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# TEST REPORT

**QUALIFICATION TESTING  
 OF THE  
 AVC EDGE  
 DRE VOTING MACHINE  
 (HARDWARE LEVEL 3.00,  
 FIRMWARE RELEASE 3.00)**

For  
**Sequoia Pacific Voting Equipment**  
 811 North Main Street  
 Jamestown, NY 14702-0926

STATE OF ALABAMA }  
 COUNTY OF MADISON }

AL Professional Engineer  
 Registration No. 16011

Joseph T. Hazeltine, P.E., being duly sworn, deposes  
 and says: The information contained in this report is the result of complete and  
 carefully conducted testing and is to the best of his knowledge true and correct in all  
 respects.

Joseph T. Hazeltine  
 SUBSCRIBED and sworn to before me this 30<sup>th</sup> day of May 2001  
Elizabeth M. Dennis  
 Notary Public in and for the State of Alabama at Seal  
 My Commission expires 9/22 2003

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TEST BY: J. R. Dearman 5-30-01  
 J. R. Dearman, Project Engineer Date

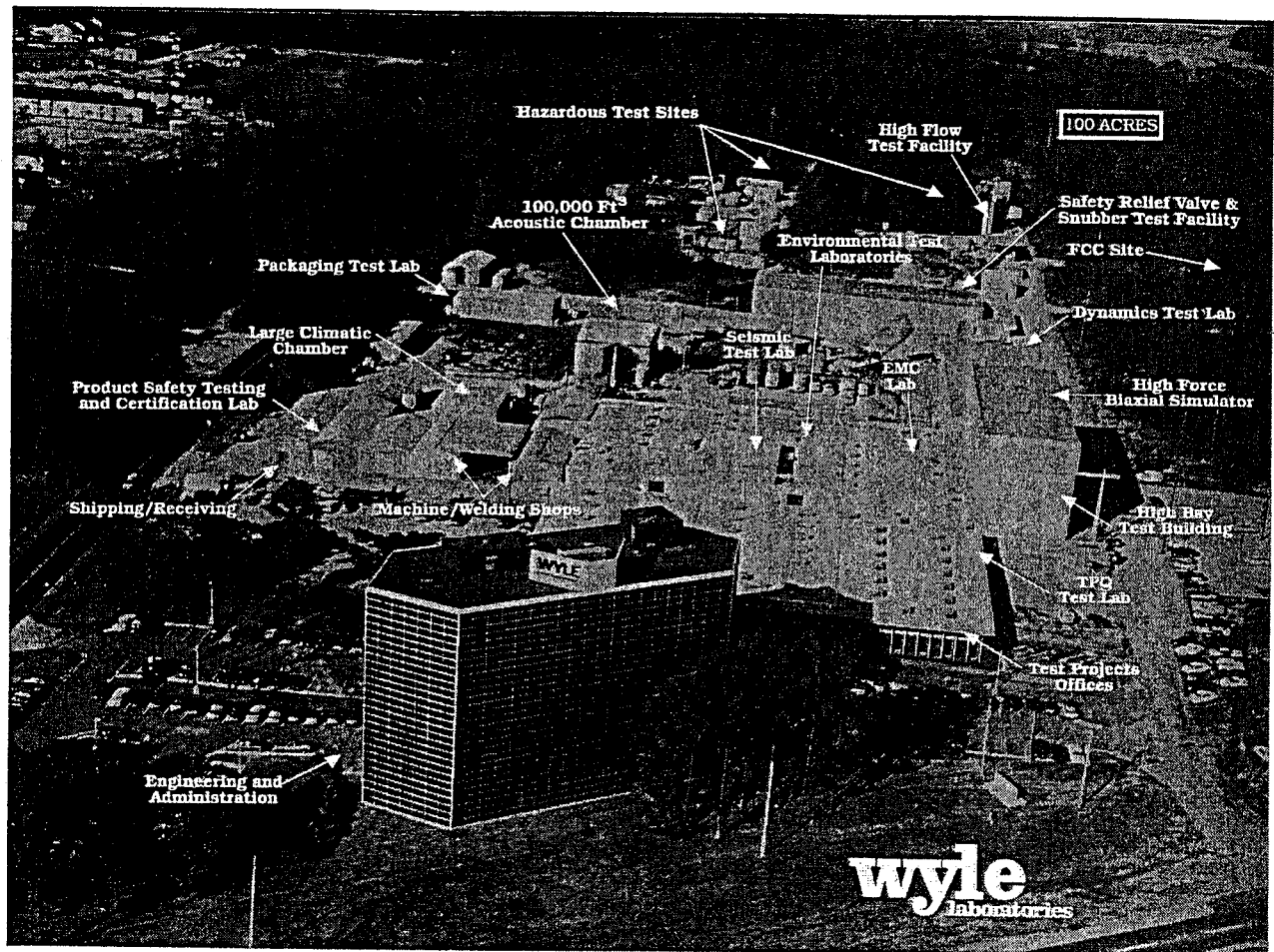
APPROVED BY: J. T. Hazeltine 5/30/01  
 J. T. Hazeltine, Test Operations Manager Date

WYLE Q.A.: T. R. Hamilton 5/30/2001  
 T. R. Hamilton, Q. A. Manager Date

(bds)



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AERIAL VIEW OF WYLE/HUNTSVILLE FACILITY

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## 1.0 INTRODUCTION

### 1.1 Scope

This report presents the test results for Qualification Testing of the Sequoia Pacific AVC Edge Direct-Record Electronic (DRE) Voting Machine.

### 1.2 Objective

The objective of this test program was to ensure that the Sequoia Pacific AVC Edge DRE Voting Machine Hardware, Level 3.00, and Voting Machine Firmware, Release 3.00, complied with the requirements of Sequoia Pacific's own design specifications and with the guidelines of the Federal Election Commission (FEC) National Voting System Standards, January 1990.

### 1.3 Summary

Qualification testing includes: the selective in-depth examination of software; the inspection and evaluation of system documentation; tests of hardware under conditions simulating the intended storage, operation, transportation, and maintenance environments; and operational tests verifying system performance and function under normal and abnormal conditions. Qualification testing was limited to precinct-level hardware and resident machine software.

The AVC Edge and associated Machine Firmware, Release 3.00, was subjected to Reliability and Functional/System-Level Tests. It was demonstrated that the AVC Edge and associated Machine Firmware successfully met the qualification test requirements of the Federal Election Commission Standards for Punchcard, Marksense, and Direct Recording Electronic Voting Systems, January 1990. Qualification testing (in-depth source code review and functional tests) was limited to the firmware and hardware used at the precinct level and did not include any election management software, which typically resides on a personal computer and is used for ballot definition, absentee, and report canvassing activities.

Additionally, AVC Edge operation was demonstrated in conjunction with an optional Card Activator, Hardware Level 2.0, Firmware Release 2.00.

The following paragraphs address, in greater detail, the design methodology of the AVC Edge Voting Machine of which the Sequoia Pacific Technical Data Package was the source for much of this information. Additionally, functional and physical characteristics of the AVC Edge and the test results observed/recorded during qualification testing are also documented, as well as those anomalies recorded during the course of the qualification program. Each anomaly was satisfactorily addressed by Sequoia Pacific personnel and was closed out upon test completion.

Due to the varying requirements of individual jurisdictions, it is recommended by the FEC Standards that local jurisdictions perform pre-election logic and accuracy tests on all systems prior to their use in an election within their jurisdiction.

## 2.0 REFERENCES

- Sequoia Pacific Purchase Order No. 10001386.
- AVC Edge Compliance with FEC Standards Release 3.00, SPVE Doc. No. 096050501.
- AVC Edge System Hardware Description Release 3.00, SPVE Doc. No. 096050601.
- AVC Edge Specification for CPU Board Release 3.00, SPVE Doc. No. 096050611.
- AVC Edge System Software Specification Release 3.00, SPVE Doc. No. 096050621.
- AVC Edge Data Dictionary Release 3.00, SPVE Doc. No. 096050651.
- AVC Edge Software Technical Description Release 3.00, SPVE Doc. No. 096050641.
- AVC Edge Validation Test Plan Release 3.00, SPVE Doc. No. 096050541.
- AVC Edge Quality Plan Release 3.00, SPVE Doc. No. 096050551.
- AVC Edge Configuration Management Procedures Release 3.00, SPVE Doc. No. 096050561.
- AVC Edge Approved Parts List Release 3.00, SPVE Doc. No. 096050571.
- AVC Edge Security Overview Release 3.00, SPVE Doc. No. 096050581.
- AVC Edge Penetration Analysis Release 3.00, SPVE Doc. No. 096050591.
- AVC Edge Functional Specification Release 3.00, SPVE Doc. No. 096050631.
- AVC Edge Voter Instructions Release 3.00, SPVE Doc. No. 096050531.
- AVC Edge System Maintenance Manual Release 3.00, SPVE Doc. No. 096050521.
- AVC Edge Maintenance Assembly/Disassembly Release 3.00, SPVE Doc. No. 096050521.
- Sequoia Card Activator, Operator's Manual Version 2.00, SPVE Doc. No. 190-400570.
- Sequoia Card Activator Assembly, Procedures, September 2000.
- Sequoia Card Activator Assembly Guide, Version 2.00, August 2000.
- Performance and Test Standards for Punchcard, Marksense, and Direct Recording Electronic Voting Systems
- Wyle Laboratories' Quality Assurance Program Manual, Revision 1
- MIL-STD-45662A, "Calibration System Requirements"
- ANSI/NCSL Z540-1, "Calibration Laboratories and Measuring and Test Equipment, General Requirements"
- ISO 10012-1, "Quality Assurance Requirements for Measuring Equipment"



### 3.0 CUSTOMER

Sequoia Pacific Voting Equipment  
811 North Main Street  
P.O. Box 1399  
Jamestown, NY 14702-1399

### 4.0 TEST HARDWARE/SOFTWARE DESCRIPTION

#### 4.1 Hardware

##### 4.1.1 AVC Edge

The AVC Edge is a Direct Record Electronic (DRE) type voting machine. The primary user interface is a color LCD with a touchscreen overlay. The AVC Edge CPU is based on a PC/AT system architecture implemented in the AMD SC400 chip. The AVC Edge weighs approximately 45 pounds and measures 10 in. by 17 in. by 26 in.

The AVC Edge includes the following:

- AMD Elan SC400 CPU
- Kyocera 15", 1024 x 768, passive matrix color LCD.
- Dynapro-compatible touchscreen controller
- ROM SIMMs for the executable code
- Sandisk Compact Flash Memory Card
- Sycard PCMCIA
- Battery Backed Static RAM for application use
- Two Type 2 PCMCIA slots
- Multiple channel A/D converter to monitor battery & other voltages
- Watchdog timer
- DPU 414 Seiko Printer
- Astec Switching Power Supply

The AVC Edge operates from an external voltage of 120 VAC and an internal voltage of 12 VDC. Internal backup battery power allows for continued operation in case of facility power loss.

The AVC Edge has been designed to perform the following functions:

- Validate and load ballot definitions
- Perform pre-election testing and verifications
- Perform election day voting
- Perform post-election testing and verifications
- Print Zero Totals and Results Reports
- Consolidate vote data from multiple machines
- Perform maintenance functions, such as Audit Trail Transfer, Set Time/Data, and print the Event Log report

## 4.1 Hardware (Continued)

### 4.1.1 AVC Edge (Continued)

The Card Activator is an optional separate unit designed to activate Voter Activation Cards, which enable the voter to access the AVC Edge. The Card Activator normally operates from a 120 VAC power source; or it may also be operated from an internal battery. The Card Activator uses a 486 CORE Module (a full-featured embedded PC). In addition to the clock and bus support chips, the processing system is comprised of one 8 Mb of DRAM, one 32 Mb of FLASH Memory, a Counter/Timer Chip, and a Serial OF Controller.

## 4.2 Firmware

### 4.2.1 AVC Edge Firmware

The AVC Edge uses the pSOS real-time, multi-tasking operating system at its core. The pSOS runs in Protected Mode. A separate real-mode BIOS is also part of the system, which is used in power-up only.

The AVC Edge CPU starts in real mode; the AVC Edge software will operate after the machine is switched to protect mode. During power-up, the Power-On Self-Tests (POST) are performed by the Phoenix BIOS. Upon completion, the machine is switched to protected mode.

Upon each power-up, the following software tasks are activated:

- Root
- System
- Machine
- Graphics
- Maintenance
- Load Ballot
- Election
- Vote Consolidation
- Vote Simulation

Extensive information on implementation of the system firmware can be found in the AVC Edge Software Technical Description, Release 3.00, referenced in Paragraph 2.0.

**5.0 PRE-QUALIFICATION TESTS**

**5.1 Pre-Qualification Test Activities**

Sequoia Pacific had performed developmental and operability test cases to verify system readiness prior to delivery for ITA Qualification Testing. These test cases were included in the Technical Data Package.

**6.0 MATERIALS REQUIRED FOR TESTING**

**6.1 Software**

Sequoia Pacific provided the latest version of the AVC Edge Machine Firmware at the time of ITA Qualification Testing commencement, which was Release 2.00. Revisions were made to the firmware during the course of the Qualification Test Program, bringing the version up to Release 2.24A upon program completion. Release 2.24A was then locked by Sequoia Pacific as Firmware Release 3.00.

Sequoia Pacific provided the latest version of the Card Activator Firmware, which was Release 1.9 and locked in by Sequoia Pacific as Firmware Release 2.00 upon program completion.

**6.2 Equipment**

Sequoia Pacific provided a sufficient number of AVC Edge system components to ensure that parallel testing, where feasible, could be performed.

**6.3 Test Materials**

Sequoia Pacific provided all ancillary support material required during the course of ITA Qualification Testing.

**6.4 Deliverable Materials**

Sequoia Pacific provided the latest versions of all hardware and software specifications and poll-worker hardware and software user/maintenance manuals. All user manuals have an identifiable Version Number and Document Control Number or Release Date. Reference Paragraph 2.0 for a listing and version of the applicable documentation.

## 7.0 TEST SPECIFICATIONS

Qualification testing and a documentation review were performed to ensure that the precinct-level AVC Edge Voting Machine and associated machine resident firmware were in compliance with the design and functional requirements contained within the following paragraphs.

The AVC Edge was functionally tested, as it would be configured for use in an election precinct.

### 7.1 Environmental Subsystem

#### 7.1.1 Shelter Requirements

The AVC Edge is capable of being operated and stored in any enclosed and habitable facility ordinarily used as a storage area or polling place.

#### 7.1.2 Space Requirements

The AVC Edge can be set up on a jurisdiction-supplied table, or as a freestanding unit using legs that are stored in a dedicated compartment in each machine. The layout of the AVC Edge should neither impede the polling place officials from performing their assigned duties, nor will it disturb the orderly flow of voters through the polling place.

#### 7.1.3 Electrical Supply Requirements

The AVC Edge is designed to operate with a standard 120 VAC, 60 Hz power source. In the event of a facility power loss, internal batteries provide power to allow for continuation of all system operations. The voting machine is capable of being connected to an external uninterruptible power supply (UPS), if so desired by the using jurisdiction.

#### 7.1.4 Environmental Control

Through qualification testing, it was demonstrated that the AVC Edge is capable of storage and operation in temperatures from  $-15^{\circ}\text{F}$  to  $150^{\circ}\text{F}$  and  $40^{\circ}\text{F}$  to  $100^{\circ}\text{F}$ , respectively. Such testing is discussed in greater detail in Paragraphs 16.0 & 17.0.

### 7.2 Ballot Definition Subsystem

#### 7.2.1 Election Programming/Ballot Generation

The Election Preparation Subsystem used for Ballot Definition and Layout activities operates in a central environment separate from the AVC Edge precinct hardware and, thus, was not subjected to testing. Note that this report addresses qualification testing limited to the precinct level hardware (AVC Edge and Card Activator) and associated machine resident firmware only.

## 7.2 Ballot Definition Subsystem (Continued)

### 7.2.2 Ballot Installation

The AVC Edge is designed as a general-purpose voting device. The AVC Edge can be matched to any ballot. The ballot definition and resulting ballot images as displayed by the AVC Edge are received as a group of data files downloaded from the transferable media cartridge.

### 7.2.3 Programming and Software Installation

Programming of the ballot definitions is a function of the Sequoia Pacific WinEDS Central System Software, which was not evaluated as a part of this portion of the qualification testing. To ensure that the programmed ballot definition has been properly selected and installed, the AVC Edge provides extensive Pre- and Post-Election Logic and Accuracy test utilities, including a method for simulating a large volume of votes, in a predetermined pattern. The test utilizes the same firmware functionality and data paths as used during an official election.

### 7.2.4 Equipment/System Readiness Tests

The AVC Edge performs a self-test as a standard part of each power-up for verification of equipment hardware readiness. The self-test includes test of the System RAM, System ROM, and peripheral devices. Full acceptance with the startup diagnostics must be received before machine operation can begin, i.e., partial operation is not possible. Additionally, through the use of Pre- and Post-Election Logic and Accuracy test utilities, ballot verification and machine readiness can be ascertained as well.

The AVC Edge, when first powered without a Results Cartridge having been loaded, will cause the system to revert to the Maintenance Diagnostics screen. From this screen, the technician is provided the means to adjust the LCD contrast, generate a printer test pattern, allow for the date and time to be set if needed, perform an overall system reset that clears all internal memories and counters (except the protective counter), and generate an Event Log Report.

### 7.2.5 Verification at the Polling Place

The AVC Edge as a standard required step in the opening of polls, includes a diagnostics pass notification upon successful completion of the power-on-self-tests, a zero proof report, the election's identification data, the AVC Edge's machine serial number, the ballot identification and the polling place output locations. Additionally, a listing of all offices and measures, and their candidates and responses with the vote counter value of each is included.

## 7.2 Ballot Definition Subsystem (Continued)

### 7.2.6 Opening the Polling Place

Opening of the polls on the AVC Edge involves powering up the machine, and turning the POLLS switch to OPEN. A programmed Results Cartridge must have already been configured into the machine. The POLLS switch is protected from inadvertent actuation by a door, which can be sealed with a security tie. Upon the opening of polls, the AVC Edge performs the following: printout of a Zero Proof Report, posts a polls-are-open event to the audit log, validates the integrity of the ballot definition data, advances the election state variables to polls open and displays the Voter Inactive prompt.

### 7.2.7 Party Selection/ Ballot Subsetting

The AVC Edge provides for both open and closed primary voting, depending on the ballot definition data that is loaded onto each machine. If voting a closed primary, the poll worker, through the use of on-screen touch-buttons, selects the party that will be activated for the voter or, if using the card activator, will program and provide the voter with a card which will call up the applicable party ballot. If the primary is open, the voter selects the party from the AVC Edge's display, and the appropriate ballot is called up. The voter is prevented from voting for a candidate of another party due to the manner by which the AVC Edge displays only the selected party ballot, i.e., the candidates for the other parties are not displayed.

Ballot subsetting due to geographical boundaries or other criteria is supported by the AVC Edge. The poll worker selects the ballot subset for each voter, and the AVC Edge only displays the contests and measures the voter is eligible to vote on.

The ballot subset information is part of the ballot definition data that is loaded onto each machine.

### 7.2.8 Enabling the Ballot

The poll worker presses the ACTIVATE button to enable the AVC Edge for voting. In the case of a ballot that uses subsets, such as a closed primary or a multiple-precinct voting location, the poll worker is required to indicate the proper ballot subset before activating the AVC Edge. The ACTIVATE button is located at the opposite end of the machine away from the voter.

If using the card activator, the poll worker provides the voter with a voter card, which is inserted in the Edge's card activator slot. The Edge reads the card to determine which ballot is displayed for the voter.

## 7.2 Ballot Definition Subsystem (Continued)

### 7.2.8 Enabling the Ballot (Continued)

The ballot is shown to the voter as a series of display pages. The voter moves between pages using the NEXT and BACK buttons. The last page of the ballot is always designated as the 'Cast Ballot' page from which the ballot can ultimately be cast, i.e., the voter must have scrolled through all the ballot pages before being presented with the ability to cast the ballot. Only upon the casting of the ballot is the voter's choices stored in redundant memories.

### 7.2.9 Candidate and Measure Selection

The ballot presented on the AVC Edge screen provides labeling, which indicates the race and name of every candidate and the titles of every measure that can be voted. Additionally, the displayed ballot provides a button (circle) icon to be pressed upon the casting of a vote. The casting of votes is performed by the voter touching with a finger the candidate/measure to be selected. Proper selection is indicated by a check mark appearing in the candidate's selection box. Additionally, if desired, the voter may deselect a candidate by pressing the button icon a second time and choosing a different candidate. Successful deselection of a desired candidate is verified by the check mark being removed from the candidate's name.

### 7.2.10 Write-In Voting

Write-in voting is accomplished by selecting the WRITE-IN button on the ballot that, in turn, displays an alphanumeric keyboard on the AVC Edge's screen. The voter then has the opportunity to vote for a write-in candidate by typing in the candidate's name. If the voter later decides to deselect the write-in candidate, the voter may do so by deselecting the WRITE-IN button and selecting another candidate for that race or by replacing the write-in candidate with the name of another. Additionally, at any time while the write-in page is being displayed, the voter can select the CANCEL button and the AVC Edge will return to the normal ballot display. Multiple write-ins can be provided for any office, so that the voter may enter as many write-in names as the office's 'vote-for' number. Each write-in on the results report has an attached code to allow the polling workers reviewing the machine reports at the end-of-day to identify if the same name was 'written-in' more than once for the same race, if the race allows for multiple write-ins.

### 7.2.11 Special Voting Options

The AVC Edge will support Straight Party Voting, Multiply Endorsed Candidates, Write-In Candidates, Recall Issues with Options, Rotation of Names within an Office, and Closed and Open Primary Elections. Each AVC Edge can be configured to allow or disallow these features.

## 7.2 Ballot Definition Subsystem (Continued)

### 7.2.12 Casting a Ballot

The ballot is shown to the voter as a series of display pages. The voter moves between pages using the NEXT and BACK buttons. The last page of the ballot is always the Cast Ballot page. When the voter presses the CAST BALLOT button, the voter's selections are redundantly recorded. The voter can find how many pages remain on the ballot by looking at the bottom of the ballot to see displayed 'X of Y' pages. The screen also indicates the current precinct/ballot style.

The AVC Edge provides both an audible and a visible alarm indication that the vote has been recorded.

The vote saving procedure includes saving the voter's ballot image, incrementing counters for each candidate/measure that the voter selected, and validating that the saves and increments were successful. The ballot image is saved to a random file position, ensuring each voter's anonymity. A confirmation message is displayed on the screen to the voter confirming that the ballot has been cast.

Once a voter has completed voting and pressed the CAST BALLOT button, the AVC Edge returns to its "Waiting For Voter" state. In this state, voting is not allowed; the poll worker must re-activate the machine for the next voter.

When the card activator is used, the smart cards are deactivated as part of saving the ballot. The cards are then automatically ejected from the Edge and returned to the poll worker for re-activation for another voter. No vote data is saved to these cards.

### 7.2.13 Public Counter

The AVC Edge is equipped with a Public Counter. This counter can only be set to zero as part of the System Reset procedure that is done after polls are closed. The Public Counter is incremented once each time a ballot is cast. The Public Counter value is printed on all Zero Proof and Results Reports, and is accessible for viewing by election officials at all times that the AVC Edge is powered on.

### 7.2.14 Protective Counter

The AVC Edge is equipped with a Protective Counter that cannot be reset. This counter is set to zero when each system is manufactured. The Protective Counter is incremented once each time a ballot is cast. The Protective Counter value is printed on all Zero Proof and Results Reports, and is accessible for viewing by election officials at all times that the AVC Edge is powered.



## 7.0 TEST SPECIFICATIONS (Continued)

### 7.3 DRE Post-Voting Functions

#### 7.3.1 Closing the Polling Place

Polls are closed on the AVC Edge by moving the POLLS switch to the CLOSED Position. This action causes the following to happen:

- a results report is printed;
- cryptographic signatures of the vote data are calculated and stored, which provides proof to the central election management software that the data tallied is authentic;
- a Polls Closed event log entry is made;
- the internal system state is advanced to Polls Closed; and
- the Polls Closed displays are presented, providing a clear indication that the machine state is polls closed.

When the above sequence has started, it cannot be stopped. Once the polls are in the polls closed state, the POLLS switch is ignored. The internal system state of the AVC Edge is stored in non-volatile memory, so the system cannot be fooled, such as by cycling power.

#### 7.3.2 Obtaining Machine/Polling Place Reports

The AVC Edge automatically prints a result report as part of the closing of polls. This report uses the same format as the zero proof report, and shows the following information:

- the election's identification;
- the AVC Edge's serial number;
- the ballot identification;
- the polling place location;
- a listing of all offices and measures, and their candidates and responses, with the vote counter value for each; and
- all special voting options, such as straight party and multiple endorsed candidates.

At the jurisdiction's option, each AVC Edge can be commanded to automatically print multiple copies of the result report.

At any time, while at the Polls Closed state, the machine operator can press a touch-button that causes another copy of the results report to be printed. This provides a recovery mechanism in case a printout is spoiled, the paper runs out, etc.

All vote data is accessed in read-only mode when a report is generated. An Event Log entry is made each time a report is generated.

### 7.3 DRE Post-Voting Functions (Continued)

#### 7.3.2 Obtaining Machine/Polling Place Reports (Continued)

The AVC Edge stores all vote data on a removable Results Cartridge device. This device is required to be present at all times when the polls are open. After polls are closed, this device is removed and may be taken to central for further vote tabulation activities using the central election management software.

The Results Cartridge contains a copy of all data from the election; including vote totals counters, ballot image detail, and the system Event Log.

The AVC Edge and its memory cartridges both use a non-volatile memory technology for all vote storage. The data retention life of this memory as specified within the Sequoia Pacific Technical Data Package is in excess of 20 years, and its reliability has been specified as less than 1 non-recoverable error in  $10^{14}$  operations.

The AVC Edge provides a Vote Consolidation feature that is available as a jurisdiction option. Vote Consolidation uses a Consolidation Cartridge to collect copies of the vote data from each AVC Edge in a polling place. After all the data has been collected, the Consolidation Cartridge can be inserted into any of the AVC Edge systems at the polling place and various reports can be generated, including consolidated totals, totals by precinct, etc. Event Log entries are made when vote consolidation is performed and when consolidation reports are generated.

### 7.4 Overall System Requirements

#### 7.4.1 Security

The AVC Edge follows a defined path through the election path sequence. The major steps within this sequence includes: system reset to initialize the machine, authentication and loading of the ballot, pre-election logic and accuracy testing, official election and post election logic and accuracy testing. Within the three election modes (Pre-LAT, Official, and Post-LAT), the following sequence is adhered to; Ready to Open Polls, Opening Polls, Print Zero Proof Report, Voting, Closing Polls, Print Results Report, Polls Closed. Critical steps in the election sequence, such as opening and closing polls, can be protected against unauthorized access with a combination of physical security such as numbered seals.

#### 7.4.2 Accuracy and Integrity

The AVC Edge utilizes several processes to ensure the accuracy and reliability of the voting data. These include:

- data is saved redundantly, via separate data paths;
- data is saved in both ballot image and summary total format; and
- ballot image data includes a CRC value, to allow detection of memory errors between voters and upon each power-up.

## 7.4 Overall System Requirements (Continued)

### 7.4.2 Accuracy and Integrity (Continued)

The AVC Edge has been designed to validate the saved data by performing a byte-by-byte comparison of the two redundant memories, confirmation that all ballot image CRC values are correct, and a recalculation and comparison of the ballot image totals and summary totals.

The process of saving votes on the AVC Edge involves redundant checking, which includes: data being read from a file (such as vote totals to be incremented are read twice and compared before being used); data being written to a file is read back twice and compared to the original data; and arithmetic operation (such as bit-packing and incrementing) is double-checked.

All ballot image and write-in data is stored in randomized fashion within its particular file. The randomizing function is based on a 32-bit maximal length pseudo-random sequence that is further randomized by the second's value of the current time. The pseudo-random sequence state is maintained in non-volatile memory and is initialized only during manufacture; the sequence does not restart from the same seed value at each power up.

The AVC Edge includes an extensive power on self-test. The execution of this test is a required part of every power-up to ensure continued voting machine operating reliability. The AVC Edge monitors itself while in operation and includes a comprehensive Event Log documenting all activities both normal and abnormal.

### 7.4.3 Data Retention

The AVC Edge voting and audit data is stored in solid-state, non-volatile memory. The data retention life of this memory, as stated within the Sequoia Technical Data Package, is in excess of 20 years and its reliability is specified as less than one non-recoverable error in  $10^{14}$  operations.

## 7.5 Hardware Standards

### 7.5.1 Hardware Configuration Management

The Hardware Configuration Management processes are extensively detailed within Sequoia Pacific's Configuration Management Procedures, Release 3.00, SPVE Document Number 096050561.

**7.5 Hardware Standards (Continued)**

**7.5.2 Enclosure**

The AVC Edge is intended for use either on a tabletop or free standing. Privacy panels are a standard feature that prevents voters from observing one another's selections.

In the freestanding configuration, the AVC Edge uses supplied legs that are designed to provide maximum stability while not hindering voter access.

The AVC Edge's display/touchscreen are adjustable to different viewing angles to accommodate a wide range of conditions, including wheelchair-bound voters.

**7.5.3 Activity Indicator**

The AVC Edge provides several indicators of the operational status. A unique tone announces each time a machine is activated for voting and each time a ballot is cast. Error conditions are announced with a siren tone. A poll worker display on the back of each AVC Edge shows the current system state – Voter Active or Waiting For Next Voter, plus the Public and Protective Counter values.

**7.5.4 Recording Speed**

Voters may make selections and cast ballots as rapidly as they are prepared to do. Voting performed on a typical ballot did not exceed three minutes in duration.

**7.5.5 Recording Reliability**

The AVC Edge adequately demonstrated its ability to sustain accuracy during the collection and retention of voting data. It was demonstrated during the Environmental Operating Test that the system was capable of collecting and retaining votes without error over a combined operational period of 163 hours.

**7.6 DRE Processing Subsystem**

**7.6.1 Processing Speed**

The AVC Edge demonstrated adequate response time to operate at speeds sufficient to respond to any operator and voter input without a perceptible delay.

The removal of the Results Cartridge from the AVC Edge after polls close takes less than one minute. The Audit Trail Transfer process, which can be used to extract voting data in the event that the Results Cartridge is lost or damaged, takes less than one minute.

The AVC Edge Vote Consolidation function takes less than five minutes per machine.

## 7.6 DRE Processing Subsystem (Continued)

### 7.6.2 Processing Accuracy

Processing of election data, including audit log data, was performed during qualification testing to ensure that the AVC Edge had the ability to process such data error free. The processing of summary reports and audit log data was limited to those reports as generated by the AVC Edge at the precinct level.

The AVC Edge performs validity checks on all vote data, both before and after Vote Consolidation occurs. The generation of consolidated reports at the polling place involves read-only access to the consolidated vote data, designed to alleviate the risk of the data being altered.

Consistency checks prevent the possibility of generating a report from a failed or damaged memory cartridge; therefore, any report discrepancy can be traced to a procedural error, the failure of a non-memory device, or to an external cause.

### 7.6.3 Memory Stability

The AVC Edge and its memory cartridges both use a non-volatile memory technology for all vote storage. The Sequoia Technical Data Package states that the data retention life of this memory is in excess of 20 years, and its reliability is specified as less than one non-recoverable error in  $10^{14}$  operations.

## 7.7 Reporting Subsystem

### 7.7.1 Removable Storage Media

The AVC Edge uses a Flash ROM memory cartridge, based on the PCMCIA interface standard. The internal Audit Trail memory of the AVC Edge is based on the same Flash ROM technology.

### 7.7.2 Printers

The AVC Edge uses a Seiko DPU-414 thermal printer. This printer is capable of generating alphanumeric data to support all reports.

## 8.0 PHYSICAL CHARACTERISTICS

### 8.1 Size

When closed for transport, the AVC Edge measures approximately 10 in. by 17 in. by 26 in.

When opened into the voting position, the AVC Edge overall dimensions are:

Usage	Depth (inches)	Width (inches)	Height (inches)
Table-top Setup	36	17	22
Free-standing Setup	36	28	54

### 8.2 Weight

The AVC Edge is classified as Portable Equipment (i.e., equipment typically installed and operated on a table or stand to which it is not permanently affixed) and has an approximate weight of 45 pounds.

### 8.3 Transport and Storage

The AVC Edge is provided with a handle for ease of carrying and setup.

The AVC Edge is self-contained, including a protective case for handling and transport. Additionally, a shipping container is available that meets the requirements for transportation by road, rail, air, or common carriers.

It was demonstrated during qualification testing that this delivery arrangement provides adequate protection to the AVC Edge in the event the machine is dropped during handling from heights as high as 48 inches. Any other delivery method would be at the risk of the user if the AVC Edge was dropped during handling.

### 8.4 Physical Security

Physical security is provided through the use of numbered seals that provide evidence of access to the internal components of the system as well as access to the poll's switch and results cartridge.

### 8.5 Transportability

The AVC Edge is capable of being transported by road, rail, or air.

## 9.0 DESIGN, CONSTRUCTION, AND MAINTENANCE CHARACTERISTICS

### 9.1 Materials, Processes and Parts

The Sequoia Pacific Technical Data Package contained an extensive listing of those system elements that make up the AVC Edge as well as an assembly procedure.

### 9.2 Durability

The commercial construction standards observed to be associated with the AVC Edge suggest a continued life available for at least eight years through normal election use. The Sequoia Pacific Technical Data Package states that the AVC Edge has been designed to have an operational life of in excess of 10 years, given that a periodic maintenance schedule is followed. The primary maintenance items are the internal batteries, which are recommended for replacement every 2 years.

### 9.3 Reliability

A Mean-Time Between Failure of a minimum of 163 hours was demonstrated during qualification testing as accumulated on two AVC Edge machines. This testing was performed during varying temperature and input voltage conditions and is discussed in further detail within paragraph 16.0. There were no hardware failures observed which resulted in the loss or unacceptable degradation of one or more machine functions during this test.

### 9.4 Maintainability

The AVC Edge is designed for easy access to internal components.

The AVC Edge provides a diagnostic capability as a standard part of its operating firmware. These diagnostics include power-up self-tests, and continuous tests, in the background, while operating.

The AVC Edge operating environment consists of three levels of support personnel, with responsibilities as listed below:

- Poll worker – Handles normal machine operations on Election Day, including activating for voters, opening and closing polls. The poll worker is also trained to be able to resolve printer problems (such as a paper jam), and to make sure the Results Cartridge is properly inserted and sealed when it is required.
- Election Technician – Handles more complex tasks, such as pre-election setup and testing, touchscreen calibration, battery recharging/testing/replacement, and module-level repair. A module-level repair would be, for example, swapping out a power supply or LCD/touchscreen assembly.
- SPVE Technician – Handles repair and testing of individual modules that are returned from the field.

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9.0 DESIGN, CONSTRUCTION, AND MAINTENANCE CHARACTERISTICS (Cont'd)

9.5 Electromagnetic Radiation

The AVC Edge voting machine was subjected to electromagnetic measurements to ensure that it meets the limits for a FCC Part 15, Class B, computing device. Radiation Sciences Incorporated performed this testing and the resulting data is contained in the Radiation Sciences Inc. Test Report No. RSI-2033E, March 2000. This report has been added to the Sequoia Pacific Technical Data Package.

9.6 Product Marking

The unit's serial number is stamped on each AVC Edge case. The Data Plate to be affixed to each unit has the AVC Edge logo, Model No., Firmware Version No., and additional information with regards to power, etc.

Attachment B contains a typical Product Label to be affixed to each AVC Edge.

9.7 Workmanship

Sequoia Pacific states that workmanship on the AVC Edge has been designed to meet or exceed standard commercial and industrial practice. A review of the AVC Edge internal layout does confirm that good workmanship/layout principles were undertaken during the assembly of the unit.

9.8 Interchangeability

The AVC Edge is designed as a group of subsystems, with well defined mechanical and electrical interfaces maximizing interchangeability.

9.9 Safety

The AVC Edge and card activator was subjected to a product safety review to ensure compliance with UL1950, Safety of Information Technology Equipment, Including Electrical Business Equipment, and was found to comply with no modifications required.

Attachment C contains Product Safety Data Sheets.

9.10 Human Engineering

9.10.1 Controls and Displays

All user operations follow a single path, from loading a ballot, through pre-election logic and accuracy testing, Election Day voting, and post-election functionals. User prompts are presented in an unambiguous manner.

All AVC Edge displays and controls are easily accessible.



## 9.10 Human Engineering (Continued)

### 9.10.1 Controls and Displays (Continued)

The voter interacts with the AVC Edge through the touchscreen and LCD. This subassembly can be moved to several positions for optimal viewing and access, including a full-vertical position that would be suitable for wheelchair-bound voters. Instructions, when needed, are provided on-screen.

Additionally, during testing, the Sequoia Pacific Technical Representative demonstrated the means through which the ballot could be presented to a sight-impaired voter via audio. This was accomplished via an audio interface box (in prototype development) connected to the serial port on the edge. The voter makes selection and receives confirmation of the votes cast via audio guidance through headphones. This device was a prototype and additional modification testing will be required once the final design is in place.

Depending on the function, the poll worker and technician interact with the AVC Edge through both the main touchscreen and LCD, and the rear panel. The rear panel contains the cartridge slots power switch, polls switch, activate button, and a 2-line LCD display. Instructions, when needed, are provided on-screen.

All messages for the poll worker other than those shown while the system is at voter-active are shown on both the main LCD and the 2-line LCD on the rear panel.

All displays are readable by persons with normal eyesight. Both LCDs are backlit, to minimize problems with insufficient ambient lighting.

Significant machine operations, such as activating for a voter, casting a ballot, and error conditions, are announced by audible tones.

Normal operating status messages are presented on either a white or green background. Software error conditions are reported on a yellow background. Hardware error conditions, such as an imminent loss of battery power, are reported on a red background.

The display of the card activator is likewise readable with an LCD backlit screen.

## 10.0 SOFTWARE STANDARDS

### 10.1 Software Design and Coding

The precinct-level AVC Edge machine level software was subjected to a source code review. The source code was reviewed to ensure it followed the recommended programming guidelines as contained in the FEC standards. This included a review for:

- **Simplicity:** the straightforwardness of the design, such as avoidance of complex structure and obscure algorithms.
- **Understandability:** the ease with which the intent and function of the code can be ascertained and verified.
- **Testability:** the construction of code so as to incorporate implicit or explicit points or features to the flow of data and control within modules and at module interfaces.
- **Robustness:** a property of software design that is enhanced by editing and range specification, by the incorporation of controls or traps for immediate detection of errors to prevent their propagation throughout the rest of the code, and by providing a means of recovery without loss of control or data.
- **Security:** the inclusion of provisions to prevent unauthorized access, or to detect and control it, should it be attempted.
- **Usability:** the ability of the Voting Machine to be operated without recourse to excessive or obscure control procedures (e.g., text messages rather than numerical error codes which require the user to consult a table).
- **Installability:** the ease with which a Voting Machine can be made fully operational after delivery.
- **Maintainability:** the ease with which defects can be identified, corrected, and validated in the field.
- **Modifiability:** the ease with which new features can be incorporated into existing software.

The AVC Edge software reviewed during qualification testing commenced with Release 2.0. Revisions were made to the firmware during the course of the Qualification Test Program, bringing the version up to Release 2.24A upon program completion. Release 2.24A was then locked by Sequoia Pacific as Firmware Release 3.00.

Sequoia Pacific provided the latest version of the Card Activator Firmware, which was Release 1.9 and locked by Sequoia Pacific as Firmware Release 2.00.

**10.0 SOFTWARE STANDARDS (Continued)**

**10.1 Software Design and Coding (Continued)**

Each revision level submitted was the result of the source code being modified to add an improvement or to correct for a functional anomaly observed during qualification testing. Each level, when submitted, was subjected to a source code review to ensure the modifications were consistent with coding standards as set forth within the FEC guidelines.

A final report detailing the results of the source code reviews for each release submitted is included in Attachment D.

**10.2 Configuration Management**

The Sequoia Technical Data Package states that the source development team uses the PVCS configuration management tool for all code and documentation files. Files to be worked are checked out by a developer, and are only checked in again after the changes are complete and tested, both at the unit and system level. PVCS provides integrated reporting of differences between versions, and can be used to retrieve older versions of any module, if necessary.

All unit testing is documented in a test journal file associated with each source file. All system-wide functional testing and defect reports are similarly documented.

**10.3 Data Quality Assessment**

The AVC Edge Software Technical Data Package addresses in depth the methodology by which the resident firmware has been built to perform real-time monitoring of system status and data quality.

**10.4 Vote Recording Accuracy and Integrity**

During testing, the AVC Edge was subjected to several test elections. During test, all votes were accurately recorded from each ballot cast and accurate summary reports were generated.

**10.5 Data and Document Retention**

The AVC Edge stores all vote data and audit log data redundantly, to an internal Audit Trail memory device and to the removable Results Cartridge device. These two devices are based on Flash ROM technology.

At any time before the vote data is erased, the Results Cartridge for a given AVC Edge can be reinserted into the machine and validated as still being identical to the Audit Trail memory copy. Further, in the event that the Results Cartridge was misplaced or damaged, a copy of the AVC Edge's Audit Trail memory data can be made using the Audit Trail Transfer feature and a special Audit Trail Transfer memory cartridge. Finally, at any time, an additional Results Report hard copy can be generated from each AVC Edge.

## 10.0 SOFTWARE STANDARDS (Continued)

### 10.6 Ballot Interpretation Logic

Through simulated elections performed during qualification testing, the AVC Edge demonstrated proper ballot interpretation of the following:

1. Closed and open primary elections
2. Partisan and non-partisan offices
3. Straight party voting
4. Split precincts
5. Vote for N of M
6. Undervotes & Overvotes
7. Total blank ballots
8. Cross-Party Endorsement
9. Write-In Voting

## 11.0 SYSTEM AUDIT

### 11.1 Operational Requirements

The AVC Edge provides an Event Log for recording all significant system activities. Type of entries include:

- pre-election ballot testing,
- election day activities,
- post-election activities,
- report printing,
- power cycling,
- operator induced errors, and
- system errors.

The Event Log is stored in both the internal Audit Trail memory and on the Results cartridge.

### 11.2 Time, Sequence, and Preservation of Audit Records

The AVC Edge incorporates a real-time clock.

All Event Log entries are automatically stamped with the current date and time. It is not possible to interrupt or disable the logging of events to the Event Log. The Event Log contents can be printed directly at the AVC Edge. The Event Log data can also be collected for later review by the central election management software.

Attachment A contains a representative example of the AVC Edge audit log report.

## **11.0 SYSTEM AUDIT (Continued)**

### **11.3 Error Messages**

AVC Edge errors are reported as they occur. In all cases, an Event Log entry is made as a standard part of the error response. All error messages are displayed in plain text, with appropriate recovery instructions.

When in an error condition, the AVC Edge is designed to limit allowable actions to only those that will recover from the error. No extraneous inputs are accepted.

The AVC Edge is designed to respond immediately when an error occurs. Each error must be resolved in turn, so there is no situation where multiple errors can be nested.

### **11.4 Status Messages**

The AVC Edge reports status information to the user immediately in easily understood text. Significant changes in status, such as opening and closing polls, are also logged to the Event Log.

### **11.5 System Readiness Audit Records**

The AVC Edge includes pre-election logic and accuracy test capabilities.

The logic and accuracy test consists of a complete cycle through the election processing software of the AVC Edge. This cycle consists of opening polls, printing a Zero Proof Report, casting votes, closing polls, and printing a Results Report. The exact voting logic and data paths that are also used during the election is used during the logic and accuracy tests; however, the vote data is stored into separate files.

At the jurisdiction's discretion, Vote Simulation can be used as part of the logic and accuracy tests. Vote Simulation consists of an external script file of keypress/touchscreen press data that is read from a special Vote Simulation cartridge that is inserted in the AVC Edge's Auxiliary Port. The Vote Simulation utility eliminates operator error when voting a test pattern during the logic and accuracy testing.

### **11.6 In-Process Audit Records**

The AVC Edge is designed to capture all the events and activities normally encountered during in-process activities. Additionally, the in-process record includes each time the AVC Edge is enabled for voting, and each time a vote is cast. A complete listing of Event Log entries is contained within the appendices of the user's manual, including error codes where applicable.

11.0 SYSTEM AUDIT (Continued)

11.7 Vote Tally Data

The Vote Tally Data on the AVC Edge includes the following separately accumulated items:

- number of ballots cast for each ballot style;
- number of ballots cast within each precinct and/or party;
- candidate and measure totals for each contest;
- write-in names that were entered, with links to which they were cast; and
- an associated ballot image record.

The latter data is presented to ensure that in multiple vote-for contests, voters do not attempt to cast multiple write-in votes for the same candidate. The write-in name data is stored in randomized order. The Ballot Image contains an exact record of each selection made for each voter stored in a randomized order. This detail provides the ability to account for all undervotes. Overvotes are not possible on the AVC Edge.

12.0 SECURITY

12.1 Access Control Measures

There are no external methods for introducing executable code into the system.

Access control in the AVC Edge is achieved by a logical design that only allows one operational path, from loading a ballot definition, to conducting pre-election testing, to Election Day activities, to post-election testing. All user actions, such as opening polls and error conditions, along with their times, are logged to the Event Log.

12.2 Physical Security Measures

12.2.1 Hardware

Secure storage of the AVC Edge is to be a function of the user jurisdiction.

12.2.2 Software

The AVC Edge contains only firmware. The AVC Edge firmware is only accessible by physically disassembling the system. Each jurisdiction must safeguard the physical security of the AVC Edge systems.

The ballot definition data that is created for each election contains no executable code; it consists of data structures, templates, and text.

The AVC Edge does not contain any compiler or similar code. The AVC Edge does not contain any self-modifying code.

## 13.0 QUALITY ASSURANCE

### 13.1 Quality Control

The AVC Edge manufacturing program is extensively detailed in the AVC Edge Quality Plan, Release 3.00, Document No. 096050551. It includes:

- procedures for specifying and procuring parts,
- incoming inspection/test procedures,
- in-process inspection and test procedures,
- firmware security,
- installation procedures, and
- final test procedures.

### 13.2 User Documentation

During qualification testing, Sequoia Pacific provided copies of the AVC Edge Operations and Maintenance Manuals.

## 14.0 SOFTWARE SYSTEM FUNCTIONAL TESTS

### 14.1 Software System Functional Test Procedures

The AVC Edge was subjected to a series of functional Software System Tests to verify proper operation of the machine as dependent upon the proper performance of the machine's operating software. This included the tasks identified below.

- Test operations performed prior to, during, and after processing of ballots, which included:
  - (a) logic tests to verify interpretation of ballot styles to be processed,
  - (b) accuracy tests to verify ballot reading accuracy,
  - (c) status tests to verify equipment,
  - (d) report generation to produce test output data, and
  - (e) report generation to produce audit data records.
- Procedures applicable to equipment used in the polling place for:
  - (a) opening the polling place and enabling the acceptance of ballots,
  - (b) maintaining a count of processed ballots,
  - (c) monitoring equipment status,
  - (d) verifying equipment response to operator input commands,
  - (e) generating real-time audit messages,
  - (f) closing the polling place and disabling the acceptance of ballots, and
  - (g) generating election data reports.

**14.0 SOFTWARE SYSTEM FUNCTIONAL TESTS (Continued)**

**14.2 Software System Functional Test Results**

The AVC Edge Machine Operating Firmware, Release 3.00, was successfully subjected to the above System Software Functional Tests.

The AVC Edge was subjected to several different test elections. The polls were opened and the machines were enabled for voting. Various votes were cast for each of the ballot styles defined. Following the completion of each test election, the polls were closed and election results (summary reports) and audit log trails were generated. The election results were compared against the predetermined votes cast to ensure that proper ballot logic and accuracy in recording the votes had been obtained.

The AVC Edge was additionally subjected to a high-volume-vote reliability/accuracy test. The test and results are discussed in further detail in Paragraph 15.1.

Attachment E contains a typical test election and election results.

**15.0 SYSTEM LEVEL TESTS**

**15.1 Volume**

During volume testing, two AVC Edge systems were subjected to high volume ballot processing and vote recording. Specifically, the AVC Edge systems were configured using an automated script to cast and record in excess of 297,589 votes without error. Additionally, in accordance with the FEC guidelines, the AVC Edge systems were subjected to reading in excess of the minimum required 5000 ballots for a precinct counter. No anomalies were encountered. All vote totals were accurate and complete.

To ensure the accurate retention of voting data in the unlikely event that a memory storage device fills to its maximum limit, tests were performed to verify the AVC Edge response. In each case, the AVC Edge disallowed the casting of a ballot when presented with a situation where the storage medium was at capacity and would not be able to successfully capture and store the ballot data.

**15.2 Stress Tests**

Stress Tests were successfully performed to investigate the AVC Edge machine's response to transient overload conditions. This included cycling the power on and off, reading of ballots to minimum battery power, etc.

**15.3 Security Tests**

As previously described, the AVC Edge election definition is secured within the machine by tamperproof seals or other sealing devices as judged appropriate by the using jurisdiction.



**15.0 SYSTEM LEVEL TESTS (Continued)**

**15.4 Usability**

Setup and subsequent operation of the AVC Edge was found to be relatively straightforward following training. Poll worker operation is straightforward, including the opening and closing of polls, all of which is performed through touchscreen entry/button actuation. The voter's actions are limited to touching their appropriate candidate's name on the AVC Edge touchscreen. The user manuals include step-by-step instructions accompanied with figures.

**15.5 Recovery**

The AVC Edge was successfully tested to verify its ability to recover from certain error-handling conditions: These included the purposeful disabling of the input power, insertion of incorrect election ballot definition cards, etc.

**15.6 Performance**

As detailed in other sections of this report, the AVC Edge was successfully subjected to several simulated elections to verify poll opening, voting, and poll closing sequences as well as voter recording accuracy and correct ballot logic interpretation.

**16.0 OPERATING TEST**

**16.1 Operating, Environmental Test**

To demonstrate a minimum acceptable Mean-Time-Between-Failure threshold of the AVC Edge, two machines were placed inside an environmental walk-in test chamber and connected to a variable voltage power source.

The temperature inside the chamber and the voltage supplied to each of the AVC Edges were varied from 40°F to 100°F and from 105 VAC to 129 VAC. The environmental test profile and Chamber Thermal Circular Charts are presented in Attachment F.

Two machines were used during the Operating Test to accumulate the time required to demonstrate a minimum Mean-Time-Between-Failure (MTBF) of 163 hours. By subjecting two machines to the Operating Test environment, the accumulated test time per machine was 81.5 hours. Upon completion of the initial 48 hours within the chamber, the chamber was returned to ambient conditions and each AVC Edge operated for an additional 33.5 hours.

There were no machine hardware anomalies observed during the hardware reliability testing.

## 17.0 NON-OPERATING ENVIRONMENTAL TESTS

The AVC Edge was subjected to various Non-Operating Environmental Tests. Prior to and immediately following each test environment, the AVC Edge was powered and subjected to operability functionals to verify continued proper operation. The AVC Edge was not powered during the performance of any of the non-operating tests.

### 17.1 Transit Drop Test

The AVC Edge and Card Activator were subjected to a Transit Drop Test. It should be noted that the National Association of State Election Directors (NASED) has substituted Military Standard 810 for the FEC Voting Systems Standards Drop Test included in the original Standards as published in 1990. Jurisdictions and companies concerned about this substitution, which was made in the interest of ensuring qualified tests current with modern manufacturing methods and materials, may consider having the voting systems manufacturer comply with the standards as written. It is the opinion of NASED and its technical advisors that the substitution provides a better measure of protection for voting systems' purchasers.

The AVC Edge and Card Activator were subjected to a baseline operability checkout to verify system readiness. The AVC Edge was packaged in a Sequoia-provided fiberboard box, measuring 19" x 35" x 26" and weighing 61 pounds. The Card Activator was contained in a nylon transit carrying case. The AVC Edge and Card Activator, each weighing less than 100 pounds with dimensions less than 36 inches, resulted in a drop height of 48 inches. The packaged units were dropped on each face, edge, and corner for a total of 26 drops. Following the drop testing, the units were removed from their shipping containers, powered, and continued operation verified. The units were successfully subjected to a post-test operability checkout.

Attachment G contains a Drop Test Data Sheet.

### 17.2 Low Temperature Test

The AVC Edge and Card Activator were subjected to a Low Temperature Test.

The AVC Edge and Card Activator were subjected to a baseline operability checkout to verify system readiness. Upon completion, the units were placed in an environmental test chamber. The chamber temperature was lowered to -15°F and allowed to stabilize. Upon temperature stabilization, the temperature was maintained for an additional four hours. The temperature was then returned to standard laboratory ambient conditions at a rate not exceeding 10°F per minute. The units were removed from the chamber and inspected for any obvious signs of degradation and/or damage. None were observed. The units were successfully subjected to a post-test operability checkout.

Attachment H contains a Low Temperature Circular Chart.

**17.0 NON-OPERATING ENVIRONMENTAL TESTS (Continued)**

**17.3 High Temperature Test**

The AVC Edge and Card Activator were subjected to a High Temperature Test.

The AVC Edge and Card Activator were subjected to a baseline operability checkout to verify system readiness. Upon completion, the units were placed in an environmental test chamber. The chamber temperature was raised to 150°F and allowed to stabilize. Upon stabilization, the temperature was maintained for an additional four hours. The temperature was then returned to standard laboratory ambient conditions at a rate not exceeding 10°F per minute. The units were removed from the chamber and inspected for any obvious signs of degradation and/or damage. None were observed.

The units were successfully subjected to a post-test operability checkout.

Attachment H contains a High Temperature Thermal Circular Chart.

**17.4 Vibration Test**

The AVC Edge and Card Activator were subjected to Vibration Tests.

The AVC Edge and Card Activator were subjected to a baseline operability checkout to verify system readiness. Upon completion, the units were strapped to a Ling 335 electrodynamics shaker. One control accelerometer was affixed to the shaker table. Vibration and control was performed with an HP5427 Shock/Vibration Controller. The units were subjected to the Basic Transportation, Common Carrier profile as depicted in MIL-STD-810D, Method 514.3, Category I. The units were subjected to vibration for 30 minutes in each orthogonal axis. Upon test completion, the units were removed and inspected for any obvious signs of degradation and/or damage. None were observed. The units were successfully subjected to a post-test operability checkout.

Attachment I contains a Vibration Test Data Sheet and Data Plots.

**17.5 Bench Handling Test**

The AVC Edge and Card Activator were subjected to Bench Handling Tests.

The AVC Edge and Card Activator were subjected to a baseline operability checkout to verify system readiness. Upon completion, the units were configured as for normal operation or servicing. Using one edge (base of machine) as a pivot, the opposite edge was raised to a height of four inches above the surface and allowed to drop freely. This was performed an additional five times for a total of six drops. The same was repeated for the remaining three base edges for a total of 24 drops. Upon test completion, the units were inspected for any obvious signs of degradation and/or damage. None were observed. The units were successfully subjected to a post-test operability checkout.

Attachment J contains a Bench Handling Test Data Sheet.

**17.0 NON-OPERATING ENVIRONMENTAL TESTS (Continued)**

**17.6 Humidity Test**

The AVC Edge and Card Activator subjected to a baseline operability checkout to verify system readiness. Upon completion, the units were placed within a Thermotron Humidity Chamber. The units were subjected to a 10-day humidity cycle in accordance with the procedures as found in MIL-STD-810D, Method 507.2, Procedure I – Natural Hot Humid. Upon test completion, the units were removed and inspected for any obvious signs of degradation and/or damage. None were observed. The units were successfully subjected to a post-test operability checkout.

Attachment K contains Humidity Circular Charts.

**17.7 Rain Exposure Test**

The AVC Edge and Card Activator were subjected to a baseline operability checkout to verify system readiness. Upon completion, the units were wrapped and sealed in poly bags. The units were then placed under a drip dispensing water at a rate of 7 gallons per square foot per hour in accordance with MIL-STD-810D, Figure 506.2-1. The units were subjected to water falling from a height of approximately 3 feet for 15 minutes. Upon test completion, the units' poly bag wrapping was removed and the units were inspected for evidence of water intrusion. None was observed. The units were successfully subjected to a post-test operability checkout.

Attachment L contains a Rain Exposure Data Sheet.

**17.8 Sand and Dust Exposure Test**

The AVC Edge and Card Activator were subjected to a baseline operability checkout to verify system readiness. Upon completion, the units were wrapped and sealed in poly bags. The units were then placed in the dust chamber and subjected to the sand and dust requirements of MIL-STD-810D, Section II-1. Upon test completion, the units were removed from the dust chamber and the accumulated dust was removed by light brushing. The poly bags were then removed and the units were inspected for any evidence of dust intrusion. None was observed. The units were successfully subjected to a post-test operability checkout.

Attachment M contains a Sand and Dust Data Sheet.

## 18.0 TEST EQUIPMENT AND INSTRUMENTATION

All instrumentation, measuring, and test equipment used in the performance of this test program were calibrated in accordance with Wyle Laboratories' Quality Assurance Program, which complies with the requirements of ANSI/NCSL Z540-1, ISO 10012-1, and Military Specification MIL-STD-45662A. Standards used in performing all calibrations are traceable to the National Institute of Standards and Technology (NIST) by report number and date. When no national standards exist, the standards are traceable to international standards or the basis for calibration is otherwise documented.

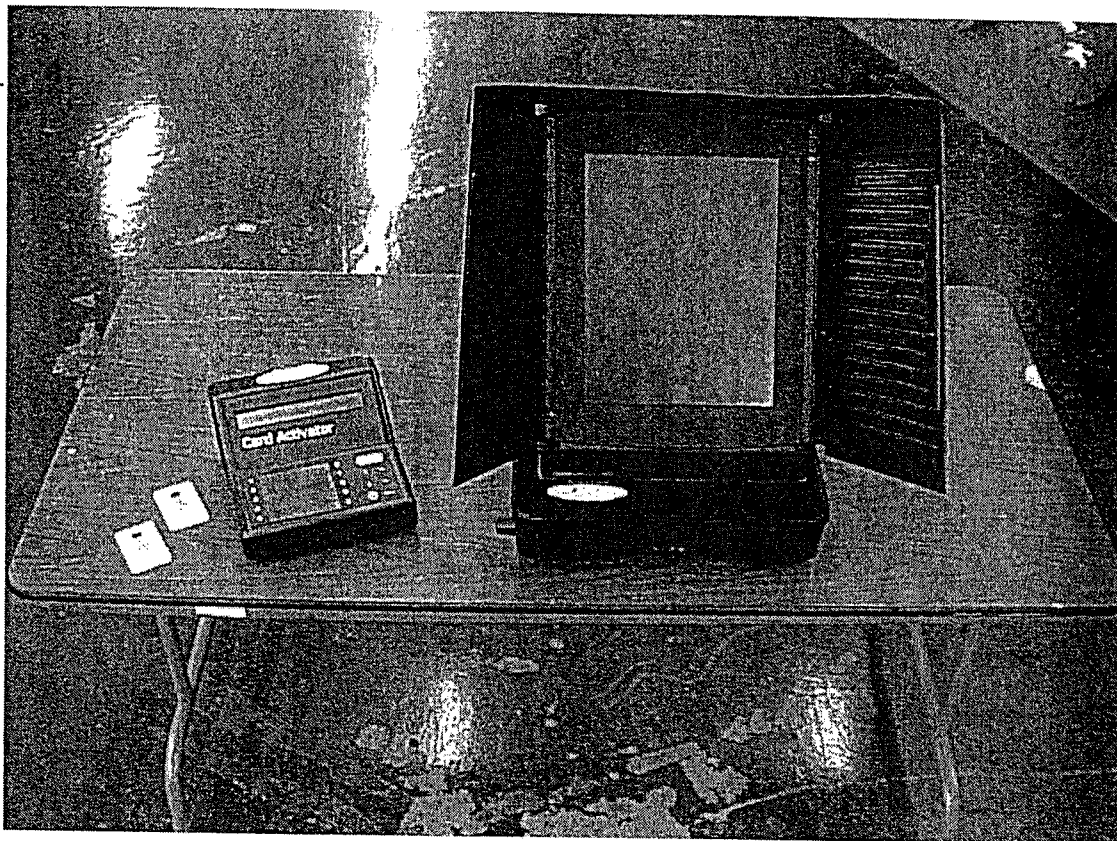
Attachment N contains Instrumentation Equipment Sheets.

## 19.0 WYLE QUALITY ASSURANCE

All work performed on this program was completed in accordance with Wyle Laboratories' Quality Assurance Program.

The Wyle Laboratories, Huntsville Facility, Quality Management System is registered in compliance with the ISO-9001 International Quality Standard. Registration has been completed by Quality Management Institute (QMI), a Division of Canadian Standards Association (CSA).

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Photograph 1 – AVC Edge Configured for Voting

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<b>ORIGINAL NOTICE OF ANOMALY</b>		DATE: April 24, 2001
NOTICE NO: <u>1</u>	P.O. NUMBER: <u>10001386</u>	CONTRACT NO: <u>N/A</u>
CUSTOMER: <u>Sequoia Pacific Voting Equipment Inc.</u>	WYLE JOB NO: <u>44733</u>	
NOTIFICATION MADE TO: <u>Paul Terwilliger</u>	NOTIFICATION DATE: <u>2.01.01</u>	
NOTIFICATION MADE BY: <u>Jim Dearman</u>	VIA: <u>Verbal</u>	
CATEGORY: <input checked="" type="checkbox"/> SPECIMEN <input type="checkbox"/> PROCEDURE <input type="checkbox"/> TEST EQUIPMENT	DATE OF ANOMALY: <u>2.01.01</u>	
PART NAME: <u>AVC Edge</u>	PART NO. <u>--</u>	
TEST: <u>Functional Configuration Audit</u>	LD. NO. <u>--</u>	
SPECIFICATION: <u>FEC Performance and Test Standards 1.90</u>	PARA. NO. <u>7.5.2</u>	
<b>REQUIREMENTS:</b> Functional Configuration Audit encompasses an examination...conduct of additional tests, to verify that the system hardware and software perform all the functions described in the vendor's documentation.		
<b>DESCRIPTION OF ANOMALY:</b> Write-in votes were improperly tagged as observed on the machine generated vote totals report.		
<b>DISPOSITION - COMMENTS - RECOMMENDATIONS:</b> The Sequoia Pacific technical representative was present and witnessed the anomalies. The anomaly was corrected in firmware revision Release 3.00, and successful implementation verified during subsequent testing.		
RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: <input checked="" type="checkbox"/> CUSTOMER <input type="checkbox"/> WYLE		
<b>VERIFICATION:</b> TEST WITNESS: <u>Paul Terwilliger</u> REPRESENTING: <u>Sequoia Pacific</u> QUALITY ASSURANCE: <u>[Signature]</u> <u>4/26/01</u>	PROJECT ENGINEER: <u>[Signature]</u> PROJECT MANAGER: <u>[Signature]</u> <u>4/25/01</u> INTERDEPARTMENTAL COORDINATION: <u>[Signature]</u> <u>J. Hazelline</u>	



<b>ORIGINAL NOTICE OF ANOMALY</b>		DATE: April 24, 2001
NOTICE NO: <u>2</u>	P.O. NUMBER: <u>10001386</u>	CONTRACT NO: <u>N/A</u>
CUSTOMER: <u>Sequoia Pacific Voting Equipment Inc.</u>	WYLE JOB NO: <u>44733</u>	
NOTIFICATION MADE TO: <u>Paul Terwilliger</u>	NOTIFICATION DATE: <u>2.01.01</u>	
NOTIFICATION MADE BY: <u>Jim Dearman</u>	VIA: <u>Verbal</u>	
CATEGORY: <input checked="" type="checkbox"/> SPECIMEN <input type="checkbox"/> PROCEDURE <input type="checkbox"/> TEST EQUIPMENT	DATE OF ANOMALY: <u>2.01.01</u>	
PART NAME: <u>AVC Edge</u>	PART NO. <u>--</u>	
TEST: <u>Functional Configuration Audit</u>	I.D. NO. <u>--</u>	
SPECIFICATION: <u>FEC Performance and Test Standards 1.90</u>	PARA. NO. <u>7.5.2</u>	
<b>REQUIREMENTS:</b> Functional Configuration Audit encompasses an examination...conduct of additional tests, to verify that the system hardware and software perform all the functions described in the vendor's documentation.		
<b>DESCRIPTION OF ANOMALY:</b> An anomaly was observed which prevented the proper consolidation of multiple results cartridges.		
<b>DISPOSITION - COMMENTS - RECOMMENDATIONS:</b> The Sequoia Pacific technical representative was present and witnessed the anomaly. The anomaly was corrected in firmware revision Release 3.00, and successful implementation verified during subsequent testing.		
RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: <input checked="" type="checkbox"/> CUSTOMER <input type="checkbox"/> WYLE		
<b>VERIFICATION:</b>		
TEST WITNESS: <u>Paul Terwilliger</u>	PROJECT ENGINEER: <u>[Signature]</u>	PROJECT MANAGER: <u>[Signature]</u> 4/25/01
REPRESENTING: <u>Sequoia Pacific</u>	INTERDEPARTMENTAL COORDINATION: <u>J. Hazeltine</u>	
QUALITY ASSURANCE: <u>[Signature]</u> 4/26/01		



<b>ORIGINAL NOTICE OF ANOMALY</b>		DATE: April 24, 2001
NOTICE NO: <u>3</u>	P.O. NUMBER: <u>10001386</u>	CONTRACT NO: <u>N/A</u>
CUSTOMER: <u>Sequoia Pacific Voting Equipment Inc.</u>	WYLE JOB NO: <u>44733</u>	
NOTIFICATION MADE TO: <u>Paul Terwilliger</u>	NOTIFICATION DATE: <u>2.01.01</u>	
NOTIFICATION MADE BY: <u>Jim Dearman</u>	VIA: <u>Verbal</u>	
CATEGORY: <input checked="" type="checkbox"/> SPECIMEN <input type="checkbox"/> PROCEDURE <input type="checkbox"/> TEST EQUIPMENT	DATE OF ANOMALY: <u>2.01.01</u>	
PART NAME: <u>AVC Edge</u>	PART NO. <u>--</u>	
TEST: <u>Functional Configuration Audit</u>	I.D. NO. <u>--</u>	
SPECIFICATION: <u>FEC Performance and Test Standards. 1.90</u>	PARA. NO. <u>7.5.2</u>	
<b>REQUIREMENTS:</b> Functional Configuration Audit encompasses an examination...conduct of additional tests, to verify that the system hardware and software perform all the functions described in the vendor's documentation.		
<b>DESCRIPTION OF ANOMALY:</b> It was observed that when the AVC Edge was configured for a 24-time format, the machine generated totals report continued to carry a 12-hour format timestamp in lieu of the expected 24-hour format.		
<b>DISPOSITION - COMMENTS - RECOMMENDATIONS:</b> The Sequoia Pacific technical representative was present and witnessed the anomaly. The anomaly was corrected in firmware revision Release 3.00, and successful implementation verified during subsequent testing.		
RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21: <input checked="" type="checkbox"/> CUSTOMER <input type="checkbox"/> WYLE		
<b>VERIFICATION:</b> TEST WITNESS: <u>Paul Terwilliger</u>	PROJECT ENGINEER: <u>[Signature]</u> PROJECT MANAGER: <u>[Signature]</u>	INTERDEPARTMENTAL COORDINATION: <u>[Signature]</u>
REPRESENTING: <u>Sequoia Pacific</u>	QUALITY ASSURANCE: <u>[Signature]</u> <u>4/26/01</u>	



<b>ORIGINAL</b>		<b>NOTICE OF ANOMALY</b>	<b>DATE:</b> April 24, 2001
<b>NOTICE NO:</b> 4	<b>P.O. NUMBER:</b> 10001386	<b>CONTRACT NO:</b> N/A	
<b>CUSTOMER:</b> Sequoia Pacific Voting Equipment Inc.		<b>WYLE JOB NO:</b> 44733	
<b>NOTIFICATION MADE TO:</b> Paul Terwilliger		<b>NOTIFICATION DATE:</b> 2.01.01	
<b>NOTIFICATION MADE BY:</b> Jim Dearman		<b>VIA:</b> Verbal	
<b>CATEGORY:</b> <input checked="" type="checkbox"/> SPECIMEN <input type="checkbox"/> PROCEDURE <input type="checkbox"/> TEST EQUIPMENT	<b>DATE OF ANOMALY:</b> 2.01.01		
<b>PART NAME:</b> AVC Edge	<b>PART NO.:</b> --		
<b>TEST:</b> Functional Configuration Audit	<b>I.D. NO.:</b> --		
<b>SPECIFICATION:</b> FEC Performance and Test Standards 1.90	<b>PARA. NO.:</b> 7.5.2		
<b>REQUIREMENTS:</b>			
Functional Configuration Audit encompasses an examination...conduct of additional tests, to verify that the system hardware and software perform all the functions described in the vendor's documentation.			
<b>DESCRIPTION OF ANOMALY:</b>			
The report set-up screen continually displayed a printer on-line even when the printer was off-line.			
<b>DISPOSITION - COMMENTS - RECOMMENDATIONS:</b>			
The Sequoia Pacific technical representative was present and witnessed the anomaly. The anomaly was corrected in firmware revision Release 3.00, and successful implementation verified during subsequent testing.			
<b>RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21:</b>		<input checked="" type="checkbox"/> CUSTOMER	<input type="checkbox"/> WYLE
<b>VERIFICATION:</b>		<b>PROJECT ENGINEER:</b> <i>[Signature]</i>	
<b>TEST WITNESS:</b> Paul Terwilliger	<b>PROJECT MANAGER:</b> <i>[Signature]</i> Dearman 4/25/01		
<b>REPRESENTING:</b> Sequoia Pacific	<b>INTERDEPARTMENTAL COORDINATION:</b> J. Hazeltine		
<b>QUALITY ASSURANCE:</b> <i>[Signature]</i> 4-26-01			



<b>ORIGINAL</b>		<b>NOTICE OF ANOMALY</b>	<b>DATE:</b> April 24, 2001
NOTICE NO: <u>5</u>	P.O. NUMBER: <u>10001386</u>	CONTRACT NO: <u>N/A</u>	
CUSTOMER: <u>Sequoia Pacific Voting Equipment Inc.</u>		WYLE JOB NO: <u>44733</u>	
NOTIFICATION MADE TO: <u>Paul Terwilliger</u>		NOTIFICATION DATE: <u>2.01.01</u>	
NOTIFICATION MADE BY: <u>Jim Deaman</u>		VIA: <u>Verbal</u>	
CATEGORY: <input checked="" type="checkbox"/> SPECIMEN	<input type="checkbox"/> PROCEDURE	<input type="checkbox"/> TEST EQUIPMENT	DATE OF ANOMALY: <u>2.01.01</u>
PART NAME: <u>AVC Edge</u>	PART NO. <u>-</u>		
TEST: <u>Functional Configuration Audit</u>	I.D. NO. <u>-</u>		
SPECIFICATION: <u>FEC Performance and Test Standards. 1.90</u>	PARA. NO: <u>7.5.2</u>		
<b>REQUIREMENTS:</b>			
Functional Configuration Audit encompasses an examination...conduct of additional tests, to verify that the system hardware and software perform all the functions described in the vendor's documentation.			
<b>DESCRIPTION OF ANOMALY:</b>			
In the event of a cartridge overflow condition, the machine entered into an improper error mode.			
<b>DISPOSITION -- COMMENTS -- RECOMMENDATIONS:</b>			
The Sequoia Pacific technical representative was present and witnessed the anomaly. The anomaly was corrected in firmware revision Release 3.00, and successful implementation verified during subsequent testing.			
RESPONSIBILITY TO ANALYZE ANOMALIES AND COMPLY WITH 10 CFR PART 21:		<input checked="" type="checkbox"/> CUSTOMER	<input type="checkbox"/> WYLE
VERIFICATION:	PROJECT ENGINEER: <u>[Signature]</u> J. Deaman		
TEST WITNESS: <u>Paul Terwilliger</u>	PROJECT MANAGER: <u>[Signature]</u> J. Hazeltine		
REPRESENTING: <u>Sequoia Pacific</u>	INTERDEPARTMENTAL COORDINATION:		
QUALITY ASSURANCE: <u>[Signature]</u>	<u>4-26-01</u>		

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ATTACHMENT A  
AVC EDGE TYPICAL PRECINCT-LEVEL PRINTOUT

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V2.0 Actuator

\*\*\*\*\*  
OFFICIAL RESULTS REPORT  
\*\*\*\*\*

Date 02/20/2001                      Time 17:54  
Serial Number                              1238  
Protective Counter                        36474  
Public Counter                             4  
Poll Site  
SIMTST2  
Polling Place ID                           SPVE  
Ballot Version                             A  
Report Source                              Internal Memory

AVC Edge Vote Sim Test #2  
Created: 24 March, 1998  
Sequoia Pacific Voting Equip. Inc  
Jamestown, NY

Candidate Totals		
Candidate		Total
***	***	***
PRESIDENT/VICE PRESIDENT		(1)
CLINTON/GORE		1
DOLE/KEMP		1
BROWNE/JORGENSEN		1
HAGELIN/TOMPKINS		1
PEROT/CAMPBELL		0
STRAIGHT PARTY		(1)
DEMOCRATIC		1
REPUBLICAN		1
LIBERTARIAN		1
NATURAL LAW		1
UNITED STATES SENATE		(1)
HARVEY B. GANTT		1
JESSE HELMS		1
RAY UBINGER		1
J. VICTOR PARDO		1
CONGRESS - 6TH		(1)
MARK COSTLEY		1
HOWARD		1
GARY C		1

CONGRESS	(1)	
W. G. (BILL) HEFNER		1
CURTIS BLACKWOOD		1
THOMAS W. CARLISLE		1
CONGRESS - 12TH	(1)	
MEL WATT		1
JOSEPH A. MARTINO, JR.		1
ROGER L. KOHN		1
WALTER LEWIS		1
GOVERNOR	(1)	
JAMES B. (JIM) HUNT, JR.		1
ROBIN HAYES		1
SCOTT D. YOST		1
JULIA VAN WITT		1
LIEUTENANT GOVERNOR	(1)	
DENNIS A. WICKER		1
STEVE ARNOLD		1
JOHN DAINOTTO		1
STATE SEN - 22ND	(1)	
JAMES C. JOHNSON, JR.		1
FLETCHER L. HARTSELL, JR.		1
STATE SEN - 23RD	(1)	
JIM PHILLIPS		1
MAC BUTNER		1
STATE SEN - 36TH	(1)	
BETSY L. COCHRANE		1
WRITE-IN		0
COUNTY COMMISSIONERS	(2)	
GEORGE (PETE) SMITH		2
DEMOCRAT	1	
REPUBLICAN	1	
ANNE STUART WELCH		1
DAVE ROWLAND		1
STATE PROPOSITION 1A	(1)	
YES		4
NO		0
STATE PROPOSITION 1B	(1)	
YES		4
NO		0

Write In  
No Write

Selection Code Totals

PCT 101		1	
1	Precinct 101		1
PCT 102		1	
2	Precinct 102		1
PCT 103		1	
3	Precinct 103		1
PCT 104		1	
4	Precinct 104		1
Total			4

Election Officers

Please Complete After Closing The Polls  
We the undersigned Election Officers do  
hereby certify that on the \_\_\_\_\_  
day of \_\_\_\_\_ 20\_\_\_\_ this board  
under the scrutiny of each member,  
closed the polls from further voting,  
obtained this printed record of votes  
cast on this machine and that after the  
polls closed, the Protective Counter  
read 36474, the Public Counter  
read 4 and the machine has  
been sealed with seal # \_\_\_\_\_.

Signed:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

S/N 1238 v 2.24a 02/20/01 17:54

\*\*\*\*\*  
EVENT LOG REPORT  
\*\*\*\*\*

Date 01/16/2001                      Time 3:38 PM  
Serial Number                                      1661  
Protective Counter                                      26745  
Report Source                                      Internal Memory

Votins Machine Activity:

System Reset		
01/16/01 2:36 PM	26745	
Begin Maintenance Diag		
01/16/01 2:36 PM	26745	
AC Power Status		Off
01/16/01 2:42 PM	26745	
Print Event Log		
01/16/01 2:43 PM	26745	
System Power Down		
01/16/01 2:22 PM	26745	
System Power Up Ok		0000
01/16/01 3:22 PM	26745	
System Self-Test Passed		
01/16/01 3:22 PM	26745	
Begin Maintenance Diag		
01/16/01 3:22 PM	26745	
System Reset		
01/16/01 3:24 PM	26745	
Print Event Log		
01/16/01 3:25 PM	26745	
LCD Contrast Adjust		
01/16/01 3:27 PM	26745	
System Power Up Ok		0000
01/16/01 3:29 PM	26745	
System Self-Test Passed		
01/16/01 3:29 PM	26745	
Begin Maintenance Diag		
01/16/01 3:29 PM	26745	
LCD Contrast Adjust		
01/16/01 3:29 PM	26745	
LCD Contrast Adjust		
01/16/01 3:31 PM	26745	
Set Time And Date		
01/16/01 3:35 PM	26745	

S/N 1661                      v 2.24 01/16/01 3:38 PM

**ATTACHMENT B**  
**AVC EDGE PRODUCT LABEL**

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<b>AVC Edge®</b>		Sequoia Pacific Voting Equipment Inc. Jamestown, NY	Made in USA
Model: A	Firmware Version: _____	This equipment has been certified to comply with the limits of Class B computing devices, pursuant to Subpart J of Part 15 of FCC Rules. See Instruction Manual.	<u>Preventative Maintenance:</u>
Volts 110/220 AC			<u>Monthly:</u> Charge batteries for 24 hours, inspect for damage.
Amps 7 Max			<u>Quarterly:</u> Power up, check for self-test errors, check screen contrast, check touchscreen calibration.
Freq 50-60 Hz			<u>Before use:</u> All of above, plus check for correct time & date.

Serial Number is affixed separately  
on AVC Edge Enclosure

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**ATTACHMENT C**  
**PRODUCT SAFETY DATA SHEETS**

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# NORMAL TEMPERATURE TEST DATA SHEET

Job No.: 44733 Date: 8 Feb 01  
Specimen ID: Card Activator S/N: W# 001  
Customer: Sequoia Pacific

These measurements were taken in accordance with the following standards:

- Underwriters Laboratories 1950;  Canadian Standard C22.2 #950;  European Standard EN 60950;  
 European Standard 61010-1;  Other: \_\_\_\_\_

TC No.	TC Location	Readings <input checked="" type="checkbox"/> °C/ <input type="checkbox"/> °F				
1.	Not Used					
2.	6-Volt Battery	24.6				
3.	U10 (Daughter board)	27.5				
4.	Printed Wiring Board (near C27)	26.6				
5.	3-Volt Battery	25.5				
6.	T1	53.6				
7.						
8.						
9.						
10.						

Voltage Input to E.U.T.: 120 Vac supplied via an approved SELV Power Transformer

Ambient Temperature: 23° Relative Humidity: 35 %

Thermocouple Meter: #1

Notes on Data: \_\_\_\_\_

Remarks: \_\_\_\_\_

Technician: Barbara A Brooks Date: Feb 8, 2001

Engineer: [Signature] Date: 2.8.01

Job No.: 44733 Date: 8 Feb 01  
 Specimen ID: Card Activator S/N: W #001  
 Customer: Sequoia Pacific



Permanence of Marking Test	Standard	CSA 950(95)/UL 1950(95)	EN 60950	EN 61010-1
	Clause	1.7.15	1.7.15	5.3

Compliance: T Yes    ≤ No  
 Tested by: Barbara Brooks Date: 8 Feb 01  
 Approved by: [Signature] Date: 28.01

**Method:**

A sample of the marking label was subjected to the following test. The surface of each marking as noted below was rubbed by hand for a period of 15 seconds with a water soaked cloth and again for a period of 15 seconds with a petroleum spirit (Hexane) soaked cloth. The results are listed below.

Test Conditions	Results	
Use of marking?	Screen-Printed	
Material?	Mylar-type Label	
Held By?	Pressure Sensitive Adhesive	
Applied surface material	Metallic Housing	
Observations:	Water	Hexane
Any Damage?	No	No
Legible?	Yes	Yes
Curled?	No	No
Edges Lifted?	No	No
Easily removed intact?	No	No

Comments:

Job No.: 44733 Date: 8 Feb 01  
 Specimen ID: Card Activator S/N: W #001  
 Customer: Sequoia Pacific



Accessibility Test	Standard	CSA 950(95)/UL 1950(95)	EN 60950
	Clause(s)	2.1.2 & 2.8.3	2.1.2 & 2.8.3
Acceptance Criteria (or Maximum Allowable Limits):			
Compliance: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Tested by: <u>Richard Bickel</u> Date: <u>8 Feb 01</u>	
		Approved by: <u>[Signature]</u> Date: <u>23-01</u>	
<p>The EUT with all operator access covers removed was subjected to this test. A test finger was applied without appreciable force to all apertures, in an attempt to contact hazardous parts. Operator detachable connectors were tested in an attempt to contact hazardous parts. Operator detachable connectors were tested during and after disconnections. Openings preventing the entry of the test finger were further tested by means of a straight unjointed version of the test finger, which was applied with a force of 30 N (6.75 lbs). If entry of the unjointed finger was possible, the test with the articulated test finger was repeated with the finger being pushed through the aperture, if necessary.</p>			
<p><b>Results:</b> No Hazardous Parts could be contacted with the test finger with all operator detachable covers removed.</p>			
<p>The EUT with all operator detachable parts, including fuse holders and lamps were left in place and operator access doors and covers closed, was subjected to this test. A test pin was applied to all apertures located in electrical enclosures, in an attempt to contact hazardous parts.</p>			
<p><b>Results:</b> With all operator detachable parts and connectors in place, Hazardous Parts could not be contacted with the test pin.</p>			
<p>The EUT employing a safety interlock was subjected to this test. The test finger was applied to all covers, guards, doors, etc., to determine that if inadvertent reactivation of the interlock circuit did occur.</p>			
<p><b>Results:</b> NA - No Safety Interlocks</p>			

Job No.: 44733 Date: 12/27/00  
 Specimen ID: AVC Edge S/N: 1733  
 Customer: Sequoia Pacific



Heating Test Data Sheet		Clause	CSA 950(95)/UL 1950(95)	IEC 950	
		5.1		5.1	
Acceptance Criteria (or Maximum Allowable Limits): Table 16 (CSA 950, IEC 950, UL 1950); Table 13 (CSA 234)					
Compliance: T Yes ≤ No		Tested by: <u>Banburt Brooks</u> Date: <u>28 Dec 00</u> Approved by: <u>[Signature]</u> Date: <u>12.28.00</u>			
Rated Voltage or Voltage Range: <u>110/220 Hz</u> Rated Supply Frequency: <u>50-60 Hz</u>					
Upper Limit (+6%): ( <u>220</u> x 1.06)V = <u>242</u> V Lower Limit (-10%): ( <u>110</u> x 0.90)V = <u>99</u> V					
Duty Cycle/Operating Condition: <u>Active/ Autovote Program Running</u>					
T.C. Locations	dt Measured (Deg C)				dt Allowed (Deg C)
	<u>60</u> Hz, <u>120</u> V	<u>50</u> Hz, <u>242</u> V	<u>60</u> Hz, <u>99</u> V	<u>50</u> Hz, <u>220</u> V	
0. Power Supply - C2	50.8	54.1	51.7	53.5	
1. Power Supply - T1	54.5	57.1	52.5	56.2	
2. Power Supply - T2	57.7	55.6	60.7	55.3	
3. EMI Filter	38.9	39.7	26.3	39.4	
4. Battery (Rt. Side)	36.1	36.7	36.6	36.7	
5. Circuit Breaker Case	25.6	25.8	25.9	25.9	
6. Barrier over Processor Card	31.3	31.4	31.6	31.6	
7. Enclosure (Rear)	24.1	24.1	24.4	24.4	
8. Enclosure (Top)	38.0	38.5	38.3	38.4	
9. (Enclosure (Rt. Side)	25.5	25.6	25.5	25.6	
T(X) RC ( <u>   </u> ohm) RH ( <u>   </u> ohm)	---	---	---	---	---
T( ) RC ( <u>   </u> ohm) RH ( <u>   </u> ohm)	---	---	---	---	---
Room Ambient	23.0	23.0	23.0	23.0	

WH-1482, Rev. APR '99

(11)

Job No.: 44733 Date: 6 Jan 01  
 Specimen ID: AVC Edge S/N: 1733  
 Customer: Sequoia Pacific



Power Interface (Input) Test Data Sheet		Clause	CSA 950(95)/UL 1950(95) 1.6	EN 60950 1.6
Acceptance Criteria (or Maximum Allowable Limits): Maximum 10% Deviation				
Compliance: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Tested by: <u>Barbara A. Brooks</u> Date: <u>6 Jan 01</u> Approved by: <u>[Signature]</u> Date: <u>1.6.01</u>		
Test No.	Input			
	Volts	Hz	Amps	Watts
1	110.0	60	0.64	70.40
2	99.0	60	0.69	68.31
3	121.0	60	0.59	71.39
4	220.0	50	0.40	88.00
5	198.0	50	0.42	83.16
6	242.0	50	0.37	89.54
Test Conditions				
1	Nominal Rated Voltage (Low Range)			
2	- 10% Nominal Rated Voltage (Low Range)			
3	+ 10% Nominal Rated Voltage (Low Range)			
4	Nominal Rated Voltage (High Range)			
5	- 10% Nominal Rated Voltage (High Range)			
6	+ 10% Nominal Rated Voltage (High Range)			

\*For power supply outputs and/or convenience outlet receptacle.

WH-1481, Rev. DEC '99

(11)

Job No.: 44733 Date: 6 Jan 01  
 Specimen ID: AVC Edge S/N: 1733  
 Customer: Sequoia Pacific



Permanence of Marking Test	Standard	CSA 950(95)/UL 1950(95)	EN 60950	EN 61010-1
	Clause	1.7.15	1.7.15	5.3

Compliance:  Yes  No

Tested by: Robert Brooks Date: 6 Jan 01  
 Approved by: Jim Dean Date: 1.6.01

**Method:**

A sample of the marking label was subjected to the following test. The surface of each marking as noted below was rubbed by hand for a period of 15 seconds with a water soaked cloth and again for a period of 15 seconds with a petroleum spirit (Hexane) soaked cloth. The results are listed below.

Test Conditions	Results	
Use of marking?	Screen-Printed	
Material?	Mylar-type Label	
Held By?	Pressure Sensitive Adhesive	
Applied surface material	Thermo-plastic Enclosure	
Observations:	Water	Hexane
Any Damage?	No	No
Legible?	Yes	Yes
Curled?	No	No
Edges Lifted?	No	No
Easily removed intact?	No	No

Comments:



Job No.: 44733 Date: 6 Jan 01  
 Specimen ID: AVC Edge S/N: 1733  
 Customer: Sequoia Pacific



Protective Earthing Resistance Measurement	Standard	CSA 950(95)/UL1950(95)	EN 60950		
	Clause	2.5.11	2.5.11		
Acceptance Criteria (or Maximum Allowable Limits):					
Max 4V drop;		Max 0.1 ohm.			
Compliance: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Tested by: <u>Richard Brooks</u> Date: <u>6 Jan 01</u>				
	Approved by: <u>[Signature]</u> Date: <u>1.6.01</u>				
Earth Path Resistance Measurements:					
Test Current*	Max Volt Drop	Test Time **	Calculated Resistance	From	To
<u>25</u> A	<u>2.44</u> V	<u>1</u> min	<u>0.098</u> ohm	<u>Input Gnd</u>	<u>Frm Screw Lt. Sd.</u>
_____ A	_____ V	_____ min	_____ ohm	_____	_____
_____ A	_____ V	_____ min	_____ ohm	_____	_____
_____ A	_____ V	_____ min	_____ ohm	_____	_____
	(Max allowable 4V)		(Max allowable 0.1 ohm)		
* IEC 950, CSA 950, UL 1950: 1.5 times current capacity (25A max). CSA 0.4: 2 times overcurrent protection.					
** IEC 950, CSA 950, UL 1950: 1 minute. CSA 0.4: 2 minutes.					
Comments:					

Job No.: 44733 Date: 6 Jan 01  
 Specimen ID: AVC Edge S/N: 1733  
 Customer: Sequoia Pacific



Earth Leakage Current Measurement Data Sheet	Standard	CSA 950(95)/UL 1950(95)	EN 60950
	Clause	5.2	5.2

Acceptance Criteria (or Maximum Allowable Limits):

CSA 950: Table 17 or CI 5.2.5 (TT or TN Power System), Table G1 or CI G5 (IT Power System)  
 CSA 234: Table 14 or CI 5.2.5 (TT or TN Power System), Table G9 or CI G5 (IT Power System)  
 IEC 950: Table 17 or CI 5.2.5 (TT or TN Power System), Table G1 or CI G5 (IT Power System)  
 UL 1950: Table 17 or CI 5.2.5 (TT or TN Power System), Table G1 or CI G5 (IT Power System)

Compliance:  Yes  No

Tested by: Barbara A. Brooks Date: 6 Jan 01

Approved by: [Signature] Date: 1-6-01

No.	Leakage (mA)	Input Volt/Hz	Measured Volt	Location	Primary Power Switch*	Filter Name/Type
1	0.69	110/60	NA	Line-Ground	ON	NA
2	0.67	110/60	NA	Line-Ground	OFF	NA
3	0.58	110/60	NA	Neutral-Ground	ON	NA
4	0.58	110/60	NA	Neutral-Ground	OFF	NA

Notes:

- \* Unit under test with:
- \*\* Maximum limit is 0.25mA for floating output with no components shorted.
- \*\*\* Maximum limit is 0.5mA with one bridging capacitor shorted; and 0.25mA with both capacitors in circuit.
- i. Single-Pole Primary Power Switch: Take four measurements (combination of two mains polarities and two primary power switch positions).
- ii. Double-Pole Primary Power Switch: Take two measurements (for two possible mains polarities).

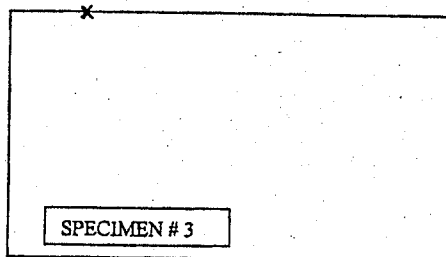
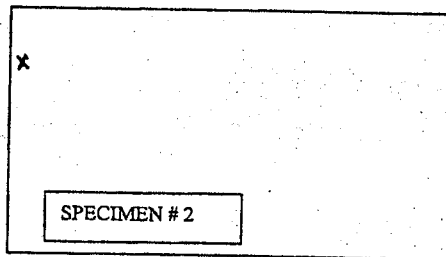
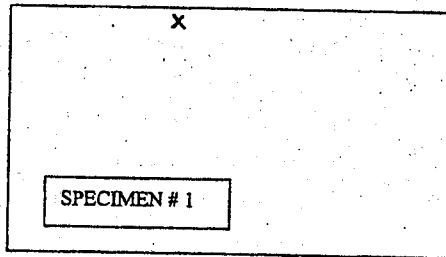
Comments:

Job No.: 44733 Date: 6 Jan 01  
 Specimen ID: AVC Edge S/N: 1733  
 Customer: Sequoia Pacific



Earth Leakage Current Measurement Data Sheet				Standard	CSA 950(95)/UL 1950(95)	EN 60950
				Clause	5.2	5.2
<b>Acceptance Criteria (or Maximum Allowable Limits):</b> CSA 950: Table 17 or CI 5.2.5 (TT or TN Power System), Table G1 or CI G5 (IT Power System) CSA 234: Table 14 or CI 5.2.5 (TT or TN Power System), Table G9 or CI G5 (IT Power System) IEC 950: Table 17 or CI 5.2.5 (TT or TN Power System), Table G1 or CI G5 (IT Power System) UL 1950: Table 17 or CI 5.2.5 (TT or TN Power System), Table G1 or CI G5 (IT Power System)						
Compliance: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				Tested by: <u>Richard Brooks</u> Date: <u>6 Jan 01</u> Approved by: <u>[Signature]</u> Date: <u>1-11-01</u>		
No.	Leakage (mA)	Input Volt/Hz	Measured Volt	Location	Primary Power Switch*	Filter Name/Type
1	1.01	220/50	NA	Line-Ground	ON	NA
2	1.00	220/50	NA	Line-Ground	OFF	NA
3	1.01	220/50	NA	Neutral-Ground	ON	NA
4	1.01	220/50	NA	Neutral-Ground	OFF	NA
<b>Notes:</b> * Unit under test with: ** Maximum limit is 0.25mA for floating output with no components shorted. *** Maximum limit is 0.5mA with one bridging capacitor shorted; and 0.25mA with both capacitors in circuit. i. <u>Single-Pole Primary Power Switch</u> : Take four measurements (combination of two mains polarities and two primary power switch positions). ii. <u>Double-Pole Primary Power Switch</u> : Take two measurements (for two possible mains polarities).						
<b>Comments:</b> _____ _____ _____ _____ _____ _____ _____ _____						

UL-1950  
FIRE RESISTANCE  
SEQUOIA PACIFIC  
44733  
02/02/01







**DATA SHEET**

Customer:	SEQUOIA PACIFIC	WYLE LABORATORIES	
Specimen:	FIRE PROOF ENCLOSURES		
Part No.:	Amb. Temp.:	68 Degrees F	Job No.: 44733
Spec.: UL-1950 A-1	Photo:	Yes	Report No.:
Para 4.2 & 5.2	Video:	NO	Start Date: 2-2-01
S/N wyle #3	Test Med.:	N/A	
GSI :N/A	Specimen Temp.:	AMB	
Test Title: FIRE RESISTANCE TEST 3			

Test flame was obtained through a natural gas Bunsen burner. Methane was supplied at 1.8 LPM and the Burner was adjusted to give a vertical flame of @130 mm with a blue cone of @ 40 mm.

The conditioned specimen was placed in a horizontal position to simulate the stored and charging position.

The burner was applied at a 20 degree angle to compensate for the unusual dimensions inside the container.

The flame was applied for 5 sec and removed for 5 sec for 5 rotations to the test point.

No ignitions were noted and no melting or dripping plastic was found. Only a minor indentation was found After the testing was complete.

	Tested By: <i>J. Davis</i>	Date: 5-17-01
	Witness: <i>TA</i>	Date: 7A
Notice of Anomaly <i>None</i>	Sheet No. <i>3</i>	of <i>3</i>
	Approved: <i>[Signature]</i>	Date: <i>5.17.01</i>

Wyle Form WH 614A, Rev. APR '84

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**ATTACHMENT D**  
**SOURCE CODE REVIEW SUMMARY REPORTS**

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#### Sequoia Software Review Summary

This review covers the Sequoia Edge 2\_24 voting system software as it deals with changes suggested by the 2\_20 review. The review involved evaluation of its compliance with the FEC guidelines for software quality and reliability. This evaluation included, but was not limited to, the following considerations:

Readability	How straightforward and apparent was the design?
Understandability	How complicated was the code to implement it?
Modularity	How well was the code divided into logical, functional units?
Robustness	How well does the code handle error conditions or unexpected inputs?
Security	Does the code protect the integrity of voting data at all times?
Maintainability	How easy would it be to extend, fix, or modify this code in the future?
Consistency	Was the design of the code coherent throughout?
Documentation	Does the code contain useful and frequent comments?
Usability	Does the code inform the user about progress or errors?
Flow control	Are control constructs and entry/exit points logical and controlled?

Files were compared with their 2\_20 counterparts and the differences investigated in view of the Sequoia response document. Files differing from the 2\_20 version and those otherwise noteworthy are listed below, as well as comments regarding compliance.

The recommendation is given at the end of this document.

#### Evaluation

The evaluation of the code is given on the subsequent sections. This document is arranged as follows:

- 1) Source File Specific Notes
- 2) Revision Assessment Statements

#### 1. Source File Specific Notes

The following is a list of source files reviewed, along with source-file specific comments for each one, if any.

/EDGE2\_24

PRGBEG.C

Reason for bit-shifting complexity explained adequately in response as well as the question regarding TRUE/FALSE, but while the response indicates that comments were added to the code for above explanations there was no difference in 2\_20 and 2\_24 versions.

PRGEND.C

ASM.S

/EDGE2\_24/CONSOLID

CHKCART.C

Lines 542, 554 - ChkSize() - multiple exit points.

Lines 576-619 - ConsVerBalKeyDmy() - upon being rewritten for single exit point the behavior was changed, perhaps inadvertently. Originally if ChkIndex() was true, CANCEL would be returned. Now if ChkIndex() is true, ENTER is returned..

CONSOLID C

VALIDATE C

Line 157 - PBlockChk() - multiple exit points.  
Line 238 - WrInChk() - multiple exit points.  
Lines 295, 313 - EVInfoChk() - multiple exit points.  
Line 368 - ConsInfoChk() - multiple exit points.  
Lines 710, 716, 734, 747 - ValCons() - multiple exit points.

/EDGE2\_24/EDGTOOLS

AT\_XFER.C - file unchanged from 2\_20.

Lines 168, 175, 182, 213 - ElecATXferCopy() - multiple exit points.

COMPARE.C

COPY.C

Line 274 - CopyDirFile() - multiple exit points.  
Lines 624 - CopyAll() - multiple exit points.

CRC\_CALC.C

CRYPTSIG.C - File unchanged from 2\_20.

DES.C

Line 449 - setkey() - multiple exit points.  
Line 736 - dedes() - multiple exit points.  
Lines 895, 924 - Des() - multiple exit points.

E2POT.C - File unchanged from 2\_20.

Line 310 - I2CStop() - #define SET\_SCL expands to multiple exit points.  
Line 351 - I2CWrite8() - #define SET\_SCL expands to multiple exit points.  
Line 444 - I2CStart() - #define SET\_SCL expands to multiple exit points.  
Line 515 - ChkWiperPosition() - multiple exit points.  
Line 593 - SetWiperPosition() - multiple exit points.

FOPEN.C - File unchanged from 2\_20.

Lines 92, 126 - ed\_fopen() - multiple exit points.  
Lines 192, 213 - ed\_fclose() - multiple exit points.

FREEBLKS.C

FSIZE.C - File unchanged from 2\_20.

GET\_TIME.C - File unchanged from 2\_20.

Line 66 - get\_time() - multiple exit points.

LCD\_DRV.C - File unchanged from 2\_20.

Line 175 - wr\_lcd() - multiple exit points.

Line 329 - lcd\_drv() - multiple exit points.

MALLOC.C - File unchanged from 2\_20.

Lines 189, 219 - ed\_malloc() - multiple exit points.

Lines 333, 353, 383 - ed\_free() - multiple exit points.

Lines 568, 584 - ed\_free\_all() - multiple exit points.

Lines 700, 712, 724, 736, 747, 760, 771 - ThoroughMemTst() - multiple exit points.

Lines 811, 823, - chk\_mem() - multiple exit points.

Lines 857, 880, 894, 908, 919, 932, 941, 954, 963, 974 - free\_chk() - multiple exit points.

PARSER.C

Lines 467, 497 - Loop() - multiple exit points.

Line 543 - GotoLine() - multiple exit points.

Line 1010 - GetNextLine() - multiple exit points.

Line 1054 - RunScript() - multiple exit points.

Line 1194 - ScrFgets() - multiple exit points.

Line 1310 - SemiColon() - multiple exit points.

Lines 1343, 1366 - SkipAllWhtSpC() - multiple exit points.

PWRDOWN.C

RANDOM.C

READCARD.C - File unchanged from 2\_20.

SEEP.C

SMRTCARD.C - File unchanged from 2\_20.

Lines 164, 184 - EjectSmartCard() - multiple exit points.

Lines 232, 276 - ReadSmartCard() - multiple exit points.

Line 328 - WriteSmartCard() - multiple exit points.

SOUND.C

STRING16.C

strcmp16() - The "inaccurate lexicographical analysis will result" comment in the 2\_20 review was clearly wrong. My apologies - a flash of incompetence.

STR\_FRMT.C

Lines 446, 467 - PutInt() - multiple exit points.

Line 643 - ed\_sprintf() - multiple exit points.

Line 766 - ed\_vsprintf() - multiple exit points.

Line 944 - PutHex16() - compound a?b:c statement strains readability.

Lines 1123, 1144 - PutInt16() - multiple exit points.  
Line 1313 - ed\_sprintf16() - multiple exit points.  
Line 1909 - ed\_sscanf() - multiple exit points.

#### TOUCH.C

Lines 465, 480, 493, 506, 516 - ComSendArray() - multiple exit points.  
Lines 576, 589 - ComSend() - multiple exit points.  
Lines 989, 996, 1054 - ComInit() - multiple exit points.  
Lines 1111, 1121, 1132 - GetSerTouchISR() - multiple exit points.  
Lines 1188-1190, 1202-1204 - GetSerTouchISR() - compound a?b:c statement strains readability.  
Lines 1294, 1304, 1315 - GetSerMouseISR() - multiple exit points.  
Lines 1384-1389, 1427-1432 - GetSerMouseISR() - compound a?b:c statements strain readability.  
Lines 1521, 1531, 1541 - GetAudioSwISR() - multiple exit points.  
Line 1681 - ControllerInit() - multiple exit points.  
Lines 1743, 1759, 1777, 1819, 1846 - SerDevInit() - multiple exit points.

UNDXTIME.C - File unchanged from 2\_20.

Lines 179, 197 - timeunix() - multiple exit points.

#### /EDGE2\_24/ELECTION

#### AUDIOOUTL.C

Lines 115-123 - AudioWhenAuxPulled() - Different behavior exhibited in 2\_24 version rewritten for single exit point. A q\_send() occurs if isinst() is FALSE in 2\_20, but occurs if isinst() is TRUE in 2\_24.  
Lines 147-155 - AudioWhenAuxInserted() - Different behavior exhibited in 2\_24 version rewritten for single exit point. A q\_send() occurs if isinst() is TRUE in 2\_20, but occurs if isinst() is FALSE in 2\_24.  
Lines 349-375 - FreeSoundFiles() - Different behavior exhibited in 2\_24 version rewritten for single exit point. If Spt==NULL, none of the rest of the code is executed in 2\_20, but all of it is executed if Spt==NULL in 2\_24.  
Lines 553, 565, 577, 589 - LdBalValAudio2() - multiple exit points.  
Lines 621, 631, 673, 682, 711, 724, 735 - LdBalValAudio1() - multiple exit points.  
Lines 765, 787, 812, 865 - LdBalValAudio() - multiple exit points.  
Lines 540, 610, 755 - function names LdBalValAudio1() and LdBalValAudio2() should be more mnemonically named to be more different than LdBalValAudio(). This item is flagged as a standard convention that functions of significant length should differ by more than a single character at the end.

#### AUTOACT.C

Lines 909, 931 - ProcSelCodes() - multiple exit points.

#### BALIMAGE.C

Lines 160, 167 - GetImgFile() - multiple exit points.  
Lines 681, 692, 703, 711, 717 - getImpPg() - multiple exit points.

#### CFGROMRW.C

#### EEINTEGR.C

Line 453 - prt\_recovery() - multiple exit points.  
Line 550 - GetValueEE1() - multiple exit points.

ELCAUDIO.C

Line 93 - CHECK\_EXIT referenced 13 lines before it is defined. Is this a problem?  
Lines 2199, 2211, 2276 - InitElecAudio() - multiple exit points.  
Lines 2371, 2408, 2429, 2439, 2464 - DoElecAudio() - #define CHECK\_EXIT expands to multiple exit points. This has been deemed not to be an "abnormal exit condition", hence should be rewritten to accommodate a single exit point implementation. Since this declaration was made prior to receipt of this release it will not be held against this one. Future versions should address this situation, though.  
Line 2421 - DoElecAudio() - #define WAIT\_FOR\_KEY expands to multiple exit points. This has been deemed not to be an "abnormal exit condition", hence should be rewritten to accommodate a single exit point implementation. Since this declaration was made prior to receipt of this release it will not be held against this one. Future versions should address this situation, though.

ELECIN.C

ELECINIT.C

ELECMAIN.C - File unchanged from 2\_20.

ELECTION.C

ELNAVBAL.C

ERR\_HNDL.C - File unchanged from 2\_20.

EVOTING.C - File unchanged from 2\_20.

Lines 684, 696 - EVChkSize() - multiple exit points.

GRSUPFUN.C

PROCNT.C

PRSUPPORT.C

PUBCNT.C - File unchanged from 2\_20.

Line 137 - pubcnt() - multiple exit points.

Lines 226, 290, 315 - incpubcnt() - multiple exit points.

Lines 363, 374, 384, 395 - zeropubcnt() - multiple exit points.

RAND\_BLK.C - File unchanged from 2.20.

REGISTRY.C

RPT\_SET.C

SUMCOMP.C

Lines 145-164 - IncVBSelTot() - multiple exit points - this is new code, generated with knowledge of the ongoing discussion regarding multiple exit points, and the extra exit point on line 156 cannot even be said to be due to an error condition.

SUMSCRN.C

Line 383 - gotoBalPg() - multiple exit points - this is new code, generated with knowledge of the ongoing discussion regarding multiple exit points, that could have easily been implemented with a single exit point.

UTILITY.C

VAL\_BALL.C

Lines 74,82,90,97,104, 112, 123,131, 138,145, 148 - check\_crcs\_ramballot() - multiple exit points.

VOTE.C

VOTELANG.C

VOTER.C

VOTING.C

Line 697 - DoSimulation() - multiple exit points.

WRITE\_IN.C

AUDIO.H

ELECTION.H

/EDGE2\_24/GRAPHICS

BAD.C

BAL\_GROB.C

Lines 135, 142, 150 - LOC\_SZ\_CHK() - multiple exit points.

BMPLOAD.C

CURSOR.C

Lines 168, 195 - ChkMskFils() - multiple exit points.

Line 239 - RdBmpCurIni() - multiple exit points.

Lines 455, 466, 474, 483, 491 - InitCursor() - multiple exit points.

DISPFORM.C

Line 430 - \_DisplayPopup() - multiple exit points.

Line 621 - AppProcessForm() - multiple exit points - this could easily be written with a single exit point.

Line 671 - RefreshForm() - multiple exit points - this could easily be written with a single exit point.

Line 707 - PopAppForm() - multiple exit points - this could easily be written with a single exit point.

Line 755 - ReplaceForm() - multiple exit points - this could easily be written with a single exit point.

Line 1399 - LoadPleaseWaitData() - multiple exit points - this could easily be written with a single exit point.

Line 1476 - SavePleaseWaitData() - multiple exit points - this could easily be written without this extra return().

DRAWBALT.C



EXPAND.C

F15BUTN.C

FONTFUNC.C

Lines 302, 308 - GetFontDescNam() - multiple exit points.  
Lines 628, 634, 660, 668, 676, 685, 693, 701, 709, 717, 725, 733, 743, 750 - GetFontDescs() - multiple exit points.  
Lines 790, 797 - ChkForReqFonts() - multiple exit points.  
Line 837 - LdFontsI() - multiple exit points.  
Lines 875, 905, 913, 920, 934, 993, 1005 - LdFonts() - multiple exit points.

GRTASK.C

Lines 797, 803, 809 - InitGraphicsSubsystem() - multiple exit points.  
Lines 1012-1017 - ProcForm() - statement a.b.c->d[e].f.g(h,i) very complex, not very robust.  
Lines 1145-1150 - GetQMsg() - statement a.b.c->d[e].f.g(h,i) very complex, not very robust.  
Line 1356 - GraphicsEntry() - multiple exit points.  
Line 1558 - ConfigureVideoChip() - multiple exit points.

ROTFONT.C

Line 361 - RotateFontCW() - multiple exit points.

ZSTR.C

Line 604 - OpenFont() - multiple exit points.  
Lines 1392, 1428 - PaintChar() - multiple exit points.  
Lines 1504, 1529, 1554, 1576 - PaintItalicChar() - multiple exit points.  
Lines 1634, 1704 - DrawString() - multiple exit points.  
Lines 1776, 1845 - DrawString16() - multiple exit points.  
Lines 1919, 1991 - DrawText() - multiple exit points.  
Lines 2065, 2136 - DrawText16() - multiple exit points.

/EDGE2\_24/INCLUDE

BALGBL.H

CONFIG.H

EDGE.H

EDGEMAP.H

EDGEMEM.H

EDGESYS.H

EDGTOOLS.H

REP\_EXT.H

RESOURCE.H

STRING16.H

STRUCT.H

SYSEVENT.H

SYS\_CONF.H

/EDGE2\_24/LDBAL

FILOCHK.C

FILDFCHK.C

Lines 460, 467, 480, 494, 509 - CandCk() - multiple exit points.  
Line 693 - ResBalChk() - multiple exit points.  
Lines 813, 818, 827 - LoadBallot() - multiple exit points.

LDBAL.C

Lines 763, 771, 782, 792, 802, 812 - FirstChk() - multiple exit points.  
Line 842 - GetConfig() - multiple exit points.  
Lines 892, 907, 917 - ChkElecCRCs() - multiple exit points.  
Lines 950, 976, 986, 992, 998, 1010, 1017, 1022 - VerifyCart() - multiple exit points.  
Lines 1106, 1117, 1133, 1143, 1155 - ChkAndLdBallot() - multiple exit points.

LDIMAGED.C

Line 250 - GetLBFile() - multiple exit points.  
Line 309 - CopyCndPos() - multiple exit points.  
Line 400 - CopyCntPos() - multiple exit points.  
Lines 488, 494 - CpyCndDim() - multiple exit points.  
Lines 589, 595 - CpyCntDim() - multiple exit points.  
Lines 752, 769, 792 - DoSimpleImg() - multiple exit points.  
Line 844 - LoadUpImgs() - multiple exit points.  
Lines 909, 984, 1057, 1086 - DoComplexImg() - multiple exit points.  
Lines 1178, 1189, 1199, 1212, 1225, 1233 - LoadAndXlatBallImages() - multiple exit points.

XLATSTRS.C

Line 639 - DoStrXlat() - multiple exit points.  
Line 790 - DoAllTextStrs() - multiple exit points.  
Line 1224 - XlatBalStrings() - multiple exit points.

/EDGE2\_24/MACHINE

ADCONV.C

MACH.C

PRTSPLR.C

SWSCAN.C

MACH.H

/EDGE2\_24/MAINT

AUXRPT.C

Lines 830, 836, 841, 866, 871 - UserInterface() - multiple exit points.

MAINT.C

SETDT.C

Lines 174-176- Date\_Time\_Ref() -excessively complex extrapolations of a?b:c syntax strain readability. Regarding why this was not flagged in previous certifications, the probability is that previous reviewers overlooked the statement in a flash of incompetence, much the way this reviewer completely misdiagnosed strcmp16() in the 2\_20 edgtools\strcmp16.c review. They would agree, if shown today, that the statement strains readability, as does the software panel at Wyle.

/EDGE2\_24/MENUET

MNATTR.C

Line 274 - ReadAttrTbl() - multiple exit points.

MNFORMS.C

Lines 454, 464 - OpenForm() - multiple exit points.

MNGRAF.C

Lines 81, 86 - pushGrEnv() - multiple exit points.  
Lines 100, 105 - popGrEnv() - multiple exit points.

MNOBJS.C

Line 2250 - QryFldContents() - multiple exit points.  
Line 2267 - SetFldContents() - multiple exit points.  
Line 2320 - DoTextHelp() - multiple exit points.

MNOBLNG.C

No file mnoblng.c in 2\_24. It is assumed that its code was no longer needed and has been removed like many other functions in this directory.

MNTOKEN.C

MNTYPES.C

Line 50 - SetObAttr() -what if cnt was inadvertently passed in a value of 1,000,000? (robust?)  
Line 64 - ObFlagCount() -what if cnt was inadvertently passed in a value of 1,000,000? (robust?)  
Line 83 - ObTypeCount() -what if cnt was inadvertently passed in a value of 1,000,000? (robust?)  
Lines 150, 152, 154, 158, 159 - DestroyObTags() -what if cnt was inadvertently passed in with a value of 1,000,000? (robust?)  
The answer to Sequoia's response

"To all of the above, "So what?". Isn't this a case of a long being saved in a structure element that is defined as a long?"

is that in all the above instances the long variable is being used as an index into an array, which in all likelihood, does not have 1,000,000 elements. Accessing the millionth element of an array that does not have a million elements is bad news. Unless it is guaranteed that an excessive value will not be inadvertently passed in for this variable, defensive techniques would be wise.

MNXTAGS.C

Line 98 - InitListOb() - multiple exit points.  
Line 247 - InitMultOb() - multiple exit points.

MENUET.H

MNTYPES.H

MNXTAGS.H

/EDGE2\_24/PORTRAIT

TRANS.C

/EDGE2\_24/REPORTS

AT\_RPT.C

BYOPTION.C - File unchanged from 2\_20.

Line 83 - prtbyoption\_totals1() - function should be more mnemonically renamed to be more different than prtbyoption\_totals(). This item is flagged as a standard convention that functions of significant length should differ by more than a single character at the end.  
Lines 110, 118 - prtbyoption\_totals1() - multiple exit points.  
Lines 191, 233, 246, 264 - prtbyoption\_totals() - multiple exit points.  
Lines 394, 447, 457 - byoption() - multiple exit points.

BYPRCNT.C - File unchanged from 2\_20.1

Lines 115, 144, 172 - GetSessionCnts() - multiple exit points.  
Line 374 - RecordsLeft() - multiple exit points.  
Lines 603, 649, 657, 665, 675, 707 - ByPrecinct() - multiple exit points.

CENTNAME.C - File unchanged from 2\_20.

Line 87 - centname() - multiple exit points.

CONSTAT.C - File unchanged from 2\_20.

Lines 106, 115, 121, 130, 146, 153 - ConsStatus() - multiple exit points.

DISPRPT.C - File unchanged from 2\_20.

ENDRS.C - File unchanged from 2\_20.

Lines 167, 182, 197, 221, 228 - endrs() - multiple exit points.

NORM\_RPT.C - File unchanged from 2\_20.

Lines 245, 273 - NotStdRpt() - multiple exit points.

N\_WRTINS.C - File unchanged from 2\_20.

Line 145 - prtwi\_totals1() - function should be more mnemonically renamed to be more different than prtwi\_totals(). This item is flagged as a standard convention that functions of significant length should differ by more than a single character at the end.

Lines 213, 224 - prtwi\_totals1() - multiple exit points.

Lines 264, 310 - prtwi\_totals() - multiple exit points.

PRNLIST.C - File unchanged from 2\_20.

Lines 64, 72 - print\_badblock\_list() - multiple exit points.

PRTUTIL.C - File unchanged from 2\_20.

Lines 84, 107, 114, 120 - prtfoot() - multiple exit points.

Lines 151, 155, 160, 165, 170 - prthead() - multiple exit points.

Lines 200, 205, 210 - mrpthdr() - multiple exit points.

Lines 242, 265, 272 - \_prtime() - multiple exit points.

PRT\_CAND.C - File unchanged from 2\_20.

Lines 106, 115, 124, 135, 163, 173 - print\_candidate() - multiple exit points.

PRT\_CNDS.C - File unchanged from 2\_20.

Lines 153, 163, 181 - prt\_cnnds() - multiple exit points.

PRT\_CONT.C - File unchanged from 2\_20.

Line 93 - prt\_cont() - multiple exit points.

PRT\_OPT.C - File unchanged from 2\_20.

Lines 126, 137, 143 - SumPrecinct() - multiple exit points.

Line 228 - ProcSelCodes() - multiple exit points.

Lines 320 - SetUpFilesAndMem() - multiple exit points.

PRT\_PLAT.C - File unchanged from 2\_20.

Lines 110, 114, 118, 122, 126, 130, 150, 159 - PrtConsPlate() - multiple exit points.

Lines 206, 210, 218, 228, 232, 236, 240, 249, 253, 257, 261, 266, 270, 278, 285, 290, 295, 302, 312, 319, 323 - prt\_plate() - multiple exit points.

PRT\_WI.C - File unchanged from 2\_20.

Lines 91, 118, 131, 143 - prt\_wi() - multiple exit points.

Lines 196, 208, 224 - PrtConsByPrecWI() - multiple exit points.

Lines 274, 305, 310 - PrtConsByBallWI() - multiple exit points.

Lines 350, 366, 374, 384 - prt\_ConsWI() - multiple exit points.

PR\_LOG.C

Lines 195, 211, 217, 231, 240, 249 - pr\_log() - multiple exit points.

PUT\_ADDR.C - File unchanged from 2\_20.

Lines 175, 184, 191, 199, 211 - put\_addr() - multiple exit points.

Lines 244, 255, 262, 269, 274, 281, 288, 295, 302, 309 - put\_addr() - multiple exit points.

REPORTS.C

Lines 253, 265, 275, 284, 293, 306 - PrintReport() - multiple exit points.

Lines 336, 341, 346, 351 - print\_miscompare() - multiple exit points.

Line 446 - QuitRpt() - multiple exit points.

Lines 506, 526, 537, 544, 548, 552 - CheckReportData() - multiple exit points.

Lines 584, 589, 598, 604, 613 - DoStandardReport() - multiple exit points.

Line 954 - chkPrintingStat() - multiple exit points.

Lines 1180, 1235 - report() - multiple exit points.

RPTHEAD.C - File unchanged from 2\_20.

Line 229 - rpt\_form\_done() - multiple exit points.

Line 280 - rpt\_form\_enter() - multiple exit points.

Lines 375, 380, 387, 394, 399 - headrpt() - multiple exit points.

Lines 437, 442 - SetResults() - multiple exit points.

Lines 531, 542, 553, 557, 565, 569, 577, 581, 593, 598, 609, 617, 625, 632, 640 - rpthead() - multiple exit points.

TURNOUT.C - File unchanged from 2\_20.

Lines 117, 122, 127, 132, 138, 144, 148 - PrintTurnoutRptHeader() - multiple exit points.

Lines 224 - SumPrecTotals() - multiple exit points.

Lines 294 - SumEdgeTotals() - multiple exit points.

Lines 368 - EdgeTotBySelCd() - multiple exit points.

Lines 423, 430 - PrecTotByEdge() - multiple exit points.

Lines 498, 534, 552, 606, 616, 623, 636 - turnout() - multiple exit points.

REP\_PRO.H

/EDGE2\_24/RESOURCE

RSC\_EVNT.C

RSC\_MISC.C

RSC\_POP.C

RSC\_RPT.C

/EDGE2\_24/SIM

SIM.C

Line 290 - SimAuxHndlr() - multiple exit points.

Line 324 - SimWhenAuxPulled() - multiple exit points.

Line 358 - SimWhenAuxInserted() - multiple exit points.  
Lines 1507, 1536 - SimAutoAct() - multiple exit points.  
Lines 1880, 1896, 1915, 1936, 1961 - SimCandPress() - multiple exit points.

/EDGE2\_24/SYSTEM

SYSEVENT.C

SYSTEM.C

/EDGE2\_24/AUDIO/PICFIRM

EDGSOUND.C

## 2. Revision Assessment Statements

Many of the questioned aspects of 2\_20 code were satisfactorily explained in comments in 2\_24. Many similarly named functions renamed for clarity as requested. Formerly naked constants have been explained in new comments. Many functions with multiple exit points have been rewritten to accommodate a single exit point implementation.

Error conditions were evaluated according to the recent clarification received by Wyle labs, namely that acceptable error conditions for allowing 'abnormal exit conditions' would be limited to failure of fundamental C library functions (i.e. fopen(), malloc(), fwrite(), fseek(), etc.). It is assumed that wrappers around those functions are also included, as are functions whose sole content is the above type of functions. Statements regarding these formerly 'multiple exit points' and regarding those that obviously were wrappers of fundamental C library functions have been removed from the review. Other error conditions that remain are not included in the 'abnormal exit conditions' exemption and should be rewritten to implement a single exit point. It should be noted that there remain over five hundred instances of with multiple exit points inside functions.

All statements regarding function length have been removed, as recent declarations from Wyle define function length to only include lines of C, not spaces or comments. The vendor has proven that, using that standard, it is fully compliant with the numbers in the FEC guideline.

Several instances of significant complexity (e.g. a7b:c expansions and six-deep dereferencings) reported in the 2\_20 review remain unchanged in this version and continue to raise concern regarding readability and robustness.

Some functions rewritten to implement a single exit point will exhibit different behaviors than their 2\_20 counterparts. These differences were almost immediately apparent to the reviewer as the functions reported were small; it is left to the vendor to confirm that other changes in more involved functions had no effect on the behavior.

Some functions were claimed to have been fixed in the response, but were actually unchanged (one example was getImpPg() in election\balimage.c). It is assumed that this was simply an oversight.

For the most part, compliance with FEC guidelines for coding practices as set forth within the FEC Performance and Test Standards for Punchcard, Marksense, and Direct Recording Electronic Voting Systems has been achieved. Some of the issues listed above were passed in previous reviews, and as such will not prevent certification of the current release. They are expected, however, to be addressed as a matter of compliance in releases in the reasonable future.

## 3. Revision 2\_24A Assessment Statements

Release 2\_24A of the code was received. A quick diff indicated that only minor changes had been made. All files were compared with their 2\_24 counterparts and the differences investigated with a view of how changes would affect compliance with FEC guidelines.

## 4. Revision 2\_24A Source File Specific Notes

The following is a list of source files that have changed since Release 2\_24, along with source-file specific comments for each one, if any.

/EDGE2\_24A

PRGBEG.C  
VERSION.C



/EDGE2\_24A/CONSOLID  
CHKCART.C  
CONSOLID.C  
  
/EDGE2\_24A/EDGTOOLS  
ATAMOUNT.C  
COPY.C  
MALLOC.C  
PWRDOWN.C  
STR\_FRMT.C  
  
/EDGE2\_24A/ELECTION  
ERR\_HNDL.C  
EVOTING.C  
UTILITY.C  
  
/EDGE2\_24A/GRAPHICS  
MENUET.C  
  
/EDGE2\_24A/INCLUDE  
RESOURCE.H  
  
/EDGE2\_24A/LDBAL  
FILDFCHK.C  
  
/EDGE2\_24A/MACHINE  
PRTSPLR.C  
SWSCAN.C  
  
/EDGE2\_24A/MAINT  
AUXRPT.C  
  
/EDGE2\_24A/PSOS2\_OF  
ROOT.C  
  
/EDGE2\_24A/REPORTS  
DISPRPT.C  
  
/EDGE2\_24A/RESOURCE  
RSC\_EVNT.C  
RSC\_LCD.C  
RSC\_POP.C

/EDGE2\_24A/UTILITY

SETUP.C - compared with 2\_20 version (/UTILITY file not supplied in 2\_24)  
SMTCDPRG.C - compared with 2\_20 version (/UTILITY file not supplied in 2\_24)  
STFIRMCD.C - compared with 2\_20 /PSOS2\_OF version (/UTILITY file not supplied in 2\_24)  
UTILITY.C - compared with 2\_20 /UTILITY version (/UTILITY file not supplied in 2\_24)  
UTILITY.H - compared with 2\_20/UTILITY version (/UTILITY file not supplied in 2\_24)

5. Revision 2\_24A Final Assessment Statements

A text file explaining the changes was included and was very accurate in its listings of the files that had changed. The only files not listed in the changes file were those in the /UTILITY directory, a directory that existed in the code supplied for Release 2\_20 but not Release 2\_24. As such the changes that existed were compared with their 2\_20 counterparts.

All changes were very minor from the previous version, and as such, it is asserted that this release exhibits the same compliance as Version 2\_24 with the FEC guidelines for coding practices as set forth within the FEC Performance and Test Standards for Punchcard, Marksense, and Direct Recording Electronic Voting Systems.

Kevan L. Moore, Contract Engineer

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C:\My Documents\Nased\Sequoia Pacific\Edge 3.0\2.24a Source\src224a.zip

Name	Modified	Size	Ratio	Packed	Path
asm.s	1/27/01 09:55	59,916	83%	10,284	
beginram.s	1/27/01 09:55	3,450	68%	1,087	
beginrom.s	1/27/01 09:55	3,379	69%	1,033	
BIOS.bin	1/27/01 09:55	4,194,304	98%	80,557	
Bios.hex	1/27/01 09:55	170,514	60%	68,398	
Biosrom.bin	1/27/01 09:55	4,194,304	98%	80,337	
Bld_flp.bat	1/27/01 09:55	3,131	62%	1,197	
Boot_dos.hex	1/27/01 09:55	315,481	61%	121,549	
C_bios.hex	1/27/01 09:55	98,194	63%	36,697	
curver.mak	1/27/01 09:55	1,560	63%	576	
disk.hex	1/27/01 09:55	44	14%	38	
Finish.hex	1/27/01 09:55	15	20%	12	
FrstTime.c	1/27/01 10:00	162	15%	137	
IncRvNum.h	1/27/01 10:05	904	52%	434	
Jmpvctr.hex	1/27/01 09:55	40	8%	37	
k10cbios.hex	1/27/01 09:55	98,194	63%	36,897	
K15cbios.hex	1/27/01 09:55	98,577	62%	36,874	
LdCache.c	1/27/01 09:55	2,816	60%	1,120	
Makefile.mak	1/27/01 09:55	13,840	75%	3,513	
Mkfilinc.mak	1/27/01 09:55	18,128	72%	5,154	
PrgBeg.c	1/27/01 09:55	3,366	57%	1,453	
PrgEnd.c	1/27/01 09:55	7,298	68%	2,303	
ram.bat	1/27/01 09:55	424	44%	238	
Ram.bld	1/27/01 09:55	2,136	56%	945	
Rom.bld	1/27/01 09:55	2,223	55%	994	
romend.bld	1/27/01 09:55	1,574	51%	766	
romr.bld	1/27/01 09:55	1,808	54%	743	
Setupenv.bat	1/27/01 09:55	4,709	67%	1,554	
SetUpRom.bat	1/27/01 09:55	1,966	57%	840	
Version.c	1/27/01 10:05	3,615	66%	1,215	
makeout.tmp	1/27/01 10:05	285,514	92%	23,253	
Makeerr.tmp	1/27/01 10:05	18,620	99%	179	
Cc.tmp	1/27/01 09:56	488	47%	246	
MI.tmp	1/27/01 09:56	167	46%	90	
Utcc.tmp	1/27/01 10:00	167	16%	140	
Lib.tmp	1/27/01 10:05	54	11%	48	
Bc.tmp	1/27/01 10:05	78	14%	67	
Ram.tmp	1/27/01 10:05	859	65%	299	
Lnk.tmp	1/27/01 10:05	835	55%	372	
makefile.mak	1/27/01 10:33	1,290	52%	620	portrait\
trans.c	1/27/01 10:00	16,551	75%	4,207	portrait\
Rsc_lcd.c	1/27/01 10:00	11,381	70%	3,455	resource\
makefile.mak	1/27/01 10:33	1,344	52%	650	resource\
resource.c	1/27/01 10:00	3,700	62%	1,414	resource\
rsc_evnt.c	1/27/01 10:00	9,822	68%	3,127	resource\
Rsc_rpt.c	1/27/01 10:00	10,842	68%	3,381	resource\
rsc.h	1/27/01 10:00	1,908	58%	799	resource\
RSC_MISC.c	1/27/01 10:00	14,106	74%	3,663	resource\
Rsc_pop.c	1/27/01 10:00	18,960	74%	4,840	resource\
Makefile.mak	1/27/01 10:33	1,987	57%	856	system\
System.c	1/27/01 10:00	12,403	67%	4,111	system\
Sysevent.c	1/27/01 10:00	19,361	76%	4,642	system\

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C:\My Documents\Nased\Sequoia Pacific\Edge 3.0\2.24a Source\src224a.zip

Name	Modified	Size	Ratio	Packed	Path
Makefile.mak	1/27/01 10:33	1,230	52%	594	sim\
Sim.c	1/27/01 10:00	66,657	77%	15,552	sim\
Makefile.mak	1/27/01 10:33	2,527	56%	1,111	reports\
at_rpt.c	1/27/01 10:00	7,447	66%	2,521	reports\
Byoption.c	1/27/01 10:00	14,267	70%	4,222	reports\
Byprcnt.c	1/27/01 10:00	23,893	75%	6,038	reports\
Centname.c	1/27/01 10:00	3,176	55%	1,414	reports\
constat.c	1/27/01 10:00	4,744	62%	1,822	reports\
disprpt.c	1/27/01 10:00	27,409	76%	6,569	reports\
Endrs.c	1/27/01 10:00	7,744	64%	2,801	reports\
evrpts.c	1/27/01 10:00	12,819	77%	3,012	reports\
Global.c	1/27/01 10:00	4,028	64%	1,433	reports\
ld_mngle.c	1/27/01 10:00	2,203	51%	1,089	reports\
N_wrtins.c	1/27/01 10:00	9,512	67%	3,162	reports\
Norm_rpt.c	1/27/01 10:00	13,726	70%	4,084	reports\
pr_log.c	1/27/01 10:00	8,037	66%	2,723	reports\
Pmlist.c	1/27/01 10:00	2,471	54%	1,128	reports\
Pri_blok.c	1/27/01 10:00	3,288	60%	1,328	reports\
Pri_cand.c	1/27/01 10:00	6,103	63%	2,285	reports\
Pri_cnds.c	1/27/01 10:00	6,112	63%	2,288	reports\
Pri_cont.c	1/27/01 10:00	3,446	57%	1,493	reports\
Pri_opt.c	1/27/01 10:00	14,101	71%	4,149	reports\
prt_plat.c	1/27/01 10:00	10,115	70%	3,037	reports\
prtutil.c	1/27/01 10:00	7,746	71%	2,225	reports\
Pri_wl.c	1/27/01 10:00	12,684	74%	3,294	reports\
Put_addr.c	1/27/01 10:00	10,113	69%	3,171	reports\
Reports.c	1/27/01 10:00	37,299	77%	8,410	reports\
Rpthead.c	1/27/01 10:00	17,569	75%	4,445	reports\
Set_blok.c	1/27/01 10:00	23,402	77%	5,397	reports\
Turnout.c	1/27/01 10:00	21,889	76%	5,261	reports\
Rep_pro.h	1/27/01 10:00	6,261	67%	2,081	reports\
report.h	1/27/01 10:00	5,567	63%	2,048	reports\
Makefile.mak	1/27/01 10:33	1,775	55%	803	psos2_0f
Drv_conf.c	1/27/01 10:00	28,013	82%	5,092	psos2_0f
Root.c	1/27/01 10:00	27,589	70%	8,271	psos2_0f
UpdtFirm.c	1/27/01 10:00	33,418	77%	7,611	psos2_0f
Makefile.mak	1/27/01 10:33	2,355	58%	983	maint\
auxrpt.c	1/27/01 10:00	28,911	74%	7,564	maint\
Lcd_adj.c	1/27/01 10:00	22,068	76%	5,249	maint\
LCDCALfm.c	1/27/01 10:00	5,205	71%	1,487	maint\
Lcdctfm.c	1/27/01 10:00	4,441	66%	1,520	maint\
Maint.c	1/27/01 10:00	14,668	66%	4,936	maint\
Setdt.c	1/27/01 10:00	19,545	79%	4,069	maint\
Setdtfm.c	1/27/01 10:00	8,200	77%	1,906	maint\
menuscns.h	1/27/01 10:00	3,894	68%	1,255	maint\
Makefile.mak	1/27/01 10:33	1,268	52%	614	machine\
Mach.c	1/27/01 10:00	6,928	68%	2,189	machine\
Swscan.c	1/27/01 10:00	12,338	73%	3,323	machine\
Adconv.c	1/27/01 10:00	12,469	67%	4,080	machine\
prtsplr.c	1/27/01 10:00	31,849	78%	7,161	machine\
Mach.h	1/27/01 10:00	1,629	58%	682	machine\
Makefile.mak	1/27/01 10:33	1,448	52%	692	idbal\

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Name	Modified	Size	Ratio	Packed	Path
fldfchk.c	1/27/01 10:00	25,056	76%	6,039	ldbal\
fil0chk.c	1/27/01 10:00	8,594	73%	2,360	ldbal\
Ldbal.c	1/27/01 10:00	31,361	75%	7,822	ldbal\
ldimaged.c	1/27/01 10:00	34,089	79%	7,122	ldbal\
xlatstrs.c	1/27/01 10:00	33,237	74%	8,574	ldbal\
ldbal.h	1/27/01 10:00	2,387	58%	1,005	ldbal\
Bad.c	1/27/01 10:00	2,467	77%	560	graphics\
makefile.mak	1/27/01 10:33	3,693	62%	1,402	graphics\
Bal_grob.c	1/27/01 10:00	21,941	73%	5,952	graphics\
bmpload.c	1/27/01 10:00	37,542	75%	9,426	graphics\
cursor.c	1/27/01 10:00	19,862	74%	5,111	graphics\
Dispform.c	1/27/01 10:00	45,701	79%	9,683	graphics\
Drawball.c	1/27/01 10:00	24,433	74%	6,354	graphics\
expand.c	1/27/01 10:00	25,346	74%	6,577	graphics\
F15butn.c	1/27/01 10:00	7,160	73%	1,926	graphics\
Fontfunc.c	1/27/01 10:00	23,971	78%	5,287	graphics\
grstring.c	1/27/01 10:00	40,523	77%	9,358	graphics\
grtask.c	1/27/01 10:00	47,609	72%	13,180	graphics\
popup.c	1/27/01 10:00	3,525	62%	1,345	graphics\
RotFont.c	1/27/01 10:00	11,595	80%	2,338	graphics\
strtupfm.c	1/27/01 10:00	2,751	58%	1,153	graphics\
zstr.c	1/27/01 10:00	50,200	86%	7,181	graphics\
menuscns.h	1/27/01 10:00	5,833	61%	2,298	graphics\
menuet.fnt	1/27/01 10:00	5,018	44%	2,814	graphics\
Menuet.c	1/27/01 10:04	31,689	83%	5,486	graphics\
Elecin.c	1/27/01 09:59	7,538	61%	2,921	election\
Makefile.mak	1/27/01 10:33	3,258	61%	1,270	election\
12codes.c	1/27/01 09:59	7,061	75%	1,770	election\
audioutl.c	1/27/01 09:59	25,131	79%	5,364	election\
autoact.c	1/27/01 09:59	35,717	76%	8,673	election\
balimage.c	1/27/01 09:59	30,576	76%	7,313	election\
castbal.c	1/27/01 09:59	4,636	62%	1,775	election\
cfgromrw.c	1/27/01 09:59	4,762	65%	1,643	election\
Eeintegr.c	1/27/01 09:59	26,915	75%	6,612	election\
elcaudio.c	1/27/01 09:59	65,272	77%	15,036	election\
Elecinit.c	1/27/01 09:59	21,713	70%	6,408	election\
Elecmain.c	1/27/01 09:59	13,016	68%	4,190	election\
Elecstrt.c	1/27/01 09:59	2,409	57%	1,038	election\
Election.c	1/27/01 09:59	45,177	77%	10,595	election\
Elnavbal.c	1/27/01 09:59	7,690	72%	2,115	election\
Err_hndl.c	1/27/01 09:59	13,333	68%	4,332	election\
evoting.c	1/27/01 09:59	29,840	73%	8,066	election\
Grsupfun.c	1/27/01 09:59	22,766	78%	4,925	election\
pollwork.c	1/27/01 09:59	6,462	57%	2,806	election\
Procnt.c	1/27/01 09:59	4,974	65%	1,726	election\
Prtsetup.c	1/27/01 09:59	6,365	68%	2,038	election\
Prsupport.c	1/27/01 09:59	8,991	70%	2,676	election\
Pubcnt.c	1/27/01 09:59	12,607	72%	3,511	election\
Rand_blk.c	1/27/01 09:59	8,921	70%	2,650	election\
recorded.c	1/27/01 09:59	2,266	52%	1,081	election\
Registry.c	1/27/01 09:59	6,032	70%	1,806	election\
Rpt_set.c	1/27/01 09:59	17,450	77%	4,070	election\

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C:\My Documents\Nased\Sequoia Pacific\Edge 3.0\2.24a Source\src224a.zip

Name	Modified	Size	Ratio	Packed	Path
Wait.c	1/27/01 09:59	1,828	56%	799	edgtools\
Wrlng.c	1/27/01 09:59	7,130	66%	2,422	edgtools\
Crc_calc.c	1/27/01 09:59	18,813	67%	6,235	edgtools\
Makefile.mak	1/27/01 10:33	1,302	52%	628	consolid\
Consolid.c	1/27/01 09:59	24,709	74%	6,491	consolid\
Validate.c	1/27/01 09:59	21,639	74%	5,844	consolid\
Chkcart.c	1/27/01 09:59	20,498	73%	5,534	consolid\
Consolid.h	1/27/01 09:59	3,263	60%	1,298	consolid\
Makefile.mak	1/27/01 10:33	1,755	54%	801	menuet\
Mnattr.c	1/27/01 09:59	17,010	83%	2,856	menuet\
mnbmp.c	1/27/01 09:59	5,032	72%	1,429	menuet\
Mnforms.c	1/27/01 09:59	13,808	74%	3,588	menuet\
Mngraf.c	1/27/01 09:59	11,520	75%	2,841	menuet\
Mnobjs.c	1/27/01 09:59	55,254	81%	10,678	menuet\
Mnrect.c	1/27/01 09:59	2,435	73%	662	menuet\
Mntoken.c	1/27/01 09:59	4,670	75%	1,184	menuet\
Mntypes.c	1/27/01 09:59	4,817	72%	1,352	menuet\
mnxtags.c	1/27/01 09:59	9,994	74%	2,637	menuet\
Menuet.h	1/27/01 09:59	6,267	70%	1,908	menuet\
mnattr.h	1/27/01 09:59	10,207	75%	2,531	menuet\
mnbmp.h	1/27/01 09:59	1,649	62%	619	menuet\
Mnenv.h	1/27/01 09:59	3,932	72%	1,088	menuet\
Mnforms.h	1/27/01 09:59	2,492	66%	856	menuet\
Mngraf.h	1/27/01 09:59	3,551	67%	1,172	menuet\
Mnobjs.h	1/27/01 09:59	5,362	73%	1,470	menuet\
Mnrect.h	1/27/01 09:59	1,568	64%	559	menuet\
Mntoken.h	1/27/01 09:59	2,441	70%	731	menuet\
Mntypes.h	1/27/01 09:59	11,846	73%	3,188	menuet\
Mnxtags.h	1/27/01 09:59	2,044	68%	691	menuet\
Hardcopy.h	1/27/01 09:57	3,874	80%	783	metawin\
makefile.mak	1/27/01 10:32	6,278	66%	2,152	metawin\
Metawndo.h	1/27/01 09:57	2,766	62%	1,045	metawin\
Metconst.h	1/27/01 09:57	28,440	75%	7,191	metawin\
Metextm.h	1/27/01 09:57	13,230	75%	3,249	metawin\
Metfonts.h	1/27/01 09:57	5,069	66%	1,739	metawin\
Metports.h	1/27/01 09:57	9,801	70%	2,950	metawin\
Pcxlab.h	1/27/01 09:57	3,249	67%	1,082	metawin\
8514a.inc	1/27/01 09:57	3,701	66%	1,252	metawin\
Bits_5.inc	1/27/01 09:57	10,648	74%	2,769	metawin\
Blit_0.inc	1/27/01 09:57	4,075	87%	543	metawin\
Blit_5.inc	1/27/01 09:57	7,979	66%	2,735	metawin\
Blit_6.inc	1/27/01 09:57	6,967	68%	2,221	metawin\
Blit_7.inc	1/27/01 09:57	6,934	68%	2,225	metawin\
Blit_8.inc	1/27/01 09:57	2,571	54%	1,181	metawin\
Devc.inc	1/27/01 09:57	2,752	65%	976	metawin\
Dpen.inc	1/27/01 09:57	473	38%	305	metawin\
Drv386.inc	1/27/01 09:57	2,604	72%	721	metawin\
File.inc	1/27/01 09:57	2,488	61%	958	metawin\
Fill_5.inc	1/27/01 09:57	5,472	65%	1,938	metawin\
Fill_6.inc	1/27/01 09:57	7,832	66%	2,644	metawin\
Fill_7.inc	1/27/01 09:57	7,652	67%	2,545	metawin\
Fill_8.inc	1/27/01 09:57	7,736	67%	2,572	metawin\

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Page 4

C:\My Documents\Nased\Sequoia Pacific\Edge 3.0\2.24a Source\src224a.zip

Name	Modified	Size	Ratio	Packed	Path
Selbal.c	1/27/01 09:59	6,566	73%	1,801	election\
siclang.c	1/27/01 09:59	16,595	69%	5,067	election\
sumscm.c	1/27/01 09:59	39,600	74%	10,400	election\
sv_opt.c	1/27/01 09:59	10,219	76%	2,411	election\
syserr31.c	1/27/01 09:59	2,552	57%	1,108	election\
Utility.c	1/27/01 09:59	25,794	75%	6,455	election\
Vote.c	1/27/01 09:59	29,441	79%	6,110	election\
votelang.c	1/27/01 09:59	47,313	78%	10,537	election\
Voteok.c	1/27/01 09:59	12,909	67%	4,280	election\
Voter.c	1/27/01 09:59	15,421	70%	4,562	election\
Votesave.c	1/27/01 09:59	31,265	81%	5,931	election\
Voting.c	1/27/01 09:59	59,334	76%	14,506	election\
WI_blk.c	1/27/01 09:59	6,159	66%	2,124	election\
Wikybd.c	1/27/01 09:59	15,085	83%	2,620	election\
Wikybd.c	1/27/01 10:00	14,554	83%	2,443	election\
Write_in.c	1/27/01 10:00	9,881	64%	3,597	election\
Elecgbl.h	1/27/01 10:00	8,937	63%	3,292	election\
Election.h	1/27/01 10:00	14,157	67%	4,636	election\
Menuscns.h	1/27/01 10:00	4,028	62%	1,527	election\
audio.h	1/27/01 10:00	2,632	58%	1,148	election\
Sumcomp.c	1/27/01 10:03	13,180	70%	3,905	election\
Val_ball.c	1/27/01 10:03	8,614	69%	2,712	election\
Makefile.mak	1/27/01 10:33	4,258	63%	1,588	edgtools\
atamount.c	1/27/01 09:59	7,953	74%	2,034	edgtools\
At_votes.c	1/27/01 09:59	2,839	57%	1,224	edgtools\
At_xfer.c	1/27/01 09:59	16,481	75%	4,046	edgtools\
Str_frm.c	1/27/01 09:59	46,580	84%	7,302	edgtools\
Compare.c	1/27/01 09:59	16,437	72%	4,555	edgtools\
Copy.c	1/27/01 09:59	23,174	73%	6,159	edgtools\
Cryptsig.c	1/27/01 09:59	18,378	72%	5,223	edgtools\
Des.c	1/27/01 09:59	23,040	72%	6,451	edgtools\
E2pot.c	1/27/01 09:59	18,041	77%	3,678	edgtools\
Fopen.c	1/27/01 09:59	7,609	67%	2,490	edgtools\
Freeblks.c	1/27/01 09:59	2,021	55%	910	edgtools\
Fsize.c	1/27/01 09:59	2,875	64%	1,032	edgtools\
Get_time.c	1/27/01 09:59	2,368	58%	1,005	edgtools\
Getputtp.c	1/27/01 09:59	7,028	75%	1,746	edgtools\
init_drv.c	1/27/01 09:59	3,014	64%	1,093	edgtools\
isinst.c	1/27/01 09:59	3,025	62%	1,155	edgtools\
Lcd_drv.c	1/27/01 09:59	11,066	68%	3,549	edgtools\
Malloc.c	1/27/01 09:59	27,414	77%	6,183	edgtools\
Parser.c	1/27/01 09:59	37,777	80%	7,405	edgtools\
Pwrdwn.c	1/27/01 09:59	8,030	67%	2,684	edgtools\
Random.c	1/27/01 09:59	2,531	56%	1,103	edgtools\
readcart.c	1/27/01 09:59	5,276	74%	1,370	edgtools\
Seep.c	1/27/01 09:59	19,866	79%	4,193	edgtools\
Sound.c	1/27/01 09:59	8,856	72%	2,505	edgtools\
Smrtcard.c	1/27/01 09:59	8,890	74%	2,338	edgtools\
string16.c	1/27/01 09:59	13,476	79%	2,836	edgtools\
Touch.c	1/27/01 09:59	51,595	76%	12,166	edgtools\
Unixtime.c	1/27/01 09:59	8,894	67%	2,927	edgtools\
Unpack.c	1/27/01 09:59	2,740	59%	1,135	edgtools\

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Test Report No. 44733-01

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C:\My Documents\Nased\Sequoia Pacific\Edge 3.0\2.24a Source\diff224a.zip

Name	Modified	Size	Ratio	Packed	Path
Version.txt	1/27/01 08:38	538	62%	204	
Chkcart.txt	1/27/01 08:38	866	57%	285	
Consolid.txt	1/27/01 08:38	543	51%	264	
Malloc.txt	1/27/01 08:38	2,128	62%	804	
Atamount.txt	1/27/01 08:38	634	55%	287	
Copy.txt	1/27/01 08:38	6,297	71%	1,797	
Str_frmt.txt	1/27/01 08:38	1,420	75%	349	
Pwrdown.txt	1/27/01 08:38	647	53%	305	
Err_hndl.txt	1/27/01 08:38	644	53%	302	
Evoting.txt	1/27/01 08:38	942	51%	458	
Utility.txt	1/27/01 08:38	632	53%	299	
Resource.txt	1/27/01 08:38	1,023	52%	492	
Fiidfchk.txt	1/27/01 08:38	668	56%	296	
Prtsptr.txt	1/27/01 08:38	824	49%	418	
Swscan.txt	1/27/01 08:38	1,484	63%	547	
Auxrpt.txt	1/27/01 08:38	1,215	57%	522	
Roof.txt	1/27/01 08:38	696	46%	374	
Disprpt.txt	1/27/01 08:38	722	50%	363	
Rsc_evnt.txt	1/27/01 08:38	743	55%	334	
Rsc_lcd.txt	1/27/01 08:38	493	48%	258	
Rsc_pop.txt	1/27/01 08:38	640	53%	303	
21 file(s)		23,599	61%	9,261	



#### Sequoia Software Review Summary

This review covers the Sequoia CardActivator 1.9 software. The review involved evaluation of its compliance with the FEC guidelines for software quality and reliability. This evaluation included, but was not limited to, the following considerations:

Readability	How straightforward and apparent was the design?
Understandability	How complicated was the code to implement it?
Modularity	How well was the code divided into logical, functional units?
Robustness	How well does the code handle error conditions or unexpected inputs?
Security	Does the code protect the integrity of voting data at all times?
Maintainability	How easy would it be to extend, fix, or modify this code in the future?
Consistency	Was the design of the code coherent throughout?
Documentation	Does the code contain useful and frequent comments?
Usability	Does the code inform the user about progress or errors?
Flow control	Are control constructs and entry/exit points logical and controlled?

The review report details specific instances where it was felt that the code fell short in some areas being reviewed, and lists file names, line numbers, and suggestions where applicable to guide the maintainers in making any needed corrections. Also included is a general synopsis section where recurring problems are explained and solutions may be suggested. Some areas may be identified where improvements are needed in non-critical areas, and those changes should be addressed in future versions of this software.

The recommendation is given at the end of this document.

#### Evaluation

The code on the disk has been reviewed and described in the software specification. The evaluation of the code is given on the subsequent pages. This document is arranged as follows:

- 1) Source File Specific Notes
- 2) General Observations
- 3) Final Assessment Statements

1. Source File Specific Notes

The following is a list of source files reviewed, along with source-file specific comments for each one, if any.

CRYPTSIG.C

DES.C

Lines 388, 399 - desinit() - multiple return statements that are not due to errors from library function calls. Entire function could be easily rewritten to accommodate a single exit point, including library function errors.  
Line 460 - setkey() - expansion of a7b:c strains readability.  
Line 538 - f() - not immediately obvious by function name what its purpose is. Further comments would help.  
Line 608 - endes() - multiple exit point.  
Line 652 - endes() - comments suggest byte swapping if little endian, though as is, byte swapping is unconditional. No such 'if' comment exists in line 770.  
Line 679 - doencrypt() - multiple exit point.  
Line 726 - dedes() - multiple exit point.  
Line 798 - dodecrypt() - multiple exit point.  
Line 839 - desdone() - multiple exit points.  
Lines 885, 914 - Des() - multiple exit points.

KYB\_DRV.C

Lines 79,80 - keyboard\_read() - need comments explaining values.  
Lines 156,160,173 - special\_keyboard\_read() - need comments explaining reason for translations.  
Line 172 - special\_keyboard\_read() - multiple exit points.  
Lines 202,203 - isa\_keyhit() - need comments explaining values.

LCD\_DRV.C

Line 45 - lcd\_display() - multiple executable statements on a single line.  
Lines 106,107 - lcd\_busy\_control() - need comments explaining values.  
Lines 154,160 - initialize\_lcd() - need comments explaining values.  
Lines 254,259 - read\_ram\_address() - naked constants 59,60.  
Line 259 - read\_ram\_address() - multiple exit points.  
Lines 310,315 - set\_cgram\_address() - naked constants 59,60.  
Line 315 - set\_cgram\_address() - multiple exit points.  
Line 336 - LCDCommand() - need comment to explain 0x378.  
Lines 354-356 - ParallelInt() - need comments explaining values.

LED\_DRV.C

Lines 41,42,45 - led\_init() - need comments explaining values.  
Line 68 - led\_off() - need comments explaining value.  
Lines 91,94 - led\_on() - need comments explaining value.

LOWSMART.C

Line 53 - ReadClock() - need comment explaining value.  
Lines 93,94,97 - ReadData() - need comments explaining values.  
Line 116 - WriteByte() - need comment explaining value.  
Lines 248-258 - I2Cinit() - need comments explaining values.

Line 316 - IsCardReader() - multiple exit points.  
Line 339 - IsSmartCardInstalled() - need comment explaining value.  
Line 372,375 - EjectSmartCard() - need comment explaining value.  
Line 378 - EjectSmartCard() - multiple exit points.  
Line 415 - ReadSmartCard() - need comment explaining values.  
Lines 422, 465 - ReadSmartCard() - multiple exit points.  
Line 510 - WriteSmartCard() - need comment explaining values.  
Line 517 - WriteSmartCard() - multiple exit points.

#### SMTCDPRG.C

Lines 132,138,146 - very wise.  
Lines 327,328,330,334,335,337 - CheckBattery - need comments explaining values.  
Line 428,437,438,439,440,443,447,453,454 - DoClock - need comments explaining values.  
Line 750 - Init - need comments explaining value.  
Line 795 - VerifyData() - multiple exit points.  
Line 869 - FindSelCode() - multiple exit points.  
Lines 910-1148 - ChangeTime() - 233 lines long (spaces not included in line count).  
Lines  
945,956,960,964,978,988,990,997,1007,1009,1010,1016,1019,1020,1067,1071,1075,1089,1099,1108,111  
8,1127,1130,1131 - ChangeTime() - need comments explaining values.  
Line 1177 - GetPassword() - multiple exit points.  
Lines 1288-1291 - GetPrgmrSerNum() - need comments explaining values.  
Line 1392 - ReadSelCodes() - multiple exit points.  
Lines 1656,1658,1652,1665,1667,1671,1674,1676,1680,1683,1685,1689,1692,1694,1699 -  
GetFileDateTime() - need comments explaining values.  
Lines 1715-2318 - SpecialMenu() - this function is well over 500 lines. FEC guidelines prohibit function  
lengths in excess of 240 lines.  
Line 1778 - SpecialMenu() - multiple exit points.  
Lines 2334,2336 - WriteComChr() - need comments explaining values.  
Lines 2358,2359 - ReadComChr() - need comments explaining values.  
Lines 2379-2703 - main() - function is well over 240 lines long. FEC guidelines prohibit function lengths  
in excess of 240 lines.

#### UTILITY.C

Lines 137-359 - GetUserStr() - function is well over 120 lines long.  
Lines 147,155,174,181 - GetUserStr() - multiple exit points.  
Line 652 - PutIniHexArray() - multiple exit points.  
Line 691 - GetIniHexArray() - multiple exit points.  
Lines 949,950 - PCardStat() - need comments explaining values.  
Lines 1000, 1007 - DoMenu() - use of GOTOs expressly forbidden by FEC guidelines.  
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Lines 1071,1072,1075,1080,1083,1086,1087 - ModemON() - need comments explaining values.  
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LED\_DRV.H

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Lines 92,93 - expansion of a?b:c strains readability.  
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## 2. General Observations

The entire body of code is well-written for the most part and usually well-commented. Function headers were very helpful. Include files are usually well-commented. Almost all functions are short and concise.

However, a couple of functions are well over 240 lines. FEC guidelines specifically prohibit a function having more than 240 lines. There are several instances of functions with multiple exit points that could easily be redesigned with a single exit point. Multiple exit points arising from C library functions (fopen, malloc, etc.) returning an error were viewed as 'abnormal exit conditions' and were not noted.

A few times expansions of a?b:c syntax existed and should be simplified. In one function, GOTOs exist.

Most of the need for additional comments came from inline assembly code where it was not immediately obvious how the constants supplied as parameters to the assembly instructions were the necessary values to achieve the desired objective. Some comments were requested simply to explain naked constants, of which there were relatively few.

3. Final Assessment Statements

While the code is otherwise mostly well-written and documented adequately, certain conditions exist that are specifically forbidden by the FEC guidelines. Other more subjective issues have suggested remedies consistent with standard review history.

Until the issues discussed in this review are resolved it is recommended that this code not be declared compliant with the FEC guidelines for coding practices as set forth within the FEC Performance and Test Standards for Punchcard, Marksense, and Direct Recording Electronic Voting Systems.

Kevan L. Moore, Contract Engineer

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### 4. Revision 02/09/2001 Assessment Statements

A revision of the code was received on 02/09/2001. This revision included minor changes to a very few functions.

All files were compared with their original 1.9 counterparts and any differences were investigated. The following is the listing of the source code files that changed and were reviewed, along with any change-specific observations (supplemental to any comments already appearing above).

### 5. Revision 02/09/2001 Source File Specific Notes

#### DES.C

Line 459 - setkey() - expansion of a?b:c <(a?b:c)?d:e> still exists and strains readability.

#### KYB\_DRV.C

Lines 158,162,173,176 - special\_keyboard\_read() - still not clear why chrin is being translated to 0x02 and 0x06 in these cases. Why 0x02 and 0x06?

#### LCD\_DRV.C

Lines 261,323 - read\_ram\_address() - what's magic about constants 59,60? Needs more specific clarification.

#### LED\_DRV.C

#### LOWSMART.C

What does register 0xa9 do? What does the data read from register 0xa9 represent, and what does writing to register 0xa9 accomplish? Added comments should be more informative.

#### SMTCDPRG.C

Lines 779,781 - Init() - multiple executables on one line. Specifically forbidden by the FEC guidelines.

Lines  
1005,1009,1013,1027,1037,1046,1056,1065,1068,1069,1119,1130,1134,1138,1152,1162,1164,1171,1181,  
1183,1184,1190,1193, 1194 - ChangeTime() - still need comments explaining values.

#### UTILITY.C

#### UTILITY.H

Lines 92,93 - expansion of a?b:c strains readability. ATOX is only used once in entire code (utility.c line 562) and XTOA is only used twice in entire code (utility.c lines 516,517) so the agreeably more complicated use would have minimal impact.

6. Revision 02/09/2001 Final Assessment Statements

A great deal of effort has been expended to implement suggestions from the previous review, both subjective and objective, to improve readability and other issues regarding FEC compliance. In view of this effort, the remaining issues are expected to be implemented in the next release, but will be allowed for this release.

It is recommended that this code be declared compliant with the FEC guidelines for coding practices as set forth within the FEC Performance and Test Standards for Punchcard, Marksense, and Direct Recording Electronic Voting Systems.

Kevan L. Moore, Contract Engineer

5/1/01 22:02

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C:\My Documents\Nased\Sequoia Pacific\Edge 3.0\Card Activator\card activator 020801.zip

Name	Modified	Size	Ratio	Packed	Path
Cryptsig.c	2/1/01 09:31	7,624	68%	2,415	
Des.c	2/6/01 13:05	24,442	73%	6,529	
Kyb_drv.c	2/5/01 10:55	7,089	78%	1,566	
Lcd_drv.c	2/5/01 11:43	13,471	80%	2,671	
Led_drv.c	2/5/01 12:02	3,812	80%	762	
Lowsmart.c	2/5/01 13:33	14,206	77%	3,248	
Smtcdprg.c	2/8/01 10:03	72,118	77%	16,673	
Utility.c	2/6/01 09:35	30,822	76%	7,417	
Kyb_drv.h	8/21/00 10:22	2,585	75%	638	
Lcd_drv.h	2/1/01 10:16	5,349	80%	1,095	
Led_drv.h	2/1/01 10:11	1,119	72%	312	
Lowsmart.h	6/14/00 11:02	9,838	76%	2,357	
Smtcdprg.h	7/6/00 10:33	1,733	68%	563	
Struct.h	8/23/00 11:57	34,758	72%	9,895	
Utility.h	8/23/00 11:01	4,720	63%	1,755	