

VOTING SYSTEM PRE-ELECTION LOGIC AND ACCURACY TESTING

The New York State Board of Elections (referred to herein as NYSBOE) was awarded a grant from the US Election Assistance Commission (referred to herein as EAC), for the purpose of assessing innovative methodologies for the conduct of pre-election logic and accuracy testing. The right of the voting public, candidates and other stakeholders to have faith in the elections in which they participate, and the goal of all election administrators to ensure that level of confidence is as high as possible, can only be met through the convergence of many tasks associated with the creation of a ballot and the configuration of the voting system which will count that ballot.

The concept of pre-election testing is not new in the State of New York, as this requirement has been a key component of voting system regulations which were adopted in the mid-1980s. At that time, regulations were adopted to initially address punch card voting systems and ballots. The regulations were later amended to address the implementation of optical scan voting systems when those systems became certified for use as central count systems in New York. At present, only optical scan voting systems are certified for use as both precinct-based and central count voting systems however, the pre-election testing protocols to be presented in this report are easily adapted to touch screen and other types of voting systems.

New York's experience with pre-election testing is extensive. This report intends to discuss the value of conducting robust pre-election testing, and the changes that can be made to processes to make them more effective and less burdensome to implement. In the interest of full disclosure, our experience with pre-election testing, while extensive, does come with some unfortunate experiences which have taught county election administrators in New York (who have vested in them the responsibility to conduct elections), that thoroughness and attention to detail will help avoid Election Day disasters. It is also fair to point out that the term 'disaster' is not excessive when it comes to describing failures in the actual voting process, and further, that when there is such a failure associated with an inaccurate election, that outcome is not one from which recovery is easy or in some instances, even possible. New York's regulations which address voting system maintenance and operations can be found in Appendix 1.

The intent of this research effort and the information it produces, is to demonstrate that adopting and exercising a robust, pre-election testing protocol, in tandem with the thorough confirmation of ballot creation and voting system configuration tasks and a post-election audit, will do much to ensure faith and confidence in the election process. We hope to achieve that goal in this report.

INTRODUCTION

Pre-election testing should consist of any and every protocol election administrators in their respective jurisdictions are required to or opt to implement, to ensure that voting systems and ballot marking devices are properly configured and are in ready-to-deploy working order. From a practical perspective, readiness tasks include making sure voting systems have sufficient paper rolls for reporting results, ensuring printers are working properly, programmable memory cards have sufficient space available to capture all Election Day activity, etc. In New York, pre-election testing includes the validation of certified voting system software, called 'hash-checking', and the implementation of test decks, which together will help to further ensure that voting system logic and accuracy is intact. While hash checking is not the only option available to jurisdictions when opting to validate software in pre-election testing, it is the method preferred in New York, and is discussed later in this report. The more complicated of these two tasks is the test deck, and it is this subject with which we begin our report.

Essential to pre-election testing is the test deck, which is defined as a voted and pre-audited group of ballots prepared for each ballot style included in the election to be conducted.

The test ballots are voted with a pre-determined number of valid votes for each candidate and each voting option on every proposal, as well as each write-in position, that appears on a particular ballot style. The test deck is required to include one or more ballots that have been improperly voted, or which are voted in excess of the number allowed for a particular contest, and one or more ballots on which no votes are cast, in order to test the ability of the system to recognize and/or notify the voter of an under-vote or over-vote. In New York, because of our unique ballot requirements, a test deck also includes one or more ballots on which two or more votes are cast for a candidate whose name appears on the ballot more than once for the same office, which

serves to test the ability of the system to count only the first of such votes cast on a ballot for the candidate selected, again as provided for in New York's Election Law. If there is more than one ballot style for an election, a separate test deck is created for each ballot style. New York's test deck procedures may be found in Appendix 2 of this report.

Ballot Integrity

The accuracy of any election and the nexus of a successful pre-election logic and accuracy test begin with the creation of a ballot. While some election/ballot errors experienced in New York were the result of inaccurate or inconsistent test deck implementations, deficiencies in the critical area of ballot preparation have led to problematic elections wherein contests did not appear on ballots, valid candidates did not appear on ballots, the number of persons to be elected was misstated, etc. – all of which speaks to a lack of professionalism and a disregard for the accuracy of ballot content. The following list reflects recommended steps to take prior to creating a ballot. Election administrators must be sure that:

- staff has a complete listing of public offices and political party positions to be filled at the election (in New York, municipal and county clerks must file public office information with election administrators eight months prior to the general election and for party positions, such information is filed by party leaders), as well as the text for any proposals or questions which will appear on the ballot;
- each contest so listed is accurately defined, including the number of persons to be elected to each position, district numbers or other political subdivision data when applicable, the term for which such person is to be elected (unexpired terms should be so indicated when a contest for the same position but for other than a full term is required to appear on a ballot), etc.;
- staff is made aware of any ongoing litigation that either removes or restores a candidate or question to a ballot;
- candidates are appropriately linked to their respective political party endorsement(s); and
- candidate names are spelled correctly.

In this preliminary ballot creation process, the draft versions of ballot styles should be proofread not only by the persons who created the drafts, but also by persons not involved in the ballot creation process, to ensure an additional and independent review for accuracy.

Ballot Logic

Ballot logic is tested via electronic interfaces, to establish how the voting system software verifies votes cast. The test deck procedure:

- validates the ability of the logic to register a vote for each candidate in each contest and for combinations of candidates for multiple vote-for contests;
- verifies the proper operation of the public and protective counters;
- verifies the functionality of all electronic interfaces;
- verifies the functionality of all tactile interfaces;
- validates the ability to cast votes through all switch closure interfaces including the pneumatic switch interface, where the jurisdiction requires and the voting system accommodates;
- verifies the ability to independently operate the voter interfaces through the final step of casting a ballot without assistance;
- validates via the ballot definition process how the ballot definition coding integrates with the audio ballot – this aspect of testing is performed to verify the functionality of the feature;
- validates the system's ability to provide audio voting through the audio voting features of the voting system;
- verifies that once the ballot is cast the system will confirm to the voter that the action has occurred and that the process of voting is complete; and
- verifies that a system generates a record of votes cast.

Election Verification

Election verification is a manual process that every jurisdiction should perform before each election. All election configurations must be verified before the use of a test deck is initiated. One basic component of this verification process involves comparing the ballot itself to the definitions that are set in the Election Management Software (EMS). A second component is the testing of every voting position on the ballot to ensure that marked ballots are being properly recognized by the voting system. Each ballot style will have a unique election configuration associated with it that must be manually checked for accuracy. All ballot styles in every language must be verified to ensure that:

- the proper audio is present, including alternate languages in those jurisdictions required to provide same;
- the correct art work is displayed;
- that the ballots contain correct
 - offices to be elected
 - candidates
 - political party endorsements, and cross endorsements, where applicable
 - ballot proposals, and
 - that ballots for all political subdivisions reflect their correct respective contests, candidates and proposals.

Ballot Configuration

Ballot Configuration (Ballot Layout) is a term that represents the positioning on and/or linkage within the ballot of all political party names and corresponding emblems (if any), names and emblems of all independent bodies (if any), office titles, ballot proposals, candidate names, and spaces for write-in candidates, in accordance with the jurisdiction's requirements or policies as to contest and party order.

Election Configuration

Election Configuration is the term used to represent the file or files created by the EMS including but not limited to the following data used to program precinct-based and central count voting systems:

- the definition of jurisdictional information (e.g., county name, local legislative, congressional or senatorial district, precinct, etc.);
- electronic and paper ballot content and artwork (e.g., ballot text, voting positions, party emblems, if any, etc.);
- definition of contests such as office titles, candidate names, number permitted to be voted for, propositions, or other types of data that control voting in all contests on the ballot;
- definition of voter groups (e.g., by political party, absentee, non-absentee, etc.), ballot styles, linkage of candidates to their respective parties and contests;
- linkage of contests to their respective political subdivisions;
- linkage of ballot text to database labels to produce results reports; and
- the allocation of trans-district vote tallies to their constituent districts for reporting purposes.

Test Deck Theory

For the purposes of this report, we will use an optical scan voting system as the basis of our conversation. Preparing a robust test deck will serve to test the logic and accuracy of the voting system software and when the results of such pre-election tests match a predetermined set of expected outcomes, a successful, fair and accurate election is attainable. In New York State, county boards of elections (CBOE) are responsible for preparing and maintaining test decks for all elections over which they have jurisdiction. Each county board prepares test decks to verify:

- voting system election configuration;
- ballot configuration;
- that the voting system will accurately recognize and cast votes, and
- that the voting system will accurately count votes within each individual ballot style.

Any pre-election test must take into consideration the many types of scenarios that can occur during an election, and test same to ensure voting system logic and accuracy. Any effective logic and accuracy testing protocols consider both the recording as well as the tabulation functionalities of the voting system to be tested. Once a test deck has been prepared for every ballot style, it must be verified by running the ballots against the appropriate election ballot software program or configuration. Inasmuch as test ballots are hand-marked by elections staff members, errors may occur during this process, therefore this verification is necessary, and is commonly called a 'dry run'. All errors should be corrected and the test deck re-run until all pre-determined vote totals by style are verified.

The term 'robust' can never be over-used when discussing any pre-election testing requirements or protocols, especially when creating a pre-election test process that results in a high level of confidence in the ability of a voting system to recognize and tabulate voted ballots accurately. A two-level test deck approach will create just such a robust pre-election test. Election administrators should consider that for each ballot style configured for an election, a **comprehensive test deck** is created and run on at least one voting system that will use that ballot configuration (definition) in that election. For each ballot style configured with more than one precinct (referred to as election districts in New York State), a **standard test deck** is created and run on every additional voting system that will use that ballot configuration. This theory and its practice will help to exercise each piece of voting equipment to be deployed on Election Day. While no one can anticipate what sort of functional issues might arise from the actual physical task of moving and positioning voting systems to and within poll sites, the initial effort is not only a best practice, but an excellent investment in ensuring the trouble-free outcome of an election. The two-tiered test deck approach also takes into consideration the best use of staff, time and fiscal resources. New York's test deck calculator can be found in Appendix 6.

A **comprehensive test deck** is made up of several sub-decks, each with a specific purpose which will test for specific vote mark-up scenarios and will ensure confidence that the system can tabulate votes correctly. Sub-deck types can include:

- **Election Verification sub-deck:** used to test every voting position on the ballot to ensure that votes cast are being recognized by the optical scanner. Ballots should be manually marked just as they would be on Election Day, and should follow a format prescribed by the jurisdiction's election officials, with pre-determined vote counts recorded and preserved, to be used when the test is actually run. Pattern voting format within this sub-deck test will change for each election (primary and general). Pattern voting will provide test results which net unique results for each candidate in a given contest, demonstrating and proving the logic and accuracy of voting system's software.
- **Cross Endorsement sub-deck:** New York State Election Law permits the appearance of candidate names in more than one voting position for the same contest, in direct correspondence to the number of political parties successfully filing that candidate's ballot access documentation, called a cross endorsement. This unique ballot provision requires that the corresponding ballot logic be validated via the use of a unique sub-deck. This sub-deck is voted following a specific pattern, and ensures that in those instances where a candidate does appear on more than one political party line for the same contest, a vote for that candidate is not counted more than once. The cross endorsement sub-deck will check every combination associated with candidates appearing on multiple party lines. The result of this sub-deck pattern is that the first occurrence has been compared and voted for, along with the second occurrence of the candidate, and so on.
- **Print Validation sub-deck:** Ballot Marking Devices (BMDs) are used to help meet the voting system and voter access requirements of the Help America Vote Act (HAVA). The functionality and accuracy of BMDs should be included in any pre-election testing protocols. Ballots for this particular sub-deck are created by marking them during the initial BMD set-up and the ensuing pre-election functional testing which requires that votes are placed on ballots using the

various devices which may be available to voters with disabilities for use on election day, including audio voting features, tactile discernible controls, and pneumatic switch attachments which can be operated orally or by vacuum pressure (sip-and-puff). Additionally, this sub-deck will verify that the scanner will recognize when a contest is over-voted, and will verify the scanner's ability to read BMD-marked voting positions.

- Blank Ballot sub-deck: serves to verify that the optical scanner recognizes the ballot's imprinted timing marks, thus identifying the ballot style for the scanner. Timing marks contain encrypted ballot style data including inter alia, precinct, contest, and political party data. This sub-deck also verifies that the scanner displays the proper corresponding warning message to the voter, that the vote tallies are not incremented in such instances, and serves to confirm that no stray marks appearing on the ballot are recognized by the scanner as valid votes.
- Random vote sub-deck: is conducted to demonstrate that votes made randomly are properly recognized by the scanner, serving to demonstrate for election officials, candidates and other stakeholders present for pre-election testing, that the system recognizes all voted positions accurately, and not just those ballots which have been pre-marked pursuant to a specific vote pattern.

As mentioned above, pre-election testing protocols should include steps that validate the creation of a voted ballot using each of the voting system's features which allow voters with disabilities to vote independently:

- audio features
- touch- screens
- push-buttons
- paddles
- key pad and/or pneumatic switches

Additionally, any pre-election testing protocol should include the confirmation of a voting system's capability to accurately display ballots and voter messages in alternate languages, when so required within a jurisdiction or political subdivision.

The **standard test deck**, as mentioned earlier, is composed of the following three ballots:

Ballot #1 - Blank ballot, which will

- verify that the optical scanner recognizes the ballot's informational timing marks (the correct precinct or political subdivision, for example);
- verify that the optical scanner displays the appropriate message to the voter (blank ballot therefore indicating an entirely under-voted ballot);
- verify that the vote tallies are not incremented in such circumstance; and
- confirm that no stray marks are recognized by the voting system as votes.

Ballot #2 – Multiple scenarios ballot, which will

- be marked with as many scenarios on one ballot as possible, as follows:
 - ◆ over-vote
 - ◆ undervote
 - ◆ write-In
 - ◆ and in New York State, cross endorsement
 - ◆ proposition / proposal

Ballot #3 – BMD ballot

- Vote a ballot using the Ballot Marking Device (BMD) to verify:
 - ◆ audio functionality
 - ◆ touch-screen, push-button, or other electronic mechanism functionalities
 - ◆ key pad and/or pneumatic switch functionalities for voters with disabilities
 - ◆ accurate alternate language displays

- ◆ overvotes
- ◆ undervotes
- ◆ and in New York State, cross endorsements

Test Deck Preparation

Prior to any election in which an optical scan voting system is to be utilized to electronically tabulate ballots, the following steps, which should already be a part of a jurisdiction's written and adopted procedures, should be followed:

- A sufficient number of extra ballots should be ordered as test ballots for each ballot style required for the election.
- All ballots to be used as test ballots should have the word "TEST" printed or hand-stamped on the face of each ballot, to distinguish pre-election ballots and tasks from live, Election Day or absentee/provisional ballots.
- Each test memory card should be clearly labeled, ensuring it corresponds to the pre-election test being conducted.

The steps which define how to create a test deck will work for any ballot orientation, the most common of which is a portrait-style ballot. New York State's jurisdictions are permitted to utilize a portrait or landscape-style ballot. In the step-by-step process this report will present, a landscape ballot orientation will be used however the concepts will work for any ballot style. In a landscape style ballot, contests appear horizontally, across the top of the ballot with the political parties and independent bodies appearing vertically, down the left side of the ballot. Samples of the ballot orientations and styles used in New York appear in APPENDIX 3 of this report.

Creation of sub-decks

Once the election configuration tasks are complete, the next step is to determine the number of sub-decks needed for the comprehensive test deck. This number of required sub-decks is determined by whether the type of election being conducted is a general election or a primary election. The following chart displays the types of comprehensive sub-decks needed for each election.

General Election	Primary Election
Election Verification Vote (to be tested on Optical Scanner)	Election Verification Vote (to be tested on Optical Scanner)
Pattern Vote (to be tested on Optical Scanner)	Pattern Vote (to be tested on Optical Scanner)
Cross Endorsement Vote (to be tested on Optical Scanner)	Print Validation Ballot (to be tested on BMD and Optical Scanner)
Print Validation Ballot (to be tested on BMD and Optical Scanner)	Blank Ballot (to be tested on Optical Scanner)
Blank Ballot (to be tested on Optical Scanner)	Random Ballot (to be tested on BMD)
Random Ballot (to be tested on BMD)	

Note: At the option of the jurisdiction, randomly marked ballots may be part of any test deck. However, election officials may find it helpful to permit candidate requests for additional ballots to be randomly marked during the 'run for record', keeping in mind that they must be added to the comprehensive test deck and ballot totals.

Test Deck Implementation

Once a test deck has been validated, test decks are scanned by a team of election officials or voting system operators, on each voting system for which that particular ballot style is valid. (In New York, it is required that teams conducting pre-election testing tasks are bi-partisan teams.) While it is acceptable for maintenance testing purposes that the voting system is in test mode, it is not acceptable that it remain in that test mode when conducting pre-election logic and accuracy tests – voting systems must be in live, Election Day operation mode for any and all pre-election tests. This phase of testing is called the ‘run for record’. The testing staff should include the scanning of at least one ballot from each sub-deck using each feature intended to provide voting system access for persons with disabilities, and also scan at least one ballot from each sub-deck using each language required to be presented to voters using the system. While one team member casts votes for the test, the other team member monitors that votes are cast correctly.

The test should be documented by the testing team on a log created specifically for this purpose. The team should compare the results reported by the voting system to the expected results articulated in the pre-election test plan, confirm the accuracy of or discrepancies in the results, and determine if the system has passed or failed the test. Any discrepancies indicating a failure must be investigated, resolved, and the system must then be re-tested.

If a test deck is run and the pre-determined vote count does not successfully compare to the voting system’s tabulated results, the test team should document the problem, and then compare the unique ballot script pattern (test plan) with the test deck pattern to ensure that the test deck was made correctly and that all ballots were scanned. Any corrections to the test deck itself, or to the casting of the test deck, should be made and it is recommended that the test deck be re-run until two error-free test results are produced. If the tested voting system fails to produce two error-free results, the system should not be used in any election until the problem is resolved and a new round of pre-election testing is successfully completed.

The pre-election test results reports should be signed by the test team, and placed in secure storage for any record retention periods the jurisdiction may require. After all voting systems for which a particular ballot style is valid have been tested the test deck should be similarly stored with all corresponding reports, audit trails and log sheets.

New York's successful experiences with test decks are many, however we would be remiss if we did not point out that in some cases, errors have occurred in the way ballots have been tabulated, owing to mistakes made by elections personnel. In certain instances, local election administrators who opted to take short cuts in the creation and/or implementation of test deck procedures were required to explain how ballots could have been mis-counted and why election results were flawed. A majority of the instances where test decks were not prepared properly revealed errors related to how local officials created and executed voting patterns reflecting the uniquely New York scenarios in which multiple appearances of candidates for the same contest, are permitted by statute.

No voting system or its accompanying processes is without issues, however the lesson learned from experience is that election administrators should ensure that their own regulations and procedures are fully implemented. Any abbreviation in pre-election procedures potentially jeopardizes the performance of voting systems and the accuracy of the election.

HASH CHECK OVERVIEW

As mentioned in the introduction of this report, in New York State, a key component to successful pre-election testing protocols is the validation of the voting system software resident on each scanner and ballot marking device, more commonly known as hash checking. Via this grant opportunity, we have reviewed pre-election logic and accuracy testing options and considered the processes other jurisdictions follow for same. We have determined that as part of pre-election testing, the validation of software serves an essential role in confirming any voting system's logic and accuracy. Hash checking is not the only process which can be employed for the purpose of validating software, however after much review and discussion, it is the process which New York has incorporated into its regulations, and one which is comfortably recommended to other jurisdictions looking to create or amplify pre-election logic and accuracy testing processes. A copy of New York's procedure for this aspect of pre-election testing appears in Appendix 4 of this report.

Jurisdictions opting to include this step in their own pre-election logic and accuracy testing processes should perform a hash check on each voting system to ensure that the firmware/software that was certified by that jurisdiction is the same as that which is currently installed on the system and that no other unauthorized software/firmware is present.

When a jurisdiction includes software/firmware validation via hash checking, hash values or numerical values are derived by the use of an algorithm which is run against the voting system's software. The 'hash value' is generated by a formula in such a way that makes it extremely unlikely that some other software will produce the same hash value. A hash value is used to determine if there were any changes in the certified version of software. When the hash value is compared against the referenced value (such a value is obtained from the jurisdiction's testing lab) and a match is found, there is now a high level of confidence that the software has not been disaffected in any way.

Anecdotally, subsequent to the required hash check step of all pre-election logic and accuracy testing, New York has added the additional requirement of conducting hash checking whenever the chain of custody for a voting system unit has been broken, for example:

- when tamper-evident seals on voting systems are missing or damaged;
- when the voting system is returned to the election officials after having been serviced at a vendor service facility; and
- when voting system firmware upgrades are performed.

New York's experiences in the arena of preventative maintenance and pre-election testing have helped establish updated policies which provide that hash-checking need not be performed as part of the testing protocols provided the voting system has remained in the secure custody of election officials, the tamper-evident seal numbers match seal numbers logged for that unit, and that the seals remain intact.

Model and version information for the voting systems currently certified in New York can be found in Appendix 5.

CONCLUSION

It is not easy for any election administrator to meld limited resources, a modest pre-election window of opportunity, and any number of unique jurisdictional issues – all in an effort to take every step possible to ensure an accurate and trouble-free election. Nonetheless, each of the steps described in this report, and indeed every step an election administrator can take along the path to that same end, is worth taking. The aggregate result of all such steps taken – and taken successfully - will do much to instill the highest degree of confidence in any election, demonstrating for all participants and stakeholders that the election has been carefully planned for, properly configured, and for which a robust pre-election logic and accuracy test has been implemented.

The tools this project helped to create, and in some cases revise, will serve election administrators well. These tools, including a test deck calculator, procedures and sample forms appear in this report's Appendices. This report is accompanied by a training DVD, which will help to ensure that election staff members assigned to this task are well-trained in the preparation, creation and implementation of pre-election logic and accuracy testing. Further, because that task is a cyclical one, refresher training is invaluable. The DVD demonstrates clearly how a test deck comes together, and can be reviewed at the user's convenience as often as necessary.

This initiative afforded us an opportunity to consider changes to our own processes, and the result for New York State – and those who wish to take these recommendations and processes to heart – is a renewed acknowledgement that the highest degree of confidence in voting system performance and election outcomes means so much to so many, and it is the responsibility of each of us to ensure. We encourage election administrators across the nation to explore all opportunities which will help restore the public's faith in all aspects of the voting process.

NOTE: Samples of ballots and forms provided in this report have been reduced for ease of publication. If you would like to obtain full-size samples of any of the forms or ballots referenced in this report, or a copy of the DVD mentioned herein, please contact the Election Operations Unit at the New York State Board of Elections.

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**REPORT IN RESPONSE TO THE MISSION AND OPPORTUNITY PROVIDED FOR
IN A GRANT FROM THE U.S. ELECTION ASSISTANCE COMMISSION:**

**Develop and Document Processes and Best Practices
for Coordinating Quality and Cost-effective**

VOTING SYSTEM PRE-ELECTION LOGIC AND ACCURACY TESTING

**New York State
Board of Elections
Voting System Testing and
Operational Regulations
APPENDIX 1**

OFFICIAL COMPILATION OF CODES, RULES AND REGULATIONS OF THE STATE OF NEW YORK

TITLE 9. EXECUTIVE DEPARTMENT

SUBTITLE V. STATE BOARD OF ELECTIONS

PART 6210. ROUTINE MAINTENANCE AND TESTING OF VOTING SYSTEMS, OPERATIONAL
PROCEDURES, AND STANDARDS FOR DETERMINING VALID VOTES

Current through January 31, 2013

Section 6210.1. Definitions.

Except to the extent set forth below, the definitions contained in section 6209 of this Title shall apply in this section

(a) Pre-qualification test is a test prescribed by the State Board, conducted immediately prior to the voting systems' use in an election in which a predetermined set of votes are cast which will ensure that all voting positions for each ballot configuration are tested. Such votes shall be entered into the voting system in the same manner as they will be entered by voters during an election. If a voting system offers several methods for votes to be entered, such as touch-screen, push-button, or other electronic mechanism, a key pad and/or pneumatic switch for voters with disabilities, or alternate language displays, then a pre-determined set of votes shall be entered separately using each method and language display. The results of the casting of said votes and all voting system logs shall be extracted from the system as though during normal use in an election, and the results and logs shall be compared to the predetermined results of the test votes and vote totals prepared pursuant to regulations and procedures of the State Board.

(b) Printout means either the printed copy of zero totals, candidate names and offices and other information produced by the voting equipment prior to the official opening of the polls or the printed tabulation report of votes cast for each candidate and question, the names of candidates and the offices for each candidate and other information provided after the official closing of the polls.

(c) Election mode. An operational setting and/or functional level of a voting system that would allow the user, under the required conditions stated by law, to make selections, and/or cast a ballot, and which also uniquely provides the potential to have a marked ballot officially accepted for counting at the time of a defined election. Note: This mode of operation may also be synonymous with the term "live vote mode" or similar. This mode may also be run at any time, either for the running of realistic simulations for testing, and/or after various maintenance activities. This mode is specifically required to be run in the conduct of an official election.

(d) Test mode. An operational setting and/or functional level of a voting system that would allow the user to specify/select, access, and/or test various levels/areas of the device, either, for example, during

possible upgrades, diagnostic testing, and/or specific maintenance activities that may not require full functional simulation, or capabilities at that time. Note: This mode of operation is a separate option from election mode, and is prohibited from being run in the conduct of an official election.

(e) Closed network. A closed network is a stand-alone server that is used for a specific purpose, such as an election management system (EMS), and to which access is restricted to specific workstations and users and not connected to any other internal or external network.

Section 6210.2. Routine maintenance and testing of voting systems.

(a) Testing of all voting systems shall be conducted by the county board before the use of the system in any election and at such other times of the year as prescribed by these regulations. Testing procedures shall be approved by the State Board. The voting system shall be tested to determine that the system is functioning correctly and that all system equipment, including but not limited to hardware, memory, and report printers, are properly integrated with the system and are capable of properly performing in an election. Testing, other than pre-qualification testing, shall be conducted by casting manual votes and may include the casting of simulated votes.

(b) In addition to vendor-prescribed maintenance tasks and diagnostic tests, tests of voting equipment shall be conducted by the county board, on each piece of equipment owned by the county board. Such testing shall be administered periodically and be completed during the following periods during each year that the equipment is in use:

(1) January 15-April 15;

(2) April 16-July 15;

(3) July 16-September 15; or

(4) September 16-November 15.

Whenever a voting system is to be tested for pre-qualification purposes, such test must be conducted while the voting system is in election mode.. Votes cast for pre-qualification test purposes shall be manually cast using all of the devices available to voters on Election Day (i.e.: audio, key pads and or pneumatic switches, and/or alternate language displays).

(c) Testing shall include the comparison of software installed on the delivered system to certified software, via the use of a Secure Hash Signature Standard (SHS) Validation Program, as described in Federal Information Processing Standards Publication 180-2 issued by the National Institute Standards Technology (This publication is available electronically by accessing <http://csrc.nist.gov/publications/>. Alternatively, copies of NIST computer security publications are available from: National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161.)

Testing shall consist of the re-calibration of equipment, as appropriate, pursuant to recommendations made in vendor's maintenance documentation, and the casting of a test deck by voting the minimum

