Software QA Checklists

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This document includes a variety of checklists that we use to guide and document structured software QA.

Integration Testing

VxAdmin

- ☐ Configure with an election package
- ☐ Program smart cards
    - ☐ Sys admin card
    - ☐ Election manager card
    - ☐ Poll worker card
- ☐ Lock machine
- ☐ Can't unlock with poll worker card
- ☐ Unlock with sys admin card, only with the correct PIN
- ☐ Unlock with election manager card, only with the correct PIN
- ☐ Save signed election package

VxMark

- ☐ Unlock with sys admin card to sys admin screen
- ☐ Configure with election manager card and signed election package
- ☐ Stay in test mode
- ☐ Open polls with poll worker card
- ☐ Mark and cast a ballot (more cases will be covered in official mode)
- ☐ Close polls with poll worker card
- ☐ Unlock with election manager card and switch to official mode
    - ☐ Scanned ballot count is reset

- ☐ Opening printer-scanner cover does not trigger alarm
- ☐ Open polls with poll worker card
- ☐ Mark ballots
    - ☐ Ballot without write-in
    - ☐ Ballot with write-in
    - ☐ Blank ballot
    - ☐ Ballot with undervote
    - ☐ Attempt to overvote
    - ☐ Edit selections on review screen
- ☐ Choose to cast ballot at review step
- ☐ Choose to reject ballot at review step
- ☐ Rescan flow
    - ☐ Remove ballot during review step
    - ☐ Re-insert ballot and choose to cast
    - ☐ Re-insert ballot and choose to reject
- ☐ Opening printer-scanner cover triggers alarm
    - ☐ Alarm plays through speaker, whether headphones are connected or not
- ☐ Peripherals
    - ☐ Audio plays through headphones when headphones are connected
    - ☐ Audio does not play through speaker when headphones are not connected
    - ☐ Accessible controller works
    - ☐ PAT input works
- ☐ Close polls with poll worker card
- ☐ Opening printer-scanner cover does not trigger alarm

VxScan

- ☐ Unlock with sys admin card to sys admin screen
- ☐ Configure with election manager card and signed election package
- ☐ Remove election manager card without selecting a precinct and verify that you see "no precinct selected" screen
- ☐ Unlock with election manager card and select precinct
- ☐ Stay in test mode
- ☐ Open polls with poll worker card
- ☐ Print an additional polls open report
- ☐ Verify polls open report
    - ☐ Contains all contests
    - ☐ Contains 0 tallies for all contests
- ☐ Scan a few HMP ballots (more cases will be covered in official mode)
    - ☐ Test ballot is accepted

- ☐ Official ballot is rejected
- ☐ Scan a few BMD ballots (more cases will be covered in official mode)
  - ☐ Test ballot is accepted
  - ☐ Official ballot is rejected
- ☐ Close polls with poll worker card
- ☐ Print an additional polls close report
- ☐ Verify polls close report
  - ☐ Contains all contests
  - ☐ Contains correct tallies for all contests
- ☐ Unlock with election manager card and switch to official mode
  - ☐ Tallies are reset
- ☐ Scan HMP ballots
  - ☐ All orientations
  - ☐ Official ballot is accepted
  - ☐ Test ballot is rejected
  - ☐ Ballot without write-ins
  - ☐ Ballot with write-ins
    - ☐ All orientations
  - ☐ Ballots that should be marked for adjudication by the current election definition surface a warning
    - ☐ Blank ballots
    - ☐ Overvotes
    - ☐ Undervotes
    - ☐ Choosing to cast as is counts the ballot, i.e., test that an overvote is in the in the final VxAdmin tally
    - ☐ Choosing not to cast the ballot does not count the ballot, i.e., test that an overvote is not in the final VxAdmin tally
- ☐ Scan BMD ballots
  - ☐ All orientations
  - ☐ Official ballot is accepted
  - ☐ Test ballot is rejected
  - ☐ Ballot without write-ins
  - ☐ Ballot with write-ins
    - ☐ All orientations
  - ☐ Ballots that should be marked for adjudication by the current election definition surface a warning
    - ☐ Blank ballots
    - ☐ Undervotes
    - ☐ Choosing to cast as is counts the ballot
    - ☐ Choosing not to cast the ballot does not count the ballot

- ☐ Close polls with poll worker card
- ☐ Print an additional polls close report
- ☐ Verify polls close report
    - ☐ Contains all contests
    - ☐ Contains correct tallies for all contests

VxCentralScan

- ☐ Can't unlock with poll worker card
- ☐ Unlock with sys admin card to sys admin screen
- ☐ Unlock with election manager card to election manager screen
- ☐ Configure with signed election package
- ☐ Stay in test mode
- ☐ Scan a few HMP ballots (more cases will be covered in official mode)
    - ☐ Test ballot is accepted
    - ☐ Official ballot is rejected
- ☐ Scan a few BMD ballots (more cases will be covered in official mode)
    - ☐ Test ballot is accepted
    - ☐ Official ballot is rejected
- ☐ Export CVRs
- ☐ Switch from test to official mode
    - ☐ Ballots are cleared
    - ☐ Can't export CVRs because there are none to export
- ☐ Scan HMP ballots
    - ☐ Official ballot is accepted
    - ☐ Test ballot is rejected
    - ☐ Ballot without write-ins
    - ☐ Ballot with write-ins
        - ☐ All orientations
    - ☐ Ballots that should be marked for adjudication by the current election definition are paused on
        - ☐ Blank ballots
        - ☐ Overvotes
        - ☐ Undervotes
        - ☐ Choosing to tabulate as is counts the ballot, i.e., test that an overvote is in the in the final VxAdmin tally
        - ☐ Choosing to remove the ballot does not count the ballot, i.e., test that an overvote is not in the final VxAdmin tally
- ☐ Scan BMD ballots
    - ☐ Official ballot is accepted

- [ ] Test ballot is rejected
- [ ] Ballot without write-ins
- [ ] Ballot with write-ins
    - [ ] All orientations
- [ ] No adjudication of BMD ballots on VxCetralScan
    - [ ] Blank ballots → No pause
    - [ ] Undervotes → No pause
- [ ] Delete a batch
- [ ] Export CVRs
- [ ] Export backup

VxAdmin

- [ ] Import CVRs
    - [ ] Once test mode CVRs are imported, official mode CVRs are not presented for import
    - [ ] Once official mode CVRs are imported, test mode CVRs are not presented for import
    - [ ] Import CVRs from VxScan
    - [ ] Import CVRs from VxCentralScan
- [ ] View unofficial full election tally report and verify that tally is correct
- [ ] Write-in adjudication
    - [ ] Write-ins are populated in the Write-Ins tab
    - [ ] Images are cropped appropriately
    - [ ] After adjudicating a write-in as an official candidate, the tally report reflects the change
    - [ ] After adjudicating a write-in as a non-official candidate, the write-in adjudication report reflects the change, and the tally report buckets under a generic write-in category
    - [ ] HMP ballot write-ins
    - [ ] BMD ballot write-ins
- [ ] View unofficial full election tally report and verify that tally is correct after write-in adjudication
- [ ] Add manual tallies
- [ ] View unofficial full election tally report and verify that tally is correct after manual tally entry
- [ ] View other tally report breakdowns
- [ ] Mark tally as official

All machines

- [ ] Unlock with vendor card, only with the correct PIN
- [ ] Boot to vendor menu
- [ ] Boot to app

- ☐ Signed Hash Validation
- ☐ Diagnostics

System Settings Testing

Auth settings

- ☐ arePollWorkerCardPinsEnabled = true (non-default value)
- ☐ inactiveSessionTimeLimitMinutes = non-default value
- ☐ numIncorrectPinAttemptsAllowedBeforeCardLockout = non-default value
- ☐ overallSessionTimeLimitHours = non-default value
- ☐ startingCardLockoutDurationSeconds = non-default value

Adjudication settings

		VxCentralScan	VxScan
Blank ballot	On	☐	☐
	Off	☐	☐
Overvote	On	☐	☐
	Off	☐	☐
Disallow casting overvotes	On	☐	☐
	Off	☐	☐
Undervote	On	☐	☐
	Off	☐	☐
Unmarked write-in	On	☐	☐
	Off	☐	☐

Miscellaneous settings

- ☐ precinctScanEnableShoeshineMode = true
- ☐ castVoteRecordsIncludeOriginalSnapshots = true
- ☐ castVoteRecordsIncludeRedundantMetadata = true
- ☐ disableVerticalStreakDetection = true

Election/Ballot Variety Testing

- [ ] General
- [ ] Primary
    - [ ] With some non-partisan candidate contests
    - [ ] With some ballot measures
- [ ] All-bubble
- [ ] NH test with timing-mark metadata instead of QR-code metadata
    - [ ] Doubly-endorsed candidates
- [ ] Maximal election, with high contest/candidate counts and long strings
- [ ] Different precinct arrangements
    - [ ] Single precinct
    - [ ] Multiple precincts, with some contests shared across precincts and others unique to certain precincts
    - [ ] Precinct split
- [ ] HMP ballot lengths
    - [ ] 11"
    - [ ] 14"
    - [ ] 17"
    - [ ] 18"
    - [ ] 21"
    - [ ] 22"
- [ ] Language
    - [ ] Multi-language
    - [ ] Single-language
- [ ] Other contest situations
    - [ ] Vote for N candidate contest
    - [ ] Markdown in ballot measures

Paper Path Stress Testing

- [ ] VxCentralScan
    - [ ] Jam handling
    - [ ] Folded ballots
    - [ ] All paper lengths per [Election/Ballot Variety Testing](#)
- [ ] VxMark
    - [ ] Jam handling
- [ ] VxScan
    - [ ] Jam handling

- ☐ Folded ballots
- ☐ All paper lengths per [Election/Ballot Variety Testing](#)
- ☐ Ballots inserted with skew
- ☐ Multi-sheet detection
    - ☐ Enabled
    - ☐ Disabled
    - ☐ Calibration
    - ☐ Various paper weights

VxAdmin Detail Testing

Sys admin UI

- ☐ Can't unlock with election manager card if machine is unconfigured
- ☐ Unlock with sys admin card
- ☐ Settings tab
    - ☐ "Save Log File" works
    - ☐ "Set Date and Time" works
    - ☐ "Format USB" works
    - ☐ "Reboot to BIOS" works
    - ☐ "Signed Hash Validation" works
- ☐ Diagnostics tab
    - ☐ "Print Test Page" is disabled if printer is not connected
    - ☐ "Print Test Page" is enabled if printer is connected
    - ☐ "Print Test Page" works and records if the print was a pass
    - ☐ "Print Test Page" works and records if the print was a fail
    - ☐ All displayed statuses are correct
        - ☐ Configuration status is correct
        - ☐ Power status is correct when connected to charger
        - ☐ Power status is correct when not connected to charger
        - ☐ Storage status is correct
        - ☐ Printer status is correct
    - ☐ "Save Readiness Report" saves data that matches what's shown on screen
- ☐ Configure with an election package using automatically displayed options
- ☐ Unconfigure machine
- ☐ Configure with an election package using "Select Other File…"
- ☐ USB drive status in the top bar is correct
    - ☐ No USB drive
    - ☐ USB drive

- ☐ "Eject USB" works
- ☐ Smart card programming
  - ☐ Can program sys admin card
  - ☐ Can program election manager card
  - ☐ Can program poll worker card
  - ☐ New sys admin card can unlock machine if correct PIN is entered
    - ☐ Card can't unlock machine if incorrect PIN is entered
    - ☐ After fifth incorrect unlock attempt, card is locked, and you have to wait 15 seconds before another entry
    - ☐ After sixth incorrect unlock attempt, card is locked, and you have to wait 30 seconds before another entry
    - ☐ Card can unlock machine if correct PIN is entered after wait time
  - ☐ New election manager card can unlock machine if correct PIN is entered
    - ☐ Card can't unlock machine if incorrect PIN is entered
    - ☐ After fifth incorrect unlock attempt, card is locked, and you have to wait 15 seconds before another entry
    - ☐ After sixth incorrect unlock attempt, card is locked, and you have to wait 30 seconds before another entry
    - ☐ Card can unlock machine if correct PIN is entered after wait time
  - ☐ New poll worker card can't unlock machine
  - ☐ Can reset sys admin card PIN and then unlock machine using that new PIN
  - ☐ Can reset election manager card PIN and then unlock machine using that new PIN
  - ☐ Poll worker card shows no option to reset card PIN
  - ☐ Can't unprogram sys admin card
  - ☐ Can unprogram election manager card programmed for current election
  - ☐ Can unprogram poll worker card programmed for current election
  - ☐ Can unprogram election manager card programmed for another election
  - ☐ Can unprogram poll worker card programmed for another election
- ☐ Lock machine

Election manager UI

- ☐ Unlock with election manager card
- ☐ Saving signed election package works
- ☐ Settings tab
  - ☐ "Save Log File" works
  - ☐ "Set Date and Time" works
  - ☐ "Signed Hash Validation" works
- ☐ Reports tab shows proper zero reports before CVR import
- ☐ Import CVRs

- ☐ Import modal shows the expected information
- ☐ Import a CVR export using the pre-populated suggestions
- ☐ Import a CVR export using the option to "Select Export Manually…"
- ☐ Once test mode CVRs are imported, official mode CVRs are not presented for import
- ☐ Once official mode CVRs are imported, test mode CVRs are not presented for import
- ☐ Can't import a CVR export from the wrong election
- ☐ Can't import a file/directory that isn't a CVR export
- ☐ Can't import a duplicate CVR export
- ☐ Duplicate ballot IDs are recognized and not imported twice (test by scanning X ballots, exporting CVRs, scanning Y more ballots, exporting CVRs again, importing both CVR exports, and seeing that only X+Y total ballots are imported, not 2X+Y)
- ☐ Write-in adjudication
  - ☐ Write-ins are populated in the Write-Ins tab
  - ☐ Images are cropped appropriately
  - ☐ Zoom in and out
  - ☐ After adjudicating a write-in as an official candidate, the tally report reflects the change
  - ☐ After adjudicating a write-in as a non-official candidate, the write-in adjudication report reflects the change, and the tally report buckets under a generic write-in category
  - ☐ After adjudicating a write-in as invalid, i.e., as an undervote, the write-in adjudication report and tally report update as expected
- ☐ Manual tallies
  - ☐ Manual tallies for official candidates are included in the tally report
  - ☐ Manual tallies for existing write-ins are included in the write-in adjudication report
  - ☐ Manual tallies for new write-ins are included in the write-in adjudication report
  - ☐ Can't repeat a write-in option when adding write-in candidates
- ☐ Reports tab
  - ☐ "Full Election Tally Report" is correct
    - ☐ "Print Report" works
    - ☐ "Export Report PDF" works
    - ☐ "Export Report CSV" works
    - ☐ "Export CDF Report" works
  - ☐ "All Precincts Tally Report" is correct
    - ☐ "Print Report" works
    - ☐ "Export Report PDF" works
    - ☐ "Export Report CSV" works
  - ☐ "Single Precinct Tally Report" is correct for every precinct
    - ☐ "Print Report" works
    - ☐ "Export Report PDF" works

- ☐ "Export Report CSV" works
- ☐ "Precinct Ballot Count Report" is correct
  - ☐ "Print Report" works
  - ☐ "Export Report PDF" works
  - ☐ "Export Report CSV" works
- ☐ "Voting Method Ballot Count Report" is correct
  - ☐ "Print Report" works
  - ☐ "Export Report PDF" works
  - ☐ "Export Report CSV" works
- ☐ "Write-In Adjudication Report" is correct
  - ☐ "Print Report" works
  - ☐ "Export Report PDF" works
- ☐ "Save Tally Report" "Save As…" option works for a PDF report
- ☐ "Save Tally Report" "Save As…" option works for a CSV report
- ☐ "Tally Report Builder" works
  - ☐ "Filters" work
  - ☐ "Report By" works
  - ☐ "Print Report" works
  - ☐ "Export Report PDF" works
  - ☐ "Export Report CSV" works
- ☐ "Ballot Count Report Builder" works
  - ☐ "Filters" work
  - ☐ "Report By" works
  - ☐ "Print Report" works
  - ☐ "Export Report PDF" works
  - ☐ "Export Report CSV" works
- ☐ Mark election results as official
  - ☐ References to "Unofficial" on the page and in PDF and CSV reports switch to "Official"
  - ☐ Can't import new CVR exports
  - ☐ Can't make changes to write-in adjudication
  - ☐ Can't enter manual tallies

Interpretation Stress Testing

The goal of this testing is to ensure that the ballot interpreter neither exceeds the VVSG2 misfeed rate (1/500) nor misinterprets, on representative hardware. This testing is repeated across multiple VxScans.

Phase 1

- [ ] Configure VxScan with the shoe-shine all-bubble ballot
- [ ] Open polls
    - [ ] This will initiate a print of an extremely long polls open report that we don't need. You can bypass the printing by opening the VxScan access door and pressing the green lever on the printer to pop the printer hood open. Pop the printer hood back in place and remove your poll worker card. This will cancel the print, and you'll be able to proceed.
- [ ] Select a sheet of the cycling test deck, ideally selecting a different cycle index for each VxScan
    - [ ] Record cycle index
- [ ] Shoe-shine scan ~500 ballots
    - [ ] Record accepted count
    - [ ] Record rejected count, including reasons, e.g., cleaning vs. unreadable ballot
- [ ] Close polls and use the same printing bypass technique as above
- [ ] Import results into VxAdmin and review tallies, one VxScan at a time
- [ ] Expect to see the same count across the report, e.g., all 500s and 0s, no 499s and 1s
    - [ ] Record results from this phase
- [ ] Export report to USB drive
- [ ] Upload reports and CVRs for further review

Phase 2

- [ ] Unconfigure and reconfigure VxScan with the non-shoe-shine all-bubble ballot
- [ ] Open polls and use the same printing bypass technique as above
- [ ] Select the same sheet of the cycling test deck as in phase 1
- [ ] Hand scan ~20 ballots normally (not trying to skew)
    - [ ] Record accepted count
    - [ ] Record rejected count, including reasons, e.g., cleaning vs. unreadable ballot
- [ ] Hand scan ~20 ballots trying to skew/stretch (okay if these are rejected)
    - [ ] Record accepted count
    - [ ] Record rejected count, including reasons, e.g., cleaning vs. unreadable ballot – rejections are okay in this phase
- [ ] Close polls and use the same printing bypass technique as above
- [ ] Import results into VxAdmin and review tallies, one VxScan at a time
- [ ] Expect to see the same count across the report, e.g., if you successfully scanned 35, all 35s and 0s, no 34s and 1s
    - [ ] Record results from this phase
- [ ] Export report to USB drive
- [ ] Upload reports and CVRs for further review

Locked-Down Image Testing

This is a minimal checklist for later stage QA with locked-down images. The main focus is covering all write paths, as writing to a read-only partition is one of the main ways a locked-down image can fail after successful boot.

VxAdmin

- [ ] Access vendor menu with vendor card and confirm that Secure Boot is enabled
- [ ] Set clock
- [ ] Run Signed Hash Validation and check at check.voting.works
- [ ] Format USB drive
- [ ] Configure with an election package
- [ ] Program smart cards
    - [ ] Sys admin card
    - [ ] Election manager card
    - [ ] Poll worker card
- [ ] Save signed election package

VxMark

- [ ] Access vendor menu with vendor card and confirm that Secure Boot is enabled
- [ ] Set clock
- [ ] Run Signed Hash Validation and check at check.voting.works
- [ ] Configure with signed election package
- [ ] Switch to official mode
- [ ] Open polls
- [ ] Get appropriate paper, 11" BMD paper if using letter HMP ballots, 13.25" BMD paper if using legal HMP ballots
- [ ] Mark and cast a ballot, with at least one write-in
- [ ] Peripherals
    - [ ] Audio plays through headphones when headphones are connected
    - [ ] Audio does not play through speaker when headphones are not connected
    - [ ] Accessible controller works
    - [ ] PAT input works
- [ ] Alarm
- [ ] Close polls
- [ ] Save logs

VxScan

- [ ] Access vendor menu with vendor card and confirm that Secure Boot is enabled

- ☐ Set clock
- ☐ Run Signed Hash Validation and check at check.voting.works
- ☐ Configure with signed election package
- ☐ Switch to official mode
- ☐ Open polls
- ☐ Scan HMP ballots, at least one with write-ins
- ☐ Scan BMD ballots, at least one with write-ins
- ☐ Close polls
- ☐ Save logs

VxCentralScan

- ☐ Access vendor menu with vendor card and confirm that Secure Boot is enabled
- ☐ Set clock
- ☐ Run Signed Hash Validation and check at check.voting.works
- ☐ Configure with signed election package
- ☐ Switch to official mode
- ☐ Scan HMP ballots, at least one with write-ins
- ☐ Scan BMD ballots, at least one with write-ins
- ☐ Export CVRs
- ☐ Save logs

VxAdmin

- ☐ Import CVRs
    - ☐ Import CVRs from VxScan
    - ☐ Import CVRs from VxCentralScan
- ☐ Adjudicate write-ins
- ☐ Enter manual tallies
- ☐ View unofficial full election tally report
- ☐ Mark tally as official
- ☐ Print report
- ☐ Save report
- ☐ Save logs