

Verity Voting 1.0 for State of Colorado Phase I Test Plan

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Prepared for:

Vendor Name	Hart InterCivic
Vendor System	Verity Voting 1.0
Vendor Address	15500 Wells Port Drive, Austin, TX 78728

Prepared by:



216 16th St.
Suite 700
Denver, CO 80202
303-575-6881

www.SLIGlobalsolutions.com



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June 30, 2015	1.1	M. Santos	Added table (table 2) with Verity voting 1.0 version numbers, and updated subsequent table numbers. Added "Phase I" on title page, so reads "Phase I Test Plan". Rev'd document to 1.1. Updated date on signature.

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1 INTRODUCTION

This Test Plan outlines the test approach SLI Global Solutions will follow when performing Testing for the State of Colorado, on the **Hart Verity Voting 1.0** voting system. The purpose of this document is to provide a clear understanding of the work SLI will conduct and a detailed plan outlining the test effort.

When the testing is complete, SLI will submit a Test Report that details all test results and findings from the Test effort.

1.1 References

The following is a listing of all documents that contain material that was used in the preparation of this test plan.

1. Federal Election Commission Voting System Standards (FEC VSS), 2002 Volumes I and II
2. SLI VSTL Quality System Manual, Rev. 1.16, prepared by SLI, dated December 3, 2013.

1.2 Terms and Abbreviations

The following terms and abbreviations will be used throughout this document:

Table 1 – Terms and Abbreviations

Term	Abbreviation	Description
Ballot Marking Device	BMD	An accessible computer-based voting system that produces a marked ballot (usually paper) that is the result of voter interaction with visual or audio prompts.
Central Count Scanner	CCS	High Speed Digital Scanner is a ballot scanning device typically located at a central count facility and is operated by an automated multi-sheet feeding capability.
Compact Flash card	CF	This is a type of flash memory card in a standardized enclosure often used in voting systems to store ballot and/or vote results data.
Compact Flash AST	CFAST	A compact flash media based on the Serial ATA bus rather than the Parallel ATA bus, used by the original CompactFlash



Term	Abbreviation	Description
Commercial Off the Shelf	COTS	Commercial, readily available hardware devices (such as card readers, printers or personal computers) or software products (such as operating systems, programming language compilers, or database management systems)
Election Management System	EMS	Typically a database management system used to collect jurisdiction information (district, precincts, languages, etc.) as well as election specific information (races, candidates, voter groups (parties), etc.). In addition, the EMS is also used to layout the ballots, download the election data to the voting devices, upload the results and produce the final results reports.
Independent Test Authority	ITA	This is a test lab that is not connected with the vendor or manufacturer of the voting system.
Chevron	No Abbreviation	Verity components use workflow chevrons. Workflow chevrons, arranged along the top of the screen, identify the function the user is currently viewing.
National Institute of Standards and Technology	NIST	A non-regulatory federal agency within the U.S. Dept. of Commerce. Its mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.
National Voluntary Laboratory Accreditation Program	NVLAP	A division of NIST that provides third-party accreditation to testing and calibration laboratories.
Precinct Count Scanner	PCS	A precinct-count optical scanner is a mark sense-based ballot and vote counting device located at a precinct and is typically operated by scanning one ballot at a time.
Standard Lab Procedure	SLP	SLI's quality system documentation is made up of standard lab procedures (SLPs), which are procedures required to ensure a systematic, repeatable and accurate approach to voting systems testing and governing the actual performance of SLI's work.
Validation	No Abbreviation	Confirmation by examination and through provision of objective evidence that the requirements for a specific intended use or application have been fulfilled (ISO 9000)



Term	Abbreviation	Description
Verification -	No Abbreviation	Confirmation by examination and through provision of objective evidence that specified requirements have been fulfilled (ISO 9000)
2002 Voting Systems Standards Volumes 1 & 2	2002 VSS	A set of specifications and requirements against which voting systems can be tested to determine if the systems provide all of the basic functionality, accessibility and security capabilities required of these systems.
Voting System Test Lab	VSTL	This is the lab where the voting system is being tested.
Voting System Under Test	VSUT	The designation for a voting system that is currently being tested.
Voting Test Specialist	VTS	A SLI employee within the Compliance division that has been qualified to perform voting system testing.

1.3 Project Overview

This test plan outlines the approach SLI will implement to perform testing of the **Hart Verity Voting 1.0** voting system against the outstanding requirements to be validated for the State of Colorado certification program.

1.4 Purpose

The purpose of this Test Plan is to create clear and precise documentation of the processes that SLI, as a VSTL, will implement throughout the course of voting system verification testing.

This Test Plan:

- Defines the overall test approach.
- Identifies required voting system hardware and software to be tested, and in what configurations.
- Serves as a foundation for the development of **Verity Voting 1.0** test suites that will verify the State of Colorado requirements being tested
-

1.5 Scope of Testing

SLI will provide testing on the **Hart Verity Voting 1.0** voting system based on the requirements listed in “Appendix A – Requirements to be Verified”, to satisfy outstanding requirements for the State of Colorado. *In support of this Test Plan,*



SLI has also provided attestations to the State of Colorado regarding requirements that we believe the specified Verity Voting 1.0 system has already satisfied, based on past testing or documentation associated with the federal test campaign that SLI conducted for the system.

While **Verity Voting 1.0** does not support a DRE device, the State of Colorado has requested that the DRE requirements be used in the evaluation of the ballot marking device, **Verity Touch Writer**.

SLI's major task categories for voting system verification testing, as defined by SLI's Quality System Manual, include:

- Management of **Hart Verity Voting 1.0** supplied deliverables
- Generation of test modules based on SLI's formal Test Methods, to ensure the voting system is tested against all applicable requirements. As declared by the State of Colorado.
- Traceability of test modules to the requirements of the State of Colorado.
- Reporting of all test results.

SLI will develop and submit to the State of Colorado, a final test report for the **Hart Verity Voting 1.0** voting system.

1.6 Testing Responsibilities

The following schedule describes the high level tasks and assigned personnel titles that will be involved in the Test effort of the **Hart Verity Voting 1.0** voting system.

1.6.1.1 Owner Assignments

- Test Module Development and Validation will be conducted by Voting Test Specialist (VTS) personnel, with oversight provided by the Test Manager.
- Test Suite Development and Validation will be conducted by VTS personnel, with oversight provided by the Test Manager.
- Formal Test Execution will be conducted by VTS personnel, with oversight provided by the Test Manager.



1.6.2 State of Colorado & Manufacturer Dependencies

The Test Plan will require State of Colorado approval prior to finalization.

Hart InterCivic will be required to provide all documentation, equipment and supporting materials identified as part of the voting system.

In addition, **Hart InterCivic** is required to provide support for the duration of the project.

1.7 Scope of the Hart Verity Voting 1.0 Voting System

This section provides a description of the scope of **Hart Verity Voting 1.0** voting system components:

- The **Hart Verity Voting 1.0** voting system represents a set of software applications for pre-voting, voting and post-voting election project activities for jurisdictions of various sizes and political division complexities. **Verity Voting 1.0** functions include:
 - Defining the political divisioning of the jurisdiction and organizing the election with its hierarchical structure, attributes and associations.
 - Defining the election events with their attributes such as the election name, date and type, as well as contests, candidates, referendum questions, voting locations and their attributes.
 - Preparing and producing ballot for polling place and absentee voting.
 - Preparing media for precinct voting devices and central count devices
 - Configuring and programming the Verity Scan digital scanners
 - Configuring and programming the Verity Touch Writer BMD devices
 - Producing the election definition and auditing reports.
 - Providing administrative management functions for user, database, networking and system management.
 - Import or manual data entry of the Cast Vote Records from Verity Scan devices and Verity Central.
 - Preview and validation of the election results.
 - Producing election results tally according to voting variations and election system rules.
 - Producing a variety of reports of the election results in the desired format.
 - Publishing of the official election results.
 - Auditing of election results including ballot images and log files.



1.7.1 System Overview

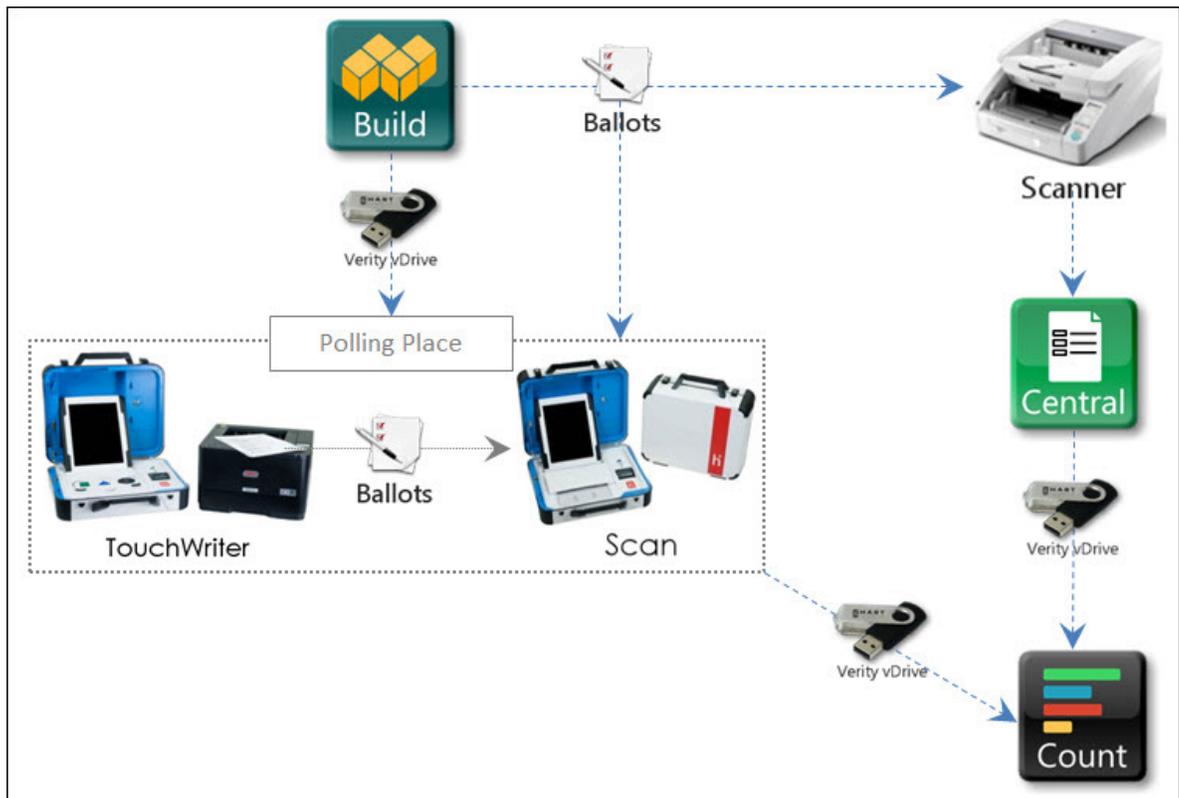
The **Hart Verity Voting 1.0** voting system is composed of 5 software applications, 2 polling place devices with accompanying firmware, COTS printers, COTS thumb drives and COTS central scanners that are supported by the voting system.

- **Verity User Manager** is software which enables users with the administrative role to create and manage user accounts within the Verity Voting system. Depending on the component, the user roles may include additional roles. All user accounts are accessible through this feature in all system components. Depending on the role, each user has access to different features and data management, available through tabbed sections with a list of all permissions..
- **Verity Election Management** is software which enables users with the administrative role to import, export, archive, restore, and manage election definitions into the system. Once added, the election can be opened and handled per the features available within the Verity Voting system components installed on the workstation. The interface provides features for importing, deleting, and performing archives of the election data and settings within the specific Verity component. Officials can load an election definition for an in-progress election or store an archive election. This interface also allows officials to perform archives of the election definition as-is without changing the state. Once archived, the election can be restored in that same state at the time of archive. All restored election definitions display in the list of elections within the component.
- **Verity Build** is a software application that provides capabilities to define an election definition and ballot for an election, including all contests, parties and options. Verity Touch Writer, Verity Scan, Verity Central, and Verity Count can all receive the election definition and ballots generated and locked for usage from Verity Build.
- **Verity Touch Writer** is a polling place ballot marking device that provides digital ballot marking through a touch screen tablet system or accessibility interface (Verity Access using audio-tactile interface, jelly buttons, and sip-and-puff devices). When the voter accepts Touch Writer's vote markings, a marked paper ballot is produced
- **Verity Scan** is a polling device that scans completed printed ballots provided by voter marking ballot sheets manually or printed ballots generated from Touch Writer. Scanned ballots become Cast Vote Records (CVRs).
- **Verity Central** is a software application that provides capabilities to scan ballot batches through a high volume scanner, review all ballots, and adjudicate any ballots marked as having an issue.
- **Verity Count** is a software application that provides final collection and tabulation of ballots into election and contest results, and reporting of those results. Count also provides adjudication of Verity Scan Write-In votes

and/or Verity Central write-in votes (if deferred from Verity Central), ranked choices, and mismarked ballots.

- **Verity vDrive** is a required **Verity Voting** component, used as a portable media device generated by Verity Build. **vDrive** allows election definitions to be moved from Verity Build to Verity Scan and Verity Touch Writer. vDrive supports the transfer of Cast Vote Records (CVRs) in Verity Scan and Verity Central.
- **Verity Key** is electronic media that is created by **Verity Build** for a specific election. **Verity Key** is a required **Verity Voting** component. Key is the electronic media that provides user authentication and configures election security throughout the **Verity Voting** system.

1.7.2 Block Diagram



Overview of the diagram:

- The components are displayed as touch points of data access, transfers, and verification.
- Dotted lines show the flow of data and air gaps using vDrives.
- The **Verity TouchWriter** and **Verity Scan** components are part of the Polling Place setup.



- **Verity Key** (not shown) is required for user access into components to load elections, use features, and generate reports. Feature access depends on the roles applied to user accounts.

2 MATERIALS REQUIRED FOR TESTING

Any materials that are used in an election cycle must be provided to SLI to facilitate testing of the voting system. This section outlines these materials that are required.

2.1 Software/Firmware

Any and all software/firmware that is to be used by the declared voting system whether directly or indirectly, in a production environment, must be validated during the testing process.

The following software/firmware is required for the execution of testing to verify the requirements within the scope of this testing effort. This includes all supporting software such as operating systems, compilers, assemblers, application software, firmware, any applications used for burning of media or creation/management of databases.

2.1.1 Hart Verity Voting 1.0 Software/Firmware

Hart Verity Voting 1.0 system consists of the following software and firmware components:

- **Verity Build** EMS software
- **Verity Central** high speed digital scanning software
- **Verity Count** central count location accumulation and tallying software
- **Verity Scan** optical scanner firmware
- **Verity Touch Writer** BMD firmware
- **Verity** Device Microcontroller firmware for **Verity Touch Writer**



Table 2 – Hart Verity 1.0 Software and Firmware

Manufacturer	Application(s)	Version
Verity Build	EMS software	1.0.3
Verity Central	High speed digital scanner software	1.0.3
Verity Count	Central count location accumulation and tallying software	1.0.3
Verity Scan	Digital scanner firmware	1.0.3
Verity Touch Writer	BMD firmware	1.0.3
Verity Device Microcontroller	Firmware for Verity Devices	V17

2.1.2 COTS Software/Firmware

This section details the Commercial Off The Shelf software and firmware utilized within the **Verity Voting 1.0** system.

Table 3 – COTS Software/Firmware

Manufacturer	Application	Version	Verity Voting 1.0 Component
Microsoft	Windows 7 Embedded	Standard	Scan, Touch Writer
Microsoft	Windows 7, Service Pack 1	6.1.7601	Build, Central, Count
Microsoft	SQL Server	6.1	Build, Central, Count
Adobe	Acrobat	10.0	Build, Central, Count



2.2 Equipment

The following equipment is required for the execution of the hardware, software and security tests. This includes system hardware, general purpose data processing and communications equipment, and any test instrumentation required.

2.2.1 Hart Verity Voting 1.0 Equipment

The following **Hart Verity Voting 1.0** equipment will be used in testing:

Table 4 – Hart Verity Voting 1.0 Custom Equipment

Hardware	Model
Verity Scan (digital scanner)	Revision B
Verity Touch Writer (BMD)	Revision B

2.2.2 COTS Equipment

The following Commercial Off-the-Shelf equipment will be used in testing:

- Desktops/Laptops
- Printers
- High Speed Scanner

Table 5 – COTS Equipment

Manufacturer	Hardware	Model
OKIDATA (for Verity Build, Verity Central, Verity Touch Writer and Verity Count)	Ballot Printer (Monochrome)	431dB
Various (for Verity Build, Verity Central and Verity Count)	Intel-Windows Workstation (Minimum Requirements) Processor – Intel Celeron D 420 3.06GHz Dual Core Memory – 2GB upgradable to 4GB Hard Drive – 120 GB Removable Storage – 8xDVD+/-RW Slim line USB Ports – 4 ports Video Card - Integrated Graphics Keyboard - USB Keyboard	



Manufacturer	Hardware	Model
	Mouse - USB Mouse	
Various (for Verity Build , Verity Central and Verity Count)	Monitor (Minimum Requirements) Panel Size - 50.8 cm Aspect Ratio - Widescreen (16:9) Optimal Resolution - 1600 x 900 at 60 Hz Contrast Ratio - 1000: 1 Brightness - 250 cd/m2 (typical)	
Canon (for Verity Central)	Ballot Scanner	DR-G1130
OKIDATA (for Verity Build, Verity Central, Verity Touch Writer and Verity Count)	Ballot Printer (Monochrome)	431s

2.3 Test Materials

The following test materials are required for the performance of testing including, as applicable, test ballot layout and generation materials, test ballot sheets, test ballot cards and control cards, standard and optional output data report formats, and any other materials used in testing.

- Ballots & Blank Ballot grade paper
- Thumb Drives
- Ballot marking pens
- Printer paper rolls

3 TEST SPECIFICATIONS

The following are the specifications for testing to be conducted on the **Hart Verity Voting 1.0** system. The specifications contain details on the focus of testing, configuration(s), and the requirements to be tested.

3.1 Requirements

The **Hart Verity Voting 1.0** will be tested to the Colorado requirements needing to be verified, as listed in “Appendix A – Requirements to be Verified”.



3.2 Hardware Configuration and Design

The **Hart Verity Voting 1.0** system, as needed to verify the requirements in Appendix A, includes:

- A **Verity Build** workstation to create all election media.
- **Verity Key** and **Verity vDrive**, as media to conduct the election and accumulate vote data.
- At the precinct level, **Verity Scan** optical scanners and **Verity Touch Writer** ballot marking devices are employed.
- The central count location employs a high speed COTS scanner, in combination with a workstation that utilizes the **Verity Central** software, for tabulation of absentee ballots.
- The consolidation, tally and reporting location employs a workstation with **Verity Count** software as well as a printer.

Note that these are the basic components of the system.

3.3 How Requirements Will Be Tested

This section looks at the voting system and the individual components in order to determine testing strategies at the component level as well as the system level.

3.3.1 Test Suite 1

One system level test suite will be created with a data set that will verify the bulleted basic system requirements below are met:

- 2002 VSS req. 2.2.8.2.o
- Colorado req. 1-5-404
Colorado req. 1-5-406
- Colorado req. 1-5-407(2)
- Colorado req. 1-5-407(4.5)
- Colorado req. 1-5-615(1)(e)(III)
- Colorado req. 1-5-704(1)(n)(VIII)
- Colorado req. 1-8-308(3)(b)
- Colorado req. 1-8.5-110(2)
- Colorado req. 4.8.2
- Colorado req. 21.5.2(e)(4)
- Colorado req. 21.5.2(f)(5)



- Colorado req. 21.5.2(f)(6)
- Colorado req. 21.5.2(f)(7)
- Colorado req. 21.4.5(e)(3)

Components needed include **Build**, **Scan**, **Touch Writer** and **Count**.

3.3.2 Test Suite 2

One Component level test will be created to verify the **Touch Writer** requirements bulleted below:

- 2002 VSS req. 2.2.7.1.c-f
- 2002 VSS req. 2.2.7.2.e.2&3
- 2002 VSS req. 2.4.3.3.a-h
- Colorado req. 21.5.2(e)(2)

Components needed include **Build** and **Touch Writer**.

3.3.3 Test Suite 3

One Component level test will be created to verify **Central** and **Scan** requirement bulleted below:

- 21.5.2(d)

Components needed include **Build**, **Central** and **Scan**.

4 TEST OPERATIONS PROCEDURES

Throughout the testing effort, test suites and modules will be marked as follows:

- **Accept** – Test is accepted as successful.
- **Reject** – Test is rejected as unsuccessful.
- **NT** – Not Testable is used for test modules that cannot be followed. For example, if failure of one test modules failure precludes attempting subsequent test modules, the latter will be marked as NT.

Test results **Reject** and/or **NT** will include comments explaining the reason for the result.



Issues encountered during testing will be documented in the Discrepancy Report. Issues that do not conform to the requirements of the State of Colorado will be marked as **Documentation Discrepancies** or **Functional Discrepancies** (a discrepancy occurs when the software does not meet defined software requirements or specifications).

5 Approval Signatures

SLI:

A handwritten signature in blue ink, appearing to read 'Traci Mapps'.

Traci Mapps
VSTL Director
June 30, 2015



6 Appendix A - Requirements to be Verified

2002 VSS	Requirement	Rules and Statutes	Colorado Additional Requirements
2.2.7.1	Common Standards		
c.	The position of any operable control is determined with respect to a vertical plane that is 48 inches in length, centered on the operable control, and at the maximum protrusion of the product within the 48-inch length.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
d.	Where any operable control is 10 inches or less behind the reference plane, have a height that is between 15 inches and 54 inches above the floor.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
e.	Where any operable control is more than 10 inches and not more than 24 inches behind the reference plane, have a height between 15 inches and 46 inches above the floor.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
f.	Have operable controls that are not more than 24 inches behind the reference plane.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
2.2.7.2	DRE Standards		
e. 2)	Adjust the color settings, when color is used.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
e. 3)	Adjust the size of the text so that the height of capital letters varies over a range of 3 to 6.3 millimeters.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
2.2.8.2	Voting Variation		
o.	Provisional or challenged ballots.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
2.4.3.3	DRE Systems Standards		
a.	Prohibit the voter from accessing or viewing any information on the display screen that has not been authorized by election officials and preprogrammed into the voting system (i.e., no potential for display of external information or linking to other information sources).	21.4.2	All voting systems must meet the 2002 Voting System Standards.
b.	Enable the voter to easily identify the selection button or switch, or the active area of the ballot display that is associated with each candidate or ballot measure response.	21.4.2	All voting systems must meet the 2002 Voting System Standards.



c.	Allow the voter to select his or her preferences on the ballot in any legal number and combination.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
d.	Indicate that a selection has been made or canceled.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
e.	Indicate to the voter when no selection, or an insufficient number of selections, has been made in a contest.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
f.	Prevent the voter from overvoting.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
g.	Notify the voter when the selection of candidates and measures is completed.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
h.	Allow the voter, before the ballot is cast, to review his or her choices and, if the voter desires, to delete or change his or her choices before the ballot is cast.	21.4.2	All voting systems must meet the 2002 Voting System Standards.
		1-5-404 1-5-406	Requirements for the order of candidate names with contests for both partisan (1-5-404) and nonpartisan (1-5-406) elections
		1-5-407(2)	The ballots shall be printed so as to give to each eligible elector a clear opportunity to designate his or her choice of candidates, joint candidates, ballot issues, and ballot questions by a mark as instructed. On the ballot may be printed words that will aid the elector, such as "vote for not more than one".
		1-5-407(4.5)	If no candidate has been duly nominated and no person has properly filed an affidavit of intent of write-in candidate for an office, the following text shall appear under the designation of the office: "There are no candidates for this office."
	Provide the voter with the opportunity to correct the ballot before the ballot is cast and counted.	21.4.2; 1-5-615(1)(e)(I II)	All voting systems must meet the 2002 Voting System Standards. No electronic or electromechanical voting system shall be certified by the Secretary of State unless such system: If the elector overvotes it gives the elector the opportunity to correct the ballot before the ballot is cast.
		1-5-704(1)(n)(VIII)	The voting system shall warn the elector of the consequences of overvoting for an office.
		1-8-308(3)(b)	If the total number of votes cast and counted in any precinct by early voters' and absentee ballot is less than ten, the returns for all such precincts in the political subdivision shall be reported together.
		1-8.5-110(2)	Voting systems shall provide a means for reporting the results of provisional ballots as a separate total when more than 25 or inclusion with mail in ballots when less than 25.



		4.8.2	If there is no candidate for an office, the ballot must state, "There are no candidates for this office."
		21.5.2(d)	For mark-sense or optical scan devices, the Secretary of State or the VSTL will prepare 100 or more test ballots with marking devices of various color, weight and consistency to determine the range of marks that can be read and the range and consistency of reading marginal marks.
		21.5.2(e)(2)	Polling location / DRE = 500;
		21.5.2(e)(4)	Provisional = 500.
		21.5.2(f)(5)	Allow for programming to accommodate Colorado recall questions as prescribed in Article 12 of Title 1, C.R.S.;
		21.5.2(f)(6)	A minimum of 20 pairs of "yes" and "no" positions for voting on ballot issues; and
		21.5.2(f)(7)	Ability to contain a ballot question or issue of at least 200 words.
		21.4.5(e)(3)	<p>Ability to print a report which must contain:</p> <ul style="list-style-type: none"> (A) Names of the offices; (B) Names of the candidates and party, when applicable; (C) A tabulation of votes from ballots of different political parties at the same voting location in a primary election; (D) Ballot titles; (E) Submission clauses of all initiated, referred or other ballot issues or questions; (F) The number of votes counted for or against each candidate or ballot issue; (G) Date of election (day, month and year); (H) Precinct number (ten digit format); (I) County or jurisdiction name; (J) "State of Colorado"; (K) Count of votes for each contest; and (L) An election judge's certificate with an area for judges' signatures with the words similar to: "Certified by us", and "Election Judges". Space must allow for a minimum of two signatures.

End of State of Colorado Test Plan