



Vendor Guidelines to Ensure Voting Equipment Capacity to Run Ranked-Choice Voting Methods, FairVote-The Center for Voting and Democracy, March 2005

Founded in 1992, FairVote advocates for electoral systems that promote voter turnout, fair representation, inclusive policy and meaningful choices. We conduct research, analysis, education, and advocacy to improve and reform electoral systems at the national, state, and local levels. This document was prepared with Caleb Kleppner of Election Solutions (www.ElectionSolutions.com), 203-781-8406

Why Vendors Should Have Machines Ready to Implement Ranked-Choice Voting Methods:

Federal standards [Volume 1, Section 2.2.8.2 Voting variations, subsections a.) through o.)] currently require voting equipment vendors to report on the compatibility of their equipment with different ballot types in use within the United States. Now, as the ranked-choice voting system known as instant runoff voting (IRV) gathers growing support, some counties and states are moving to require ballot type flexibility in standards for new voting equipment. In California, for example, Mendocino County, Alameda County and Santa Clara County all required machine compatibility with instant runoff voting (IRV) in recent request for proposals, and the state's Help America Vote Act committee strongly urged vendors to provide IRV-ready equipment. The inclusion of such requirements is likely to grow. IRV is used in San Francisco's major elections and has been approved by two-to-one margins by voters in Burlington (VT), Ferndale (MI) and Berkeley (CA). Louisiana and Arkansas require IRV absentee ballots for most overseas voters in elections that might go to runoff, and legislatures in Maine, Massachusetts, North Carolina and Washington are among those seriously debating IRV. To meet the increasing demand for flexible voting equipment and to remove uncertainty for election officials suddenly in a position to implement a ranked-choice voting method, vendors must consider the requirements of these electoral systems as they develop and sell their equipment and software.

Summary of Ranked Choice Voting Systems

- **Instant runoff voting (IRV)** ensures that winners in a single-seat election have majority support without the need for a second runoff election. **Choice voting** ensures fair representation for both majority and minority voters in multi-seat elections. Rather than voting for a single candidate, voters rank candidates in order of choice. This allows tabulators to distribute votes from eliminated candidates (with IRV) or elected candidates (with choice voting) to remaining candidates.
- **Administration of ranked choice systems:** Voters rank candidates in order of choice, indicating their 1st, 2nd choice, 3rd choice and so on. The voting equipment either prevents voters from casting invalid votes (overvote, skipped ranking, listing the same candidate more than once) or notifies voters of errors and allows for their correction. The voting equipment stores ballot images of each voter's rankings rather than sub-totals for each ballot position. The output of the voting equipment is a data file containing anonymous records of each voter's 1st choice, 2nd and so on.

Summary of Cumulative Voting Systems

- Voters have as many votes as there are seats to be filled but **they can distribute these votes however they want**, giving one vote each to several candidates, or all votes to a single candidate.
- **Administration of cumulative voting elections:** The ballot must allow voters to cast a number of votes up to the number of seats and to give one or more votes to one or more candidates. The voting equipment must either prevent voters from casting an invalid vote (overvote) or notify voters of errors, allowing voters to correct them. It must record the total number of votes received by each candidate.

Toward Technical Standards for Voting Systems that Accommodate Ranked-Ballot Elections

Overview of requirement of standards for ranked ballot elections

In a traditional election, vote-counting equipment can store running totals for each ballot position. In a ranked choice voting election, ballots must allow voters to rank candidates in order of choice and voting equipment must store an electronic record of each voter's ranking. In a separate step, all rankings must be aggregated and then tabulated according to the rules of the election. Because of this difference in the role of the voting system, technical standards for ranked-ballot elections must address these two steps independently.

Legislation authorizing ranked ballot elections can address certain details in a variety of ways. One example is duplicate rankings. Some legislation discards ballots when a duplicate ranking is reached, whereas other legislation skips the duplicate ranking. Thus, vendors must specify how their systems handle particular details and if there are any options for handling those details. Questions in [red text](#) address details that vendors must spell out.

In the text below, we lay out all the issues that must be addressed in the technical standards as well possible options for each issue. It is divided into three parts:

1. Voting and capturing rankings,
2. Cleaning data and tabulating results, and
3. Result reporting, logic and accuracy tests, and post-election counts.

Part One: Voting and capturing rankings

This part concerns the process by which the voters completes her ballot and the voting system scans it for errors, notifies the voter if there's an error, and then stores the image of the ballot.

1. Ballots and ranking

Ballots shall be simple and easy to understand. Ballots shall allow voters to indicate their first choice, their second choice, their third choice and so on.

For vendors: What is the maximum number of candidates (including write-ins) that the system can accommodate?

2. Error prevention (DRE equipment)

The voting system shall be able to prevent the voter from casting an invalid ballot by ensuring voters do not rank more than one candidate with the same ranking. It also shall be able to prevent the voter from skipping a ranking.

3. Error notification (precinct-based equipment using paper or punch card ballots)

A ballot with one or more candidates ranked sequentially starting with first choice shall be considered an intended ballot. All other ballots shall be considered error ballots (although only

invalid once the voter error is reached – for example, a voter who had ranked two candidate as their second choice will still have their ballot count for their first choice). Errors include the following scenarios:

- Duplicate rankings, such as listing more than one candidate for first choice
- Skipped rankings, such as listing a second choice but no first choice
- Same candidate ranked more than once, such as a candidate ranked first and third.

The voting system shall be able to notify voters if they cast a ballot with an error. The system shall print out a descriptive message in plain English that informs the voter of the error. If error notification is used, the voter shall have the options of correcting her ballot and overriding the error by submitting it “as is.” The voting system may be programmed to notify voters if they rank fewer than a fixed number of candidates in a race.

For vendors: Can error notification be turned on or off at the jurisdiction’s request?

4. Write-in candidates

The voting system shall allow the voter to vote for one write-in candidate for each seat being elected.

5. Storage of ballot images

The voting system shall store true ballot images and shall be able to produce a human-readable report containing all ballot images. The ballot images should store duplicate rankings, skipped rankings and the same candidates listed more than once exactly as the voter marked the ballot. For example, if a voter casts an undervote as a 1st choice and a vote for candidate A as a 2nd choice, the vote should be stored as (undervote, A) rather than in the “cleaned” or advanced form, “(A, undervote).

For vendors: Does the system keep track of the actual candidates that received the same ranking or does it store a code for duplicate rankings?

Part Two: Cleaning data and tabulating results

This part concerns the process by which the stored data is cleaned and interpreted according to the authorizing legislation and then tabulated to determine the winner or winners of the election.

1. Skipped rankings

Does the system allow for the distribution of the ballot to the next valid ranking?

Does the system allow for the skipping of no more than a fixed number of rankings and exhausting ballots that skip more than that (e.g., skip from 1st to 3rd, but not from 1st to 10th)?

Does the system allow for the exhausting of ballots when they reach skipped rankings?

2. Duplicate rankings

Does the system allow for the exhausting of duplicate rankings?

Does the system allow for skipping of duplicate rankings?

Does the system allow for the counting of duplicate rankings if exactly one of the duplicate candidates has not been eliminated?

Does the system allow for the dividing of ballots fractionally among all duplicate ranked candidates?

3. Same candidate ranked more than once

Does the system allow for skipping to the next valid ranking?

Does the system allow for the exhaustion of ballots after it reaches a candidate ranked more than once?

4. Ties

Does the system allow for resolving of ties for last place by drawing lots?

Does the system allow for resolving of ties for last place in favor of the candidates with the most votes in the previous round, or by lots if tied in all previous rounds?

5. Simultaneous elimination

Is it possible to set the tabulation to simultaneously eliminate two or more candidates with the fewest votes if the sum of their votes is less than the candidate with the next most votes?

Is it possible to simultaneously eliminate all candidates with fewer than a fixed number of percent of the valid votes?

Part Three: Result reporting, logic and accuracy tests, and post-election counts

1. Result reporting: The system shall be able to produce reports of the number of votes credited to each candidate, along with the number of exhausted ballots, in each round of counting. The system shall be able to produce a human readable file of all rankings on all ballots in the election. The system shall also be able to report the total number of complete undervotes (no candidate ranked) and overvotes for ranked choice races.
2. Pre-election Logic and Accuracy tests: L&A testing shall consist of running sufficiently large test decks with predetermined patterns through the system, capturing ballot images, and tabulating the ranked choice results. The ballot images and the tabulated results can be compared to the predetermined patterns.
3. Post-election Logical and Accuracy tests (e.g., 1% manual tallies): The system shall have clear procedures for performing a manual tally of ballots in one or more precincts and comparing the round by round results of that tally to a machine tabulation of the ballot images from the same precinct or precincts.