



Directive on Logic & Accuracy Testing

Date: September 25, 2023

Directive 4 of 2023

ARCHIVED – Refer to Department of State website for current information

Directive 4 of 2023

The following Directive is issued September 25, 2023, by the Secretary of the Commonwealth of Pennsylvania pursuant to authority contained at Sections 201 and 1105-A of the Election Code, 25 P.S. §§ 2621, 3031.5.

Background

All counties in Pennsylvania must conduct pre-election logic and accuracy testing (L&A testing) prior to every election (primary, general, special, or municipal) that is conducted in the jurisdiction.

L&A testing is a series of pre-election steps intended to ensure that ballots, scanners, ballot marking devices, and all components of a county's certified voting system are properly configured and in good working order prior to being used in an election. These steps must include every procedure that counties will use in the actual election.

L&A testing promotes election integrity by:

- 1) Providing election officials an opportunity to identify errors in election definition and ballot format and layout, including, but not limited to appropriate locations for folds on absentee/mail-in ballots, missing races, missing party identification, misspellings of candidate names, incorrectly worded ballot questions, and incorrect tabulation.
- 2) Exposing inadequate, incorrect or faulty election supplies, such as incorrect paper stock and memory cards that have not been properly wiped of data and reformatted.
- 3) Demonstrating to political parties, candidates, the media, and voters the preparedness of the county, which should create further confidence in the integrity of Pennsylvania elections.

Following completion of L&A testing, each county board shall certify to the Secretary when they have completed their L&A testing and identify the system configuration for the election. The certification shall be on a form prescribed and furnished by the Secretary, a copy of which is attached as Appendix A. Jurisdictions must complete the certification at least fifteen (15) days prior to every election held in the jurisdiction and must be submitted via email to RA-STBEST@pa.gov.

Summary of L&A Testing Goals

- Verify that all ballots are accurately defined, including:
 - All necessary contests (races) are properly programmed, including special elections, retention elections, and ballot questions.
 - Ballot styles are properly mapped to their respective precincts.
 - Candidate names are accurately spelled.
 - Contests and candidates are displayed in the required order.
 - The parties or political bodies of candidates are properly identified.
 - Names of all parties/independent political bodies are correctly spelled.
 - Audio files are present and properly configured for all candidates and ballot questions.
- Verify that all votes are aggregated and tabulated correctly, and that all accompanying hardware is in working order.
- Verify that all voting system component configurations meet federal and state certification standards and conditions.
- Verify that the voting system software/firmware works as expected.

Testing of Absentee and Mail-in Ballots

Prior to beginning the structured L&A testing, test the printed ballots that will be issued to voters to confirm that the ballots can be read by the tabulating equipment once they are returned for counting. Test these ballots on the equipment that will be used to centrally count mail ballots. If using a ballot on demand (BOD) printer to print mail ballots, test the functionality of the printer for all ballot styles.

- Prepare the BOD printer following the manufacturer's procedures and load the required ballot definition files on the BOD printer. Print ballots of all ballot styles that would be printed using the device for election use.
- If using pre-printed ballots or using a mailing house, gather test ballots to be used for all ballot styles used in the election from the print vendor.

- Mark ballots of each ballot style and type (absentee/mail-in) following the “tabulation test voting pattern” and scan them using both a central scanner and precinct scanner.
- A good way to test all of the ballots is to create an “All Poll” media device for the scanners. An “All Poll” media device will permit all ballot styles for the election to be scanned.
- Fold some ballots comparable to the manner in which absentee and mail-in ballots are received.
- Scan the ballots on the central scanner following the exact same process that you would follow on election day.
- Further, scan the ballots four (4) times on the precinct scanner, each time changing the direction in which the ballot is inserted into the scanner. The goal of this test is to ensure that all printed ballots can be read by the tabulator in all orientations.
- Once ballots are tested for absentee and mail-in voting, changes should not be made to a county’s election definition. If the election definition is changed, ballots need to be retested. If the election definition is changed after the county has distributed any absentee or mail-in ballots, when these ballots are returned the ballots will either need to be hand-counted or a ballot duplication team will need to transfer the voter’s votes to a ballot that can be tabulated by the voting equipment. Follow the procedure for creating a true duplicate copy of a damaged or defective ballot. When a ballot is duplicated, the county must maintain both the original and duplicate ballot and record an identical serial number on each.

Preparing for Full L&A Testing

Logistics

Under Section 1110-A(d) of the Election Code, 25 P.S. § 3031.10(d), no later than forty (40) days before an election, the county election board shall mail to the chairman of each political party recognized to participate in a primary election within the county, and to the chair or presiding officer of any citizens organization which has registered its name and address at least fifty (50) days before such election, a written notice stating the date, time and location when L&A testing will begin. Further, county boards should provide at least forty-eight (48) hours’ notice to the public of the time and place of the test to ensure the public has an opportunity to attend:

- Public notice may be placed in a newspaper or legal publication that has a countywide distribution.
- The notice should outline the starting time and location of the testing.
- The notice does not need to include an ending time for the testing.

The preparation and testing of voting equipment are to be open to the public to observe; however, such members of the public shall not in any manner interfere with the preparation and testing of the voting equipment units. To prevent any interference by the public when observing, the election office may make such reasonable rules and regulations concerning the conduct of those members of the public who wish to observe. These rules shall not prevent members of the public from fairly observing and should be published after public approval by the board subject to 25 P.S. §2642 (f).

Further, election offices must consider the following when preparing for L&A testing:

- Review the Secretary of the Commonwealth's certification report for your voting system to ensure that the voting system components are being prepared to meet all conditions of the report that will be used in your county's election.
- Finalize the dates, times and location of L&A testing.
- Proofread all balloting materials at every stage of setup and production. It is recommended to use more than one proofreader. Ensure that ALL types of ballots are proofread, including election day ballots, absentee ballots, mail-in ballots, provisional ballots, bilingual or alternative language ballots, accessible (audio) ballots, and emergency ballots.
- Ensure that you have adequate multi-partisan teams to conduct the testing. If it is necessary to employ additional staff, it is recommended that counties employ precinct officials, in lieu of third-party vendor personnel, as additional staff.
- If a vendor will be participating in L&A testing, a county election official must always be present during the testing and verify and attest the results after the testing is complete.
- Ensure that you have adequate space to conduct testing.
- Ensure that you have an inventory, or manifest, of all devices to be used on election day, including equipment not directly assigned to a specific polling place. All components of the voting system must be tested as part of the L&A testing.

- Prepare a task list detailing every action to be taken during the testing. In conducting the test, the scenarios should mimic election activities as much as possible.

Preparation of Test Decks and Testing Scenarios

Create a robust test deck for each ballot style and voting system component.

The test deck consists of ballots that are voted with a pre-determined number of valid votes for each candidate, referendum, or retention question, as well as each write-in position, that appears on every ballot style used in the upcoming election. The test deck is required to include one (1) or more ballots that have been improperly voted, i.e., voted with more votes than allowed for a particular contest, and one or more ballots on which no votes are cast, to test the ability of the system to recognize and/or notify the voter of an under-vote or over-vote. Any pre-election test must take into consideration the many types of scenarios that can occur during an election and test them all to ensure voting system logic and accuracy.

The Department strongly discourages relying solely on automated L&A testing or using only preprinted ballots provided by vendors. Manual entry of votes, using pre-audited ballots prepared by election officials, is the most effective way to identify potential errors and anomalies.

Test decks or testing scenarios must align with the following:

- Prepare a task list detailing every action to be taken during the testing. In conducting the test, the scenarios should mimic election activities as much as possible.
- The relevant test decks must include ballots printed via all printing options - by the ballot printing and/or mail house vendor, from a ballot on demand (BOD) printer, and ballots generated from a ballot marking device (BMD). (The goal is to ensure that test deck ballots are printed under the exact same conditions as live ballots provided to and voted by the voters.)
- Include ALL ballot styles.
- Include ALL ballot types applicable to the election (election day, absentee, mail-in, emergency, provisional, ballot on demand, ballot marking devices, accessible ballots, non-partisan ballots, bilingual ballots, etc.)
- Include scenarios that include votes for all candidates and ballot positions, including retention elections, ballot questions, candidates for special elections that are held concurrent with regularly scheduled elections.
- Include scenarios for ballots in all languages.

- Include scenarios for blank ballots and over-voted and under-voted contest selections.
- Include scenarios for ballot markings that will trigger various equipment warnings as applicable for use on election day.
- Ensure that all ballot positions are included.
- The ballots shall be voted with a pre-determined number of valid votes for each candidate, each write-in position, and each voting option on every referendum or retention contest that appears on the ballot to verify that the voting system is programmed to correctly count the ballots.
- The deck must include one or more ballots that are intended to fail, have been improperly voted, or that are voted in excess of the number allowed by law, and one or more ballots on which no votes are cast, in order to test the ability of the system to recognize and/or notify of an under- or over-vote. Preferably, prepare scenarios that have vote totals for each candidate or contest choice that are different. The goal is to see if the improperly marked ballots result in different totals so that it is evident if the improperly marked ballots will change tabulation totals.
- Prepare a tabulation test deck for each ballot style:
 - Recommended Pattern: This is a test deck where each choice in a contest will get a different number of votes. If there is a contest containing 4 choices, choice 1 will have one 1 vote, choice 2 will have 2 votes, choice 3 will have 3 votes, and choice 4 will have 4 votes. The write-in option must be considered as a choice.
 - Alternative Pattern: This is a test deck where the maximum vote any choice in a contest receives is set and then the pattern is repeated within the contest. For example, if the maximum vote is set to 2 and the contest contains 4 choices, then each choice in the contest will get votes in a 1-2-1-2 pattern. The write-in option must be considered as a choice.
 - The same pattern above must be repeated for each ballot set, if applicable:
 - Blank ballot.
 - Ballot with all contests over-voted.
 - Ballot with random contests over-voted.
- Prepare a functionality test deck – this is a test deck used when multiple devices are used to tabulate the same ballot styles. In this test deck, each choice in a contest

receives one vote (to be used for any devices not tested with a tabulation test deck) as follows:

- For each ballot style, mark a vote for the first candidate in each contest and continue until all the candidates in each contest receive a single vote.
- For a single contest, once all contest choices are marked for a single vote, create a scenario for a contest undervote.
- Each write-in option must be considered as a separate choice.
- The same pattern above must be repeated for each type of ballot, for example election day ballot, ballot marking device, absentee/mail-in ballot, and provisional ballots, as applicable.
 - Blank Ballot.
 - Ballot with all contests overvoted.
 - Ballot with random contests overvoted.
- An Excel spreadsheet may be used for documenting the voting variations to be used for creating a test desk and compiling anticipated results if you have no other specific software of choice. Using formulas in Excel will allow you to calculate the anticipated test results and then compare them to the actual results.

Preparation of Media Device

- Before data for an election can be placed on any memory card for an optical scan tabulator, central count scanner, or ballot marking device, the data contained on the memory card from any previous election must be removed under the guidelines of the relevant voting system. Ensure that media has been fully formatted before using the media for L&A testing.
- Inspect all media devices and ensure that they are formatted, labeled and numbered appropriately.
- Label the media device with the name of the poll (e.g., precinct name, absentee, mail-in, provisional). It is a best practice to make the marking and labelling as evident as possible. For example, write the precinct name/number, and device name clearly. As a best practice, use different colored labels for primary and redundant (back-up) media.

- Download the election information to the media devices according to the voting systems manufacturer's instruction.
- Create a media device for each precinct scanner or central scanner that will be used in the election.

Preparation of Voting Equipment

L&A testing must include testing every hardware component of the voting system regardless of whether it will be deployed to a precinct or retained at the warehouse as a backup. Below is a list of items to be tested or verified during L&A testing for an election:

- Ballot marking devices
- Precinct scanners
- Central count scanners
- Connected printers
- Connected peripherals for ADA voting equipment

Prior to the testing, perform the following checks:

- 1) Inspect the physical condition of the equipment and locks and sealing mechanisms to ensure they are intact.
- 2) Power on the devices and validate that the certified software/firmware is installed.
- 3) Check the batteries in voting systems that use batteries as either the primary power source, or as backup to the primary power source.
- 4) Implement a process to ensure that all batteries are fully charged for election day.
- 5) Check the scanner heads on all precinct scanners.
- 6) Check the calibration of scanners.
- 7) Verify the calibration of any ballot marking device (BMD) screens and replace or repair as needed.
- 8) Verify the date and time settings on all voting systems.
- 9) Verify that all media devices are "zeroed out."
- 10) Verify that each device is labelled with its assigned precinct or polling place where it will be deployed, and is accurately listed on your county's inventory or manifest list.

CONDUCTING L&A TESTING

All components being used for the election, including all ballot styles, precinct scanners, central count scanners, accessible devices, and any backup equipment being used, must be part of the L&A testing.

Administrative Steps

As described above in section 3.1, the county board of elections may establish reasonable rules and regulations for public observation of L&A testing. The board must also be available during the first day of preparation, at the beginning of the day or for the first hour of public observation, to explain the process and respond to questions. The following practices must be observed:

- Administer an oath to those conducting the L&A tests for all persons who are not permanent elections staff.
- Establish an area where the public can observe the process
- Allow only election officials and those conducting tests into the testing area.
- Prohibit the photocopying of any testing reports or other materials.
- Prohibit security seals or serial numbers from being photographed during public observation.
- Prohibit photographic and audio equipment, including cellphone cameras, from being used to record security seals or serial numbers. While the news media may report on the testing process, ensure security seals, serial numbers, locks, and other details concerning security measures are not recorded or displayed.

Ballot Marking Device Testing

The functionality and accuracy of ballot marking devices (BMDs) must be included in any pre-election testing protocols. A test deck must be created using a BMD based on the guidelines outlined in the "Preparation of Test Decks and Testing Scenarios" of this document. Once the BMD test deck is created, the ballots must be tested on a related scanner. It is also necessary to test the various devices available to voters with disabilities for use on election day, including audio voting features, tactile discernible controls, and

pneumatic switch attachments which can be operated orally or by vacuum pressure (AKA sip-and-puff devices).

Machine Setup and Preparation

- Set each voting system to be tested in “election mode” rather than “test mode.”
- Review and confirm that the prepared test decks contain all the applicable test cases suggested in “Tabulation test voting variation” and “Functionality test voting variation.”
- Print any “open polls” report that can be printed from the Ballot Marking Device.
- Perform all the actions that would take place on election day. The goal is to test all actions as they would occur on election day.
- For each ballot style, mark and print ballots following the tabulation test voting variation on at least one BMD.
 - Use touchscreen, audio ballot and Audio Tactile Interface (ATI) controller and any other assistive devices provided by the manufacturer.
 - Use ballots in all languages used on election day.
 - Use all the accessible features provided for the ballot: font, contrast, audio-only mode, etc.
- Jurisdictions may choose to mark and print ballots following the functionality test voting variation on other BMDs set up for the same ballot style.
 - Use touchscreen, audio ballot and ATI controller and any other assistive devices provided by the manufacturer.
 - Use ballots in all languages used on election day.
 - Use all the accessible features provided for the ballot: font, contrast, audio-only mode, etc.
- Jurisdictions must test and prepare any ballot marking devices intended to be used as backup devices. Since it is hard to predict where the device would be used, the best approach is to test at least two random ballot styles. Mark and print ballots following the functionality test voting pattern.

Test Closing Procedures

- Perform end-of-day polling place activities as on election day.

- Perform a review of marked and printed ballots to ensure that ballots are marked accurately as required by the test voting variations.
- Gather prepared ballots for scanning.
- After confirming that the marked ballots scan and generate expected results, prepare the machines for election day:
 - Clear the data generated during testing.
 - Ensure that the device has all supplies required for printing ballots on election day.
 - Lock and seal the devices.
 - Shut the machines down.
- Review the seals and locks once again and document the validation. The best practice is to have one person prepare the machine and then have one or two reviewers review the seals and locks.
- Any discrepancies noted during the L&A testing must be evaluated in detail to identify the root cause of the problem.
- If the problem is isolated to a specific machine, that machine must be marked and must not be used on election day.
- Explain clearly to observers if any discrepancies are noted to ensure that everyone present completely understands the process and conclusions.

Precinct Scanners

Once a test deck and expected results have been validated, test decks are scanned by a bipartisan team of election officials or voting system operators on each voting system for which the ballot style is used. This test is used to check the accuracy of the ballot coding, the ability of the tabulators to accurately record votes marked on the ballots, and the ability of tabulators to accurately tally votes from all scanned ballots. Every scanner that will be used in the election must be tested.

Machine Setup and Preparation

- Set each device to be tested in “election mode” rather than “test mode.”
- Review and confirm that the prepared test decks contain all the applicable test cases suggested in “tabulation test voting variation.”

- Load each precinct scanner with the pre-labeled memory cards specific to each election day precinct.
- Perform all the actions that would take place on election day. The goal is to test all actions as they would happen on election day.
- Ensure that the precinct scanner is set for the correct election.
- Open the polls and validate the accuracy of the information displayed on the screens and public counters.
- Print zero reports and validate the reports. Check the date and time, precinct polling place details, election, and that contest totals are zero.
- Once the polls are “open” and a zero tape is generated, the bipartisan team should sign the zero tape to identify the officials participating in the test for each precinct scanner.

Test Deck Scanning

- The bipartisan team must then begin scanning the ballots on each voting system for which the given ballot style is valid.
- The team should follow the ballot instructions while marking and processing ballots to ensure that the instructions are clear.
- Scan ballots in all orientations, alternating between all four possible orientations.
- The testing staff should scan at least one ballot using any feature intended to provide voting system access for persons with disabilities. They should also scan at least one ballot using each required language. While one team member scans ballots, the other team member should monitor the equipment to ensure that the scanner and ballot counter are functioning properly.
- The team must review and confirm that all configured error messages display properly
- Once all ballots from the test deck have been scanned into an individual machine, the team must “close” the polls and run a totals report.
- The team should compare the results reported by the voting system to the expected results, confirm the accuracy of or discrepancies in the results, and determine if the system has passed or failed the test. Any discrepancies indicating a failure must be investigated, resolved, and the system must then be re-tested.

- If a test deck is run and the pre-determined vote count is different than the voting system's tabulated results, the test team should document the problem, and then compare the unique voting variation (test plan) with the test deck pattern to ensure that the test deck was made correctly and that all ballots were scanned.
- Any corrections to the test deck itself, or to the casting of the test deck, should be made, and the test deck should be re-run until two error-free test results are produced. If the tested voting system fails to produce two error-free results, the system should not be used in any election until the problem is resolved and a new round of pre-election testing is successfully completed.
- The pre-election test results reports should be signed by the test team and placed in secure storage for any record retention periods the jurisdiction may require. After all voting systems for which each ballot style is valid have been tested, the test deck should be similarly stored with all corresponding reports, audit trails and log sheets.
- The test should be documented by the testing team on a log created specifically for this purpose. The log shall include:
 - The date the test was executed.
 - The names of the persons who performed the test and recorded the results.
 - The serial number of the machine on which the test was executed.
 - The machine's protective counter number as it appeared both at the beginning and conclusion of testing.
 - The name or description of the test performed.
 - The version number of the software tested.
 - The test result – either “pass” if the results match the expected results exactly, or “fail” if there is even one discrepancy.
- Jurisdictions must test and prepare any scanning devices intended to be used as backup devices. Since it is hard to predict where the device could be used, the best approach is to test two random ballot styles. Scan ballots following the functionality test voting pattern.

Test Closing Procedures

- Perform end-of-day polling place activities as on election day.
- Gather media [including redundant (back-up) media if applicable] with results, upload to the election management system, and generate the consolidated result

reports. It is a good practice to use redundant media on election day whenever possible. Ensure that the redundant media is also included in testing.

- Document testing results as you would the official results.
- Retain and seal all pre-election testing materials.
- Prepare machines for election day use:
 - Clear totals.
 - Clear the results on the tabulator.
 - Insert new printing tapes.
 - Lock and seal the devices.
 - Shut the machine down.
- Review the seals and locks once again and document the validation. The best practice is to have one person prepare the machine and then have one or two reviewers review the seals and locks.
- Any discrepancies noted during the L&A testing must be evaluated in detail to identify the root cause of the problem.
- If the problem is isolated to a specific machine, that machine must be marked and must not be used on election day.
- Explain clearly to observers if any discrepancies are noted.

Central Count Scanners

Test central scanners used at the election office. Jurisdictions using precinct and central scanners can rescan the ballots used for precinct scanner testing on central scanners to test the central scanners.

Machine Setup and Preparation

- Set each voting machine to be tested in “election mode” rather than “test mode.”
- Review and confirm that the prepared test decks contain all the applicable test cases suggested in “tabulation test voting variation.”
- Load each central scanner with the pre-labeled memory cards and prepare them for scanning as you would on election day.

- Perform all the actions that would happen at the beginning of the central scanner use on election night.
 - Be sure the tabulator is set for the correct election.
 - Open the polls and validate the accuracy of the information displayed on the screens.
 - Print zero reports and validate the reports – Check the date and time, precinct polling place details, election, and that contest totals are zero.
- Once the polls are “open” and a zero report is generated, the bipartisan team should validate and confirm that all contests and candidates have zero votes recorded for each central scanner.

Test Deck Scanning

- The bipartisan team must then begin scanning the ballots on each central scanner in exactly the same manner as on election day.
- Batch ballots as you would on election day and prepare them for scanning. Reuse the same ballots marked for precinct scanner testing.
- Fold several marked absentee/mail-in ballots to ensure that the folds do not interfere with the scanning.
- Once all ballots from the test deck have been scanned into an individual machine, the team must “close” the polls and run a totals report.
- The team should compare the results reported by the voting system to the expected results, confirm the accuracy of or discrepancies in the results, and determine if the system has passed
- or failed the test. Any discrepancies indicating a failure must be investigated, resolved, and the system must then be re-tested.
- If a test deck is run and the pre-determined vote count is different than the voting system's tabulated results, the test team should document the problem, and then compare the unique voting variation (test plan) with the test deck pattern to ensure that the test deck was made correctly and that all ballots were scanned.
- Any corrections to the test deck itself, or to the casting of the test deck, should be made, and the test deck should be re-run until two error-free test results are produced. If the tested voting system fails to produce two error-free results, the

system should not be used in any election until the problem is resolved and a new round of pre-election testing is successfully completed.

- The pre-election test results reports should be signed by the test team and placed in secure storage for any record retention periods the jurisdiction may require. After all voting systems for which a particular ballot style is valid have been tested, the test deck should be similarly stored with all corresponding reports, audit trails and log sheets.
- The test should be documented by the testing team on a log created specifically for this purpose. The log shall include but is not limited to:
 - The date the test was executed.
 - The names of the persons who performed the test and recorded the results.
 - The serial number of the machine on which the test was executed.
 - The machine's protective counter number as it appeared both at the beginning and conclusion of testing.
 - The name or description of the test performed.
 - The version number of the software under test.
 - The test result – either “pass” if the results match the expected results exactly, or “fail” if there is even one discrepancy.

Test Closing Procedures

- Perform the end-of-central scanning activities as on election day.
- Gather media [including redundant (back-up) media if applicable] with results and upload to election management system and generate consolidated result reports. It is a good practice to use redundant media on election day whenever possible. Ensure that the redundant media is also included in testing.
- Document the testing results as you would the official results.
- Retain and seal all pre-election testing materials.
- Prepare machines for election day use:
 - Clear totals.
 - Clear the results on the tabulator.

- Insert new printing tapes.
- Lock and seal the devices.
- Shut the machine down.
- Review the seals and locks once again and document the validation.
- Any discrepancies noted during the L&A testing must be evaluated in detail to identify the root cause of the problem. If the problem is isolated to a specific machine, that machine must be marked and must not be used on election day.
- Explain clearly to observers if any discrepancies are noted to ensure that everyone present completely understands the process and conclusion.
- Ensure that there is a mix of all types of ballots used by the jurisdiction for the election.

Hybrid Device Check

Hybrid devices must be tested for both the ballot marking device functionality and the scanning and tabulation functionality. Jurisdictions using hybrid devices must follow the below guidelines for performing L&A testing.

Machine Setup

- Set each voting machine to be tested in “election mode” rather than “test mode.”
- Review and confirm that the prepared test decks contain all the applicable test cases suggested in “tabulation test voting variation.”
- Load each device with the pre-labeled memory cards specific to each election day precinct.
- Perform all the actions that would take place on election day. The goal is to test all actions as they would happen on election day.
- Be sure the tabulator is set for the correct election.
- Open the polls and validate the accuracy of the content displayed on screens and public counters.
- Print zero reports and validate the reports. Check the date and time, precinct polling place details, election, and that contest totals are zero.

- Once the polls are “open” and a zero tape is generated, the bipartisan team should sign the zero tape to identify the officials participating in the test for each precinct scanner.

Test Deck Scanning

- The bipartisan team must then begin marking and scanning the ballots on each voting system for which a given ballot style is valid.
- The team should follow the ballot instructions while marking and processing ballots to ensure that the instructions are clear.
- The testing staff should include marking of at least one ballot using any feature intended to provide voting system access for persons with disabilities. While one team member is marking and casting ballots, the other team member should monitor the equipment to ensure that it is functioning properly.
- The team must review and confirm that all configured error messages display properly.
- Once all ballots from the test deck have been voted into an individual machine, the team must “close” the polls and run a totals report.
- The team should compare the results reported by the voting system to the expected results, confirm the accuracy of or discrepancies in the results, and determine if the system has passed or failed the test. Any discrepancies indicating a failure must be investigated, resolved, and the system must then be re-tested.
- If a test deck is run and the pre-determined vote count is different than the voting system's tabulated results, the test team should document the problem, and then compare the unique voting variation (test plan) with the test deck pattern to ensure that the test deck was made correctly and that all ballots were scanned.
- Any corrections to the test deck itself, or to the casting of the test deck, should be made and the test deck should be re-run until two error-free test results are produced. If the tested voting system fails to produce two error-free results, the system should not be used in any election until the problem is resolved and a new round of pre-election testing is successfully completed.
- The pre-election test results reports should be signed by the test team and placed in secure storage for any record retention periods the jurisdiction may require. After all voting systems for which a given ballot style is valid have been tested, the test deck should be similarly stored with all corresponding reports, audit trails and log sheets.

- The test should be documented by the testing team on a log created specifically for this purpose. The log shall include but is not limited to:
 - The date the test was executed.
 - The names of the persons who performed the test and recorded the results.
 - The serial number of the machine on which the test was executed.
 - The machine's protective counter number as it appeared both at the beginning and conclusion of testing.
 - The name or description of the test performed.
 - The version number of the software under test.
 - The test result – either “pass” if the results match the expected results exactly or “fail” if there is even one discrepancy.
- Jurisdictions must test and prepare any hybrid devices intended to be used as back up devices. Since it is hard to predict where the device could be used, the best approach is to test two random ballot styles. Scan ballots following the functionality test voting pattern.

Test Closing Procedures

- Perform the end-of-day polling place activities as on election day.
- Gather media (including redundant media if applicable) with results and upload to election management system and generate consolidated result reports. It is a good practice to use redundant media on election day whenever possible. Ensure that the redundant media is also included in testing.
- Document testing results as you would the official results.
- Retain and seal all pre-election testing materials.
- Prepare the machines for election day use:
 - Clear totals.
 - Clear the results on the tabulator.
 - Insert new printing tapes.
 - Lock and seal the devices.

- Shut the machines down.
- Review the seals and locks once again and document the validation. The best practice is to have one person prepare the machine and then have one or two reviewers review the seals and locks.
- Any discrepancies noted during the L&A testing must be evaluated in detail to identify the root cause of the problem.
- If the problem is isolated to a specific machine, that machine must be marked and must not be used on election day.
- Explain clearly to observers if any discrepancies are noted to ensure that everyone present completely understands the process and conclusion.
- Ensure that there is a mix of all types of ballots used by the jurisdiction for the election.

Vote Tabulation Software Check

Test the result tabulation software by loading and generating summary reports of all test votes.

- Gather all the media used for vote capture from precinct scanners/hybrid devices and central scanners (including redundant media if applicable) with results and upload to the election management system and generate the consolidated result reports and compare them to the expected results.
- It is a good practice to use redundant media on election day whenever possible. Ensure that the redundant media is also included in testing. Document testing results as you would the official results.

Election Night Reporting (ENR)

- Generate the ENR files for reporting to the Department of State and publishing to your county's website.
- Test the ENR file submission process, and if the timeline for testing the Department of State ENR does not align with the county L&A testing timeline, safely store the extract files for use during the assigned testing window. Counties must submit multiple files during the ENR file submission testing to ensure that all the candidate

vote totals by reporting group and turnout information are validated on the Department of State website.

Electronic Poll Books (EPBS)

The county board of elections must test electronic poll books being used at the polling place as part of the L&A testing.

- Load the required voter data onto the electronic poll books and ensure that the configuration meets the approval conditions from the Secretary of the Commonwealth.
- Ensure the accuracy of the voter data on each device.
- Test all election day check-in activity workflows on all the devices.
- Once complete, print any reports as you would do on election night and validate the results.
- Test any check-in activity workflows that would take place on election day – e.g., regular check-in, ID verification, absentee/mail-in voter, provisional voter, etc.
- Test the ballot spoiling procedures if the electronic poll book is being used to track the number of ballots spoiled.
- Test the connectivity between two devices assigned to a polling place and ensure that check-in data is synced between the devices.
- Prepare electronic poll books for election day use:
 - Clear test data.
 - Lock and seal the devices.
- Review the seals and locks once again and document the validation. The best practice is to have one person prepare the machine and then have one or two reviewers review the seals and locks.

Post-Election Verification Testing for Central Tabulation Equipment

- Central tabulation equipment needs additional post-election verification testing prior to finalizing the election results. At the conclusion of the central tabulation of ballots

and prior to the completion of the official canvass, the central scanner(s) must pass the same test using the same test deck(s) used during the pre-election testing.

- To ensure that test deck ballots are not inadvertently intermingled with election ballots, L&A testing ballots must be labeled, bundled together and kept separately from other election records. Counties can follow the best practice of labeling the L&A ballots with appropriate notation on each ballot while marking. For example, write “LA1” on the first L&A ballot in an area not interfering with the barcode.

Maintaining L&A Testing Results

All documentation and test decks and any test data, including but not limited to copies of ballot programming used for required maintenance tests, shall be maintained in secure locked storage for the requisite records retention schedule. Gather all reports and ballots as you would for official elections and file them along with the test deck used. Note any corrections and explanations and retain and seal all artifacts from pre-election testing.

The Department recommends maintaining a file for the life cycle of each voting machine component, starting with acceptance testing when you purchase the equipment. Document important events that take place during the voting machine life cycle, including but not limited to acceptance testing, trusted build validation, upgrade acceptance testing, each election L&A testing, and election use. The document must provide a complete history of the voting machine components.

###

Version	Date	Description
1.0		Initial document release
2.0	9.25.2023	Addition of Central scan post-election verification testing

ARCHIVED - Refer to Department of State website for current information

**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF STATE CERTIFICATION
OF LOGIC AND ACCURACY TESTING**

COUNTY OF _____

ELECTION DATE _____

NUMBER OF PRECINCTS PARTICIPATING IN ELECTION: _____

VOTING SYSTEM: _____

I do hereby certify that "County Name" County has completed the pre-election testing requirements for logic and accuracy testing of all its electronic voting system components on _____.

During the test process, a predetermined test deck was prepared, ballots were marked and tabulated. The results were then compared to ensure that the actual results matched expected results.

The testing included the following:

Component	Number tested	Tested?
Ballot styles		Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Ballot sets <i>(absentee, mail-in, election day, provisional)</i>		Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Precinct scanners		Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Central count scanners		Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Standard BMDs		Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Hybrid BMDs		Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Election Management System		Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>

Signature of Chief Clerk
or Authorized Representative

Name of Chief Clerk
or Authorized Representative

Date