1: 4.1.2.10 Electromagnetic Susceptibility
- VVSG V.1: 4.1.2.11 Conducted RF Immunity
- VVSG V.1: 4.1.2.12 Magnetic Fields Immunity
- VVSG V.1: 4.1.2.13 Environmental Control – Operating Environment
- VVSG V.1: 4.1.2.14 Environmental Control – Transit and Storage

Due to revision of the standard test methods, iBeta shall require execution of the environmental hardware tests:

- WSG 2005 V.1: 4.3.8 – Safety – UL-60950-1 Edition 2, Information Technology Equipment - Safety - Part 1: General Requirements (March 27, 2007); examination includes WSG 2005 V.1: 4.1.2.3 Furnishing and Fixtures
- WSG 2005 V.1: 4.1.2.9 Electromagnetic Emissions –FCC Part 15 Class B (October 1, 2006)

iBeta shall incorporate WSG 2005 Volume 1, Section 4.1.2.4.c – Electrical Supply, validation of the 2 hour battery back up, into the Characteristics Test Case.

Examination of the Chatsworth OMR-9002 and ACP-2200 Dual-Sided Optical Mark Reader system specifications provide documented evidence of COTS equipment and operation to VVSG V.1: 4.1.2.14.a Environmental Control – Transit and Storage, equivalent to MIL-STD810-D: High and low temperature methods 501.2 and 502.2, Procedure I-Storage. No documentation of the other tests was provided. Evidence of the environmental tests or performance of the environmental tests must be completed prior to certification.

Based upon the findings of the preliminary PCA TDP Documentation Review performed to assess compliance with the requirements of VVSG 2005 vol. 2 sect. 2, iBeta has found MicroVote's TDP to be generally compliant. Results of the preliminary PCA TDP Documentation Review were submitted to MicroVote, in the PCA and FCA Discrepancy Report. Their report contained 23 documentation defect issues and three informational issues. MicroVote submitted documentation revisions for 22 documentation defects. iBeta accepted the resolutions. Resolutions submitted by MicroVote and the validations by iBeta are documented in the PCA and FCA Discrepancy Report. This report will be included as an appendix in the final VSTL Certification Test Report. One document defects remains open (see # 26) and must be resolved and validated prior to the completion of certification testing.

Informational issues are items noted during testing or review that do not contravene the standard. They may include cosmetic issues, functional bugs, format errors, or concerns which impact use of the voting system. They are identified for the purpose of disclosure to the manufacturer, EAC, election officials and the public. It is the manufacturer's option to address them. They are included in the appendix of the final report.

#	Type	Location	Issue Description	Guideline
26	Doc Defect	Appendix C COTS SPECIFICATIONS Election Management System v.1.0	The Chatsworth Data Corporation central count optical scanners ACP 2200 and the OMR 9002, were verified as unmodified COTS hardware. In order to exempt unmodified COTS equipment specifications/evidence of equivalent testing to the VVSG must be provided. The COTS manufacturer documentation submitted as part of the TDP did not address VVSG vol.1: 4.1.2.5 Electrical Power Disturbance 4.1.2.6 Electrical Fast Transit 4.1.2.7 Lightening Surge	v2:4.2.1 Testing Focus and Applicability ...All hardware components that are custom-designed for election use shall be tested in accordance with the applicable procedures contained in this section. Unmodified COTS hardware will not be subject to all tests. Generally such equipment has been designed to rigorous

#	Type	Location	Issue Description	Guideline
			4.1.2.8 Electrostatic Disruption 4.1.2.9 Electromagnetic Emission 4.1.2.10 Electromagnetic Susceptibility 4.1.2.11 Conducted RF Immunity 4.1.2.12 Magnetic Fields Immunity	industrial standards and has been in wide use, permitting an evaluation of its performance history. To enable reduced testing of such equipment, vendors shall provide the manufacturer specifications and evidence that the equipment has been tested to the equivalent of these Guidelines...

3 Materials Required for Testing

The System Identification stipulates the following materials required for testing of MicroVote Election Management System voting system v.4.0.0.

3.1 Voting System Software

The software listed in Table 4 is the documented configuration of the MicroVote General Corporation, Election Management System voting system.

Table 4 Voting System Software

Application	Manufacturer	Version	Description (identify COTS)
Election Management System (EMS)	MicroVote General Corp.	4.0.0.0*	Ballot preparation and central count software programmed in VB.Net and SQL
Infinity Voting Panel Firmware	Carson Manufacturing Company, Inc.	v.3.11**	DRE software programmed in C
Microsoft Windows 2000	Microsoft		COTS personal computer operating system
Microsoft Windows XP Professional	Microsoft		COTS personal computer operating system
Microsoft Desktop Engine	Microsoft		COTS database software
DOUBLETALK LT	RC Systems	1.0	COTS: Text-to-speech converter box attached to the Infinity machine

* EMS versions submitted for review and testing will start with v.4.0.0.0. The final certified version will be release version 4.0.0.

** The Infinity versions submitted for review testing is 3.11. The final certified version will be incremented as required during testing.

3.2 Voting System Hardware and Equipment

The equipment listed in Table 5 is the documented configuration of the MicroVote General Corporation, Election Management System voting system.

Table 5 Voting System Hardware and other Equipment

Hardware or Equipment	Manufacturer	Version/ Model	Description (identify COTS)
Infinity Voting Panel	Carson Manufacturing Company, Inc.	Model VP-1 Rev: C	DRE 16¼ "X 13 " X 2½"; 6 Lbs. w/ power supply & cord -Power Input: Standard ¼" miniature power jack, 12VDC ± 10% @ 2.5A max -Interface: RJ45 connector with RS-232 levels and special pin assignments for use with adapters connected to printer or --PC, automatic baud rate selection for PC or printer. ----------Communication: 1 start bit, 8 data bits, no parity, baud rate = 38K for PC and 9600 for printer, hardware handshake (DTR/DSR) -Computer: AAEON PC/104 SBC with X386 processor -Memory: CompactFlash 8Mb primary, Disk-On-Chip 8Mb

Hardware or Equipment	Manufacturer	Version/ Model	Description (identify COTS)
			backup -Display: Sanyo 9¼ in. LCD, 640 x 480 resolution B/W transflective -Indicators: (2) Red LED Cast Vote indicators -Keyboards: Custom conductive rubber over gold contact-
Batteries (8) cells		Alkaline “C”	COTS: Back up power supply for the Infinity Voting Panel.
Power Supply: Ault model PW101MA1203F01, 100-250VAC, 50-60Hz, 0.75A Output: 12VDC, 2.75A regulated		Ault model PW101MA1203F01	Power supply for the Infinity Voting Panel.
Dell computer desktop	Dell, Inc.	Model DHM*	COTS. Personal computer Intel Pentium R processor 2.80GHz, 2.79GHz, 512 MB RAM XP Professional 2002 Svc Pack
Dell Laptop	Dell, Inc.	Model PP17L*	COTS Personal computer Intel Pentium M processor 1.73GHz, 795MHz, 504 MB RAM XP Professional 2002 Svc Pack
PS/2 to USB Adapter	Adesso	Model ADP-PU21	Connect keyboard and mouse to USB port
Seiko Printer	Seiko Instruments	Model DPU-414	COTS. For printing reports, absentee ballots
Seiko Printer	Seiko Instruments	Model DPU-3445	COTS. For printing reports, absentee ballots.
GemPlus with ISO7816-3 standard interface	GEMPLUS		COTS. Card Reader
Chatsworth ACP-2200 Dual-Sided Optical Mark Reader	Chatsworth Data Corporation	Model 605000-190	COTS. Dual-Sided Optical Mark Reader for scanning paper ballots into the EMS software.
Chatsworth OMR-9002 Dual-Sided Optical Mark Reader	Chatsworth Data Corporation	Model 650000-010	COTS. Dual-Sided Optical Mark Reader for scanning paper ballots into the EMS software..
Seiko Printer Cable	Seiko Instruments		COTS. Cable to connect the printer and the Infinity
EMS Cable			COTS: Standard modular plug-8 positions
Smart Cards			COTS: Start card, Vote card, Vote N card and Tally card.
Keyboard*	Dell, Inc.		COTS: USB Keyboard
Mouse*	Dell, Inc.		COTS: USB 2-Button
Speakers	Dell, Inc.	A215*	COTS: Two Piece Stereo Speaker System
UPS Backup		ES 350*	COTS: Backup Power Supply
Monitor		Model E153FPb*	COTS: 15 Inch Flat Panel

Hardware or Equipment	Manufacturer	Version/ Model	Description (identify COTS)
Audio headphones	Radio Shack		COTS
Dell Laser Jet Printer	Dell, Inc.		Report printer
Infinity Storage/Shipping Case			Polling booth & shipping case
Infinity Storage/Shipping Case (Handicap accessible)			Wheelchair accessible polling booth & shipping case

***** Model or version identifies the one used in testing. MicroVote specifications do not identify a specific version.

3.3 Testing Software, Hardware and Materials

The software, hardware and materials listed in Table 6 are needed to support testing and in test simulations of elections of the MicroVote Election Management System voting system.

Table 6 Testing Software, Hardware and Materials

Software, Hardware or Material	Description	Description of use in testing
Paper ballots or ballot cards	COTS Pre-printed data cards 256 position: 2615–STB 7/99 312 position: LP 2628 9/98 402 position: LP 2443-B, &	Paper ballot cards to record votes for the OMR
Pens and pencils	COTS Pencils and black, blue, red and green ink pens	Marking votes on paper data cards
Paper (81/2 x 11)	COTS Paper, Inkjet Printer	Central tally reports
Paper rolls	COTS Paper, Thermal Printer	Infinity open and close poll reports
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	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
Center 325 Mini Sound Level Meter	IEC 651 Type 2 handheld sound level meter	Supplied by iBeta: Measure decibel level
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
Hash.exe v.7.08.10.07.12 (Maresware)	Hash creation utility	Supplied by iBeta: used to generate hash signatures for Trusted Builds

3.4 Deliverable Materials

The documents listed in Table 7 were delivered as part of the MicroVote General Corporation, Election Management System voting system. In reviewing the list of the MicroVote TDP documents it may appear that some documents have duplicate names. These are not duplicates but different files

contained in a named folder which when combined form an integrated "document". Within the MicroVote document control system the folder is the "document". The "document" may contain one or more files.

In order to ensure an accurate inventory of the parts of the "documents", each file is listed in Table 7. If the Title does not indicate the part of the "document" (Table of Contents, Cover Letter, or Appendix), a reference in the first column provides a clarification.

Table 7 Voting System Technical Data Package Documents

	Title	Ver #	Date	Author
	CARSON MANUFACTURING COMPANY, INC. PROPRIETARY AND CONFIDENTIAL NOTICE	no version	no date	Carson Manufacturing Company, Inc.
	Appendix A23 Test Execution Plan for Manual Vote Entry	0.1	3/07/2006	MicroVote General Corp.
	Appendix A24 Test Execution Plan for Overall System Functionality	0.1	5/10/2006	MicroVote General Corp.
	Appendix A26 Test Execution Plan for Election Data	0.1	6/01/2006	MicroVote General Corp.
	Appendix A27 Test Execution Plan for Election Data	0.1	6/01/2006	MicroVote General Corp.
	Appendix A28 Test Execution Plan for Election Data	0.1	6/01/2006	MicroVote General Corp.
	Appendix A29 Test Execution Plan for Infinity Programming – Defect #146	0.1	7/24/2006	MicroVote General Corp.
	Appendix A31 Test Execution Plan for Infinity Programming – Defect #151 with Button Tags	0.1	7/24/2006	MicroVote General Corp.
	Appendix A32 Test Execution Plan for Election Data – Straight Party Report	0.1	6/01/2006	MicroVote General Corp.
	Appendix A33 Test Execution Plan for Election Data	0.1	6/01/2006	MicroVote General Corp.
	Appendix A34 Test Execution Plan for Infinity Programming – Change Date	0.1	6/06/2006	MicroVote General Corp.
	Appendix A35 Test Execution Plan for Election Data	0.1	6/01/2006	MicroVote General Corp.
	Appendix A36 Test Execution Plan for Infinity Programming – Start Card Functions- Defect #166	0.1	6/06/2006	MicroVote General Corp.
	Appendix A37 Test Execution Plan for Infinity Programming – Tally & Accumulate Card Functions- Defect #167	0.1	6/06/2006	MicroVote General Corp.
	Appendix A38 Test Execution Plan for Election Data	0.1	8/08/2006	MicroVote General Corp.
	Appendix A39 Test Execution Plan for Election Data – Early Vote Extraction	0.1	8/01/2006	MicroVote General Corp.
	Appendix A40 Test Execution Plan for Election Data	0.1	6/01/2006	MicroVote General Corp.
	Appendix A41 Test Execution Plan for Election (Data Network OMR Ballot Cards)	0.1	8/01/2006	MicroVote General Corp.
	Appendix A42 Test Execution Plan for Election Data (Network Tally Cards)	0.1	8/01/2006	MicroVote General Corp.
	Appendix A46 Test Execution Plan for Primary Election System Test	0.1	3/16/2007	MicroVote General Corp.
	Appendix A47 Test Execution Plan for Tally Card/Advanced Voting Volume Testing	0.1	2/14/2007	MicroVote General Corp.
	Appendix A48 Test Execution Plan for Election Summary Report	0.1	3/16/2007	MicroVote General Corp.
	Appendix A49 Test Execution Plan for Precinct Summary Report	0.1	3/08/2007	MicroVote General Corp.
	Appendix A50 Test Execution Plan for Tally Card Detail Report	0.1	2/14/2007	MicroVote General Corp.
	Appendix A51 Test Execution Plan for Undervotes and Overvotes Report	0.1	3/15/2007	MicroVote General Corp.
	Appendix A53 Test Execution Plan for OMR Ballot	0.1	4/02/2007	MicroVote General Corp.

	Title	Ver #	Date	Author
	Card Testing Matrix for Types (C312,C402,C256)			
AppB2	Quality Assurance Procedures	0.1	5/28/2006	MicroVote General Corp.
(cover)	Appendix B-2 CARSON MANUFACTURING QUALITY ASSURANCE PROCEDURES Election Management System	0.1	5/28/2006	MicroVote General Corp.
	Appendix A20 Test Execution Plan for Clear Votes	0.2	3/03/2006	MicroVote General Corp.
	Appendix A21 Test Execution Plan for OMR Ballot Cards	0.2	3/20/2006	MicroVote General Corp.
	Appendix A22 Test Execution Plan for Tally Cards	0.2	3/03/2006	MicroVote General Corp.
	Appendix A30 Test Execution Plan for Infinity Programming – Voter Control Page	0.2	4/13/2006	MicroVote General Corp.
	Appendix A54 Test Execution Plan for Common Industry Format Dexterity Testing of the Infinity Voting Panel	0.2	08/03/2006	MicroVote General Corp.
	Appendix A54 Test Execution Plan and Test Report Common Industry Format Usability Testing of the Infinity Voting Panel Version 0.2	0.2	08/03/2006	MicroVote General Corp.
AppB1	INFINITY VOTING PANEL Technical Reference Manual	3.11	4/24/2007	Carson Manufacturing Company
(cover).	Appendix B-1 INFINITY VOTING PANEL TECHNICAL REFERENCE MANUAL Election Management System	0.2	04/24/2007	MicroVote General Corp.
AppB3	INFINITY FIRMWARE FUNCTIONAL SPECIFICATION VERSION 3.11	3.11	4/24/2007	Carson Manufacturing Company
(cover)	Appendix B-3 INFINITY FIRMWARE FUNCTIONAL SPECIFICATIONS Election Management System	0.2	4/24/2007	MicroVote General Corp.
(cover)	Appendix Q DEFECT TRACKING SYSTEM Election Management System	0.2	8/28/2006	MicroVote General Corp.
	Appendix A33 Test Execution Plan for Election Data –Office Detail Report	0.3	04/27/2007	MicroVote General Corp.
(TOC)	Appendix B CARSON MANUFACTURING DOCUMENTS Election Management System	0.3	04/24/2007	MicroVote General Corp.
(TOC)	Appendix A TEST PLANS Election Management System	0.4	7/23/2007	MicroVote General Corp.
	Section 2.1 SCOPE Election Management System	1.0	1/12/2007	MicroVote General Corp
	Section 2.10 PERSONNEL DEPLOYMENT AND TRAINING REQUIREMENTS Election Management System	1.0	1/12/2007	MicroVote General Corp.
	Section 2.13 SYSTEM CHANGE NOTES Election Management System	1.0	5/28/2006	MicroVote General Corp.
	Section 2.7 SYSTEM TEST AND VERIFICATION SPECIFICATION Election Management System	1.0	1/12/2007	MicroVote General Corp.
	Appendix A0 Test Execution Plan for Logon	1.0	2/15/2007	MicroVote General Corp.
	Appendix A10 Test Execution Plan for Election Data (Form Actions (FR-GUI-SP-0012400))	1.0	2/06/2006	MicroVote General Corp.
	Appendix A16 Test Execution Plan for Build Activations	1.0	2/06/2006	MicroVote General Corp.
	Appendix A17 Test Execution Plan for Assign Ballots	1.0	2/06/2006	MicroVote General Corp.
	Appendix A18 Test Execution Plan for Ballot Printing	1.0	2/06/2006	MicroVote General Corp.
	Appendix A19 Test Execution Plan for EMS – INFINITY PROGRAMMING EMS – VOTE CARD ACTIVATION INFINITY FIRMWARE – ELECTION FUNCTIONS	1.0	2/10/2006	MicroVote General Corp.
	Appendix A4 Test Execution Plan for Vote Type	1.0	2/06/2006	MicroVote General Corp.

	Title	Ver #	Date	Author
	Appendix A43 Test Execution Plan for OMR Straight Party	1.0	8/15/2006	MicroVote General Corp.
	Appendix A44 Test Execution Plan for General Election #1	1.0	3/19/2007	MicroVote General Corp.
	Appendix A45 Test Execution Plan for General/Primary Election #3	1.0	3/19/2007	MicroVote General Corp.
	Appendix A5 Test Execution Plan for Precincts	1.0	2/06/2006	MicroVote General Corp.
	Appendix A52 Test Execution Plan for Insert, Update and Delete Office, Candidate, Text Messages	1.0	3/21/2007	MicroVote General Corp.
	Appendix A7 Test Execution Plan for Ballot Graphics	1.0	2/06/2006	MicroVote General Corp.
	Appendix A8 Test Execution Plan for Equipment	1.0	2/06/2006	MicroVote General Corp.
	Appendix AA MicroVote System Identification Tool User Manual	1.0	4/12/2007	MicroVote General Corp.
	Appendix C COTS SPECIFICATIONS Election Management System	1.0	1/12/2007	MicroVote General Corp.
	Appendix D GLOSSARY OF TERMS Election Management System	1.0	1/12/2007	MicroVote General Corp.
	Appendix E Completed COTS Testing Forms	1.0	1/12/2007	MicroVote General Corp.
(cover)	Appendix E COMPLETED COTS TESTING FORMS Election Management System	1.0	1/12/2007	MicroVote General Corp.
	Appendix G COTS INVOICES AND CERTIFICATIONS Election Management System	1.0	1/12/2007	MicroVote General Corp.
AppH	READ ME FIRST (OMR ACP 2200)	no version	no date	Chatsworth Data Corporation
(cover)	Appendix H ACP-2200 OPTICAL SCANNER QUICK START GUIDE Election Management System	1.0	1/12/2007	MicroVote General Corp.
AppI-2.2	ACP -2200 Dual Sided Optical Mark Reader	1.1	4/15/2004	Chatsworth Data Corp.
(cover)	Appendix I ACP-2200 OPTICAL SCANNER USER'S MANUAL Election Management System	1.0	1/12/2007	MicroVote General Corp.
AppJ	User's Guide Thermal Printer DPU-3445-20	11th Edition	Dec 2004	Seiko Instruments, Inc.
(cover)	Appendix J SEIKO DPU-3445-20 PRINTER USER'S MANUAL Election Management System	1.0	1/12/2007	MicroVote General Corp.
AppK	DPU-414 Operation Manual	3rd edition	Dec 1998	Seiko Instruments
(cover)	Appendix K SEIKO DPU-414 PRINTER USER'S MANUAL Election Management System	1.0	1/12/2007	MicroVote General Corp.
AppL	GemCore V1.21-Based Reader Reference Manual	1.0	1/12/2007	Gemplus
(cover)	Appendix L GEMPLUS CARD READER/WRITER USER'S MANUAL Election Management System	1.0	1/12/2007	MicroVote General Corp.
AppN	DOUBLETALK PC/LT USER'S MANUAL	no version	1997	RC Systems, Inc
(cover)	Appendix N DOUBLETALK PC/LT USER'S MANUAL Election Management System	1.0	1/12/2007	MicroVote General Corp.
AppO	StarTech.com Spec Sheet (StarTech ID: 35FCREADBK)	no version	no date	StarTech
(cover)	Appendix O1 3.5" BAY 7-IN-1 Flash Card Reader USB 2.0 TECHNICAL SPECIFICATION Election Management System	1.0	2/02/2007	MicroVote General Corp.
AppO2	USB 2.0 Flash Card Reader	no version	9/12/2006	StarTech
(cover)	Appendix O2 3.5" BAY 7-IN-1 Flash Card Reader USB 2.0 USER'S MANUAL Election Management	1.0	2/02/2007	MicroVote General Corp.

	Title	Ver #	Date	Author
	System			
(TOC)	Appendix O 3.5" BAY 7-IN-1 Flash Card Reader USB 2.0	1.0	2/02/2007	MicroVote General Corp.
	Appendix P-1 INSTALLATION CHECKLIST Election Management System	1.0	1/12/2007	MicroVote General Corp.
	Appendix P-2 DATABASE CREATION CHECKLIST Election Management System	1.0	1/12/2007	MicroVote General Corp.
AppP3	CERTIFICATION OF: VOTING MACHINE PROGRAMMER	no version	no date	MicroVote General Corp.
(cover)	Appendix P-3 INFINITY PROGRAMMING CHECKLIST Election Management System	1.0	1/12/2007	MicroVote General Corp.
	Appendix P-4 DELIVERABLE SCHEDULE Election Management System	1.0	1/12/2007	MicroVote General Corp.
(TOC)	Appendix P INSTALLATION CHECKLISTS AND SCHEDULES Election Management System	1.0	1/12/2007	MicroVote General Corp.
(TOC)	Technical Data Package (TDP) TABLE OF CONTENTS Election Management System	1.0	1/12/2007	MicroVote General Corp.
AppW	MicroVote General Corp.	1.0	1/12/2007	MicroVote General Corp.
(cover)	Appendix W SAMPLE COUNTY INVOICE Election Management System	1.0	1/12/2007	MicroVote General Corp.
AppX-	File Name of Unit Compliance Status Comments	1.0	4/16/2007	MicroVote General Corp.
(cover)	Appendix X SOURCE CODE FILES LIST Election Management System	1.0	4/16/2007	MicroVote General Corp.
AppZ	SECTION 1 (OMR9002)	no version	no date	Chatsworth Data Company
(cover)	Appendix Z OMR-9002 Card Reader USER'S MANUAL Election Management System	1.0	3/29/2007	MicroVote General Corp.
	Section 2.12 QUALITY ASSURANCE PROGRAM Election Management System	1.1	1/12/2007	MicroVote General Corp.
	Section 2.3 SYSTEM FUNCTIONALITY DESCRIPTION Election Management System	1.1	12/05/2006	MicroVote General Corp.
	Section 2.6 SYSTEM SECURITY SPECIFICATION Election Management System	1.1	8/1/2007	MicroVote General Corp.
	Section 2.9 SYSTEM MAINTENANCE PROCEDURES Election Management System	1.1	5/23/2007	MicroVote General Corp.
	Appendix A1 Test Execution Plan for Menu Bar	1.1	3/03/2006	MicroVote General Corp.
	Appendix A11 Test Execution Plan for Security	1.1	3/23/2007	MicroVote General Corp.
	Appendix A12 Test Execution Plan for Office Entry	1.1	3/03/2006	MicroVote General Corp.
	Appendix A14 Test Execution Plan for Secondary Vote Limit	1.1	3/03/2006	MicroVote General Corp.
	Appendix A15 Test Execution Plan for Create and Edit Ballots	1.1	3/03/2006	MicroVote General Corp.
	Appendix A9 Test Execution Plan for Assign Equipment	1.1	3/03/2006	MicroVote General Corp.
	Appendix T PROGRAM SPECIFICATIONS Election Management System	1.1	12/18/2006	MicroVote General Corp.
	Section 2.11 CONFIGURATION MANAGEMENT PLAN Election Management System	1.2	5/24/2007	MicroVote General Corp.
	Section 2.2 SYSTEM OVERVIEW Election Management System	1.2	5/22/2007	MicroVote General Corp.
	Section 2.4 SYSTEM HARDWARE SPECIFICATION Election Management System	1.2	5/22/2007	MicroVote General Corp.
	Section 2.8 SYSTEM OPERATIONS PROCEDURES Election Management System	1.2	08/01/2007	MicroVote General Corp.

	Title	Ver #	Date	Author
	Appendix A13 Test Execution Plan for Candidate Filing	1.2	1/09/2007	MicroVote General Corp.
	Appendix A2 Test Execution Plan for Preferences	1.2	2/14/2007	MicroVote General Corp.
	Appendix A6 - Test Execution Plan for Ballot Text	1.2	1/09/2007	MicroVote General Corp.
(TOC)	Appendices TABLE OF CONTENTS Election Management System	1.2	4/24/2007	MicroVote General Corp.
	Appendix Y BUILD AND INSTALLATION INSTRUCTIONS Election Management System	1.2	5/03/2007	MicroVote General Corp.
	Appendix F VOTING VARIATIONS Election Management System	1.3	07/09/2007	MicroVote General Corp.
AppU	MicroVote Infinity Poll Worker's Manual Version 4.0.0.0	1.3	no date	MicroVote General Corp.
	Appendix R GUI SPECIFICATIONS Election Management System	1.4	07/25/2007	MicroVote General Corp.
AppV	Microvote General Corporation Election Management System User Manual	1.5	08/01/2007	MicroVote General Corp.
	Section 2.5 SOFTWARE DESIGN AND SPECIFICATION Election Management System	1.9	7/25/2007	MicroVote General Corp.
	Appendix A3 Test Execution Plan for Political Parties	2.0	8/09/2006	MicroVote General Corp.

The materials listed in Table 8 are to be delivered as part of the MicroVote General Corporation, Election Management System voting system.

Table 8 Voting System Materials

Material	Material Description	Use in the Voting System
Election Management System (EMS) software	Voting software release version 4.0.0	Ballot preparation and central count software
GemPlus smartcard reader/writer	COTS smartcard reader/writer with ISO7816-3 standard interface	Read and write election Start, Vote Vote N, Tally and Accumulator cards
Infinity Voting Panel	DRE push button voting hardware Model VP-1 Rev: C	DRE polling place device for recording votes
Power supply	COTS power supply Ault model PW101MA1203F01, 100-250 VAC, 50-60Hz, 0.75A Output: 12VDC, 2.75A regulated	DRE Power supply
DOUBLETALK LT	COTS: v.1.0 Text to speech converter box	Text to speech converter attached to the Infinity machine for audio ballots
Seiko Printer(s) and printer cable	COTS Thermal printers; model DPU-3445 or DPU-414	Printer connected to the DRE to print the open and close poll reports
Infinity Voting Panel firmware	Firmware release v.3.1X	DRE operating software
Infinity storage/shipping cases	Molded plastic shipping cases that convert to either a regular or wheelchair accessible voting booth	Protective case for shipping and storing that converts into the voting privacy booth. Cases are either regular or wheelchair accessible.
Chatsworth Dual Side Optical Mark Reader ACP-2200 or OMR-9002	COTS optical scanner model 605000-190 or 650000-010	Optical scanner to read voted data cards in the EMS software
Paper ballots or ballot cards	COTS Pre-printed data cards (LP 2628 9/98, LP 2443-B, & 2615 – STB 7/99)	Paper data cards to record votes

3.5 Proprietary Data

All software, hardware, documentation and materials will be considered by iBeta as proprietary to MicroVote. None of the elements submitted for certification testing may be used outside the scope of

testing. No release or disclosure may occur without the written authorization of MicroVote. Authorization for release to the EAC is contained in the MSA contract.

4 Test Specifications

Testing for conformance to the VVSG 2005 will be conducted as identified below. The Test Methods for the system level (functional integration, security, volume, telephony and cryptographic), environmental, accuracy (accuracy, volume, stress, reliability, and availability) and characteristics (recovery, usability, accessibility, and maintainability) test cases are contained in the appendix. A test case will be provided for each type of test. Documentation of all test iterations will be maintained with a separate record of the configuration and results of each test execution.

4.1 Hardware Configuration and Design

The baseline hardware configuration of the MicroVote Election Management System voting system submitted for testing is identified in Table 5. It is recorded in the PCA Configuration document. If during testing there is any change to the configuration of the system, the complete voting system configuration will be recorded on a new tab. The new tab will reflect the date upon which the new configuration was documented. All test cases identified in Tables 9 and 10 will include verification and documentation of the test environment against the applicable PCA Configuration tab.

4.2 Software System Functions

Testing of the software system functions defined in the VVSG 2005 include:

- Identification of the functional test scope based upon the PCA TDP Document Review (Vol. 2, Sect. 2) and FCA review of the MicroVote Election Management System voting system testing (Vol.2 Appendix A.2);
- PCA TDP Source Code Review of all submitted code, see Table 4 (Vol.2 Sect. 5.4);
- Witnessing the build (Trusted Build) of the reviewed code for the baseline version of the system intended to be sold by the manufacturer and delivered to the jurisdictions. (Vol.2. Sect. 6.2);
- Development of a Certification Test Plan and Test Cases (Vol. 2, Appendix A.);
- Execution of Functional/System Integration Tests (General 1 & 2, Primary 1, and Accuracy) (Vol. 2, Sect. 6);
- Testing of the performance and sequence of system hardware and software functions identified in System Operations, Maintenance and Diagnostic Testing Manuals (General 1 & 2, Primary 1, Accuracy, Security, and Characteristics) (Vol. 2. Sec. 6.8); and
- Completion of a trusted build by the VSTL with file signatures provided to the Escrow Agency.

4.3 Test Case Design

In order to secure VSTL accreditation, iBeta developed a standard set of test cases for testing voting systems to the VVSG 2005. All voting systems are subjected to these standard sets of test cases, to ensure consistent and repeatable testing. Test cases are then customized to the individual voting system.

4.3.1 Hardware Qualitative Examination Design

iBeta conducted a review of all submitted testing of the MicroVote Election Management System voting system. The review was conducted in accordance with vol.2 Appendix A.4.3.1 (a-d) of the VVSG 2005 and Section 301 of HAVA. The results of this review were recorded in the FCA Test Document Review and mapped to the applicable iBeta standard test cases. As a result of this review it was determined that iBeta will conduct testing to determine the quality of the hardware design. This will be assessed in the Characteristic (Usability, Accessibility and Maintenance) and Security Test Cases. iBeta will also conduct tests to determine the quality of the overall voting capabilities, pre-voting, voting and post voting functions of the MicroVote EMS Voting System. These will be assessed in the General 1 & 2, Primary 1 Functional System Level Test Cases and the Accuracy Test Case.

An examination of the MicroVote Election Management System voting system was conducted to confirm that it does not contain: wireless technology; use of the public networks, a voter verified paper audit trail, a paper-based precinct counter or electronic dexterity equipment. The results of this review were recorded in the FCA Test Document Review and mapped to the applicable iBeta standard test cases. As a result of this review it was determined that the voting system:

- Is exempted from the Telephony and Cryptographic Test Case;
- Is exempted from the optional requirements of the voter verified paper audit trail;
- Is exempted from requirements only applicable to paper base precinct counters; and
- Is not required by the VVSG 2005 or Section 301 of HAVA to have electronic dexterity equipment.

Wyle Laboratories examined the Infinity Voting Panel and submitted documentation to the results of environmental tests performed in 2006 to the VSS 200 to confirm if earlier test results would fulfill the environmental test requirements of the VVSG 2005.

iBeta Quality Assurance examined the Chatsworth OMR-9002 and ACP-2200 Dual-Sided Optical Mark Readers against the COTS manufacturer specifications for evidence of modification to support their use in voting systems. Additionally the specifications were reviewed against the VVSG 2005 vol. 1 sect. 4.1.2 for a record of performance under conditions defined in Environmental Requirements.

4.3.2 Hardware Environmental Test Case Design

Wyle Laboratories will use the reviewed test data and test results to issue a VVSG 2005 hardware environmental test report for the following:

- VVSG V.1: 4.1.2.4.a & b Electrical Supply
- VVSG V.1: 4.1.2.5 Electrical Power Disturbance
- VVSG V.1: 4.1.2.6 Electrical Fast Transit
- VVSG V.1: 4.1.2.7 Lightning Surge
- VVSG V.1: 4.1.2.8 Electrostatic Disruption
- VVSG V.1: 4.1.2.10 Electromagnetic Susceptibility
- VVSG V.1: 4.1.2.11 Conducted RF Immunity
- VVSG V.1: 4.1.2.12 Magnetic Fields Immunity
- VVSG V.1: 4.1.2.13 Environmental Control – Operating Environment
- VVSG V.1: 4.1.2.14 Environmental Control – Transit and Storage

iBeta shall coordinate with Wyle Laboratories to execute of the following environmental and safety hardware tests:

- WSG 2005 V.1: 4.3.8 – Safety – UL-60950-1 Edition 2, Information Technology Equipment - Safety - Part 1: General Requirements (March 27, 2007); examination includes WSG 2005 V.1: 4.1.2.3 Furnishing and Fixtures
- WSG 2005 V.1: 4.1.2.9 Electromagnetic Emissions –FCC Part 15 Class B (October 1, 2006)

Verification of normal operation before and after execution of environmental and safety testing with an iBeta prepared operational status test. The contents of this test are identified in section 7.2 in the test prerequisites.

iBeta shall incorporate WSG 2005 V.1: 4.1.2.4.c – Electrical Supply, validation of the 2 hour battery back up, into the Characteristics Test Case.

Environmental testing of the Chatsworth Optical Mark readers is being performed by the COTS manufacturer. MicroVote will submit these results upon completion of testing. iBeta Quality Assurance shall perform a review of the test results to confirm they provide a documented record of performance under the conditions defined in the Guidelines (VVSG 2005 V.1:4.1.2)

4.3.3 Software Module Test Case Design and Data

Based upon the FCA Document Review of the MicroVote tests the iBeta standard test cases were customized to cover the applicable requirements of the MicroVote Election Management System voting system. The customized test cases include the identification of the flow control parameters between the applications, user interfaces, and hardware interfaces with the capture of entry and exit data. (See Tables 9, 10 and the appendix.)

4.3.4 Software Functional Test Case Design

A review of the MicroVote functional test cases against the VVSG 2005 and the Election Management System voting system functional requirements has been performed. Tests covering system functional requirements are incorporated into a standard set of system level integration test cases. These test cases identify Accept/Reject performance criteria for certification based upon the VVSG 2005 and the Election Management System voting system software and hardware specifications.

The MicroVote Election Management System voting system functions and the iBeta Test Cases are identified in Table 9. Greater description of each Test Case is found in the Test Methods. (See the Appendix.) Detailed test steps and test data are found in the separate individual Test Case documents.

Table 9 System Function & Test Cases

System Function	Test Case
a. Ballot Preparation Subsystem	
1) Creation of an Installation and Election database; set administrative preferences, parties, vote types, precincts, ballot text/graphics, equipment, access security levels and election reports 2) Setting up an election; enter election data: offices, candidates, secondary vote limits and reports 3) Setting up a ballot; enter, lay out and edit ballots and ballot styles; activate and assign ballots; view ballots for proofing 4) Programming and printing election media and ballots; installing ballots on the Infinity Voting Panel; process paper ballot cards	General 1 & 2, Primary 1, Accuracy, Security
b. Test operations performed prior to , during and after processing of ballots, including:	
1) Logic Test – Interpretation of Ballot Styles & recognition of precincts; displaying ballot styles correctly by election type, precinct, precinct splits and party	General 1 & 2, Primary 1
2) Accuracy Tests- Clearly identifiable voting fields associated with candidates an measures; correctly mark, record and report an Infinity ballot in visual and audio modes; correctly read and report a voted paper ballot card	General 1 & 2, Primary 1, Accuracy
3) Status Tests- Initialize the Infinity; confirm operational status of the Infinity and Ready mode; check buttons, display and ballot	General 1 & 2, Primary 1, Accuracy
4) Report Generation – Produce, view and print Infinity precinct reports; produce consolidated Infinity and optical mark reader central count reports	General 1 & 2, Primary 1, Accuracy
5) Report Generation- Produce, view and print ballot preparation, Infinity and central count audit reports	General 1 & 2, Primary 1, Accuracy
c. Procedures applicable to equipment used in a Polling Place for:	
1) Opening the polls, confirm security code; print zero proof report; enable voting; activate voter sessions; display, vote and cast ballots	General 1 & 2, Primary 1, Accuracy, Security
2) Monitoring equipment status ready and non-ready modes; voting boots provide privacy;	General 1 & 2, Primary 1, Accuracy, Characteristics
3) Equipment response to commands; confirm voting enabled; audio and visual ballots activated; adjust ballot visual and audio display (contrast, magnification, alternative language, volume, speed); write-in, review of votes, casting the ballot; activation of authorized ballot content (election information, election type, precinct, precinct split, party, supported voting variations); usable and accessible generation/display of all voter facing messages and notifications;	General 1 & 2, Primary 1, Accuracy, Characteristics
4) Generating real-time audit messages for election installation, equipment status checks, polls open, vote activations, power recovery, poll closings; report processing	General 1 & 2, Primary 1, Accuracy, Characteristics
5) Polls are closed; ballot activation is disabled; visible indication of	General 1 & 2, Primary 1,

System Function	Test Case
system status	Accuracy, Security
6) Infinity election data reports are generated	General 1 & 2, Primary 1, Accuracy
7) Transfer ballot count to central counting location via smart card and direct download from the Infinity	General 1 & 2, Primary 1, Accuracy, Security
8) Electronic network transmission is not available, no wireless capabilities	Verification electronic network transmission is not supported
d. Procedures applicable to equipment used in a Central Count Place	
1) Read and process paper ballot cards for >1 precinct with the optical mark reader	General 1 & 2, Primary 1, Accuracy
2) Monitoring equipment status; optical mark reader is correctly connected to the EMS and ready to process cards	General 1 & 2, Primary 1, Accuracy
3) Equipment response to commands; optical mark readers transfer votes to the EMS software; write-in identified; unreadable cards are rejected	General 1 & 2, Primary 1, Accuracy
4) Integration with peripherals equipment or other data processing systems;	General 1 & 2, Primary 1, Accuracy
5) Generating real-time audit messages; election installation; reader activation; equipment status checks, power recovery, report processing	General 1 & 2, Primary 1, Accuracy
6) Generating precinct-level election data reports; view and print reports with partial and complete precinct votes	General 1 & 2, Primary 1, Accuracy
7) Generating summary election data reports; view and print zero proof reports; view and print vote summary reports with partial and complete votes	General 1 & 2, Primary 1, Accuracy

4.3.5 System Level Test Case Design

System Level Test Cases have been prepared to assess the response of the hardware and software to a range of conditions. Greater description of each Test Case is found in the Test Methods. (See the Appendix.) Detailed test steps and test data are found in the separate individual Test Case documents.

Table 10 System- Level Test Cases

	Test Cases
a. Volume Test	
During the Accuracy Test a minimum of 1,549,703 ballot positions will be exercised to confirm that this volume is handled by the voting system Ballots shall include: • DRE: System maximum numbers of parties, candidates, and panel ballot locations; • Optical Mark Reader: Maximization of the limits of ballot positions permitted by the paper ballot card.	Accuracy DRE & Accuracy OMR Test Cases
b. Stress Test	
During the Accuracy Test a number of ballots sufficient to reach the minimum of 1,549, 703 ballot positions shall be executed to confirm that the system performs: • Accurately, conforming to the VVSG 2005 and without measurable performance degradation.	Accuracy DRE & Accuracy OMR Test Cases
c. Usability Tests:	
Election database and ballots will be prepared, installed, voted and reported exercising the input controls, error content, and audit message content of the voting system. • A review will assess the content and clarity of instructions and processes.	General 1, 2 & Primary 1, Characteristics Test Cases

	Test Cases
d. Accessibility Tests:	
An audio Spanish and English ballot will be programmed. Votes will be cast to confirm: • Ballots can be accessed visually, aurally or with non-electronic dexterity aids in Spanish and English • Ballots can be accessed with various screen contrast, ballot display settings, and required audio ballot controls • Physical aspect measurements of the voting system will comply with the VVSG 2005	General 2 & Characteristics Test Cases
e. Security Tests:	
During System Function testing steps will be incorporated into the pre-vote, vote, and post vote election phases. These steps shall test: • Security access controls limit or detect access to critical systems (ballot preparation ballot installation, poll opening/closing, ballot activation , transfer of data, reporting of results and audit functions) • Loss of system integrity, availability, confidentiality and accountability are detectable • The effectiveness of the documented security polices and procedures Security specific test cases shall include: • Attempts to circumvent user sign in and smart cards • Methods to bypass or defeat the security • Denial of service attacks simulated using the Smart Card • Poll workers, and voters as threat agents to access the ability of the voting system to resist or detect attacks, log and/or report attempts • Effectiveness of the documented security polices and procedures After defining language specific review criteria, a software source code review will be executed to confirm that: • Modules contain single exit points • There are no unbound arrays (• There are no vote counter overflows • Audit records log errors & events • There is separate and redundant ballot image, vote and audit recording • Voting systems halt execution at the loss of critical systems • There are no computer-generated passwords	General 1, 2 & Primary 1 Test Cases PCA Document Review Security Specifications Source Code Review Security
f. Performance Tests:	
During various functional and accuracy testing the elections will be programmed, voted and tallied to ensure ballot formats are accurately displayed, votes are accurately and reliably cast for the voting variations and functionality supported by the voting system	General 1, 2 & Primary 1 Accuracy DRE & OMR Test Cases
g. Recovery Tests:	
Test will be conducted to determine the system is able to: • Recover from power or other system failure, without loss of vote data; and • Be supported on back up power for a minimum of two hours.	General 1 & Characteristics Test Cases

5 Test Data

5.1 Test Date Recording

The results of testing and review to the MicroVote General Corporation, Election Management System voting system to the VVSG 2005 are recorded in the test case and review form s prepared by iBeta. Environmental test data will be recorded in the manner appropriate to the test equipment with output reports detailing the results and analysis. Electronic copies of all testing and reviews will be maintained.

5.2 Test Data Criteria

The results of the voting system tests and reviews results will be evaluated against the documentation of the Election Management System voting system TDP, and the requirements of the VVSG 2005. The Election Management System voting system will be evaluated for its performance against the standard and the expected results identified in each test case.

5.3 Test Data Reduction

Test data will be processed manually.

6 Test Procedures and Conditions

6.1 Facility Requirements

All software testing and review will be performed at iBeta laboratory in Aurora, Colorado.

In order to ensure control, iBeta received, checked in and documented the hardware, software and documentation of the MicroVote Election Management System voting system. The Infinity Voting Panel and hardware specifications were forwarded to Wyle Laboratories in Huntsville, Alabama to assess the required scope of environmental testing to the requirements for the VVSG 2005. As part of the assessment, Wyle reviewers verified and recorded that all equipment identified as sent was received.

All MicroVote documentation, test documentation and results will be maintained in the MicroVote Election Management System voting system project folder on the SharePoint server in the Voting section. Only project assigned test personnel will have access to the MicroVote repository. MicroVote source code will be maintained on a separate server. Only project assigned test personnel will have access to the source code repository. Repositories are backed up daily using industry standard utilities.

6.2 Test Set-up

As part of the PCA, the MicroVote Election Management System voting system test platform will be set-up in the manner identified in the system configuration identified in the Section 2.4 SYSTEM HARDWARE SPECIFICATION Election Management System. The test platform will be documented. Installation of the witnessed build will be observed and documented. An inventory of any accessories or preloaded applications will be documented.

6.3 Test Sequence

There is no prescribed sequence for the testing of the voting system. The only sequence requirement is that predecessor tasks are completed prior to initiation of a task.

Table 11 –Sequence of Certification Test Tasks

Certification Test Task	Predecessor Task	Test Personnel
Identify scope of project for contract negotiation	Determination of voting system status; New submission to the EAC	Gail Audette & Carolyn Coggins
Set up Project and Repositories	Contract Authority	Gail Audette Carolyn Coggins & Jon Goodman
Reporting of Discrepancies	Commencement of the project	All Test Staff
PCA TDP Document Review	Project repository and TDP Documents received	Gail Audette Carolyn Coggins Debra Harwood & Mary Ricketts, Kevin Wilson
PCA TDP Source Code Review	Project repository and TDP Documents & Source Code received	Gail Audette, Tim Fuller Kevin Wilson, Kalpana Siddhantham,
FCA Testing Review and Test Scope/ Requirements Identified	TDP Test Documents received	Carolyn Coggins
Certification Test Plan	Preliminary PCA TDP Document Review & FCA Testing Review	Carolyn Coggins Mary Ricketts
FCA Test Case preparation	TDP Documentation received, FCA Testing Review, Identification of Test Scope and Requirements	Carolyn Coggins Debra Harwood Mary Ricketts
PCA System Configuration	TDP Documentation, hardware and software received	Carolyn Coggins Debra Harwood Mary Ricketts
Witness/Trusted Build	PCA Source Code Review	Gail Audette & Kevin Wilson

ertification Test Task	Predecessor Task	Test Personnel
FCA Environmental Hardware Test Case Execution	FCA Test Case preparation & PCA System Configuration	Carolyn Coggins Wyle Laboratories
FCA Accuracy Test Case	FCA Test Case preparation, PCA System Configuration, Temperature and Power Variation Environmental Test	Gail Audette & Carolyn Coggins
FCA Functional/System Level Test Case Execution	FCA Test Case preparation & PCA System Configuration	Carolyn Coggins, Debra Harwood, Mary Ricketts
FCA Characteristics. Test Case Execution	FCA Test Case preparation & PCA System Configuration	Carolyn Coggins & Mary Ricketts
FCA Security Review & Testing	FCA Test Case preparation & PCA System Configuration	Gail Audette, Kevin Wilson & Carolyn Coggins, Debra Harwood & Mary Ricketts
FCA Telephony and Cryptography Review and Test Case	FCA Test Case preparation & PCA System Configuration	Carolyn Coggins
Regression Testing of Discrepancy Fixes	Receipt of applicable fix or response from MicroVote and Witness/Trusted build of reviewed code, if applicable	All test staff
VSTL Certification Report	Successfully complete all FCA and PCA tasks	All test staff
Deliver the Certification Report for EAC Review	Completion of VSTL Certification Report	Gail Audette & Carolyn Coggins
Re-issue the Certification Report with the EAC Certification Number	Acceptance of the Certification Report by the EAC	Gail Audette & Carolyn Coggins

6.4 Test Operations Procedures

Test cases and review criteria are contained in separate documents. They are provided to the iBeta test staff and Environmental Hardware Subcontractor with step-by-step procedures for each test case or review conducted. Test and review instructions identify the methods for test or review controls. Results are recorded for each test or review step. Possible results include:

- **Accept:** the expected result of the test case is observed; an element of the voting system meets the VVSG 2005
- **Reject:** the expected result of the test case is not observed; an element of the voting system did not meet the VVSG 2005
- **Not Applicable (NA):** test or review steps that are not applicable to the scope of the current Certification are marked NA.
- **Not Testable (NT)**: rejection of a previous test step prevents execution of this and subsequent test steps.

Reject, Not Applicable and Not Testable results are marked with an explanatory note. The note for rejected results contains the discrepancy number.

Issues identified in testing or reviews are logged on the Discrepancy Report. Issue types include:

- Document Defects: a documentation element of the voting system did not meet the VVSG 2005. Resolution of the defect is required for certification.
- Functional Defects: a hardware or software element of the voting system did not meet the VVSG 2005. Resolution of the defect is required for certification.
- Informational: an element of the voting system which meets the VVSG 2005 but may be significant to either the manufacturer or the jurisdiction. Resolution of Informational issues is optional. Unresolved issues are disclosed in the certification report.

Test steps are numbered and a tabulation of the test results is reported in the test case. Test operation personnel and their assignments are identified in Table 11.

7 Appendix- Test Methods

7.1 System Level Test Cases

7.1.1 General Elections

Method Detail	General Election 1 Test Method	General Election 2 Test Method
Test Case Name	General 1	General 2
Scope - identifies the type of test	A system level test incorporating validations of the 2005 Voluntary Voting System Guidelines required functionality. Testing includes validation of measurable performance including accuracy, processing rate, and ballot format handling capability. Functional aspects include error recovery, security, and usability of the hardware, software and procedures in the pre-vote, voting, and post-voting operations of a voting system.	A system level test incorporating validations of the 2005 Voluntary Voting System Guidelines required and manufacturer identified functionality. Testing includes validation of measurable performance including accuracy; processing rate, and ballot format handling capability, Functional aspects include error recovery, security, and usability of the hardware, software and procedures in the pre-vote, voting, and post-voting operations of a voting system. Functional accessibility (audio, mobility and dexterity) in the voting mode is included.
Test Objective	Validate the ability to accurately and securely create, install, vote, count and report the results of a general election including the identified voting variations.	Validation of the ability to accurately and securely create visual and audio ballots, install, vote with mobility and non-mobility restrictions, count and report the results of a general election including the identified voting variations.
Test Variables: Voting Variations (as supported by the voting system)	Create New Election: • General elections • Partisan/non-partisan offices • Contest Write-in votes (Not Candidate level) • Cross -party endorsement • Vote for N of M • Provisional ballots • Party Logos • 2 Precincts; 1 with 2 splits • Candidate Sorting - By name within Party • Candidate Stacking - Always • Ballot Style - Absentee and Infinity (DRE) • Manual Vote Entry - in central count reports	Create New Election • General elections • Straight party voting • Partisan/non-partisan offices • Write-in votes - Contest and Candidate level • Audio ballots • Multi-lingual visual and audio ballots • Secondary Vote Limit • 2 Precincts • Candidate Sorting - By Name • Candidate Stacking - Only within race when required • Auto Straight Party Crossover • Ballot Graphics (verify not available) • Dexterity Assistive Device Ballots - non-electronic mouth stick and toe entry
A description of the voting system type and the operational environment	MicroVote Election Management System voting system includes: • Ballot preparation & central count software (EMS) installed on a Windows OS PC running 2000 or XP Professional • The DRE Infinity Voting Panel running the Infinity Voting Panel Firmware • A COTS scanner for absentee ballots • Smart cards for ballot installation, poll management, voter access,	Same as General 1 except: • -COTS Smart Card Reader/Writer is not used • -Tally results are directly transferred to the central count software via a port on the panel • A COTS voice synthesis/sound system (text-to-speech converter) for Audio ballots • Audio: Headphones

Method Detail	General Election 1 Test Method	General Election 2 Test Method
	and transfer of results • COTS smart card reader/writer connected to central count (see below for test configuration detail)	• Mobility: Accessible voting booth • -Dexterity: non-electronic entry mouth stick and toe
VVSG 2005 vol.1	2.1 thru 2.4.3, 2.5	2.1 thru 2.4.3, 2.5, 3.1.3, 3.2 HAVA a thru c2
VVSG 2005 vol.2	6.2 thru 6.4.1, 6.6 & 6.7	6.2 thru 6.4.1, 6.5 thru 6.7
Hardware, Software voting system configuration and test location	• Election Management System (EMS v4.0.0.0) voting system • Ballot Prep/Central Count SW: Election Management System v.4.0.0.0 • DRE HW: Infinity Voting Panel Model VP-1 Rev: C • DRE SW: Infinity Voting Panel Firmware v 3.1x, • COTS Smart Card Reader/Writer: GEMPLUS • COTS Optical Scanner: OMR 9002/ACP2200 Test Location: iBeta, Aurora, CO	Same as General 1 except: • COTS Smart Card Reader/Writer is not used • COTS voice synthesis/sound system (text-to-speech converter): DoubleTalk LT • Radioshack Headphones • MicroVote Accessible voting booth • Non-electronic mouth stick
Pre-requisites and preparation for execution of the test case.	Prior to execution of testing the following prerequisites must be completed. • Record the testers & date • System has been set up as identified in the user documentation • Install a witnessed build from the EMS software and Infinity firmware source code submitted for review • Reference the system configuration recorded in the PCA Configuration • Document versions of the EMS User, Infinity Poll Worker's, & Infinity Voting Panel Technical Reference Manuals • Ensure customization of the test case template is complete • Create a supervisory level access user and password • - Obtain Green Start and Blue Vote Cards	Same as General 1, plus: • Use the "Preferences" settings from General 1
Getting Started Checks	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 manufacturer 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 will be performed.	Same as General 1
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 (see step i for definitions)	Same as General 1

Method Detail	General Election 1 Test Method	General Election 2 Test Method
	• In Comments enter deviations, discrepancies, or notable observations • Log discrepancies on the Discrepancy Report and insert the number in the Comments	
Pre-vote: Ballot Preparation procedures verifications	Ballot Prep: • Installation and Election databases can be accurately/securely defined & formatted. • A ballot (candidates & propositions) can be accurately/securely defined & generated. • A ballot can be accurately/securely programmed & installed onto the Vote card via the GEMPLUS card reader/writer.	Same as General 1except: • A ballot can be accurately/securely programmed & installed onto the Infinity Voting Panel via a port on the panel.
Pre-vote: Ballot Preparation Security	Ballot Prep: see Security COTS • Authentication is configured on the local terminal & external connection devices, • Operating systems are enabled for all session & connection openings, & closings, all process executions & terminations & for the alteration or detection of any memory or file object • Configure the system to only execute intended & needed processes during the execution election software. Processes are halted until termination of critical system processes (such as audit).	Same as General 1
Readiness Testing and Poll Verification	Voting system is ready for the election: • Status & data reports are generated • The election is correctly installed • Start Card Functions Screen validates voting system functions correctly • Test data is segregated from voting data, with no residual effect' • The polling place voting system functions properly including a formal record of: • Election, polling place, voting system & ballot format identification (Show Ballot) • Zero count report (Print Zero Proof) • A list of all ballot fields • Test confirmation that there are: • No hardware/software failures • The device is ready to be activated to accept votes	Same as General 1
Pre- vote: Opening the Polls Verification	DRE • Green Start Card and Security Password prevent inadvertent or unauthorized poll opening • Start Card Functions screen enforces the proper sequence of steps to open the polls • Display of Start Election Confirmation and Status Screen verifies correct activation	Same as General 1

Method Detail	General Election 1 Test Method	General Election 2 Test Method
	• Identification of any failures & corrective action	
Voting: Ballot Activation and Casting Verifications	Protects secrecy of ballot/vote • Records selection/non-selection for each contest Paper-based (Absentee & Provisional) • Allow voter to identify & mark candidates • Allow placement of voted ballots into a precinct ballot counter or secure receptacle • Gives feedback & an opportunity to correct, before the ballot is counted (under/overvotes) DRE • Voter can make selections based on ballot programming & indicate selection/non-selection (undervotes) & cancellation • Alert overvotes; permit review & change before casting • Alert selection's complete; prompt confirmation as casting is irrevocable, • Alert successful/unsuccessful storage of cast ballot; give instruction • to resolve unsuccessful casting • Prevent vote modification & access until polls close Increment the ballot counter	Same as General 1, • Accessible Spanish ballots can be accessed • English or Spanish accessible ballots can be audibly accessed • Accessible ballots contain all visual ballot content • Instructions, status and error messages display in the accessible manner • Accessible ballots can be voted securely and independently • Ballots can be voted with non-manual input
Voting: Voting System Integrity, System Audit, Errors & Status Indicators	System audit provides a time stamped always available, report of normal / abnormal events that can't be turned off when the system is in operating mode. • Status message are part of the real time audit record. • Critical status messages requiring operator intervention use clear indicators or text Error messages are: • Generated, stored & reported as they occur • Errors requiring intervention by voter or poll worker clearly display issues & action instructions in easily understood 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	Same as General 1
Post-vote: Closing the Polls	Once the polls are closed the voting system • prevents further casting of ballots or reopening of the polls • internally tests and verifies that the closing procedures has been followed and the device status is normal • visibly displays the status • produces a test record that verifies the sequence of events and indicates the extraction of vote data is activated	Same as General 1 • Votes are not identifiable as being cast via accessible means
Post-vote: Central Count	Paper Based:	Same as General 1

Method Detail	General Election 1 Test Method	General Election 2 Test Method
	The central count voting system includes: • Election identification • Zero count report • Information to confirm readiness & accommodate administrative reporting requirements • Vote Consolidation: Consolidated reported votes match predicted votes from polling places, & optionally other sources (absentee, provisional, etc) Reports include: • Geographic reports of votes; each contest by precinct & other jurisdictional levels • Printed reports of ballots counted by tabulator, with votes, undervotes & overvotes • Report of system audit information printed or in electronic memory • Report identifying the combination of candidates receiving overvotes • Prevent data from being altered or destroyed by report generation, transmission over telecommunication lines or extraction from portable media • Permit extraction & consolidate votes from programmable memory services or data storage medium • Consolidate the votes from multiple voting systems into a single polling place report DRE • Electronic ballot images of votes cast by each voter, extracted from a separate process & storage location, is reported in a human readable form	• Votes are not identifiable as being cast via accessible means
Post-vote: Security	The central count: see Security COTS systems • Authentication is configured on the local terminal and external connection devices, • Operating system audit logs are enabled for all session and connection openings, and closings, all process executions and terminations and for the alteration or detection of any memory or file object • Configure the system to only execute the intended and necessary processes during the execution of the election software. Election software process are halted until the termination of any critical system process, such as system audit.	Same as General 1
Post-vote: System Audit	The system audit provides a central count time stamped always available, report of normal and abnormal events that cannot be turned off when the system is in operating mode. Status message are part of the real time audit record.	Same as General 1
Expected Results are observed	Review the test result against the expected result: • Accept: expected result is observed • Reject: expected result of the test case is not observed	Same as General 1

Method Detail	General Election 1 Test Method	General Election 2 Test Method
	• 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 are recorded in the test case. • Any failure against the requirements of the EAC guidelines means the failure of the system and is reported. • Failures are reported to the manufacturer as Defect Issues in the Discrepancy Report. • The manufacturer has the opportunity to cure all discrepancies prior to issuance of the Certification Report. • If cures are submitted the applicable test is rerun. Complete retest information is preserved in the test case. Retest cure and results are noted in the - Discrepancy Report and 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 are logged as Informational Issues on the Discrepancy Report. It is the manufacturer's option to address these issues. Open items are identified in the report.	Same as General 1

7.1.2 Primary System Level Test Cases

Method Detail	Primary Election 1 Test Method	PrimaryElection 2 Test Method
Test Case Name	Primary 1	Primary 2
Scope - identifies the type of test	A system level test incorporating validations of the VVSG 2005 required functionality. Testing includes validation of measurable performance including accuracy; processing rate, and ballot format handling capability, Functional aspects include error recovery, security, and usability of the hardware, software and procedures in the pre-vote, voting, and post-voting operations of a voting system. Functional aspects include error recovery, security, and usability of the hardware, software and procedures in the pre-vote, voting, and post-voting operations of a voting system. Functional accessibility (audio, mobility and dexterity) in the voting mode is included.	All supported primary functionality is addressed in Primary 1
Test Objective	Validate the ability to accurately and securely create, install, vote, count and report the results of a closed primary election or an open primary election with public party declaration including the identified voting variations. Validate that the Primary ballot operates in the identical mode as a General ballot. Validate that Primary ballots are separate static ballots individually configured in the EMS.	Validate that an open primary election with private party is not supported.

Method Detail	Primary Election 1 Test Method	PrimaryElection 2 Test Method
	Validate that the selection of a Primary ballot is performed by the poll worker and requires no private or independent action by the voter so that specific "Primary only" accessible functionality is required	
Test Variables: Voting Variations (as supported by the voting system)	Closed/open primaries public declaration • Partisan/non-partisan offices • Write-in votes • Primary presidential delegation nominations • Ballot rotation is not supported • Cross -party endorsement • Multiple and Split precincts • Vote for N of M • Provisional or challenged ballots • Candidate Sorting - None • Candidate Stacking - On entire ballot when required • Audio ballots • Multi-lingual visual and audio ballots • Dexterity Assistive Device Ballots - non-electronic mouth stick and toe entry	Open primary public selection: • Party selection by the voter is not supported on the audio ballot
A description of the voting system type and the operational environment	Same as General 1	All supported primary functionality is addressed in Primary 1
VVSG 2005 vol.1	2.1 thru 2.4.3, 2.5	2.1 thru 2.4.3, 2.5
VVSG 2005 vol.2	6.2 thru 6.4.1, 6.6 & 6.7	6.2 thru 6.4.1, 6.6 & 6.7
Hardware, Software voting system configuration and test location	Same as General 1 • A COTS voice synthesis/sound system (text-to-speech converter) for Audio ballots • Audio: Headphones • Mobility: Accessible voting booth • Dexterity: non-electronic entry mouth stick and toe	All supported primary functionality is addressed in Primary 1
Pre-requisites and preparation for execution of the test case.	Same as General 1	All supported primary functionality is addressed in Primary 1
Getting Started Checks	Same as General 1	All supported primary functionality is addressed in Primary 1
Documentation of Test Data & Test Results	Same as General 1	All supported primary functionality is addressed in Primary 1
Pre-vote: Ballot Preparation procedures verifications	Same as General 1	All supported primary functionality is addressed in Primary 1
Pre-vote: Ballot Preparation Security	Same as General 1	All supported primary functionality is addressed in Primary 1
Readiness Testing and Poll Verification	Same as General 1	All supported primary functionality is addressed in Primary 1

Method Detail	Primary Election 1 Test Method	PrimaryElection 2 Test Method
Pre- vote: Opening the Polls Verification	Same as General 1	All supported primary functionality is addressed in Primary 1
Voting: Ballot Activation and Casting Verifications	Same as General 1 • Accessible Spanish ballots can be accessed • English or Spanish accessible ballots can be audibly accessed • Accessible ballots contain all visual ballot content • Instructions, status and error messages display in the accessible manner • Accessible ballots can be voted securely and independently • Ballots can be voted with non-manual input	All supported primary functionality is addressed in Primary 1
Voting: Voting System Integrity, System Audit, Errors & Status Indicators	Same as General 1	All supported primary functionality is addressed in Primary 1
Post-vote: Closing the Polls	Same as General 1	All supported primary functionality is addressed in Primary 1
Post-vote: Central Count	Same as General 1	All supported primary functionality is addressed in Primary 1
Post-vote: Security	Same as General 1	All supported primary functionality is addressed in Primary 1
Post-vote: System Audit	Same as General 1	All supported primary functionality is addressed in Primary 1
Expected Results are observed	Same as General 1	Same as General 1
Record observations and all input/outputs for each election;	Same as General 1	Same as General 1

7.1.3 Primary Security Test Cases

Method Detail	Security Test Method	Telephony and Cryptographic Test Method
Test Case Name	Security	Telephony and Cryptographic
Scope - identifies the type of test	Security testing crosses into several areas of voting system testing. • Integrated system level test cases General 1, 2 and Primary 1 are customized to test the security elements incorporated into the pre-vote, voting and post voting functions. • A review of the security documentation addresses the Access Controls, Physical Security and Software Security. • A source code review confirms: single exit points, no unbound arrays, no vote counter overflows, audit logging of errors & events, separate & redundant ballot image, vote and audit recording; halt of execution at the loss of critical systems, no computer-generated passwords	Validation that as there are no use of the public networks the voting system is exempt
Test Objective	The objective of security testing is to minimize the risk of accidents, inadvertent mistakes and errors; protect from intentional manipulation,	Validation that there is no use of the public networks

Method Detail	Security Test Method	Telephony and Cryptographic Test Method
	fraud or malicious mischief;	
Test Variables: Voting Variations (as supported by the voting system)	In general & primary elections validate the effectiveness of the pre-vote, voting, & post voting functions and security policies & procedures Enter election data that exceeds boundaries & field limits; exercise errors & status messages; confirms correct & prevention of incorrect operations. Confirm secrecy: in the voting process & including: • Ballot formatting, • Casting & recording votes, • Calculating & reporting vote totals consistent with defined ballot formats, Prevention and detection of: • Interruption of the recording of votes • Introduction of data not cast by authorized voters • Alteration of audit & vote data; • Access to votes & totals by unauthorized individuals; • Access to voter identification data so that content of a specific vote can be linked to the voter • Attempts to circumvent controls, bypass & defeat security • Poll worker & voter attacks Effectiveness of the documented security polices and procedures	Based upon security document reviews and inspection during General 1 confirm that the system does not use the public networks
A description of the voting system type and the operational environment	Same as General 1	Same as General 1
VVSG 2005 vol.1	2.1.1, 2.1.3, 2.1.4 e thru j, thru 2.1.5.2, 5.2.3.e, 7.2 thru 7.4	6.1.3 thru 6.2.7, 7.4.5.1, 7.7 thru 7.7.4
VVSG 2005 vol.2	2.6, 5.4.2.d, g, & p, 6.4 thru 6.4.2	6.4.2
Hardware, Software voting system configuration and test location	Same as General 1 Security Review and Test: • Non-election smart cards • "Non-trusted user" PC and smart card reader/writer.	Same as General 1
Pre-requisites and preparation for execution of the test case.	The System Level and Telephony and Cryptographic Test Cases are reviewed to ensure that they incorporate the security test requirements and the procedural requirements identified in the vendor supplied security documentation. Source code review for security is completed with no outstanding issues Same as General 1	Same as General 1
Getting Started Checks	Follow steps in the System Level and Telephony and Cryptographic Test Cases.	Same as General 1

Method Detail	Security Test Method	Telephony and Cryptographic Test Method
	The vendor supplied security documentation is reviewed against the requirements for Access Controls, Physical Security and Software Security. Complete the prerequisites; - Record the reviewer & date - Gather any necessary materials or manuals.	
Documentation of Test Data & Test Results	Record the results of the security & source code reviews. • Enter Accept/Reject against each review requirement. • Log discrepancies on the appropriate Discrepancy Report Same as General 1	Same as General 1
Pre-vote: Ballot Preparation procedures verifications	Follow steps in General 1 • Users are forced to change the initial hard-coded username and password • User Manual identifies the system configuration for only executing election software	Not applicable, no use of the public networks
Pre-vote: Ballot Preparation Security	Follow steps in the General 1, 2 & Primary 1 • Security access controls limit or detect access to critical systems & the loss of system integrity, availability, confidentiality & accountability • Power can be interrupted & restored without loss of election data • Audit logs contain entries for failed attempts & abnormal events. • Functions don't execute if preconditions are not met • Functions are only executable in the intended manner, order & under intended conditions outlined in the user manual, test steps, & test data • System access controls are implemented for ballot preparation • Security provisions are implemented for ballot preparation • Pre-vote communication errors are reported to the user & require corrective action to continue operation • Pre-vote errors restore the system to the prior condition without losing data • No use of public networks to transfer data • Provided documentation of mandatory administrative procedures.	Not applicable, no use of the public networks
Readiness Testing and Poll Verification	Follow steps in the General 1, 2 & Primary 1 Same as pre-vote Ballot Preparation Security except it's for the Ballot Installation functions	Not applicable, no use of the public networks
Pre- vote: Opening the Polls Verification	Follow steps in the General 1, 2 & Primary 1 Same as pre-vote Ballot Preparation Security except it's for the Poll Opening functions • Prior to opening polls, confirm Vote, Tally and non-election smart cards do not open polls	Not applicable, no use of the public networks

Method Detail	Security Test Method	Telephony and Cryptographic Test Method
Voting: Ballot Activation and Casting Verifications	Follow steps in the General 1, 2 & Primary 1 Same as pre-vote Ballot Preparation Security except it is for the: • Vote errors & communication errors • Ballot activation & voting functions • Precinct counts cannot be printed or viewed prior to the close of the polls Security Review and Test: Gemplus Voter and Tally cards; • "Trusted user" with access to a Tally card & EMS; In 45 minutes attempt to modify vote tally data; Verify data is not impacted & the attempt is logged • "Non-trusted user" with a Vote card, a PC and smart card reader/writer. In 6 hours attempt to duplicate the card to permit multiple voter sessions. • "Non-trusted user"- attempt to access the COM 1 and COM 2 ports during the election; retrieve vote data or introduce malicious content	Not applicable, no use of the public networks
Voting: Voting System Integrity, System Audit, Errors & Status Indicators	Follow steps in the General 1, 2 & Primary 1 Same as pre-vote Ballot Preparation Security	Not applicable, no use of the public networks
Post-vote: Closing the Polls	Follow steps in the General 1, 2 & Primary 1 Same as pre-vote Ballot Preparation Security except it is for the: • Post vote errors & communication errors • Poll closing and transfer functions • No use of public networks to transfer data • Precinct counts cannot be printed or viewed prior to the close of the polls	Not applicable, no use of the public networks
Post-vote: Central Count	Follow steps in the General 1, 2 & Primary 1 Same as pre-vote Ballot Preparation Security except it is for the: • Post vote errors & communication errors • Transfer, calculating and reporting functions • No use of public networks to transfer data	Not applicable, no use of the public networks
Post-vote: Security	Follow steps in the General 1, 2 & Primary 1 Same as pre-vote Ballot Preparation Security except it is for the: • Post vote errors & communication errors • Transfer, calculating and reporting functions • No use of public networks to transfer data Security Test and Review	Not applicable, no use of the public networks

Method Detail	Security Test Method	Telephony and Cryptographic Test Method
	The vote table (database) can be accessed from the EMS server	
Post-vote: System Audit	Follow steps in the General 1, 2 & Primary 1 Same as pre-vote Ballot Preparation Security except it includes voting and post voting functions Security Review & Test • Incorrect user of smart cards are logged • - Attempts to access vote tables are identified	Not applicable, no use of the public networks
Expected Results are observed	Same as General 1 Security and Source Code Review Criteria: • Accept meets the guideline • Reject does not meet the guideline • - NA the guideline does not apply	Same as General 1
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 General 1, 2 or Primary 1 Test Case. Additional security test shall be recorded in the Security Review and Test Case. A separate statement will be prepared addressing the results of the from the security perspective. It will provide the results of the testing and review required in vol. 1 section 7.	Same as General 1

7.2 Environmental Test Method

Method Detail	Environmentatl Test Method (DRE)	Environmental Test Method (COTS OMR)
Test Case Name	Environmental Test – (DRE) Infinity	Environmental Test – COTS Optical Mark Reader
Scope - identifies the type of test	Execution and provision of test results identified in the VVSG 2005 hardware operating and non-operating environmental tests. Environmental hardware testing is outside the scope of iBeta's VSTL accreditation. It is performed by Wyle Laboratories, Huntsville, AL under their A2LA accreditations Certificate Numbers 845.01 (Electrical) and 845.02 (Acoustics and Vibration). • iBeta coordinate and oversee subcontractor testing. • iBeta shall review the 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.	Document review of the COTS manufacturer's specifications and environmental test results for a documented record of performance under the conditions defined in the Guidelines
Test Objective	Validation of the polling place hardware to meet the Non-Operating/Operating Environmental test standards of the EAC VVSG 2005.	Validation of the COTS central count optical mark reader hardware to provide evidence of a documented record of performance under conditions defined in the Non-Operating/Operating Environmental test

		standards of the EAC VVSG 2005.
Test Variables: Voting Variations (as supported by the voting system)	Tests conducted in compliance with the identified standard : 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). 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). 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	System specifications provide documented evidence of operation: 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 Upon submission of Chatsworth's environmental testing confirm there is document evidence of operation performance identified in the standard methods: 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). 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). 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	DRE HW: Infinity Voting Panel Model VP-1 Rev: C DRE SW: Infinity Voting Panel Firmware v 3.11 COTS voice synthesis/sound system (text-to-speech converter): DoubleTalk LT Radioshack Headphones MicroVote Accessible voting booth	MicroVote Election Management System voting system includes: • Ballot preparation & central count software (EMS) installed on a Windows OS PC running 2000 or XP Professional COTS scanner for absentee/provisional ballots
VVSG 2005 vol.1	4.3.8, 4.1.2 thru 4.1.2.14	4.3.8, 4.1.2 thru 4.1.2.14
VVSG 2005 vol.2	4.6.1.5 thru 4.7.1 & 4.8	4.6.1.5 thru 4.7.1 & 4.8
Hardware, Software voting system configuration and test location	DRE HW: Infinity Voting Panel Model VP-1 Rev: C DRE SW: Infinity Voting Panel Firmware v.3.1x COTS voice synthesis/sound system (text-to-speech converter): DoubleTalk LT Radioshack Headphones MicroVote Accessible voting booth Test Location: Wyle Laboratories, Huntsville AL • iBeta provides Wyle with the environmental hardware test case outlining methods, instructions to document the configuration, test environment, lab accreditations, tester qualifications, and operational status check performance.	Election Management System (EMS v4.0.0.0) voting system Ballot Prep/Central Count SW: Election Management System v.4.0.0.0 COTS Smart Card Reader/Writer: GEMPLUS COTS Optical Scanner: OMR 9002/ACP2200 Test Location: iBeta, Aurora, CO

	• iBeta personnel execute the accuracy testing in conjunction with the Temperature and Power Variations provide and oversee the operational status checks.	
Pre-requisites and preparation for execution of the test case.	Complete the prerequisites; • Record the testers & date • System has been set up as identified in the user manual • 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: • Checking the operation of all buttons, switches and lights • Opening the polls & running a zero totals report • Checking appropriate error conditions for correct prompts or responses. (Error conditions will depend upon the type of equipment being tested.) • Accessibility features are operational. • Power off and on with no loss of function. • Close the polls and print all reports. (Totals & Audit Logs)	Complete the prerequisites; • Record the reviewer & date • System matches the Chatsworth COTS specification • Gather any necessary materials or manuals. • Ensure customization of the assessment template is complete
Getting Started Checks	Check the voting system to : • Verify the test environment and system configuration is documented in the PCA Configuration and matches the manufacturer 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. • Confirm the tester understands the recording requirements of the iBeta test case. • Operational status check procedures are available and successfully run. • An automated script for use during the EMC operational tests exercises necessary functionality.	Check the COTS hardware to : • Verify the system configuration is documented in the PCA Configuration and matches the COTS manufacturer's described configuration. • Confirm the Operational status check procedure is identified
Documentation of Test Data & Test Results	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	Review the documented record of performance: • Enter Accept/Reject on the Environmental Assessment tab • 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	Follow test method in the identified international standard	Verify the test method is under the conditions identified in the Guidelines
Expected Results are observed	Review the test result against the expected result: • Pass: meets the requirements • Fail: does not meet the requirements; document the failure in the comments • Not Testable (NT): not testable; provide a reason in the comments	Review the test result against the expected result: • Accept meets the guideline • Reject does not meet the guideline • NA the guideline does not apply

Record observations and all input/outputs for each election;	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 manufacturer as Defect Issues in the Discrepancy Report. • The manufacturer 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 manufacturer's option to address these issues. Open items will be identified in the report.	All review results will be recorded in the Environmental Assessment tab. • Any gaps or deficiencies in the record of performance under the conditions defined in the Guidelines will be identified as a deficiency. • Deficiencies 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 review will be repeated. Complete information about the re-review will be preserved in the Environmental Assessment. The cure and results of the re-review will be noted in the - Discrepancy Report and submitted as an appendix of the Certification Report.

7.3 Characteristics (Recovery, Accessibility, Usability & Maintainability) Test Method

Method Detail	Characteristics Test Method
Test Case Name	FCA Voting System Characteristics Test Case (Recovery, Accessibility, Usability & Maintainability)
Scope - identifies the type of test	Accessibility, usability and maintainability are characteristics of the voting system. These characteristics are performed as a single combined functional test. Validation of the integration of security and accuracy functions of the usability and accessibility features are tested in the system level tests.
Test Objective	The objective of characteristics testing is to verify the accessibility, usability and maintainability requirements of the VVSG 2005 guidelines and HAVA are met.
Test Variables: Voting Variations (as supported by the voting system)	An audio/visual straight party ballot with multi-lingual capabilities will be used. • One contest shall have a write-in vote. • One contest shall have more candidates or text than can be displayed on the screen. • Restricting visual access will be handled by blindfolding the tester
A description of the voting system type and the operational environment	Same as General 2
VVSG 2005 vol.1	2.1.5.1.a.vi & vii, 2.3.3.1.a & e, 2.3.3.3, 3.1.4 thru 3.1.7.2.b, 3.2.1 thru 3.2.6, 4.2.1 thru 4.2.3.b. ii, 4.3.1 thru 4.3.2, 4.3.4.1 thru 4.3.4.2. g, 4.3.6 a thru c & 7.9.6.a thru 7.9.7 b. HAVA 301a.3 & 4
VVSG 2005 vol.2	4.7.2, 6.5, 6.7
Hardware, Software voting system configuration and test location	Same as General 2
Pre-requisites and preparation for execution of the test case.	A test election (including parameters listed in section d) is prepared and installed on the polling place device • During installation of the election confirm the operational readiness of the voting system. • System has been set up as identified in the user manual • Record the testers & date • Gather any necessary materials including accessibility equipment, and manuals • Ensure customization of the test case template is complete
Getting Started Checks	Check the voting system to :

Method Detail	Characteristics Test Method
	• 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. • Install the Election and Installation databases, and open the polls using the process defined on the Test Data tab.
Documentation of Test Data & Test Results	Test Data: • Record all programmed & observed election & ballot 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 number in the Comments
Polling Place Hardware & Recovery	Validations of operations in the voting mode: • Adjust or magnify the font size, color, contrast, and audio volume • Power supply interruption without corruption of data • Telecommunications interruption without corruption of data • Three second response time • Review the transportation and storage features for safe and easy handling • Examine the voting system devices for caution and warning labels (exposure to electrical voltages and moving parts)
Usability- Cognitive & Perceptual	Cognitive: • Presentation of Contest Choice does not introduce any bias in both visual and aural formats. • Instruction presentation provides clear instructions and assistance: to allow voters to independently execute and cast; obtain help and instruction for all voter available operations • Color use agrees with common conventions for operational status, warnings and errors. Perceptual Issues- • Flicker display frequency is between 2 Hz and 55 Hz • Reset for each voter any voter adjustable feature • Reset to default any voter adjustable feature • Text font size is a minimum of 3.0 mm • Poor Reading Vision is addressed in the voting system • Contrast and Use of Color adjustment for color blindness • Multiple Methods for conveying action instructions (color, shape or text.) • Sans serif font is used for voter presented text • Text to Graphics Ratio (including icons) intended for the voter is 3:1.
Usability- Interaction, Privacy and Identification	Interaction Issues • No page scrolling shall be required by the voter (move to the next or prior page.) • A marked vote selection is unambiguously displayed • Any time out functionality issues an alert at least 20 seconds before the time expires and provides a means by which the voter may receive additional time. • Touch screen and key mechanisms are designed to minimize accidental activation. Privacy • Visual access to the ballot and input controls are visible only to the voter during the voting session and ballot submission.

Method Detail	Characteristics Test Method
	• Audio access is audible only to the voter • Overvote warnings preserves the privacy of the voter and the confidentiality of the ballot. • Alternative language information used by the voter is not kept within an electronic cast vote record • Accessible features are not identified in the electronic cast vote record. Biometric Identification • If voter authentication uses biometric measures requiring particular biological characteristics, a secondary means that does not depend on those characteristics must be provided.
Accessibility- Partial Vision	Partial Vision • Font size of an electronic image display is voter adjustable, between 3.0-4.0 & 6.3-9.0 mm. • Contrast of a monochrome-only electronic image display shows information in high contrast either by default or under the control of the voter/poll worker (figure-to-ground ambient contrast ratio 6:1) • Contrast adjustments of a color electronic image display allows the voter to adjust the color or the figure-to-ground ambient contrast ratio • Controls are distinguished by both shape and color controls • -Audio output is synchronized to the visual display
Accessibility- Blindness	Blindness • Audio headphone jacks support standard 3.5 mm stereo connectors. • Audio/tactile operational support is provided for all instructions and functionality • Voting system does not use a telephone handset (Wireless interference - T4 rating shall be achieved (ANSI C63.19). • Methods to sanitized headphones are available to each voter. • Default volume is set between 40 and 50 dB SPL. • The controllable volume range is 20dB SPL to 100 dB SPL, in increments less than 10 dB. • Speech frequencies produced are in the audible speech range of 315 Hz to 10 KHz. • Audio presentation is comprehensible by language proficient voters with normal hearing • Rate of speed supported ranges are 75% to 200% of the nominal rate. • Voting systems with ballot initialization by sighted voters provide this feature to blind voters. • Voting systems with ballot submission by sighted voters provide this feature to blind voters. • All mechanically operated controls or keys are tactilely discernible without activating the control or key. • Sound or tactile controls identify any voting system shift/lock and non-shift/unlocked positions.
Accessibility - Dexterity	Dexterity • All keys and controls are operable with one hand and do not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys is no greater 5 lbs. (22.2 N). • Direct body contact is not required to operate the voting system. • Non-manual input is required to be functionally equivalent to tactile input. • A voter who lacks fine motor control or the use of their hands can submit their ballot
Accessibility- Mobility	Mobility: The voting station provides • Level clear floor space of 30 in min X 48 in min with no slope exceeding 1:48; positioned for a forward or parallel approach. • All controls necessary for voter operation are within reach • Forward reach w/ no obstruction: max high reach 48 in, min low reach 15 in. • Forward approach w/ a forward obstruction less than 25 in depth, 34 in height and bottom surface no lower than 27 in. • Max high reach for obstructions less than 20 in deep: 48 in, all others 44 in. • Toe clearance is space under the obstruction between the floor and 9 in above the floor, extending max 25 in under the obstruction and min 30 in wide. Min toe clearance under the obstruction is the greater of: 17 in or the depth required to

Method Detail	Characteristics Test Method
	reach over the obstruction to operate the voting station. • Knee clearance is the space under the obstruction between 9 & 27 in above the floor: extending max 25 in under the obstruction at 9 in above the floor. Knee clearance is min 30 in wide. Min knee clearance at 9 in above the floor is the greater of: 11in or 6 in less than the toe clearance. Knee clearance may reduce at a rate of 1 inch in depth for 6 inches in height between 9 & 27 in above the floor. • Parallel Approach w/ no side reach obstruction: max high reach is 48 in; min low reach is 15 in • Parallel Approach w/ a side reach obstruction: max high reach is less than 24 in in-depth and its top is less then 34 in high. Max high reach for obstructions less than 10 in deep is 48 in, otherwise 46 in. • -For normal sighted wheelchair voters in a correctly oriented position (better than 20/40, corrected) all labels, displays, & controls to operate the voting machine are legible and visible.
Accessibility -Hearing & Speech	Hearing • Sound cues as a method to alert the voter are accompanied by a visual cue, unless the station is in audio-only mode. • Speech • No voting equipment shall require voter speech for its operation.
Physical Characteristics	Physical Characteristics • The size of each voting machine should be compatible with its intended use and the location at which the equipment is to be used. • The weight of each voting machine should be compatible with its intended use and the location at which the equipment is to be used.
Transport, Storage, Materials, & Durability	Transport & Storage of Precinct Systems • A means to safely handle, transport, and install voting equipment is provided. • The voting system provides a protective enclosure to withstand: impact, shock and vibration loads associated with surface and air transportation; stacking loads associated with storage Durability • The voting system is designed to withstand normal use without deterioration and without excessive maintenance cost for a period of ten years. • Materials • The voting system is designed and constructed so that the frequency of equipment malfunctions and maintenance requirements are reduced to the lowest level consistent with cost constraints. • TDP includes an approved parts lists
Maintainability	Maintainability- The voting system and maintenance documentation include the: • Presence of labels and the identification of test points • Provision of built-in test and diagnostic circuitry or physical indicators of condition • Presence of labels and alarms related to failures • Presence of features that allow non-technicians to perform routine maintenance tasks (such as update of the system database) Initiation of the maintenance procedures, following the maintenance documentation resulting in an assessment of the system maintenance attributes to confirm maintainability at an acceptable level for: • Ease of detecting that equipment has failed by a non-technician • Low false alarm rates (i.e., indications of problems that do not exist) • Ease of access to components for replacement • Ease with which adjustment and alignment can be performed • Ease with which database updates can be performed by a non-technician

Method Detail	Characteristics Test Method
	• Adjust, align, tune or service components
Availability	Availability- The vendor specifies the typical system configuration to be used to assess availability, and any assumptions made with regard to any parameters that impact the MTTR. The factors include at a minimum: • Recommended number and locations of spare devices or components to be kept on hand for repair purposes during periods of system operation • Recommended number and locations of qualified maintenance personnel who need to be available to support repair calls during system operation • Organizational affiliation (i.e., jurisdiction, vendor) of qualified maintenance personnel
VVPAT- Usability (insert if a VVPAT is part of the voting system)	VVPAT Usability • Verify the voting system does not contain VVPAT
VVPAT- Accessibility (insert if a VVPAT is part of the voting system)	VVPAT Accessibility Requirements • Verify the voting system does not contain VVPAT
Expected Results are observed	Same as General 1
Record observations and all input/outputs for each election;	Same as General 1

7.4 Accuracy (Accuracy, Reliability, Availability, Volume, and Stress) Test Method

iBeta Definition	Accuracy DRE(Accuracy, Reliability, Availability, Volume, and Stress)	Accuracy OMR (Accuracy, Reliability, Availability, Volume, and Stress)
Test Case Name	Accuracy- (DRE) Infinity Voting Panel	Accuracy - COTS Optical Mark Readers
Scope - identifies the type of test	Accuracy testing validates the individual ballot positions in terms of a maximum error rate while processing a specified volume of date. Maximization of ballot positions and large numbers of votes incorporate stress and volume test conditions. Reliability and availability is measured in the results of the Accuracy Test.	Same as Accuracy - Infinity Voting Panel
Test Objective	Validation of the ability to capture, record, store consolidate and report a predicted total of vote selections and the absence of vote selection for a minimum of 1,549.703 ballot positions without error or with an acceptable level of error.	Same as Accuracy - Infinity Voting Panel
Test Variables: Accuracy Reliability Volume Stress	Ballot Preparation Variable: Test the system maximum 502 ballot locations & 10 Parties 10 Contests (8 @Vote for 5, 2@ Vote for 1) = 420 ballot positions/ballots. Contest headers and ballot text will incorporate a ballot layout to the maximum of 502 Infinity ballot locations 3,719 ballots Ballots will be voted manually and using an automated script. During testing all ballot positions will be exercised. 10% of the required ballot positions are entered manually. Manual entry will occur in approximately 2% blocks (each exceeding the 26,997 Go/No Go minimum) in each of the 5 intervals (beginning, intervals 2 through 4, and end). During 3 cycles an automated script will run to exceed the minimum of 1,549,703	Ballot Preparation Variable: A ballot will be prepared using the maximum number of ballot positions supported by the OMR (LP443-B ballot cards, 402 ovals). 11 contests with 35 candidates and a Vote for 6 will be programmed on 385 ovals (ballot positions). One oval per contest (11) will be programmed with contest text and the remaining 6 ovals will not be programmed. A total of 4026 ballots will be cast to reach the 1,549,703 minimum ballot positions. A minimum of two OMR readers shall be connected to two EMS central count workstations. 71 ballots will be cast to reach the 26,997 Go/No Go minimum. All ballots will be cast in a single precinct in 42 separate batches. All ballot positions, contest ovals and non-programmed ovals will be tested to verify that programmed ovals are

iBeta Definition	Accuracy DRE(Accuracy, Reliability, Availability, Volume, and Stress)	Accuracy OMR (Accuracy, Reliability, Availability, Volume, and Stress)
	ballot positions. The VVSG permits a simulation for the purpose of eliminating human error in casting test ballots. During testing ballots will be cast in 20 precincts (1 precinct/machine in 5 intervals = 20 precincts) Vote Consolidation and Reporting Variables: Interval 1 will incorporate the Go/No Go minimum. Consolidate. Confirm that it meets the predicted result. Chamber operation: Four units will run 48 hours through two Temperature and Power variation cycles, exceeding the minimum 163 hours	accurately read and marks in contest or non-programmed ovals are not read. Vote Consolidation and Reporting Variables: Read an initial set of 71 ballots. Consolidate the results in the EMS to validate the 26,997 Go/No Go minimum. The remaining ballots shall be read in batches of no more than 100. At the end of each batch, consolidate the results in the EMS to confirm that it meets the predicted results. Non-chamber operation: The OMR is exempt. VVSG 2005 exempts COTS equipment from the 48-hour environmental chamber hardware operating test.
A description of the voting system type and the operational environment	MicroVote Election Management System voting system includes: • Ballot preparation & central count software (EMS) installed on a Windows OS PC running 2000 or XP Professional • The DRE Infinity Voting Panel running the Infinity Voting Panel Firmware • Smart cards for ballot installation, poll management, voter access, and transfer of results • COTS smart card reader/writer connected to central count	MicroVote Election Management System voting system includes: • Ballot preparation & central count software (EMS) installed on a Windows OS PC running 2000 or XP Professional • COTS scanner for absentee/provisional ballots
VVSG 2005 vol.1	2.1.2, 2.1.5. 4.1.1.a thru d.i, 4.1.5.2.a thru 4.1.6.1.a, 4.3.3, 4.3.5.a thru d	2.1.2, 2.1.5. 4.1.1 .a thru d.i, 4.1.5.2.a thru 4.1.6.1.a, 4.3.3, 4.3.5.a thru d
VVSG 2005 vol.2	1.7.1.1, 1.8.2.2, 1.8.2.3, 4.7.1.1, 4.7.3 thru 4.7.4.d.i, 6.1, 6.2.3	1.7.1.1, 1.8.2.2, 4.7.1.1, 4.7.3 thru 4.7.4.d.i, 6.1, 6.2.3
Hardware, Software voting system configuration and test location	Election Management System (EMS v4.0.0.0) voting system Ballot Prep/Central Count SW: Election Management System v.4.0.0.0 DRE HW: Infinity Voting Panel Model VP-1 Rev: C DRE SW: Infinity Voting Panel Firmware v 3.1x, Test Location: Temperature and Power variation- environmental HW lab Test will be run in conjunction with the Temperature and Power Variation as described in the Test Variables	Election Management System (EMS v4.0.0.0) voting system Ballot Prep/Central Count SW: Election Management System v.4.0.0.0 COTS Smart Card Reader/Writer: GEMPLUS COTS Optical Scanner: OMR 9002/ACP2200 Test Location: Test will be run on confirmed COTS equipment (see h. Description of Procedure - preparation of items) at room temperature
Pre-requisites and preparation for execution of the test case.	Confirm Wyle can provide a chamber to permit initiation of ballot counting cycles in the chamber by a method that ensures the integrity of the test temperature environment. Complete the prerequisites; • Record the testers, subcontractor accreditation, environmental test method, chamber calibration date & date • System has been set up as identified in the user manual • Use the Environmental Test Case for instructions on the Temperature and Power Variations test method (MIL-STD 810D Method 502.2 and 501.2). • Ensure customization of the test case template is complete • - Include confirmation that error logging and audit reports are	Confirm the equipment meets the COTS exemption by reviewing: • the device and product specifications to confirm that it has not been modified in any manner to support use as a voting system • the documentation to confirm a record of performance under the conditions defined in the VVSG (v.1:4.1.2) Complete the prerequisites; • Record the testers • System has been set up as identified in the user manual • - Ensure customization of the test case template is complete

iBeta Definition	Accuracy DRE(Accuracy, Reliability, Availability, Volume, and Stress)	Accuracy OMR (Accuracy, Reliability, Availability, Volume, and Stress)
	enabled.	
Getting Started Checks	Validate that the method for initiation of ballot counting cycles in the chamber can be accessed externally or by a method that will ensure the integrity of the temperature environment. Check the voting system to : • Verify the test environment and system configuration is documented in the PCA Configuration and matches the vendor documented 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. • Initiate an operational status to confirm the correct function of the voting system prior to initiation of Accuracy testing. • -Record start time.	Check the voting system to : • Verify the test environment and system configuration is documented in the PCA Configuration and matches the vendor documented 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. • Initiate an operational status to confirm the correct function of the voting system prior to initiation of Accuracy testing. • Record start time.
Documentation of Test Data & Test Results	Same as General 1 Total time of operation shall be recorded and compiled	Same as General 1 Total time of operation shall be recorded and compiled
Accuracy: Paper-based voting systems Processing	Verify the Infinity is not a paper based system	Paper-based voting systems, verify: • All ballot positions on paper ballots can be scanned and detect selections for individual candidates and contests, converting them to digital data. (Receive electronic signals produced by punches, vote marks and timing information; perform logical and numerical operations upon the data; and reproduce the contents of memory without error (including ballot style/precinct, a vote for a specific candidate/contest or other source.) • The voting system does not record extraneous marks, smudges or folds. • The voting system rejects more than 2% of ballots that meet the vendor's specifications for marking. • Vote selection data from multiple precinct-based voting machines is stored with the generated jurisdiction-wide vote counts • Consolidated reports are accurate against a predicted vote total • The voting system does not record extraneous marks, smudges or folds. • - The voting system rejects more than 2% of ballots that meet the vendor's marking specifications.
Accuracy: DRE Voting Systems Processing	DRE voting systems, verify: • Recording of candidate and contest voter selections into voting data storage • Recording of candidate and contest voter selections into ballot image storage independently from the voting data storage • Vote selection data from multiple precinct-based voting machines generate jurisdiction-wide vote counts • Consolidated vote data is stored	Verify the Optical Mark Readers are not a DRE

iBeta Definition	Accuracy DRE(Accuracy, Reliability, Availability, Volume, and Stress)	Accuracy OMR (Accuracy, Reliability, Availability, Volume, and Stress)
	• - Consolidated reports are accurate against a predicted vote total	
Accuracy: Error Rate	Maximum error rate is less than one in 10,000,000 ballot positions, with a maximum error rate of one in 500,000 ballot positions in the test process. Errors are from any source while testing a specific processing function and its related equipment. The error rate determines the accuracy test vote position processing volume: • Reject: one error before counting 26,997 consecutive ballot positions correctly • Accept: 1,549,703 (or more) consecutive ballot positions are read correctly • If there's one error with more than 26,997 ballot positions but less than 1,549,703 correctly read, continue testing until another 1,576,701 consecutive ballot positions are counted without error (i.e. Accept: 3,126,404 with one error)	Same as Accuracy - Infinity Voting Panel
Reliability	Reliability shall be identified by determination of the Mean Time Between Failure (MTBF) during the minimum test period of 163 hours. The MTBF is the value of the ratio of operating time to the number of failures. A failure is defined as any event which results in either the: Loss of one or more functions; Degradation of performance such that the device is unable to perform its intended function for longer than 10 seconds. Verify that the system does not include a VVPAT, and exempt from VVSG vol. 1 sect. 7.9.4	Same as Accuracy - Infinity Voting Panel Accumulation of the 163 hours shall include Accuracy and System Level testing. Verify that the system is not a DRE with a VVPAT and exempt from VVSG vol. 1 sect. 7.9.4
Availability	Voting system availability (Ai) for the function of all combined devices and components must be equal or greater than 99%. Ai = (MTBF)/(MTBF + MTTR) MTTR. Inherent availability (Ai) = % system is functional Mean Time Between Failure (MTBF) = total operation time Mean Time To Repair (MTTR) = average time required to perform a corrective maintenance task during periods of system operation. Corrective maintenance = on-site repair or substitution of the device or a component Corrective maintenance task time = active repair time + logistic /administrative time (notification and travel time of qualified maintenance personnel)	Same as Accuracy - Infinity Voting Panel
Expected Results are observed	Same as General 1	Same as General 1
Record observations and all input/outputs for each election;	Same as General 1 • System failures will be logged with the MTTR. The log will be used to determine Availability.	Same as General 1 • System failures will be logged with the MTTR. The log will be used to determine Availability.