Pre-Election Logic and Accuracy Testing and Post-Election Audit Initiative

A Report to the U.S. Election Assistance Commission

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By

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Introduction

In 2011 the U.S. Election Assistance Commission (EAC) awarded twelve grants to various governmental units in the United States to undertake projects with regard to Logic and Accuracy Testing (L&A) and Post-Election Audits. The Indiana Election Division, in conjunction with the Bowen Center for Public Affairs at Ball State University, which houses the Voting System Technical Oversight Program (VSTOP) for the State of Indiana, received one of the grants. The project description for the grant is as follows:

The State of Indiana, which uses both DRE and optical scan voting systems, will develop general protocols for L&A checklist, as well as specific protocols for different voting systems, based on the surveys with election officials. In addition, current procedures governing chain of custody of voting records will be collected from the counties and analyzed in order to develop improved procedures to govern post-election audits. Post-election audit forms will be developed to manage the procedures to be followed after the election.

I. L&A Testing: Overview

A critical step for ensuring the integrity of election outcomes in the era of electronic voting is logic and accuracy testing (L&A). With the widespread introduction of electronic voting systems following the passage in 2002 of the Help America Vote Act, election administrators across the country took steps to find an effective method for testing the voting systems prior to an election. L&A testing was an approach that many states embraced as one element to assure that the voting machines were going to operate properly in an election. Arguments were made against L&A testing in the early days, with one computer scientist testifying in Ohio in March, 2004, before the Joint Committee on Ballot Security, voicing a common concern:

Regardless of whether the software in the Diebold or other voting machines is improved to better resist attacks, bugs will always occur and the risk of tampering cannot be overcome. In particular, we (sic) believe that while logic-and-accuracy-testing can

sometimes detect flaws, it will never be comprehensive; important flaws will always escape any amount of testing.[1]

Such criticism clarified the focus of L&A testing and helped define the boundaries within which the testing results are valuable. The central purpose of the public tests is to ensure that the voting system records and tabulates the election results in a manner that reflects the voter's intent. Additional benefits of the test include providing candidates, party officials and the general public the opportunity to review ballots; provide the opportunity for election definition programming; and to provide confidence to "all parties including election officials" that the voting system "will work on election day."[2] A more technical description is provided in the 2005 Voluntary Voting System Guidelines (VVSG) which defines logic and accuracy testing as:

> Testing of the tabulator setups of a new election definition to ensure that the content correctly reflects the election being held (i.e., contests, candidates, number to be elected, ballot styles) and that all voting positions can be voted for the maximum number of eligible candidates and that results are accurately tabulated and reported.[3]

It is generally understood that the tests involve all components of the voting system including scanners (for optical systems), touch screens (for DREs), ballot counting software, memory cards, and central count processing devices and software. Ideally, L&A testing takes place within the context of a continual assessment of the entire election process from pre-election preparation to post election audit with the purpose of monitoring outcomes and improving election management.[4]

It is important to understand the role of L&A testing within the context of other tests that are applied to voting systems. L&A testing occurs after a systematic testing of voting systems has already taken place as part of the voting system certification. Through the U.S. Election

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[1] Testimony of Dr. Dan Wallach, PhD, Associate Professor of Computer Science, Rice University, before Ohio Joint Committee on Ballot Security, March 18, 2004. Available at http://votingmachines.procon.org/view.answers.php.
[2] "Pre-Election Logic & Accuracy Testing," presentation by Matt Masterson, Deputy Elections Administrator, State of Ohio, State Certification Testing of Voting Systems National Conference, June 14-15, 2012, Indianapolis, IN.
[3] Election Assistance Commission, *Voluntary Voting System Guidelines, 2005*. Accessed on January 12, 2013 at http://www.eac.gov/testing_and_certification/2005_vvsg.aspx.
[4] R. Michael Alvarez, Lonna Rae Atkeson, and Thad E. Hall, *Evaluating Elections: A Handbook of Methods and Standards* (New York: Cambridge, 2013. See, esp. chapter 5.

Assistance Commission, an elaborate testing and certification process of voting systems occurs

at the federal level. This process relies on the involvement of federally authorized Voting

System Testing Laboratories (VSTLs) which conduct elaborate tests on the voting system's

hardware and software. Once a voting system is certified by the EAC, some states automatically

provide certification of that voting system for marketing, sale and use by jurisdictions within

those states. Other states specify their own certification tests, focusing on applicable provisions

of their state laws before a voting system is allowed to be sold within their state.

In 2006, the Brennan Center, under their project titled "Making Democracy Work,"

provided a general description of the state certification process:

> While some states allow any voting system to be offered for sale that has been certified to
> meet the "voluntary" federal standards, many states impose additional requirements.
> In these states, vendors must demonstrate that they have met these additional standards
> before offering their machines for sale in that state. Some states contract out to the ITAs
> [Independent Testing Authorities] to test to these additional standards, some states
> have their own testing labs, some states hire consultants, and some states have
> boards of examiners that determine if state requirements are met.
>
> In general, there is no point in having the state qualification tests duplicate the
> ITA tests. There is considerable virtue in having state tests that are unpredictable,
> allowing state examiners to use their judgment and knowledge of the shortcomings
> of the ITA testing to guide their tests. This is facilitated by state laws that give
> board members the right to use their judgment instead of being limited to
> specific objective criteria. Generally, even when judgment calls are permitted, the
> board cannot reject a machine arbitrarily, but must show that it violates some provision
> required by state law.
>
> State qualification testing should ideally include a demonstration that the voting
> machine can be configured for demonstration elections that exercises all of the
> distinctive features of that state's election law, for example, straight party voting,
> ballot rotation, correct handling of multi-seat races, and open or closed primaries,
> as the case may be. Enough ballots should be voted in these elections to verify
> that the required features are present.[5]

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[5] The Brennan Center for Justice: Task Force on Voting System Security, *The Machinery of Democracy: Protecting Elections in an Electronic World.* June, 2006, Appendix E.

This description of certification testing also was addressed in the CalTech-MIT Project entitled "Voting: What Has Changed, What Hasn't, & What Needs Improvement," and a specific limitation on certification testing was listed when the authors stated:

> It is worth noting that certification of voting equipment doesn't protect one from bad ballot design or misprogramming (sic) of ballot scanners.[6]

Once the certification process has been completed and the voting system is sold within a state, another step in the testing process frequently occurs, which is termed "acceptance testing." The process of acceptance testing is to determine that the voting system, upon delivery, meets the criteria described in the state code and the purchasing contract. This test includes a technical diagnostic test of the voting systems as well as functional tests that cover the usability of the system by the end user.[7]   However, not all states require acceptance testing, and that list includes Indiana. In the same report quoted above, the Brennan Center, in their report on "Protecting Elections in an Electronic World," advocated the following regarding acceptance testing:

> Each machine delivered by a vendor to the jurisdiction should be tested. Even if the vendor has some kind of quality control guarantees, these are of no value unless the customer detects failures at the time of delivery. At minimum, such tests should include power-on testing, basic user interface tests (do all the buttons work, does the touch-screen sense touches at all extremes of its surface, does the paper-feed mechanism work, does the uninterruptible power supply work).
>
> By necessity, when hundreds or even thousands of machines are being delivered these tests must be brief, but they should also include checks on the software versions installed (as self-reported), checks to see that electronic records of the serial numbers match the serial numbers affixed to the outside of the machine, and so on.

The Center for Election Systems at Kennesaw State University in Georgia has developed a script for acceptance testing of the AccuVote voting system used throughout Georgia.[8] The acceptance testing script covers the following areas:

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[6] CalTech-MIT Voting Technology Project, Voting: What Has Changed, What Hasn't, & What Needs Improvement, p. 21, available at www.vote.caltech.edu/sites/default/files/voting%20technology%20report_final.pdf.

[7] See, for example, Center for Election Systems, Kennesaw State University, "AccuVote—TS Acceptance Test Script, Version 5.0, December 10, 2008, p. 1.

[8] Center for Election Systems, Kennesaw State University, "AccuVote—TS: Acceptance Test Script, Version 5.0," Ibid.

- Scope
- Materials Needed
- Reporting and Labeling Procedures
- AccuVote-TS Diagnostic Test
- AccuVote-TS Functional Test

In May, 2002, Georgia had decided on one DRE vendor for the entire state and one of the initial steps in deploying the voting systems statewide was to perform an acceptance test on the equipment. The Center for Election Systems at Kennesaw State University tested 23,000 DRE units, 8,000 encoders, 400 optical scanners, 161 servers and other peripheral devices. The Center reported in 2004 that "In the course of the three month acceptance testing process, the Center failed over 1,000 pieces of equipment for a variety of reasons, including screen freezes, incorrect time and date settings, incorrect software versions, incorrect serial numbers, defective cases, bad batteries, and various hardware failures."[9] This failure rate of roughly 3 percent seems small, but such functional testing—either at the acceptance level or the public test phase— reveals weaknesses in the election system that must be overcome to maintain the integrity of the entire voting process.

It must be noted that even in the absence of a state regulation requiring acceptance testing, when vendors deliver new voting systems to voting jurisdictions some form of demonstration of the systems usually occurs. Such a demonstration may not be a reliable substitute for a formal acceptance test, but many of the test items are included in the demonstration and vendor documentation.

It is within this context of testing voting hardware and software that L&A testing takes place, but L&A testing has a different focus than certification testing or acceptance testing. The L&A test focuses on an impending election and the equipment is tested to ensure that the voting system properly counts and tabulates votes that are to be cast by voters on the upcoming ballot.

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[9] Brit J. Williams and Merle S. King, "Implementing Voting Systems: The Georgia Method," *Communications of the ACM*, October 2004/Vol. 47:10, p. 41.

A great deal of attention has been paid to L&A testing with the understanding that rigorous testing by certified, independent laboratories or by careful acceptance testing protocols are no iron-clad guarantees that voting systems will be immune to anomalies when they are deployed in an official election. One public administration scholar pointed out that "Even a moderately centralized [testing] process has risks. High-reliability theory warns of the need for local discretion in dealing with developing situations."[10] Most states specify the L&A testing procedures either in the election code or in administrative manuals that are created and distributed by the state's chief election officer for election officials and poll workers in each county or voting jurisdiction. The range of procedures and methods utilized in L&A testing varies greatly from state to state with some states, such as Georgia, requiring detailed and extensive measures.[11] In states where multiple voting systems are certified, including Indiana, each system will be tested according to its own specific protocol. These tests at the local level are almost universally conducted in public (often with media representatives in attendance) to allow observers an opportunity to monitor voting system operations prior to Election Day.

The EAC provides recommended guidelines for carrying out pre-election L&A testing:

> Pre-election testing involves setting up the voting system for *each* of your precincts and early voting locations, loading the election definition, opening the election, casting a known pattern of votes on each ballot style, closing the election, printing the vote totals for the precinct, and then comparing the printed vote totals with the known pattern of votes. In short, you are going to set up and test your entire election.[12]

Each state develops its own procedures for conducting L&A tests and the integrity of these procedures relies on the local election officials adhering to the guidelines. Appendix A includes a table listing those portions of state election codes mandating L&A public testing and outlining procedures to be used. Some statutes specifically identify L&A testing in preparing

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[10] Donald P. Moynihan, "Building Secure Elections: E-Voting, Security, and Systems Theory," *Public Administration Review* 64:5 (September/October 2004), pp. 515-528.

[11] See, for example, Center for Election Systems, *Logic and Accuracy Testing: Instructions for the Pre-Election Testing of Optical Scan, Express Poll and Touch Screen Voting Equipment in the State of Georgia, Version 1.2* (Kennesaw State University, Kennesaw Georgia, 2010).

[12] Election Assistance Commission, *Election Management Guidelines* (Washington, DC,: Government Printing Office, 2010), p.45.

election systems for voting and specify in some detail what actions must be performed. Appendix A also identifies the location of administrative procedures regulating these tests and the document provides web addresses to those administrative documents that are particularly useful and readily available.

Overall, legislative and administrative rule-making regarding L&A testing runs the gamut with regard to specificity. Some states, such as Texas, outline in their election code (§129.023) all steps that must be included in the test. The code lists the items that must undergo testing prior to the upcoming election, and specifies the chain of custody in recording and maintaining documentation for each test. Other states, such as Delaware (15 DE Code § 5523), mandate public testing with few written requirements and delegate the promulgation of specific requirements to the State Election Commissioner or similar state authority. Similarly, instructions from state officials range from the exacting (e.g., Georgia's 53 page step-by-step Instruction Manual) to more modest directions spanning several pages (e.g., Alaska, Maine).

While details differ widely, every state includes a similar menu of requirements for the public tests: the number of days prior to Election Day when the L&A test must be conducted; identification of the officials or party representatives who must attend; notification of public and media; reporting requirements, and a specification of the number of voting units that must be examined and how these are selected. With regard to this last item, the range is again quite wide. Some states require all voting systems to be tested on all election contests while others require a subset (usually a random sample) of either precincts or units within each precinct. As with most policies where authority is spread across several layers of government, one would expect that the greater the specificity of the testing requirements from the authorizing agent (either the statute or the chief election administrator), the less discretion local authorities have in implementing the policy. One would also expect that the greater the clarity and specificity of the directions for

conducting the test, the less likely the room for error.   On the other hand, the administration of

the public test and the election itself is in the hands of the local officials.

 II. Indiana's Public Testing Statute

Indiana's election code refers to the L&A pre-election tests as "public tests," and the

statute is fairly brief compared to many states. IC 3-11-14.5 outlines the following requirements:

- The public test must occur at least fourteen days before Election Day.
- From among those precincts that will be holding an election, the county election board selects at least three precincts at random for the voting system test.
- Each system in those randomly selected precincts that will be used in the election will be tested.
- The test will ascertain that the system correctly counts votes for all candidates standing for election and for all public questions subject to voter approval in that precinct.
- Public notice will be given at least 48 hours prior to the test and published in newspaper(s) in accord with IC 5-3-1-4.
- Two appointed election board members must observe and certify the test.
- The test must be open to the media, political parties, candidates, and the general public.
- The test must include:
    - Visual inspection of the voting system and ballot labels.
    - Manual entry of pre-audited groups of ballots marked to record a predetermined number of valid votes for each candidate and for each public question.
    - At least one ballot shall be cast in excess of the number allowed by law (i.e., test for over votes).
- The cause of any error must be determined and additional tests conducted until an errorless count is achieved.
- The voting system must be sealed after the test and required materials must be retained.
- The county election board shall enter the vote totals from voting systems tested into the component used by the county election board to tally election results (central count) to determine whether this component properly tabulates the votes cast in each precinct.
- No later than 7 days following the public test, the county election board shall certify to the election division that the tests have been conducted properly.
- A copy of the certification of the tests shall be filed with election returns.

A copy of the Indiana Code (IC 3-11-14.5) pertaining to public tests is provided in

Appendix B.

III. Survey Design and Methodology

The first methodological step was to develop a sample of Indiana counties that would become the focus in observing the public L&A tests, including interviewing the appropriate election officials. Indiana has 92 counties and a 2010 population of 6,483,802. The survey design used was the technique of probability proportional to size. This approach provides that the probability of selecting a sampling unit (i.e., county) is proportional to the size of its population. The technique provides a random, representative sample.[13]

The chart below lists the 15 counties included in the sample, arranged by population:

County	County Seat	Geographical Location in State	2010 Population
Marion	Indianapolis	Central	903,393
Lake	Crown Point	Northwest	496,005
Allen	Fort Wayne	Northeast	355,329
Hamilton	Noblesville	Central	274,569
St. Joseph	South Bend	North	266,931
Elkhart	Goshen	North	197,559
Tippecanoe	Lafayette	West Central	172,780
Hendricks	Danville	Central	145,448
Johnson	Franklin	Central	139,654
Madison	Anderson	East Central	131,636
Delaware	Muncie	East Central	117,671
Floyd	New Albany	South	74,578
Warrick	Boonville	Southwest	59,689
Jackson	Brownstown	South	42,376
Parke	Rockville	West Central	17,339
		TOTAL	3,394,957
		Percent of state population:	52.36

The sample counties include slightly more than one-half the state's population. The most populous county not included in the sample is Vanderburgh (pop: 179,703; county seat, Evansville), which is in the state's Southwest corner. However, Warrick County, which is in the sample, is adjacent to Vanderburgh and is in the same media market. Overall, the counties represent a cross-section of Indiana jurisdictions differentiated according to population, urban-

[13] For example, see Therese McGinn, "Instructions for Probability Proportional to Size Sampling Technique," *RHRC Consortium Monitoring and Evaluation Toolkit,* PPS Sampling Technique, October, 2004.

rural setting, geographical location within the state, and voting machine manufacturer. The initial sample also was reviewed to examine whether counties were included that have in-house technical professionals as well as counties that rely heavily on their vendor or service providers for technical support. It was presumed that the larger populated counties would have technical staff on the payroll, and that was found to be the case.

At the time of this study only one sample county (Tippecanoe) was using vote centers. Indiana vote centers are being phased in for counties and their adoption is a county decision. Only three counties—including Tippecanoe—were the pilot counties under the state statute. The other two (Cass and Wayne) were not selected in the sample. It was initially intended to have all vote center counties in the sample, but Cass County was the last of the three to adopt vote centers and was still in the preparation period, and Wayne County had a similar profile to other sample counties.[14]

The 15 sample counties used five different models of voting systems, manufactured by three different vendors. The following chart shows the make and model of the voting system used in each of the counties in the sample.

County	County Seat	Type of Voting System
Marion	Indianapolis	ES&S iVotronic and M100
Lake	Crown Point	MicroVote Infinity VP-1
Allen	Fort Wayne	MicroVote Infinity VP-1
Hamilton	Noblesville	MicroVote Infinity VP-1
St. Joseph	South Bend	ES&S Unity Model 100
Elkhart	Goshen	ES&S AccuVote TSx&OS
Tippecanoe	Lafayette	ES&S AccuVote TSx&OS
Hendricks	Danville	MicroVote Infinity VP-1
Johnson	Franklin	ES&S Unity 3.0.1.0
Madison	Anderson	ES&S Unity 3.0.1.0
Delaware	Muncie	MicroVote Infinity VP-1
Floyd	New Albany	ES&S Unity 3.0.1.0
Warrick	Boonville	MicroVote Infinity VP1/HartInterCivic6.2.1
Jackson	Brownstown	UniSyn Open Elect 1.0-1.1
Parke	Rockville	ES&S AccuVote TSx&OS

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[14] At the time of this report (July, 2013), nine Indiana counties have now adopted vote centers.

The county clerk in each of the sample counties was contacted to obtain information concerning the next scheduled public test and the clerk was notified that a member of the research team would be attending either the test scheduled for the 2012 May primary election, or the November election that same year.

The research team developed a set of general questions that would be asked of the persons conducting the public tests. These questions focused on the standards set forth in the Indiana Code. The topics the research team summarized for inclusion while observing the public tests included:

- <u>Persons attending the public test</u>. Under Indiana law, the public test is part of a public meeting of the 3-person county election board. The county election board is comprised of one member of each of the major political parties and the elected county clerk.

- <u>Media notice of public test</u>. Under Indiana's "Open-Door Law," official meetings of governmental units, including the county election board, must notify newspapers in the county of the upcoming meeting, as well as post a notice for the meeting. Many counties post such notices at the door to the courthouse door or annex where the public meeting will be held.

- <u>How the random precincts were selected</u>. Indiana law requires that the public test must consist of voting systems from "at least" three randomly selected precincts.

- <u>The number of voting systems tested</u>.

- <u>How the test decks (ballots) were created</u>.

- <u>How the votes were counted and verified</u>.

- <u>Thoughts on improving the process, including post-election audits.</u>

Each research team observer took extensive notes on each of these items during the public tests. They also recorded general observations. Any documents that were used by the

clerk or other election board members during the test were requested. These documents, along

with the notes of the research team members were later entered into a computer file.

IV. Survey Findings

In sequence with the code requirements, a summary of the field observations are provided

in this section. The findings include follow-up conversations and communications with county

clerks and election officials in the sample counties in order to clarify certain procedures of the

testing. Following the summary of observations from the counties, several conclusions are

drawn from the observations from the research team members.

1. Participation by Election Board members in public tests

Election Board members were present during the L&A testing in all counties, with two
exceptions. In those two counties the L&A testing was directly supervised by an Election
Director and other authorized staff members, each of whom were selected by the Election
Board to conduct the tests. The Election Board members were not continuously present
during all testing of each selected voting system. In all cases, however, the Election
Board members reviewed the final testing results and signed off on the test during an
advertised public meeting.

2. Notice of public tests posted in public buildings

According to election officials, notices of the public tests were posted in all counties. In
several instances, research team members observed the printed announcements on
courthouse/annex entrances the day of the test, which conformed to the provisions of the
Indiana Code regarding open-meetings.

3. Notice of public tests announced in the media and the public invited to attend

 Election officials in most of the counties confirmed that the announcement of public tests
was published in the local media. Public attendance was minimal in nearly all locations,
with those witnessing the tests being primarily local government employees, including
members of the local Election Board. In the larger populated counties some media
representatives were present, including television and newspaper reporters.

Because public attendance was minimal in many of the counties, a question arose and
some discussion took place among election board members as to whether there should be
a more active effort to encourage public attendance and involvement during the public
tests. Such an effort might be made through area schools, universities and organizations
such as the League of Women Voters and local civic groups.

4. <u>Voting systems in at least three precincts are randomly selected and tested</u>

There was a wide variation among counties regarding how the requirement of random selection was interpreted and applied. Allen County tested all 13 machines from the randomly selected three precincts. Delaware County selected one machine from each of three precincts. Elkhart County tested three machines from each of the three randomly drawn precincts. Marion County randomly selected 48 precincts and tested 15 machines from each. Parke County tested three machines, one for each precinct selected. St. Joseph County tested 23 machines, one from each of 23 randomly selected precincts. Hendricks County had no machines present for the test, but did have tally cards with voting data from machines in twelve precincts, one from each township. These tally cards were created in a test prior to the formal meeting. Totals from each of the precincts were then tabulated from the cards that were derived from the previous test. Jackson County had three machines, one for each precinct selected. Lake County selected five precincts and tested five machines from each precinct. Madison County tested one machine from each of three precincts. Tippecanoe County selected two DRE machines and two optical scanners. Warrick County tested three MicroVote machines. In Floyd County, two Optech machines were tested.

Overall, 849 voting systems were tested in the sample counties, with the most populous county in the state, Marion, accounting for nearly 85% of the machines tested.

5. <u>How the test decks (ballots) were created</u>.

Counties either created their own test decks for the public test or they relied on their voting system vendor or support consultants to create the decks. In cases where vendors or support firms created the ballots, the representatives of the firms clearly stated verbally that ballot styles were verified to ensure that all races were properly listed along with public questions. Overvotes were included in all the test decks along with the stipulation that all races were marked by at least one vote.

6. <u>How the votes were counted and verified</u>.

In all counties the Election Board members carefully reviewed the tapes from the DRE machines (including the zero tapes that preceded the actual voting of the test decks).   In some counties, the election board members read the results to one another to verify the votes. The tapes were then initialed or signed by the Election Board members and placed in custody of the county clerk who then would follow the Indiana law in sending the results to the Indiana Election Division at the time official returns were reported after the election.

Only two of the counties encountered problems in their public tests, and in both instances the errors were traced back to the voter on a DRE casting the wrong vote from the test deck. These errors were traced by re-voting and verifying that the error was a voter casting error. There were no anomalies in the tests with respect to optical scan systems.

7. <u>Thoughts on improving the process and post-election audits</u>.

The responses to improving the process and the possible use of post-election audits are addressed in the final sections of this report.

<u>Observational Concerns about the Public Tests</u>

The following items specify the concerns that arose from the observations of the field team members who attended the public tests in the counties.

1. A major concern in the counties involved the procedures used to ensure a random selection of precincts. The Indiana Code specifies the following: Each county "shall randomly select at least three (3) precincts within the county and test the voting system units to be used at those precincts on Election Day." In larger populated counties, the selection of precincts appeared to be random. In one large county the precincts were chosen by drawing the numbers of the precincts from a hat. In counties with medium-size populations, the process was more haphazard. Some of these counties tested machines from precincts that the county clerk said should be tested. When one clerk was asked how the precincts were selected, the reply was "I wanted this one precinct included because we had some problems last election in that precinct." In the smallest counties having few precincts the clerk and other election board members used their experience to ensure that different areas of the county were being tested and to make sure different ballot types were demonstrated. A systematic random selection was not used.

   The wide variation in selecting "random" precincts was so great that standard statistical measures could not be applied to determine the extent to which differences could be measured. In effect, the attempt to justify a statewide public test of voting systems on the basis of a random sample of precincts and voting equipment within those selected precincts fails in operation.

   Some of the variation in procedures among the counties can be attributed to the Indiana Code. The wording of the Indiana Code on random selection is subject to interpretation. The Code requires "at least (3) precincts" meaning the county election board is free to select many others, which several counties did. The next wording in the Code seems straightforward in requiring the county to "test the voting system units to be used at those precincts on Election Day." The larger counties (e.g., Marion and Allen) were more likely to strictly adhere to this requirement, making sure that *all* voting systems assigned to those randomly selected precincts were tested. As the field observations make clear, however, some of the medium-size counties did not test all the voting systems to be used in that precinct on Election Day, but only randomly chose some voting systems from the selected precinct. The local election officials interpreted the state statute to mean that a random selection of voting systems within the chosen precincts would meet the intent of the law.

   Random selection of voting machines is often confounded by other factors. One such example was described in a report in Allegheny County, Pennsylvania, where firmware verification was to take place on randomly selected voting machines. The voting machines were stored in a warehouse, and the report indicated that "the initial thinking had been to use flipped coins to do a binary search on a list of machines sorted by serial number, and to pull the machines thus indicated. But it turned out that the machines were scattered throughout the warehouse in a way that bore no relation to their serial numbers; in fact, there was no mapping available from serial numbers to locations." The authors admitted that the

"procedure was imperfect," and that some "calculation errors were possible" in the selection process.[15]

Another concern noted in some of the counties involved the accessible voting systems to be used by persons with disabilities. A majority of the counties did not test those voting systems during the public L&A testing. This concern also extends to early voting and the voting systems used during that time period. The Indiana Code does not specifically mention the testing of machines used in early voting. Similarly, a few counties also tested the scanners used to count absentee ballots. However, the majority of counties did not test the scanners. Again, the Indiana Code does not cite specific components of the voting systems, leaving the actual equipment to be tested open to some interpretation by local election officials. This fact comes into play especially at the conclusion of the public test. Once the test decks had been entered in each voting system and the results from each system were verified, the test was concluded. The central count units often were not, in turn, tested. In short, the Indiana Code refers only to voting systems, whereas the interpretation could extend to all equipment that interacts with the certified voting system.

2. An additional concern is that most of the counties did not use a protocol or checklist to guide the public test. The Indiana Code specifies the contents and style of the ballots for the public test but is silent on what protocols or checklists should be used in conducting the test. Again, the larger counties were more likely to have a listing of the steps that had to be taken in conducting the test, but these lists were internal documents created by the county clerk or election director. Some vendors or service providers also had checklists for the public test. The majority of counties, however, relied upon the experience of the voting officials as well as the vendors or service providers to conduct the step-by-step test.

Even in those few counties that were able to demonstrate a written protocol or checklist, it was unclear how frequently the protocol was reviewed and who had the authority to maintain and update the protocol.

3. In most of the counties, public employees, including election officials, conducted the voting. A few counties had vendor representatives or service providers perform the voting, with election officials observing. The Indiana Code is silent on who should be performing the voting. However, the EAC's Election Management Guidelines suggest that representatives of vendors should not assist in the public tests.[16]

Views of Election Officials on Costs and Benefits of Public Tests

Discussions with county clerks and local election officials concerning the usefulness of the public tests are very positive. Two points were prominent: 1) the test provides step-by-step training for election officials and some poll workers in terms of focusing on the actual conduct of the upcoming election. Even veteran poll workers appreciate the official "mock" election as a

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[15] David A. Eckhardt and Kami Vaniea, "Report on Allegheny County iVotronic Firmware Verification, prepared by VoteAllegheny and PA Verified Voting, December 22, 2008, Revision 1.3 of March 22, 2009, p. 3.

[16] Election Assistance Commission, *Election Management Guidelines* (Washington, DC, Government Printing Office, 2010, p. 45.

refresher course in which the voting equipment is put to actual use; 2) the public test achieves its purpose in validating the voting operations that are required under state law.

The county clerks expressed no concern over the financial cost of the public test, pointing out that the election budget covers the cost of the test and most of the staff members that participate in the test are on the county payroll. Very few poll workers who staff the voting locations on Election Day and paid from the election budget are involved in the public test. Moreover, when off-year elections are held for municipalities or school districts, the costs of the public test, along with all activities of the election itself, are borne by the municipalities or school boards.

When the counties rely on vendors or service providers to assist in the public test the cost for the service depends on several factors. For example, if the county owns the voting systems the service providers will have specific charges for assisting in administering the public test. In that instance, the service provider will generally arrive early on the day of the test and program the voting equipment, with the actual public test conducted at the advertised time of day. For jurisdictions that lease the voting systems, the lease generally includes all service, including the pretest as well as Election Day support. If the county prepares the test decks in-house, there is no extra charge from the service providers for creating the test deck.

Summary conclusions from the Indiana public tests with reference to other states

When the findings based on field observations of public tests in Indiana are compared to the code requirements of other states, some similarities are apparent on standard procedures. Some states do not specify a certain number of days prior to Election Day for the L&A testing to take place, merely requiring that the test, indeed, occurs in sufficient time before Election Day. Most states, however, specify that the public tests must take place a certain number of days prior to the official Election Day. A few examples are:

Arkansas   7 days
California   7 days
Florida   10 days before early voting starts
Indiana   14 days
Vermont   10 days
Washington   3 days

Another common stipulation is that the L&A test be open to the public. Also, states require the detection and correction of any voting errors uncovered during the test. The state codes also stipulate the ballot styles that must be used in the test and require that the votes be counted properly for all races and public questions. Some states specifically describe the test ballot decks that must be tested. For example, Idaho requires three test decks to be used in the testing: the vendor's test deck; the state test deck; and the county test deck. In all states the local election officials are uniformly required to certify the results of the public tests.

While there are some similarities, there also is a wide divergence in state codes and administrative provisions regarding the public tests. Some states are explicit in terms of what equipment should be tested, while others leave that open to interpretation by local election officials. For example, North Carolina requires "all machines and voting-related equipment to be issued for the election" must be tested. However, for testing the "ballot coding," North Carolina requires "at least one" voting machine per polling place. The functionality testing, however, pertains to all machines. [17] Indiana, as indicated previously, requires that "at least three (3) precincts within the county" should be randomly selected with the test covering "the voting system units to be used at those precincts on Election Day." The Indiana code also stipulates the "each voting system shall be tested to ascertain that the system will correctly count the votes cast for all candidates and on all public questions in that precinct."   The findings from the survey of Indiana public tests indicate that this stipulation has varied interpretations depending on the local election officials, although the end result indeed showed that all systems tested were found to have correctly counted the votes cast.

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[17] North Carolina State Board of Elections, iVo Logic and Accuracy Test Procedures, March 11, 2010, p. 1.

Another finding is that a wide variation exists within Indiana with respect to the use of detailed protocols in the L&A testing. The larger counties used a checklist of the steps that were followed in conducting the tests and all other counties relied to some degree on the vendors or service providers to establish the procedures. In comparison to other states, this approach appears to be common. Research that examines state laws does not reveal one state that mandates counties to use a specific step-by-step protocol that is tied to statutory requirements. Some states, of course, have provided detailed documents that counties can use and/or supplement in conducting their tests, but these documents are not mandated by law to be used in the required public test. The reluctance to mandate a protocol may result from states having multiple vendors providing the voting systems within their respective states, which, in turn, requires multiple protocols. However, even in Georgia where the same voting system vendor is used in all counties, the detailed document on L&A testing created by the Center for Election Systems at Kennesaw State University, makes clear on the opening page that it is "meant to assist elections office employees in performing the tasks" of administering elections and that the "execution of an election is the sole responsibility of the jurisdiction's election superintendent."[18]

The Georgia approach is being followed by other states. The elections division of Ohio, which has multiple voting system vendors, has developed "Principles and Practices" for L&A testing. One document pertains to optical scan voting systems and the other for DRE/Combination voting systems.[19] In a webinar cited by Ohio on August 30, 2011, a question was asked:

> We are thinking about going to optical scanners in 2013. Does the State have an L&A Testing check list for the counties to use or do we get them from the vendors?

The answer was:

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[18] Center for Election Systems, Kennesaw State University, "Logic and Accuracy Testing: Instructions for the pre-election testing of Optical Scan, ExpressPoll and Touch Screen Voting Equipment in Georgia, Version 1.2. Opening page, available at:
www.sos.state.OH.us/sos.upload/elections/trained/GeorgiaLogic_and_Accuracy_Testing_Manual_Final_v12.pdf.
[19] The documents are available on the website of the Secretary of State of Ohio:
www.sos.state.oh.us/sos/elections.

We recommend that you develop you[r] checklist. You can use the vendor list as a starting point. Also consult with other optical scan counties regarding their L&A procedures.[20]

V. <u>Toward A General Protocol for L&A Testing and Chain of Custody</u>

The EAC's Election Management Guidelines addresses L&A testing in Chapter 6: Pre-Election and Parallel Testing. The process is described as follows:

Pre-election testing, also called Logic and Accuracy testing (L&A testing), is the act of testing *every* ballot style and *every* component of the voting system prior to the election.

In particular, this description includes configuration and testing of each component of the voting systems that will be used in an upcoming election. Each component is tested to verify that it is fully functional and free from mechanical problems and that each voting unit contains the appropriate ballot styles for each designated polling place.

This following section sets forth a generic Pre-Election Logic and Accuracy Testing Protocol and a Checklist that is flexible enough to apply to any voting system used in U.S. elections. This general protocol is then extended to a protocol that applies to the statutory provisions of the state of Indiana. Finally, L&A checklists for Indiana certified voting systems are discussed.

<u>Generic L&A Testing Protocol</u>

The generic protocol is divided into three phases. Phase I consists of notification and preparation procedures. Phase II involves the testing steps. Phase III includes post-testing and reporting procedures.

<u>Phase I – Notification and Preparation</u>

- In accordance with the calendar requirements for the public test in the state

  election code, a specific date is set for the pre-election L&A testing in your

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[20] Document titled "Frequently Asked Questions Related to Logic and Accuracy Testing (From Webinar on August 30, 2011). Available on the web site of the Ohio Secretary of State, <u>Ibid.</u>

jurisdiction. Establishing the specific date for the test will provide a timetable for meeting deadlines.

- In accordance with the state election code, publish a notice through the media as to the date, time and place of the L&A test.

- In accordance with the state election code, prepare a list of election officials and other appropriate personnel who are designated to carry out specific duties of the L&A test. The duties and responsibilities should be listed and it is recommended that representatives of the voting system manufacturer *not be included* as an actual participant in the testing, but may be present to provide technical guidance. This recognizes that public officials who conduct the test and certify the results are the ones maintaining responsibility for overall testing and execution.

- In accordance with the state election code, select voting system units from precincts and/or early voting locations. The number of voting systems and precincts should follow the directions of the state election code. It is recommended that strict interpretations of the code should be used when encountering difficulties with respect to a certain step, e.g., a random selection of voting machines. Ensure that all components that will be used in the upcoming election are available for testing, including Commercial, Off-the-Shelf items (COTS), memory cards, computers that have the Election Management System installed, printers, and peripherals, such as cables and other supplies.

- Each voting system and component should be entered, by serial number or description, into an inventory listing, either on paper or in an electronic database. This inventory should be secured by the designated election official and maintained in custody.

- Ensure that all ballot styles to be used in the election are available. This applies to ballots to be voted on OPSCAN as well as DRE systems. In accordance with the state election code, for each ballot style, create test scripts that list how the votes are to be cast. At least one vote for a candidate in each race and each issue or question shall be included in the scripts. Overvotes and undervotes must be tested as per state code.

- Voting systems used for disability access must be tested.

- The location for the test must have ample space for visitors, including media representatives. Visitors should only observe the test and must not interfere in the process. After the test is concluded, election officials may want to ask for questions and provide explanations if desired.

- In accordance with the state election code, prepare the voting systems prior to the day of test. This includes loading the election definitions and ballot styles.

Phase II – Logic and Accuracy Testing

- Visually inspect for test readiness all voting systems, peripherals, and printed ballots as applicable.

- Turn on the voting system and run the initialization procedures, including diagnostics, officially opening the test election, and zero-counts.

- Conduct the test on one precinct at a time. When testing DREs, votes should be cast manually as indicated by the scripts.

- For optical scan ballots, run the entire test deck for every ballot style.

- Actual voting in the pre-election test on DRE voting systems will require two persons per voting system, with one person entering the votes while the other person verbally states the votes and verifies the votes on the voting screen. These individuals should be employees of the county or voting jurisdiction.

- Use the EMS to count ballot totals and compare those results with the predetermined count from the scripts. In case of errors or mismatches, repeat the election until all results match or the error is analyzed and explained.

- Repeat the test for each selected precinct and early polling location.

- At the end of the test, close the voting systems with the closing procedures and zero totals.

- Seal the voting systems with tamper-proof seals, record the serial numbers and secure the machines until Election Day.

Phase III – Post testing and reporting procedures

- In accordance with the state election code, prepare detailed reports of the test, totals and comparisons. Note any discrepancies and include explanations. Included is double-checking the inventory of tested equipment.

- The reports, including the inventory of tested equipment, should be reviewed and approved by all officials as specified by the state election code.

- Submit the required reports to the appropriate state election officials in accordance with state deadlines.

Additional Recommendations and Best Practices

Best practices are defined as methods, processes or techniques that have consistently achieved desired results that are superior to those achieved by other means, and the results are sustainable. In L&A testing, modifications to hardware and software are frequent. Some of these modifications are minor while others may require certification testing by a testing lab before they can be deployed. Consequently, it is imperative that methods, processes and techniques be continually reviewed to ensure that desired results continue to be achieved. The following items summarize best practices that have been tested and implemented by various states and jurisdictions, including Indiana, and apply directly to L&A testing.

- One Indiana County (Allen) specifically states in their "Checklist for Public Test" that the preparation should start "2 months prior to testing date."[21] If the voting system requires paper ballots, close attention must be given to the preparation and printing of these ballots. More lead time for this step must be provided in Phase I, whereas a shorter lead time is required for preparing DREs. One or more staff members should be assigned exclusively to the ballot preparation (and printing) and relieved of other administrative responsibilities until all the ballots styles are confirmed accurate.

- The Public L&A test is an important activity in assuring citizens that the voting systems properly count and tabulate choices made by voters. The citizens who attend the public test are personal witnesses to the preparations and acts taken to ensure the integrity of the upcoming election. Consequently, taking steps to go beyond the requirements of state law to advertise and publicize the test is likely to attract more observers. The public test should be advertised on the website of the county. The EAC publication on "Election Management Guidelines" further recommends that election officials provide a media briefing about "a week before the pre-election tests," which can provide details on locations, times, and rules and procedures of the test. Mailing information to civic groups is a relatively inexpensive way to alert citizens to the test as well as pointing out the importance of public participation. One California County (Yuba) maintains a "County Election Observer Panel Plan" with the purpose to "provide an avenue for public observation of the election process," where citizens can obtain input and assist in ensuring the integrity of the election process as well as encourage participation and build voter confidence in elections. The county sends letter to political party

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[21] The complete Allen County, Indiana, checklist for the MicroVote voting system is included in Appendix D.

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leaders, advocacy groups, including the League of Women Voters, and other civic

groups. A copy of their plan is available at

www.sos.ca.gov/votingsystems/oversight/eop/nov08/yuba.pdf.

- Video tape the public test. This documentation can become important in the event

  of a discrepancy in the official election results. The videotape should be archived

  as part of the chain of custody of materials relating to the L&A test.

- Document any anomalies in the vote counts of the test. It is important to have a

  documented history of the errors that are detected during the pre-election test.

  The documentation should be archived because it can provide assistance to future

  election officials when they conduct L&A tests.

- A checklist should be prepared and used to assure proper retention and transfer of

  all election records and documents. State laws specify the records that must be

  certified and sets forth the deadlines for transmitting results to the appropriate

  state officials. State and federal laws also specify the time period that voting

  systems and all accompanying records must be sealed and retained in secure

  locations. The checklist is important as a record of the chain of custody of the

  official records and equipment. The checklist should have an item requiring

  periodic review and updating.

Detailed L&A Testing Checklist

The following checklist follows the testing steps outlined in the Generic L&A Testing

Protocol discussed above. It also incorporates steps that were discussed above under "best

practices." The detailed checklist incorporates items from several different protocols in several

different states, including Indiana. In addition, the best practices noted above are included.

- o Establish date of L&A testing in accordance with state law and review checklists
     and chain of custody policies and forms. If chain of custody forms do not exist,
     they should be created, relying of successful procedures from other jurisdictions.

o Assign staff for the following functions: ballot definition (and printing, if needed); verification of ballot styles and preparation and verification of audio ballots; identification and selection of voting systems in accordance with state law.

o Advertise the date, time and place of the public test, including media advances and early briefings. Notify civic groups of the date, time and place of the public test.

o Convene the official meeting of the election officials on the time specified for the public test and begin videotaping the meeting. In turn, conduct the test according to the following steps:

+ Open the polls
+ Verify the zero tapes
+ Conduct the election with test decks, with county employees voting
+ Close the polls
+ Verify the results tapes
+ Examine the audio ballot and disability voting system and verify results

o Verify that the test deck has actual ballots for testing and that the test deck has ballot on demand (BOD) printed ballots, if applicable, and that the test deck has manual marked ballots that include valid votes for each candidate on each measure.

o Verify the test deck includes overvotes (votes in excess of the number allowed to reject such votes) and undervotes (no votes for a specific race or public question).

o Run and verify the zero tapes.

o Upload test results into the election management system.

o Verify the results.

o Verify that appropriate seals are properly installed on equipment.

o Follow procedures to ensure equipment back-up

The detailed L&A testing checklist provides specific steps for preparing and conducting and closing the pre-election test. It is worth noting that the final step is to ensure equipment back-up for the impending election. The Marion County, Indiana, Protocol and Checklist for their ES&S combination voting system provides a detailed listing for this last step. The Marion

County L&A Protocol/Testing Procedures for their voting system is included in Appendix C.

The list also will initiate the broader considerations that must be involved in the actual election. To concentrate checklists into the overall standard operating procedures for conducting an election requires the creation of forms for each step. The forms are largely built around one of the more significant concepts in election administration: the chain of custody.

The Indiana code provides guidelines for the closing of polls at the end of Election Day, with the precinct inspector, "in the presence of the judges and poll clerks" to secure each voting system against more voting and obtains at least one (1) paper printout of the total votes cast for each candidate and on each public question. (IC 3-11-14-30). The code continues with provisions requiring the removal of any memory packs from the voting systems and transporting the packs and each voting system to the place designated by the local election board. The local election officials also sign all statements of the number of votes required by law and the certificates and other pertinent records "shall be returned to the circuit court clerk in the same manner and with the same penalties that are prescribed [in the code]." (IC3-11-14-32).

Whereas specific steps are stated in the statutes, along with the election officials responsible for the actions, there is no standardized protocol or checklist stipulated in the state law. This leaves the responsibility for such procedures in the hands of the local election officials.

Two leading scholars in election administration wrote in 2008 about the chain of custody:

Elections have many critical items, including ballots (paper or electronic) and signed voter registration lists that need to be kept secure throughout the electoral process. However, basic processes and standard operating procedures have not been uniformly adopted across the states for the security of the voting systems. [M]any state laws assume a chain of custody process without defining one. … We are especially cognizant of how election administration is a unique aspect of public administration. Elections are a critical activity of the government…. This creates unique challenges for election officials, who must ensure that the election system produces an outcome in which everyone can have faith. Fortunately, there are model security ballots and voting

systems that provide a chain of custody for the ballots and machines and ensure that the votes produced at the end of the election are authentic.[22]

Alvarez and Hall point out that the chain of custody in the election setting differs from the concept used in legal cases. The election standard is whether the custody of the election materials, such as the ballots and voting systems, meet a criterion "whereby the candidates and the voters can be confident that the election outcome is fair." They contend that a robust chain of custody promotes confidence regardless of the election winners and losers, but if the standard procedures in the chain of custody are weak or questionable, "the losing side may argue that the outcome is unjust."[23] The authors cite examples of states that, as of 2008, had implemented statewide uniform systems of chain of custody procedures. Georgia was one of the earliest states, but Travis County, Texas (Austin), is also cited. Since then, many other states have sought to provide detailed chain of custody procedures. However, states do not mandate their use by local election officials; rather, they are available for consultation and use by the local officials. For example, Indiana's statutory requirements are essential to a comprehensive chain of custody and standard operating procedures, but these requirements do not include a specific document to be used by local election officials. Individual counties, however, have developed forms for their use, referring to state statutes as the legal requirements, but also setting forth checklists and forms.

An internet search of the states and local jurisdictions for chain of custody forms and procedures reveals that many states have provided useful documents that other jurisdictions may consult. The following list provides a summary of some of the more detailed documents and the web addresses for locating the information.

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[22] R. Michael Alvarez and Thad E. Hall. 2008. Building Secure and Transparent Elections through Standard Operating Procedures. *Public Administration Review,* September-October, p. 828.

[23] *Ibid.,* p. 829.

Iowa:	Iowa has the best detailed listing of forms that can be used for every step of testing, Election Day administration and chain of custody. The alphabetical listing for searching for forms provides a comprehensive tally of every step of the election. http://sos.iowa.gov/elections/auditors/forms/alphaindex.html.
Montana:	Montana has created a document of "Uniform Voting System Procedures on Security, Testing and Troubleshooting," that provides a series of forms that addresses inventory of voting systems and voting materials along with ballot security, including pre-election testing through election day to, storage of ballots and voting equipment. http://sos.mt.gov/elections/officials/2012/handouts/uniformvotingsystempr ocedures2.6.2012.pdf.
North Carolina:	North Carolina has a comprehensive security plan, along with separate forms for different election equipment tracking. Of special note is the disaster planning that addresses the capability to restore election data and recovery of election management operations in the case of a disaster. www.ncvoter.net/downloads/NC_security_Plans_10_2_06.pdf.
New York City:	New York City has developed a detailed transportation chain of custody form that includes tracking of every piece of voting equipment, with special attention to the delivery of equipment to polling places. www.ntsdata.com/nyseca/2011conferences/nyc_transport.pdf.
Ohio	Ohio has a developed a comprehensive poll worker manual where a chain of custody form is referenced. www.sos.state.oh.us/upload/elections/forms/400.pdf.

Other states also have made strides in establishing standard operating procedures and chain of custody forms. Election administrators should reference their respective state election division first for any information directly addressing steps required in maintaining the chain of custody of election records and equipment.

VI. Main Principles in Post-Election Audits

When state and local election officials have finalized protocols for public tests and developed the standard operating procedures ensuring the chain of custody of election equipment and records, the aftermath of the election does not relieve the pressure to audit the overall performance and results of the voting.

The following is a discussion of the main principles in post-election audits that are considered in this section.

Ballot Organization and Reconciliation

This key principle calls for simple and straight forward procedures for tracking all ballots in an election. The procedures must include votes cast during early voting, absentee voting, and voting on Election Day. The main focus is on Election Day because that is when most voting occurs, although early voting has increased significantly in the past few election cycles. Ballot organization and reconciliation tracks each ballot at all polling locations and after the election is closed the reconciliation process accounts for all the ballots in each polling place. This process helps to ensure that all ballots cast are counted. Moreover, soiled or defaced ballots, provisional ballots and unused ballots also must be accounted for in terms of the total count.

The Oasis-Open Organization provides an eight-step ballot reconciliation process consisting of the following steps.[24]

- Operator and Witness sign-in

- Paper Ballot Manual Count

- Paper Ballot Scan Count: The Benefits of a Paper Ballot

- Paper Ballot Scan Count: Paper Ballot Scanning Process

- Vote Station Data Loading

- Test Ballot Registration

- Spoiled Ballot Registration

- Paper and Digital Ballot Comparison: Reconciling the Data

- Paper and Digital Ballot Comparison: Precinct Vote Tabulation and Reports

- Operator and Witness sign-off

This process begins with accountability residing in the operator and witness that are responsible for the counting and reconciliation of the ballots. The tallies are ultimately retained in a database. In smaller jurisdictions with fewer voters the ballot control and reconciliation

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[24] The entire document is available at https://lists.oasis-open.org/archives/election-services/200504/pdf00002.pdf.

frequently takes place at various points during the voting day and the tallies are hand calculated. In these situations, one election official is assigned and trained to maintain a running total of all ballots issued that day and reconcile that number with the number of voters. At any juncture, if the tally differs between the number of voters and the number of ballots, the election official investigates to clearly identify the point of difference. This procedure was the common one employed in Indiana on Election Day. The Indiana procedure is closely attuned to the written procedure used in Cuyahoga County, Ohio. The document details the materials needed along with the specific steps that must be taken. The steps and reconciliation figures are tracked via a spreadsheet application on the county election audits website at http://cuyahogaelectionaudits.com/audit/ballot-reconciliation.

Transparency

This key principle in the voting process is vital. The principle has constancy in election literature because it is directly tied to the public's confidence in an election outcome. Transparency is closely tied to post-election audits, particularly an audit referred to as a "vote tabulation audit." Alvarez, Atkeson and Hall quote a standard definition of vote tabulation audits as "the audit of election results, conducted after the polls have closed and before certification of results, by performing manual counts of paper ballots and voter-verifiable paper records in randomly selection units (e.g., voting precincts) and comparing them to the corresponding electronic or manual tallies…."[25] The vote tabulation audit is essentially a manual check of the electronic voting equipment to ensure that the votes have been properly counted. One version of the vote tabulation audit is a random manual tabulation where ballots to be audited are selected randomly and counted and the results are compared with tallies made by the voting system. Again, if differences are detected in the reconciliation, the audit re-traces steps until discrepancies are found and explained.

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[25] R. Michael Alvarez, Lonna Rae Atkeson, and Thad E. Hall, eds. 2012. Confirming Elections: Creating Confidence and Integrity through Election Auditing, Palgrave/Macmillan, p. 12 and ftnt. 13.

Vote tabulation audits are the most frequently used audits in the states. Alvarez, Atkeson and Hall report that in 2008 there were 23 states and the District of Columbia that carried out some form of a vote tabulation audit.[26] They also report that no state or jurisdiction performs a comprehensive, performance audit, which consists of a full pre-election preparation, including L&A testing, through the postelection process. The goal of the comprehensive audit is to make certain that all election workers and officials—as well as voters—followed the correct election processes and procedures of the election. This approach takes a unified view of elections, tying all acts, processes, procedures and regulations together so the entire election management system can be evaluated to ensure the integrity of election outcomes. As the authors contend, such comprehensive audits "would obviously provide a wealth of management information and actionable policy findings and allow all parties to identify the issues surrounding various election processes. However, given that generally the United States has no history of such audits, it may be necessary to move slowly toward this comprehensive model from the existing postelection audit process."[27]

One form of post-election audits—the risk-limiting audit—has recently gained more attention. This audit, called the "gold standard of audits" by the Verified Voting Organization, was adopted by New Mexico in 2009 and California has been piloting program in the counties.[28]

Lindeman and Stark define risk-limiting audits as

[A] method to ensure that at the end of the canvass, the hardware, software, and procedures used to tally votes found the real winners. Risk-limiting audits do not guarantee that the electoral outcome is right, but they have a large chance of correcting the outcome if it is wrong.[29]

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[26] Ibid., p. 9. The National Conference of State Legislatures, relying on data from the Verified Voting Foundation, reported in September, 2012, that 25 states, plus the District of Columbia "require or authorize" post-election audits. The NCSL data are at: www.ncsl.org/legislatures-elections/the-canvass-september-2012.aspx.

[27] Alvarez, et.al. *Confirming Elections,* p. 15.

[28] Alvarez, et.al. *Confirming Elections,* pp. 136-7; and see www.sos.ca.gov/voting-systems/oversight/risk-pilot/draft-audit-instructions.pdf.

[29] Mark Lindeman and Philip B. Stark, "A Gentle Introduction to Risk-limiting Audits," *IEEE Security and Privacy, Special Issue on Electronic Voting,* 2012, pp. 1-7.

Risk-limiting audits randomly sample voting systems, or precincts, or ballots, with a statistical confidence interval, meaning that to achieve a smaller chance of error in the audit more units have to be audited. Ultimately, of course, a recount of all ballots would have to be performed to determine the ultimate outcome. The risk-limits allow the auditors to determine, with statistical confirmation, that a full recount should be undertaken. Statisticians have worked on election auditing for some time, producing an impressive amount of academic research.[30] It is probable that more states will begin using the risk-limiting methodology for future post-election audits.

Indiana is one the states that does not require any form of post-election audits, but there are provisions in the Indiana law for audits. In the Indiana Code (3-11-13-37) the county chairperson of either of the major political parties may petition the local election board to confirm the vote case on a "ballot card" voting system. The petition must be filed no earlier than the Saturday before an election and "no later than the Thursday after an election." The petition cannot exceed more than 5 percent of the precincts "or five (5) precincts, whichever is greater." The county election board conducts the audit, following tests and procedures that have been approved by the state Election Commission. The local election board must certify the audit results not later than noon twelve days after the election. The audit proceedings are open to the public and public notice of the meetings must be given. These Indiana audit provisions are narrower than those of many states, and triggering the post-election audit is in the hands of the local political party chairpersons.

Nearly half the states do not require formal post-election audits and there are several reasons given for not conducting them. One is that vote margins for election victors are usually large enough to eliminate any claims that errors in the vote tabulation would be sizable enough to change the outcome. Several studies confirm that margins of victory in election contests are

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[30] See, for example, Joseph Lorenzo Hall, "Election Auditing Bibliography," February 12, 2010, available at https://josephhall.org/eamath/bib.pdf.

usually large enough to allay claims of vote manipulation or tabulation error. For example, the

Joint Legislative Audit and Review Commission of Virginia conducted a review of post-election

audits of voting equipment in 2010 and had pulled a sample of 416 election contests in the state.

Of those, they found that 384 (87.5%) had margins of victory greater than 10%. Moreover,

Virginia allows a defeated candidate to appeal for a recount if the margin is 1% or less, thereby

opening the argument that validating election outcomes through post-election audits is an

unnecessary requirement.[31] In conversations with election officials in Indiana, the same

argument is made that post-election audits are unnecessary because state laws provide a

mechanism to recount ballots for elected offices as well as public questions.[32] Candidates are

entitled to recounts in Indiana and local party chairpersons also can initiate recounts. The

process begins by filing a petition naming the office to be recounted, along with the precincts,

the names candidates and a "good faith" statement that "the votes cast for nomination or election

to the office at the election in the precincts were not correctly counted and returned." (IC 3-12-

11-3). For federal and state offices, including the state legislature, a 3-member state Recount

Commission has jurisdiction. For local offices, a 3-member Recount Commission is established

and appointed by the circuit court judge.

Indiana's electronic voting systems using touch-screen panels are required to have the

capability of producing a paper image of the ballot cast by each voter. The guidelines used by

the state recount commission permit a party to a recount to request that the individual image in a

DREs memory be printed for use in a recount. In recent years, however, according to the Indiana

Election Division, no candidate has ever requested the ballot images. Consequently, the recent

recounts have merely compared the voting system's vote total printouts with the canvassed

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[31] Joint Legislative Audit Review Commission of Virginia, "Review of Post-Election Audits of Voting Equipment," Commission Briefing, June 14, 2010, p 28.
[32] See IC 3-12-11 and IC 3-12-12.

totals.[33] Most Indiana election officials at the local level were not fully informed about the purpose and procedures of post-election audits, and many compared them to recounts. One county not in the sample (Monroe County in South Central Indiana) contacted the research team and stated that the county had formed an Election Advisory Committee and they were looking into several election issues, including VVPT and post-election audits. Recent minutes of the Monroe County Election Board do not contain any references to post-election audit discussions, however, but the county moved to all paper ballots in the 2012 election.

Indeed, there are several reasons cited to avoid post-election audits. The reasoning that recounting election results is a valid claim, however, is not a compelling factor. Clearly, the purpose of providing for recounts in close contests is different than the purpose served by conducting post-election audits. Alvarez and his co-authors argue that recounts certainly can "clarify the outcome" of a close race, but such races are few and recounts are only intermittent and therefore do not "serve as an essential check on the quality of the election process."[34] In short, a recount is focused on which candidate wins the most votes. A post-election audit focuses on the performance of the voting equipment.

There are additional reasons for opposing post-election audits other than the availability of recount procedures. One such factor is the inertia of custom. Alvarez and his co-authors state that many states and localities rely on the custom that they "have never done [post-election audits] before, so why should they start now?" The "pull" of custom makes resistance to change a powerful trait. Also mentioned are the costs of the audits, as well as the time it takes to properly conduct the audits, particularly given the tight election deadlines that laws impose on the canvassing of official returns and the certification of voting systems. This confidence in customary election practices is prevalent in Indiana, with election officials in all sample counties

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[33] The Indiana Recount Commission Guidelines are at
www.in.gov/sos/elections/files/2012_RecountCommission_Guidelines_and_SBoA_Manual.pdf.
[34] Alvarez, et al., *Confirming Elections,* p. 10.

expressing confidence in their staff members and poll workers and pride in their historical record of administering successful elections without post-election audits.

Concerns over costs of post-election audits clearly have relevance in the counties, given the continual pressure on governmental budgets. There are a few reports on the costs of conducting post-election audits. Dean Logan, the Chief Deputy Registrar-Recorder/County Clerk of Los Angeles County collected cost data he reported at the "Post-Election Audit Summit" in Minneapolis in October, 2007. For a 1% audit in Los Angeles County following the 2006 general election, fifty people were recruited for the "counting boards" and a total of 436 people involved in the entire audit process. There were 25,526 optical scan ballots audited from 88 precincts, encompassing 52 contests. The total came to 1.7 percent of all ballots. The dollar cost was $207,508, but when absentee ballots were included, the cost rose to more than $280,000. Logan also reported the cost of a 1% audit (11,321 ballots) in San Diego, in the same election. The number of people needed was substantially fewer, along with the time needed to conduct the audit. The cost was $44,357. Orange County, California also conducted a post-election audit that year for $66,180. Logan also cited the cost of a post-election audit in King County, Washington, in 2004, with 90,000 optical scan ballots audited for one race. The average cost extrapolated to the statewide audit of 2.4 million ballots at 50 cents per vote was $1,400,000.[35]

In 2010 the Virginia State Legislative Audit and Review Committee also estimated costs for conducting 1% fixed-percentage (vote-tabulation) audit at $145,267.[36]

The key factors affecting the cost of post-election audits include the following:

- The Scope of the Audit: A fixed percentage of precincts/ballots? A tiered percentage (e.g., a sliding percentage of precincts or voting systems based on the victory margin in races)? Number of ballots subject to audit (e.g., percent of

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[35] Dean Logan,"Post-Election Audits: People-Time-Money." Presentation at Post Election Audit Summit, Minneapolis, Minnesota, October 25-27, 2007.

[36] Joint Legislative Audit and Review Commission, "Review of Post-Election Audits of Voting Equipment," June 14, 2010, p. 30. Available at: http://jlarc.virginia.gov/meetings/June10/voteaudits.pdf.

ballots, absentees? provisional ballots? spoiled ballots)? Pilot counties rather than statewide audits?

- The Type of Voting System: DRE; Optical Scan; all paper ballots? Multiple vendors statewide will increase costs.

- Method of Counting: Manual counting by members of a counting or audit board? Verification of vote counts on DREs?

- Size of manual audit boards;

- Labor costs for recruiting and training counters, and supervisors, and selecting equipment & facilities. [37]

A summary of the cost of manually counting ballots in a post-election audit is provided in a 2007 study conducted by Stephen Goggin and Michael Byrne.[38] Following a 2006 study in Georgia, where it was determined that it would cost $3.01 per vote cast to conduct an audit, therefore costing $540,753 to audit all 179,652 votes cast in Cobb County, Georgia, in November 2006.[39] In Goggin and Byrne's experimental study, they used three independent counters—the same as the Georgia pilot study—and they conclude that: "[F]or 120 ballots, we estimate with 95% confidence that it would take between 0.74 and 0.85 hours of labor *per race* for an audit of 120 ballots to be completed."[40] They extrapolate these hours to a complete audit recount of Cuyahoga County, Ohio, with 673,740 voters in the 2004 presidential election would take between 4,155 and 4,772 hours to recount only one race, concluding that "a large recount would be a laborious and costly process."

Goggin and Byrne continued their research on post-election audits in a 2012 article in which they examined the counting procedures used by the auditing groups and the ballot types in

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[37] See Robert Kibrick, Gail Pellerin, Jaime Young, "Resources Needed for Post-Election Audits: People, Time, and Money," Presentation at 2007 Post Election Audit Summit, Minneapolis, Minnesota, October 26, 2007.

[38] Stephen N. Goggin and Michael D. Byrne, "An Examination of the Auditablility of Voter Verified Paper Audit Trail (VVPAT) Ballots," *EVT'07 Proceedings of the ESENIX Workshop on Accurate Electronic Voting Technology,* USNIX Association, Berkeley, CA. Available at:
www.usenix.org/legacy/events/evt07/tech/full_papers/goggin/goggin_html/.

[39] The Goggin/Byrne study cites the Georgia Secretary of State, Elections Division. 2007. "Voter Verified Paper Audit Trail: Pilot Project Report, SB500 2006 Georgia Accuracy in Election Act" at:
http://www.sos.state.ga.us/elections.VVPATreport.pdf.

[40]*Ibid.* Emphasis in original.

the election and found that the "two procedures, quite different in their implementation and employed in real elections in two U.S. states, have built-in redundant checks and multiple tallies to help bolster accuracy; [but] we found that even with this redundancy, errors are surprisingly frequent," but that a clear division of labor among the individual counters and very clear procedures help ensure more accurate audit tallies.[41]

This finding that post-election manual counting of ballots is fraught with errors is confirmed in other studies. Connecticut has one of the strongest post-election audit programs in the nation, wherein 10% of the voting districts are randomly selected and audited. On the request of the Connecticut's Secretary of State, the University of Connecticut VoTeR Center provided a statistical analysis of the post-election audit data for the state following the 2008 November elections. In the summary the authors wrote: "The main conclusion in this report is that for all cases where non-trivial discrepancies were originally reported, it was determined that hand counting errors or vote misallocation were the causes. No discrepancies in these cases were reported to be attributable to machine tabulation."[42]

When Indiana election officials were asked about the major factors they would consider important in initiating post-election audits in the state, the responses were varied, but a central concern was maintaining the integrity of the voting systems because of the aging equipment. County Clerks and election officers are attuned to the reality that voting systems are coming to the end of their useful functionality. The concern is how to preserve the integrity of the elections when using old equipment, yet not having sufficient funds to purchase new equipment. For example the Clerk of the largest Indiana county, Marion, launched a "Voter Experience Project" during the summer of 2013, in which a board of city and civic leaders were appointed to engage in a series of open meetings to learn and discuss the issues involved in replacing the aging voting

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[41] Stephen N. Goggin, Michael D. Byrne and Juan E. Gilbert. 2012. "Rules, Politics and Policy." *Election Law Journal,* March 2012, 11 (1), pp. 36-51.

[42] VoTeR Center, UConn Voting Technology Research Center. 2009. "Statistical Analysis of the Post-Election Audit Data, 2008 November Elections." Version 1.0. May 12, 2009. Available at: www.eac.gov/search/?keywords=UConn.

systems. Leaders of both political parties were in attendance at the meetings, along with elected members of the City-County Council and local civic leaders. This project was aimed at identifying the problems with the aging equipment as well as the technologies that are on the horizon for the next generation of voting systems. Election administration concerns also were addressed, including vote centers. There was no extended discussion of post-election audits. This Marion County approach of public meetings involving civic and political leaders as well as members of the general public has received attention in other counties. At the time of this report (July 2013), the final report of the Voter Experience Project is being written by the staff in the Marion County Clerk's office.

From the 15 Indiana sample counties, election officials in only two counties expressed any interest in investigating post-election audits and even then a major question was cost. There is little enthusiasm at this point in time for initiating post-election audits. This small amount of interest mirrors what the Audit and Review Commission of Virginia found in 2010, where 11% of the General Registrars surveyed said that post-election audits should be required, "mostly if the state provided resources." Even fewer than that (7%) said that post-election audits would "be an effective use of recourses to improve the election process."

The Virginia survey did find that 42% of the General Registrars surveyed thought that "localities should be able to conduct audits at their discretion, but not required to do so." The final conclusion of the Virginia study was the "Post-election audits can provide benefits, but an ongoing, large-scale program may not be necessary to achieve them." That conclusion coincides with the information from Indiana.[43]

Responses from Indiana election officials concerning other improvements to election administration focused on poll worker recruitment and training. When asked if it was becoming more difficult to recruit capable poll workers, the answer was an overwhelming "yes" from the

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[43] Joint Legislative Audit and Review Commission of Virginia, *op. cit.,* pp. 34-35.

15 counties. The poll worker recruitment and training problems undergird the strong movement in Indiana for counties to move to vote centers. Vote centers require fewer poll workers because voters can vote at any vote center in the county. Nine Indiana counties have now adopted vote centers and at last count at least a dozen more were seriously considering moving away from precinct-based polling sites to vote centers.

Audit Procedures and Protocols

In 2010 the State of Virginia, through the authority of the Joint Legislative Audit and Review Commission developed a "Review of Post-election Audits of Voting Equipment." This study summarizes the decisions that must be made in terms of the type of post-election audit that will be pursued (e.g., vote tabulation; tiered—fixed percentage of precincts, machines, or ballots; or risk-limiting audits). Unfortunately, the labels for the different types of post-election audits have not been standardized. Nonetheless, there is widespread agreement among state election officials, interest groups interested in elections, and state election officials, that these three are the ones currently in use.

In the 2010 Virginia study, four pilot counties conducted post-election vote tabulation audits races held in 2009. Precincts were sampled and optical scan voting systems were used in all four counties. In Page County the audit showed four additional votes for the candidate winning the precinct and two additional votes for the other. The deviation in votes was .59 percent for the winning candidate and .65 percent for the losing candidate. The analysis concluded that the deviations were "due to incorrectly-completed ballots that a human could read, but the optical scan machine could not." In the second precinct the audit total exactly matched the Election Day total. Audits in two other counties also showed the exact same votes for the candidates as were reported on Election Day. In the fourth county, Fairfax, six precincts were audited and three of these showed slight deviations of between 1 and 4 votes for a specific candidate. The overall findings across all four counties were:

+ The overall difference between Election Day totals and audit totals across audited precincts equaled .21 percent.

+ Differences between Election Day and audit totals would not change election outcomes in all but closest elections.

+ The optical scan machines were adept at reading many, but not all, ballots incorrectly completed by voters.[44]

The Virginia results are similar to many other post-election audits. The voting systems are generally found be very close to the exact totals of the audit, with any errors usually attributed to optical scanning equipment being technologically unable to precisely read the intent of a voter who does not mark the ballot properly.

Creating a protocol for conducting post-election audits depends on the type of audit the policy-makers choose. Most states that have implemented post-election audits have opted for the vote-tabulation approach. This type of audit requires a random sample of precincts or ballots. There are many decisions that must be made before launching a post-election audit and expert advice will be needed in most cases, particularly in counties with small staffs.

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[44] Joint Legislative Audit and Review Commission of Virginia, *op.cit.*, p. 21.

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APPENDIX A

<u>State Election Codes on L&A Testing</u>

	State	Public Test	Reference (State Election Code and Administrative Rule where available)
1	Alabama	All voting equipment must be publicly tested at least 14 days prior to election	Alabama Code of 1975 §§ 17-2-4, 17-7-21, 17-7-23, 17-7-27;Administrative Code Chapter 307-X-1
2	Alaska	Yes, all	Alaska Statutes §§ 15.15.032, 15.20.900, 15.20.910; 6 AAC 25.045
3	Arizona	Yes	Arizona Election Code§16-449; A.R.S. § 16-449.
4	Arkansas	Yes, all	Arkansas Code § 7-5-515
5	California	Yes	§§ 19100-19255; 19320-19323
6	Colorado	Yes, appropriate number	Colorado Revised Statutes §§ 1-7-509;Election Rules [8 CCR 1505-1], Rules 11.5.3 11, 35-37, 45
7	Connecticut	Yes, State law requires the machines to be tested prior to each election and certified according to EAC standards and a process established by the Secretary of State	General Statutes of Connecticut §§ 9-240a, 9-241, 9-242, 9-242b, 9-242c; Secretary of the State Regulations §§ 9-241-30
8	Delaware	Testing requirements are not specified by law	
9	Florida	Yes, County elections supervisors must conduct pre-election public testing of all voting equipment not more than 10 days prior to the commencement of early voting.	Florida Statutes Title IX §§ 101.5612; Florida Administrative Code §§ 1S-2.015, 1S-5.001
10	Georgia	Yes, Prior to each election, each county superintendent is required to conduct public testing of voting equipment	Code of Georgia Annotated §§ 21-2-322, 21-2-324, 21-2-379.1, 21-2-379.6; Georgia Rules and Regulations §§ 590-8-1-.01, 183-1-12-.01, 183-1-12-.02
11	Hawaii	Yes, Experimental testing by qualified observers before and after the election,	§§ 16-1, 16-2, 16-12, 16-42; Hawaii Administrative Rules §§ 2-54-1, 2-54-4
12	Idaho	Yes, Pre-election testing and public demonstration of all voting equipment is required	§§ 34-2405, 34-2409, 34-2416, 34-2426
13	Illinois	Yes, Pre-eletion public testing and demonstration of all voting equipment is required	10 Illinois Compiled Statutes §§ 5/24C-9, Illinois Administrative Code Title 26 § 204-206

14	Indiana	Yes, Public tests of voting systems must also occur at least 14 days prior to Election Day; Varies by machine and county	Indiana Code §§ 3-11-7, 3-11-7.5, 3-11-13, 3-11-14, 3-11-14.5, 3-11-15, 3-11-16
15	Iowa	Yes, Pre-election public testing of all voting equipment	§§ 52.2, 52.5, 52.7, 52.35; Iowa Administrative Code § 721—22.43
16	Kansas	Yes, County commissioners are required to conduct pre- (at least 5 days prior) and post-election public testing of all voting equipment	§§ 25-4404, 25-4406, 25-4411, 25-4603, 25-4610;Kansas Election Standards, Chapter II
17	Kentucky	Yes, County election officials are required to conduct pre-election public testing of all voting equipment at least five days prior to an election	Revised Statutes §§ 117.125, 117.165, 117.377, 117.379,117.381, 117.389; 31 Kentucky Administrative Regulations 2:020
18	Louisiana	Yes, all	Revised Statutes §§ 18:1373
19	Maine	Yes, Pre-election testing required	Revised Statutes Title 21-A Ch.9, Sub.6, Art. 2, §§ 854
20	Maryland	Yes, All machines must be tested at least 10 days prior to election	§§ 9-101, 9-102; Code of Maryland Regulations §§ 33.09.02—33.09.07, 33.10.02, 33.10.11
21	Massachusetts	Yes, Local election officials are required to conduct pre-election testing of all voting equipment no later than one week prior to election	General Laws, Chapter 54 §§ 32, 33, 33A,33F, 34
22	Michigan	Yes, Pre-election public testing of all voting systems is required	§§ 168.37, 168.795, 168.794, 168.795, 168.795a,168.798; Department of State Rules 168.771-168.793
23	Minnesota	Yes, Minnesota requires pre-election testing within 14 days of an election; May test sample	§§206.57; 206.81; 206.82 Minnesota Administrative Rules Chapter 8220.1550
24	Mississippi	Yes, Pre-election testing is required for DREs and pre-count testing for any optical scan systems still in use.	Title 15 §§ 23-15-169.3, 23-15-169.6, 23-15-481, 23-15-521, 23-15-531.1, 23-15-531.4
25	Missouri	Yes, prior to each election	Revised Statutes of Missouri §§ 115.225.1, 115.233, 115.249, 115.479;15 CSR 30-10.010, 15 CSR 30-10.010—15 CSR 3010.160
26	Montana	Yes, Pre-election performance testing of at least 10% of all voting systems is required and Election Day test of at least 5% also required	Annotated §§ 13-17-101, 13-17-103, 13-17-104, 13-17-107, 13-17-211, 13-17-212; Administrative Rules of Montana 44.3.1701—44.3.1717

27	Nebraska	Yes, County commissioner will conduct at least three tests in public	Revised Statutes §§ 32-1041, 32-1044, 32-1045, 32-1049
28	Nevada	Yes, prior to each election	http://www.leg.state.nv.us/NRS/NRS-293B.html#NRS293BSec150; Revised Statutes §§ 293.2696, 293B.063, 293B.082, 293B.084, 293B.104, 293B.105, 293B.140, 293B.150, 293B.400; Nevada Administrative Code Chapter 293B)
29	New Hampshire	Yes	RSA 656:42 http://sos.nh.gov/WorkArea/DownloadAsset.aspx?id=27638; Annotated §§ 656:1-a , 656:40, 656:41, 656:42, 656:43-a
30	New Jersey	Yes	19-48-6; Annotated §§ 19:48-1, 19:48-2, 19:48-3, 19:48-4, 19:48-6, 19:50-2, 19:53A-2. 19:53A-3, 19:53A-4, 19:53A-8
31	New Mexico	Yes, At least 1o days prior to election	1-11-6. http://www.sos.state.nm.us/Legislation_And_Resources/NMElectionHandbook_2011.pdf; Annotated §§ 1-9-1, 1-9-2, 1-9-4.1, 1-9-5, 1-9-7.1, 1-11-6.1, 1-9-12, 1-9-15, 1-9-16; New Mexico Administrative Code §§ 1.10.20.3, 1.10.20.8,1.10.20.9, 1.10.20.10, 1.10.21.3, 1.10.21.8, 1.10.21.9
32	New York	Yes, Details promulgated by State Election Board	7–207 Subsection 2. §§ 8-302, 8-303, 8-304
33	North Carolina	Yes	08 NCAC 04 .0307 http://reports.oah.state.nc.us/ncac/title%2008%20-%20elections/chapter%2004%20-%20voting%20equipment/08%20ncac%2004%20.0307.html; §§ 163-33.2, 163-165.7, 163-165.8, 163-165.9; North Carolina Administrative Code §§ 04 .0301, 04 .0302, 04 .0306, 04 .0307

34	North Dakota	Yes, pre-election testing of all voting equipment at least a week prior to an election	16.1-06-15 https://vip.sos.nd.gov/pdfs/Portals/2012%20Election%20Law%20Book%20with%20Index.pdf; §§ 16.1-06-10.1, 16.1-06-11, 16.1-06-14, 16.1-06-15, 16.1-06-26; North Dakota Administrative Code Article 72-06
35	Ohio	Yes	3506.14B, DIRECTIVE 2008-28
36	Oklahoma	Yes	§§ 26-9-115, 26-21-101, 26-21-102; Oklahoma Administrative Code 2008 §§ 230:50-3-64—230:50-3-70, 230:50-9-1
37	Oregon	Yes	Revised Statutes §§ 246.530, 246.550, 246.560, 246.565, 254.074, 254.235, 254.525; Oregon Administrative Rules § 165-007-0250
38	Pennsylvania	Yes, open to party representatives and county boards of elections are required to publicly exhibit voting systems for the instruction and information of voters	25 P.S. § 3031.14; 25 P.S. §§ 3006, 3007, 3011, 3015, 3031.5, 3031.7, 3031.11, 3031.14
39	Rhode Island	Yes	§§ 17-19-2, 17-19-2.1, 17-19-3, 17-19-8.2, 17-19-13, 17-19-14
40	South Carolina	Yes, all, on or before third day prior to election	§§ 7-13-1390,
41	South Dakota	Yes, Testing requirements are set by the State Board of Elections in the Administrative Code Chapter 5:02:09.	12-17B-5; §§ 12-17B-2, 12-17B-2.1, 12-17B-3, 12-17B-5, 12-17B-12, 12-17B-17;
42	Tennessee	Yes	1360-2-12-.08 TESTING AND SEALING; Annotated §§ 2-2-115, 2-7-112
43	Texas	Yes, Pre- and post-election testing is required and as are daily audits of DRE machines during the early voting period to ensure accuracy	§§ 122.001—122.099, 123.001, 127.091—127.098, 127.152, 129.001; Texas Administrative Code §§ 81.45, 81.60, 81.61
44	Utah	Yes	§§ 20A-5-302, 20A-5-402.5, 20A-5-402.7 Title 20A Chapter 4 Section 104

45	Vermont	Yes, at least 10 days prior	17 V.S.A. section 2493. Subsection (b) Procedures http://vermont-elections.org/elections1/votetabulators.html; Title 17 §§ 2491—2493; Code of Vermont Rules §§ 04 010 001
46	Virginia	Yes (EAC Quick guide)	§ 24.2-633.§§ 24.2-626, 24.2-626.1, 24.2-629, 24.2-632, 24.2-633, 24.2-635; HAVA Virginia State Plan, Amended 2006, pp. 4, 14
47	Washington	Yes	WAC 434-335-300 RCW 29A.04.611. 08-05-120, § 434-335-300,;§§ 29A.12.020, 29A.12.040, 29A.12.050, 29A.12.080, 29A.12.085, 29A.12.130, 29A.12.140; Washington Administrative Code Chapter 434-335
48	West Virginia	Yes, Pre-election public testing of precinct-based voting systems is required as well as pre-count testing of any central-count vote tabulating systems.	WV Code § 3–4a–13 and 17.§§ 3-1-49, 3-1A-5, 3-1C-1—3-1C-4, 3-4A-3, 3-4A-8, 3-4A-9, 3-4A-9a, 3-4A-13, 3-4A-26
49	Wisconsin	Yes, Pre-election public testing of all voting systems is mandatory	chapter 5, Subsec. 3, 5.84(1); §§ 5.40, 5.76, 5.84, 5.905, 5.91; GAB 7.01—7.03
50	Wyoming	Yes, Pre-election public testing of all voting systems is required. Testing and security procedures are promulgated by the Secretary of State.	22-10-108; §§ 22-11-102, 22-11-103, 22-11-104; Secretary of State Rules 7042-7044
		Sources Consulted: Center for Democracy and Election Management, *Election Administration Profiles of all Fifty States, July 15, 2009;* **U.S. Election Assistance Commission ,** *State Requirements and the Federal Voting System Testing and Certification Program;* **State government websites.**	

APPENDIX B

Indiana Election Code on Public Tests of Electronic Voting Systems

Indiana Code 3-11-14.5

Chapter 14.5. Public Tests of Electronic Voting Systems

IC 3-11-14.5-1

System test; random selection of precincts

Sec. 1. At least fourteen (14) days before election day, the county election board of each county planning to use an electronic voting system at the next election shall randomly select at least three (3) precincts within the county and test the voting system units to be used at those precincts on election day. Each voting system shall be tested to ascertain that the system will correctly count the votes cast for all candidates and on all public questions in that precinct.
As added by P.L.221-2005, SEC.91.

IC 3-11-14.5-2

Public notice of test

Sec. 2. Public notice of the time and place shall be given at least forty-eight (48) hours before the test. The notice shall be published once in accordance with IC 5-3-1-4.
As added by P.L.221-2005, SEC.91.

IC 3-11-14.5-3

Certification of test by election board

Sec. 3. The two (2) appointed members of the county election board shall observe the test required by this chapter and, if they so determine, shall certify the test as meeting the requirements of this chapter.
As added by P.L.221-2005, SEC.91.

IC 3-11-14.5-4

Test open to public

Sec. 4. The test must be open to representatives of political parties, candidates, the media, and the public.
As added by P.L.221-2005, SEC.91.

IC 3-11-14.5-5

Requirements for test

Sec. 5. The test required by this chapter must include the following:
(1) The visual inspection of the voting system and ballot labels.
(2) The manual entry of a preaudited group of ballots marked so as to record a predetermined number of valid votes for each candidate and on each public question.
(3) At least one (1) ballot for each office that has votes in excess of the number allowed by law in order to test the ability of the electronic voting system to reject the overvotes.
As added by P.L.221-2005, SEC.91.

IC 3-11-14.5-6

Errors; determination of causes; correction; errorless retest

Sec. 6. If an error is detected during the test required by section 5 of this chapter, the cause of the error shall be determined and corrected, and an errorless count must be made before the use of the electronic voting system at the election is approved.
As added by P.L.221-2005, SEC.91.

IC 3-11-14.5-7

Sealing voting system and test materials after completion

Sec. 7. After completion of the count, the voting system shall be sealed. The ballots used to conduct the test and all other election materials shall be sealed, retained, and disposed of as provided for paper ballots.
As added by P.L.221-2005, SEC.91.

IC 3-11-14.5-8

Test of vote tabulation component from tested voting systems

Sec. 8. Immediately following the completion of the voting system test under section 5 of this chapter, the county election board shall enter the vote totals from the voting systems tested under this chapter into the component of the voting system used by the county election board to tabulate election results under IC 3-12-3.5. The board shall determine whether this component of the voting system properly tabulates the votes cast in each of the precincts tested under this chapter.
As added by P.L.221-2005, SEC.91.

IC 3-11-14.5-9

Certification of test results to election division

Sec. 9. Not later than seven (7) days after conducting the tests required under this chapter, the county election board shall certify to the election division that the tests have been conducted in conformity
with this chapter.
As added by P.L.221-2005, SEC.91.

IC 3-11-14.5-10

Copy of certification kept with election returns

Sec. 10. A copy of the certification of the tests conducted under this chapter shall be filed with the election returns.
As added by P.L.221-2005, SEC.91.

APPENDIX C

Marion County (Indianapolis) L&A Protocol/ Testing Procedures

ES&S iVotronic and M100

Marion County Election Board
Logic and Accuracy Testing Procedures
--Clear & Test
--Check Time/Date, Audio Ballot
--Calibrate Screen

L&A Testing Procedures

1. Retrieve the following from Front Table:

    1.1. PEB, FLASH CARD, and PCMCIA (M100) CARD(s)

    1.2. PEB# Card, Test deck

    1.3. A labeled iVO "Luggage" Tag, zip tie, PEB# sticker and M100 sticker.

2. **Preparing The iVOTRONIC (iVO)**

    2.1. Before starting, look over the iVO case. Make sure…

    2.2. The black case is in good condition

    2.3. The handle works and is affixed to the case properly

    2.4. Check to make sure there are four (4) sets of legs

    2.5. Uncoil the power cord, shut, and secure the cover.

    2.6. Open up the iVO case

    2.7. Look at the hinges and make sure they are in good condition

    2.8. Look at the iVO terminal and make sure it is in good condition

    2.9. Check the seal eyelets at the top of the machine to make sure they are not broken or are not ready to break.

    2.10. If the case and terminal are in good working order, proceed to Step 2.11.

        2.10.1.   If the case or the terminal is not in working order, request a new machine.

    2.11. **IMPORTANT: Plug in the iVO.**

2.12. **THESE STEPS ARE VERY IMPORTANT.** **If something is discovered after the terminal has been tested, it will have to be replaced, and you will have to start over.**

3. **Clear and Test the iVO**

   3.1. NO FLASH CARD NEEDED FOR THE FOLLOWING STEPS

   3.2. Insert the CLEAR & TEST PEB into the iVO terminal (**DO NOT hold down the VOTE button**)

   3.3. Enter Clear & Test Password

      3.3.1. CLRCLR

   3.4. Press "OK"

   3.5. Press the VOTE button to Clear & Test the machine

   3.6. Remove the CLEAR & TEST PEB when instructed

   3.7. Press "OK" when the process is finished

4. **Calibrate iVO Screen**

   4.1. Hold down the VOTE button and insert the CLEAR & TEST PEB. Continue to hold down the VOTE button until the unit chirps **several times**.

   4.2. At the TERMINAL MENU, press the VOTE button to calibrate the screen

   4.3. Look closely at the instructions, and press the VOTE button again to continue

   4.4. Using your finger, press the "line intersection" or "X". It will move to a new position.

   4.5. Continue to follow the "X" around the edges of the screen and then into the center.

   4.6. It will prompt you to touch the screen to verify that where you press, the "X" follows your finger.

   4.7. Repeat the four (4) times to confirm proper calibration.

   4.8. Press the VOTE button to exit the calibration process.

   4.9. Touch the screen to return to the TERMINAL MENU

5. **Check Date/Time & Audio Ballot**

   5.1. At the TERMINAL MENU, choose "Setup & Configuration"

   5.2. Enter the SERVICE MENU password

      5.2.1. SVCSVC

   5.3. Press "OK"

   5.4. At the SETUP & CONFIGURATION MENU, choose "Configure Terminal"

   5.5. At the CONFIGURE TERMINAL MENU, choose "Set Time and Date"

5.6. Set the time to **ELECTION DAY TIME and confirm the DATE IS CORRECT**

    5.6.1. Press the boxes above and below each number to change the value

5.7. **Make sure "Use Automatic Daylight Savings Time Correction" is NOT CHECKED**

5.8. When finished, press "Done" to the right and return to the CONFIGURE TERMINAL MENU

5.9. At the CONFIGURE TERMINAL MENU, select "Enable Audio Ballot"

5.10. **Make sure there is a RED "X" in the box**

5.11. Touch "OK" and return to the CONFIGURE TERMINAL MENU

5.12. Remove the CLEAR & TEST PEB

5.13. Press the VOTE button to exit

5.14. Set aside the CLEAR & TEST PEB

6. Testing the iVO

6.1. Place the small PEB # sticker on the top half of the iVO behind the right, blue clip.

    6.1.1. Make sure the "PEB# XXX" is pointed toward the ceiling.

6.2. Insert Flash Card into the iVotronic

    6.2.1. NOTE: The Flash Card (Make sure the sticker/number is face up).

6.3. Hold down the VOTE button while placing the Election Day PEB ("PEB") into the iVotronic. Continue to hold down the VOTE button until the unit chirps **several times**.

6.4. Release the VOTE button, and the TERMINAL MENU will appear.

6.5. From the main TERMINAL MENU, select "LOGIC & ACCURACY"

6.6. Enter password: SVCSVC and press "OK"

6.7. Select "L & A VOTE FOR ONE TEST"

6.8. Touch the VOTE button to continue

6.9. Touch the screen, as instructed, when the Logic and Accuracy Testing is completed

6.10. Select "DISPLAY L & A VOTE TOTALS"

6.11. Once complete select "YES" to view L & A Totals

6.12. Confirm that the information displayed on the iVO screen matches the current information being tested (Look at the "Luggage Tag")

6.13. Confirm that that each candidate/question received at least one (1) vote

6.14. Follow the instructions on the screen to advance pages

6.15. Once all data has been confirmed on the report, press the screen to EXIT

6.16.   When the report is finished (Report Finished will appear), press the screen to continue

6.17. From the LOGIC AND ACCURACY TESTS menu select "CLEAR AND TEST TERMINAL"

6.18. Press the VOTE button to clear the results

6.19. When complete, the screen will return to the LOGIC & ACCURACY TESTS menu

6.20. Select "EXIT MENU"

6.21. Remove the PEB and press the VOTE button to power down the iVotronic.

7. Preparing the M100

7.1. With the non-red key, unlock the "Access Control Panel" and remove the "Jackson Lid."

7.2. Open the Ballot Bin door to the right or left, and remove the power cord.

7.3. Slide the M100 forward, plug the power cord into the unit and into an outlet.

7.4. Place the corresponding M100 label(s) on the inside of the front, security flap (probably over an existing label)

7.5. Grab a PEB READER from the box under your workstation. Take it out of the bag and unwind the cables.

7.6. Ensure the cables are securely fastened to the base.

7.7. Plug in the power cable to an outlet.

7.8. Plug in the serial cord into the port behind the "big garage door."

7.9.   Make sure the cords are out of the way and place the PEB Reader base to the right or left of the M100 unit.

7.10.   Keep the M100 pulled forward and make sure your M100 power cable is draped over the back of the ballot bin.

8. Testing the M100

8.1. Insert the M100 card into the top slot of the "small garage door," female end first

8.2. Insert the RED supervisor key

8.3. Turn the key clockwise to the OPEN/CLOSE position

8.4. Once the M100 boots up, the following message will appear

8.4.1.   Election Card Inserted. Open Polls Now?

8.4.2.   Press "YES"

8.5. The M100 will beep and display instructions to turn the key to the VOTE position

8.6. Next, the M100 will display "PLEASE CONNECT THE PEB READER THEN INSERT THE SUPERVISOR PEB", **select "<u>CANCEL</u>"**

8.7. Enter the password (1-2-3) and press "ENTER"

8.8. When the machine displays the option to Generate Additional Zero Report – press "NO."

8.9. Run the test deck through the M100.

8.10. Override and accept the Blank and Over-voted Ballots.

8.11. Once the test deck is complete, turn the key **<u>counter-clockwise</u>** to the OPEN/CLOSE POSITION, press "CLOSE POLLS."

8.11.1. <u>DO NOT TURN THE KEY CLOCKWISE</u>

8.12. The M100 will display instructions to connect the PEB READER, place the ELECTION DAY PEB into the reader and press "CONTINUE"

8.13. The M100 will print a merged TOTALS TAPE. Do not print any additional tapes if prompted

8.14. Check for two columns

8.15. Leave the key in the OPEN/CLOSE position, and remove the M100 Card

8.16. The screen will display "NO ELECTION CARD INSERTED"

9. Closing and Sealing the Machines

9.1. Return the ZERO TAPE, TOTALS TAPE, PEB# CARD, and TEST DECK to the front table.

9.2. Take the M100 Card and PEB to the Central Tabulation Table and wait for the PEB and M100 card(s) to be read into the system.

9.3. Return to the front table and receive a wire seal, a plastic zip tie seal, a padlock seal, an M100 magnet, and a "Don't Forget Me" tag.

9.4. The M100 card(s) will be returned to you.

9.5. Return to the machines you've just tested, and write down your PEB # and the Serial # of your iVO on your LOG.

9.6. Seal the iVO FLASH CARD:

9.6.1. Unplug the iVO terminal, and lift it toward you.

9.6.2. Close the Flash Card door until it is to the right of the eyelets.

9.6.3. Insert the end of the wire into the closest eyelet to you and then through the rear eyelet.

9.6.4. Insert the end of the wire into top hole to the left the knob.

9.6.5.   Pull the wire until the loop is about 1-2" in diameter.

9.6.6.   <u>DO NOT PULL IT TIGHT! Leave some slack in the wire (about two fingers).</u>

9.6.7.   Twist the knob. It only takes a quarter to half a turn to secure the wire.

9.7. Tie the "DON'T FORGET ME!!" tag to the wire seal wire.

9.8. Tag the iVO with the "Luggage Tag"

9.8.1.   <u>Put the zip tie through ONLY the bottom left-hand hole.</u>

9.8.2.   DO NOT put the zip tie through both holes or it will seal the machine closed. **Remember: <u>HOLE IN ONE!!</u>**

9.9. Close up the iVO, and wind the cord up properly

9.10.   Seal the iVO on the right-hand side through BOTH HOLES using the GREEN plastic numbered seal

9.11. Move on to the M100

9.12. Insert the M100 Card

9.13. Clear the M100 Card – VERY IMPORTANT STEP

9.13.1.   At the CLOSED POLLS menu, choose "MORE"

9.13.2.   Choose "RE-OPEN" Polls

9.13.3.   Enter the password (1-2-3) and press "ENTER"

9.13.4.   When prompted, press "YES"

9.13.5.   Press "YES" again to confirm that you want to clear the M100 Card

9.13.6.   **STOP** at the "OPEN POLLS NOW?" menu and proceed to the next step

9.14. STOP AND FLAG A SUPERVISOR TO CHECK YOUR WORK

9.15. Check the printer paper again, and replace if more than half used (unlikely)

9.16. Turn M100 Key to OFF position and remove the keys

9.17. Disconnect the PEB READER

9.18. Seal the M100 Card into the machine using the PADLOCK SEAL

9.19. Tie on the "DON'T FORGET ME!!" tag

9.20. Pull the M100 forward, and unplug it. Remove the power cord.

9.21.   Place the "Jackson Lid" on top of the machine making sure the tabs lock in the back and the front

9.22. Reseat the M100 by pushing it back and making sure it is flush with the ballot bin

9.23. Place the magnet on top of the "Jackson Lid"

9.24. **IMPORTANT: <u>BE SURE TO VERIFY THE CORRECT MAGNET IS ON TOP OF THE CORRECT M100</u>**

9.25. Close all doors and lock them with the non-red M100 key.

10. **<u>Once the machines have been properly closed and sealed, new ones will be provided.</u>**

11. **<u>Return to STEP 1.</u>**

You will be directed to use the following instructions AFTER all regular Logic & Accuracy Testing has finished.

Marion County Election Board
iVotronic Back-Up Equipment Testing Procedures
--Clear & Test
--Check Time/Date, Audio Ballot
--Calibrate Screen

1. Retrieve the following from Front Table:

    1.1. FLASH CARD

    1.2. A labeled iVO "RESERVE IVO #" Tag, a zip tie, a wire seal, a plastic zip tie seal, and a "Don't Forget Me" tag.

2. **Preparing The iVOTRONIC (iVO)**

    2.1. Before starting, look over the iVO case. Make sure…

    2.2. The black case is in good condition

    2.3. The handle works and is affixed to the case properly

    2.4. Check to make sure there are four (4) sets of legs

    2.5. Uncoil the power cord, shut, and secure the cover.

    2.6. Open up the iVO case

    2.7. Look at the hinges and make sure they are in good condition

    2.8. Look at the iVO terminal and make sure it is in good condition

    2.9. Check the seal eyelets at the top of the machine to make sure they are not broken or are not ready to break.

    2.10. If the case and terminal are in good working order, proceed to Step 2.11

        2.10.1. If the case or the terminal is not in working order, request a new machine.

    2.11. **IMPORTANT: Plug in the iVO.**

    2.12. **THESE STEPS ARE VERY IMPORTANT. If something is discovered after the terminal has been tested, it will have to be replaced, and you will have to start over.**

3. **Clear and Test the iVO**

    3.1. Insert the Flash Card into the iVO

    3.2. Insert the CLEAR & TEST PEB into the iVO terminal (**DO NOT hold down the VOTE button**)

3.3. Enter Clear & Test Password

    3.3.1.   CLRCLR

3.4. Press "OK"

3.5. Press the VOTE button to Clear & Test the machine

3.6. Remove the CLEAR & TEST PEB when instructed

3.7. Press "OK" when the process is finished

4. Calibrate iVO Screen

4.1. Hold down the VOTE button and insert the CLEAR & TEST PEB. Continue to hold down the VOTE button until the unit chirps **several times**.

4.2. At the TERMINAL MENU, press the VOTE button to calibrate the screen

4.3. Look closely at the instructions, and press the VOTE button again to continue

4.4. Using your finger, press the "line intersection" or "X". It will move to a new position.

4.5. Continue to follow the "X" around the edges of the screen and then into the center.

4.6. It will prompt you to touch the screen to verify that where you press, the "X" follows your finger.

4.7. Repeat the four (4) times to confirm proper calibration.

4.8. Press the VOTE button to exit the calibration process.

4.9. Touch the screen to return to the TERMINAL MENU

5. Check Date/Time & Audio Ballot

5.1. At the TERMINAL MENU, choose "Setup & Configuration"

5.2. Enter the SERVICE MENU password

    5.2.1.   SVCSVC

5.3. Press "OK"

5.4. At the SETUP & CONFIGURATION MENU, choose "Configure Terminal"

5.5. At the CONFIGURE TERMINAL MENU, choose "Set Time and Date"

5.6. Set the time to **ELECTION DAY TIME and confirm that the DATE IS CORRECT**

    5.6.1.   Press the boxes above and below each number to change the value

5.7. **Make sure "Use Automatic Daylight Savings Time Correction" is NOT CHECKED**

5.8. When finished, press "Done" to the right and return to the CONFIGURE TERMINAL MENU

5.9. At the CONFIGURE TERMINAL MENU, select "Enable Audio Ballot"

5.10. **Make sure there is a RED "X" in the box**

5.11. Touch "OK" and return to the CONFIGURE TERMINAL MENU

5.12. Remove the CLEAR & TEST PEB

5.13.   Press the VOTE button to exit

5.14.   Set aside the CLEAR & TEST PEB

6. **Closing and Sealing the Machines**

6.1. Write down your RESERVE IVO # and the Serial # of your iVO on your LOG.

6.2. Seal the iVO FLASH CARD:

    6.2.1.   Unplug the iVO terminal, and lift it toward you.

    6.2.2.   Close the Flash Card door until it is to the right of the eyelets.

    6.2.3.   Insert the end of the wire into the closest eyelet to you and then through the rear eyelet.

    6.2.4.   Insert the end of the wire into top hole to the left the knob.

    6.2.5.   Pull the wire until the loop is about 1-2" in diameter.

    6.2.6.   DO NOT PULL IT TIGHT! Leave some slack in the wire (about two fingers).

    6.2.7.   Twist the knob. It only takes a quarter to half a turn to secure the wire.

6.3. Tie the "DON'T FORGET ME!!" tag to the wire seal wire.

6.4. Tag the iVO with the "Luggage Tag"

    6.4.1.   Put the zip tie through ONLY the bottom left-hand hole.

    6.4.2.   DO NOT put the zip tie through both holes or it will seal the machine closed. **Remember: HOLE IN ONE!!**

6.5. Close up the iVO, and wind the cord up properly

6.6.   Seal the iVO on the right-hand side through BOTH HOLES using the GREEN plastic numbered seal

6.7.   Alert staff to receive a new iVO and start again at "Step 1: Retrieve the following from the Front Table" of this section.

Marion County Election Board
M-100 Back-Up Equipment Testing Procedures

1. Preparing the M100
    1.1. Check the M100 for physical damage
    1.2. Enable the PEB Reader

1.2.1.   Insert Election Card and turn Key to Open/Close Polls

1.2.2.   When OPEN POLLS NOW appears **STOP!**

1.2.3.   Press the first and third M100 buttons at the same time and release

1.2.4.   Select DIAGS

1.2.5.   Select MORE DIAGS

1.2.6.   Select PEB SETUP

1.2.7.   Verify the PEB Reader is enabled

    1.2.7.1.   If the screen says DISABLED, press the button below "ENABLE"

1.2.8.   Select PREVIOUS

1.2.9.   Select PREVIOUS

1.2.10. Select PREVIOUS

1.2.11. STOP!!

1.3. Set the Time and Date

    1.3.1.   Select System Settings

    1.3.2.   Select Date/Time

    1.3.3.   Start from Right To Left

    1.3.4.   Select ZONE, should be -5 and DST should be disabled

1.4.   Select PREVIOUS

1.5.   Select TIME, change if needed (time is military)

1.6.   Select PREVIOUS

1.7.   Select DATE, change if needed

1.8.   *(NOTE: If cursor does not appear you are running on battery power!)*

1.9.   When complete select PREVIOUS

1.10. Select PREVIOUS

1.11. STOP!!

1.12. When LOCK OUT SYSTEM SETTINGS appears select **NO** (*VERY IMPORTANT!*)

1.13. Select PREVIOUS

2. Testing the M100

    2.1.   At the ELECTION CARD INSERTED OPEN POLLS NOW?

    2.2.   Select "YES" and turn the key to the VOTE position

    2.3.   Cancel the PEB Reader option

    2.4.   Enter the override password 1 – 2 – 3

    2.5.   Cancel Report Printing? "YES"

    2.6.   Select "NO" to Additional Reports

    2.7.   Scan the Test Deck, as directed in the regular instructions

    2.8.   Once complete, turn the key COUNTER CLOCKWISE to OPEN/CLOSE POLLS

    2.9.   Select CLOSE POLLS

    2.10.   Cancel the PEB Reader option

    2.11.   Enter the override password 1 – 2 – 3

    2.12.   Cancel Report Printing? "YES"

    2.13.   Select MORE

    2.14.   Select REOPEN POLLS

    2.15.   Enter the override password 1 – 2 – 3

2.16. The screen will display "CLEAR ELECTION DAY TOTALS"?

2.17. Select YES

2.18. Select YES

2.19. Turn off the M100 and remove the card

2.20. Label M100 with ELECTION DAY BACKUP STICKER

2.21. Alert staff to receive a new M100 and start at "Step 1: Preparing the M100" of this section.

APPENDIX D

ALLEN COUNTY (Fort Wayne) Checklist for Public Test

MicroVote Voting System

Public Test Checklist for Allen County Election Board

DREs: 3-11-14.5

Starting 2 months prior to testing date:

Schedule date and time – at least 14 days before election

Notify Republican and Democrat Board Members of dates – if they can not make it, they can assign proxy

Schedule mechanic to help with test - advise mechanic of machines that will be tested

Randomly select three precincts - pull out of hat

Identify voting machines with precincts on them

Prepare Predetermined Vote Worksheet for DREs

Create a spreadsheet that lists every machine with one of the precincts on it

Record a predetermined number of valid votes for each candidate and/or public question per precinct per machine

At least one vote for each candidate running for office

At least one scenario that has votes in excess of the number allowed

Create reports that total votes per candidate, per candidate per machine and total votes per machine

Prepare Predetermined Ballots for Optical Scan

Create spreadsheet that lists every precinct selected

Record a predetermined number of valid votes for each candidate and/or public question per precinct

Record at least one vote for each candidate running for office

At least one scenario that has votes in excess of the number allowed

Create reports that total votes per candidate, per candidate per precinct and total votes per precinct

Mark Test Ballot Cards with votes as determined on spreadsheet

Week Before:

Prepare and publish public notice – at least 2 days prior to test

Activate Vote Cards (insert into infinity, card administration)

Prepare tally cards for each machine

Add testing machines to EMS manually for testing purposes and assign to precincts

Run trial test to verify math, calculations and accuracy of ballot cards

Prepare minutes, proxies and certifications

Set up tabulating network, all laptops and card readers

Absentee Ballot Cards Public Test

Open Board Meeting

Gather prepared ballots and pre-determined spreadsheet totals

Run Back-up on Server prior to test

Clear Votes on Server

Run and print Election Summary with zero count on server

Enter ballot cards into optical readers using all readers and laptops

Run Election Summary to confirm totals

Verify that machine tabulated votes match predetermined spreadsheet tabulations

Run Precinct Summary to verify

Create and store back up with Public Test Results

Board signs minutes and certification of test

Adjourn Board Meeting

Save all documentation for 22 months retention

Machine Public Tests

Open Board Meeting

Run backup on Server

Clear Votes on Server

Run and print Election Summary with Zero count on server

Get Vote, Start and Tally Cards and detail of public test predetermined votes

Open election in demo mode on each machine

Vote as indicated on voting sheets (look at office to verify offices match candidates)

Vote each round on each machine

When completed voting on machine, Tally machine

Print tape with tallies

Compare machine tally to predetermined votes totals; if vote counts do not match, re-vote machine and continue until errorless count is completed;

When completed, seal machines

Repeat until all machines have been processed

Start tabulation process with networked system, entering tallies from all machines

Run Election Summary

Verify Count is correct

Board signs minutes and certificate of tests

Adjourn Board Meeting

Save all documentation for 22 months retention

Within 7 days: Send certification to State that tests have been conducted

APPENDIX E

Hart InterCivic Voting System

The Vender Protocols for L&A testing are included in the vendor's proprietary manuals and consequently are not attached in this report. They are available from the vendor.

UniSyn Open Elect Voting System

The Vender Protocols for L&A testing are included in the vendor's proprietary manuals and consequently are not attached to this report. They are available from the vendor.