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TEST REPORT

HARDWARE QUALIFICATION TESTING OF THE EDGE MODELS I & II DRE VOTING MACHINES, VERIVOTE PRINTER, CARD ACTIVATOR, AND ADA AUDIO ADAPTER PERIPHERALS (FIRMWARE VERSION 5.0.14)

For
 Sequoia Voting Systems
 7677 Oakport St. Suite 800
 Oakland, CA 94621

STATE OF ALABAMA }
 COUNTY OF MADISON }

Robert D. Hardy, 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.

Raul F. Terceno

SUBSCRIBED and sworn to before me this 17 day of March 2006

Ardele Stephens

Notary Public in and for the State of Alabama at Large

My Commission expires March 3 2007

Wyle shall have no liability for damages of any kind to person or property, including special or consequential damages, resulting from Wyle's providing the services covered by this report.

TEST BY: Wendy Owens 3/16/06
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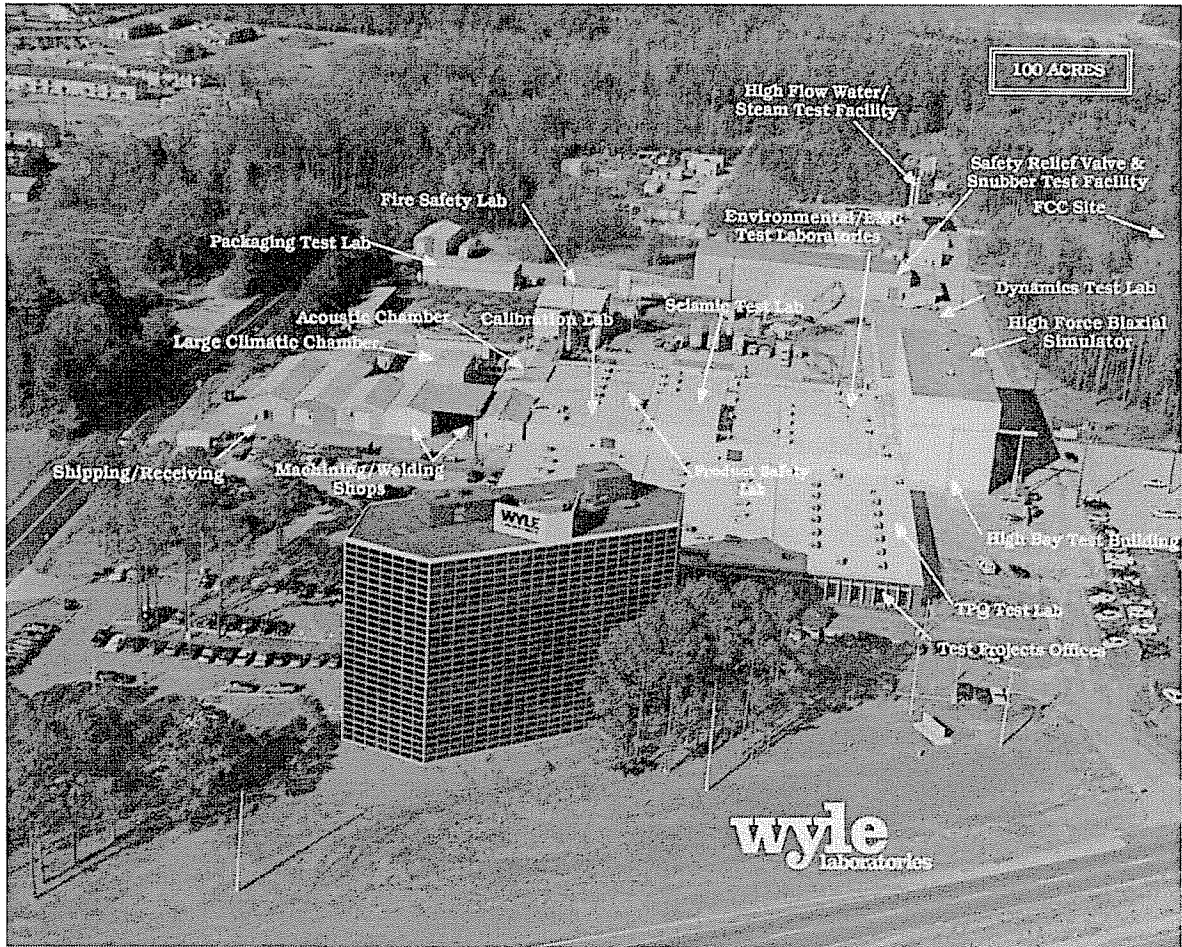
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AERIAL VIEW OF WYLE/HUNTSVILLE

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1.0 INTRODUCTION

1.1 Scope

This report presents the test results for Hardware Qualification Testing of the Sequoia Edge Models I and II Direct Record Electronic (DRE) Voting Machines, VeriVote Printer, Card Activator, and ADA Audio Adapter Peripherals.

1.2 Objective

The objective of this test program was to ensure that the Edge DRE Voting Machines, and Voting Machine Firmware, Version 5.0.14, complied with the hardware requirements of the Voting Systems Standards, April 2002.

1.3 Summary

Qualification testing includes: the selective in-depth examination of machine resident firmware; the inspection and evaluation of hardware 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 the Sequoia Edge and resident machine firmware.

The Edge and associated Machine Firmware, Version 5.0.14, was subjected to Reliability and Functional Tests. It was demonstrated that the Edge and associated Machine Firmware successfully met the hardware qualification test requirements of the Voting Systems Standards, April 2002. 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. Testing of the election management software including end-to-end system level testing will be performed by a Software ITA, CIBER, Inc, Huntsville, AL, which will issue the results of such testing under a separate report.

Due to the varying requirements of individual jurisdictions, it is recommended by the Voting Systems 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 Purchase Order No. 10006806
- Sequoia Voting Systems, VeriVote Printer Operators Manual, Version 1.08, May 2005
- Sequoia Voting Systems, VeriVote Printer Maintenance Manual, Version 1.05, May 2005
- Sequoia Voting Systems, VeriVote Printer, Test and Verification Specification, Version 1.01, July 2004
- Sequoia Voting Systems, Card Activator, Operators and Maintenance Manual, Release 5.0, Version 1.02, May 2005
- Sequoia Voting Systems, Card Activator, Software Specification, Release 5.0, Version 1.01, May 2005
- Sequoia Voting Systems, Card Activator, Poll Workers Manual, Release 5.0, Version 1.01, May 2005
- Sequoia Voting Systems, AVC EDGE, Test and Verification Specification, Version 1.00, May 2005
- Sequoia Voting Systems, AVC EDGE, Voter Instructions, Release 5.0
- Sequoia Voting Systems, AVC EDGE, System Software Specifications, Release 5.0, Revision 1.00, 5/10/05
- Sequoia Voting Systems, AVC EDGE, Functional Specification, Release 5.0, Revision 1.01
- Sequoia Voting Systems, AVC EDGE, Release 5.0, System Overview, Revision 1.00, 5/10/05
- Sequoia Voting Systems, AVC EDGE, Security Overview, Release 5.0, 5/10/05
- Sequoia Voting Systems, AVC EDGE, Software Technical Description, Release 5.0
- Sequoia Voting Systems, AVC EDGE, Penetration Analysis, Release 5.0, Revision 1.00, 5/10/05
- Sequoia Voting Systems, AVC EDGE, Personnel and Training, Version 1.00, May 2005
- Sequoia Voting Systems, AVC EDGE, Operator's Manual, Release 5.0, Revision 1.05, 6/9/05
- Sequoia Voting Systems, AVC EDGE, System Hardware Description "Edge 1", Revision 1.00, 5/10/05
- Sequoia Voting Systems, AVC EDGE, System Hardware Description "Edge 2", Revision 1.00, 5/10/05

2.0 REFERENCES (Continued)

- Sequoia Voting Systems, AVC EDGE, Data Dictionary for Release 5.0, Revision 5/2/05
- Sequoia Voting Systems, AVC EDGE, Audio Accessory, Poll Worker's/Operator's Manual for AVC EDGE Release 5.0, May 2005
- Sequoia Voting Systems, AVC EDGE, Change Summary, Release 5.0, Revision 1.00, 5/10/05
- Sequoia Voting Systems, AVC EDGE, System Maintenance Manual, Release 5.0, Revision 1.03, 5/3/05
- Sequoia Voting Systems, AVC EDGE II, Specification for CPU Board, Revision 1.00, 5/10/05
- Sequoia Voting Systems, AVC EDGE, Specification for CPU Board "EDGE 1", Revision 1.00, 5/10/05
- Sequoia Voting Systems, AVC EDGE, Quality Assurance Program, Revision 1.00, May 2005
- Sequoia Voting Systems, AVC EDGE, Configuration Management Plan, Version 1.00, May 2005
- Sequoia Voting Systems, Acceptance Testing Guide, Document Version 2.05, April 15, 2005
- Wyle Laboratories' Report No. 50932-01 Rev. A, "Change Release Report of the AVC Edge Models I and II DRE Voting Machine Configured with a VeriVote Printer (Firmware Release 4.3.320)", dated August 11, 2005
- FEC April 2002 Voting System Standards, Volume I, "Performance Standards", and Volume II, "Test Standards"
- Wyle Laboratories' Quality Assurance Program Manual, Revision 2
- 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

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4.0 TEST HARDWARE/SOFTWARE DESCRIPTION

4.1 Hardware

4.1.1 Edge

The AVC Edge is a Direct-Record Electronic (DRE) voting device which uses a color Liquid Crystal Display (LCD) with an integrated touchscreen, a control panel for use by election poll workers, appropriate electronic circuitry and processing devices for performing specific system functions, internal memory for storing ballot data and voting records, a removable Results Cartridge with non-volatile memory, protective and public counters, and integrated voter privacy panels.

The AVC Edge provides a large format LCD and associated touchscreen to present the ballot and allow the voter to make their selections. Offices and issues can be set up in multiple formats allowing election administrators flexibility in the presentation of the ballots.

The AVC Edge is modular in design and is available with options that allow the customer to configure it to their specific needs. The AVC Edge is a stand-alone system, i.e.; it does not require any networking to a central system in order to function. All processing from loading the ballot to recording votes is done on individual units. Loading ballots and accumulating tallies from the machines is accomplished via a Results Cartridge. Consolidation of votes from individual machines located within the same precinct can also be performed.

The Results Cartridge is designed so that it can be inserted into the voting machine, record voting results, be removed from the machine at the closing of the polls and be transferred to a central location and read by the Sequoia Voting System WINEDS election management software.

The Results Cartridge stores:

- An electronic representation of the ballot
- Ballot logic to enable the voter to make those selections to which they are lawfully entitled
- The aggregated vote totals
- A randomized record of all individual ballots cast
- A chronological log of significant machine operations, including error conditions

There are two models of the AVC Edge available. Both models were subjected to all tests. The difference in the models is limited to the location of the PCMCIA cartridge slots and the serial number nomenclature. On Edge I models, the PCMCIA slots are located just below the poll worker display and the serial numbers are less than 22000. On Edge II models, the PCMCIA slots are located behind the touch screen and the serial numbers are greater than 21999. Reference Photographs 2 and 3 for further details.

4.0 TEST HARDWARE/SOFTWARE DESCRIPTION (Continued)

4.1 Hardware (Continued)

4.1.1 Edge (Continued)

The AVC Edge is a suitcase shaped device measuring 10" by 17" by 26" and weighing approximately 45 pounds. It is portable and has a handle to allow for ease in carrying. For common carrier transport a protective fiberboard shipping carton is provided. An optional nylon carrying case is also available for additional protection of the Edge during transit between a storage facility and polling precinct.

The AVC Edge is powered via nominal 115 VAC/60 Hz power and includes internal battery backup power.

4.1.2 Verivote VVPAT Printer

The Verivote printer is a thermal-type side-mounted printer which attaches to the AVC Edge via a slide rail located to the left of the touchscreen display housing. The Verivote is used to produce a paper record that can be reviewed by the Voter during voting.

The Verivote printer includes the following:

- Privacy panel/drape which allows the printout to be seen only by the Voter
- Provision for putting a seal on the printer ensuring that the housing containing the receipt paper cannot be disturbed without recognition
- Provision for putting a lock on the slide rail to which the printer is attached, preventing its removal from the AVC Edge
- The Printer also includes the poll's opening and closing reports

The Verivote measures approximately 16" by 6" by 6" and weighs 7.4 pounds. It includes a nylon canvas carrying case. It is powered and receives data directly from the AVC Edge via a stand-alone power connector and a DB-25 plug.

The Verivote uses a 300' length thermal paper roll.

As tested using the AVC Edge Firmware Release 5.0.14, the Verivote printer was configured to suppress, (does not print out) any associated Serial Number data to which the printed roll can be traced back to the specific machine from which the voter receipts were printed. Additionally, there were no provisional voter ID tags printed, just a statement denoting "provisional voter."

4.0 TEST HARDWARE/SOFTWARE DESCRIPTION (Continued)

4.1 Hardware (Continued)

4.1.3 Card Activator

The Card Activator is an optional device designed to activate Voter Cards, which enables the voter to access the AVC Edge voting machine upon card insertion into the AVC Edge. If a Card Activator is not used, a polling official must be present to manually activate the AVC Edge for each voter. After identifying the voter, the poll worker inserts a Voter Card into the Card Activator. The Card Activator prompts the poll worker for the ballot style to which the voter is allowed to vote based upon the voters geographic location of residence. The Card Activator then transfers the poll worker responses to the voter's Voter Card. After the transfer is complete, the Card Activator ejects the activated card. The poll worker hands the activated Voter Card to the voter, who will use the activated Voter Card to access the AVC Edge voting machine. The Card Activator is comprised of a Central Processing Unit (CPU)/Printed Circuit Board, power conditioning, keypad, and its firmware. The Card Activator uses a 486CORE Module, i.e., embedded PC.

The Card Activator measures approximately 4" by 6" by 12" and can be operated from 115 VAC/60 Hz power or internal battery. It includes a nylon canvas carrying case.

4.1.4 ADA Handset

The ADA Handset is an optional Audio Voting accessory used for audio voting with the AVC Edge voting machine. The ADA Handset measures approximately 3.5" by 5.5" by 1.5" and is powered through a data cable attached to the AVC Edge. The ADA Handset utilizes 8-bit serial data, which is passed from the AVC Edge to a 20-PIC microprocessor in the handset. In the PIC microprocessor, a 10-bit pulse-switch modulator converts serial-audio voting data into a pulse-width modulated data stream, which is then passed through a 4 kHz low-pass filter where it is amplified and then sent to the stereo jack on the handset. It includes a nylon canvas carrying case.

4.2 Firmware

4.2.1 EDGE Version 5.0 Firmware

The AVC Edge firmware is totally self-contained. It does not use an off-the-shelf operating system. A periodic interrupt routing is used to monitor hardware events, such as switch closures. The AVC Edge firmware includes purchased components for its file system (ERTFS) and graphics (Menuet and Metagraphics). These components all include source code, which the vendor has brought to compliance with the 2002 VSS. A separate real-mode BIOS is also part of the system, which is used during power up only.

4.0 TEST HARDWARE/SOFTWARE DESCRIPTION (Continued)

4.2 Firmware (Continued)

4.2.1 EDGE Version 5.0 Firmware (continued)

Edge Version 5.0 firmware includes a dual-printer operational mode as a configuration option that is controlled from WinEDS. This mode prints to the Seiko DPU-414 printer when polls are not open (before and after) but to the VVPAT during voting. This allows for secure voter receipts while not limiting the ability for tear-off results and other reports, such as when the results are required to be posted at the polling place. When the dual-printer mode is active, the AVC Edge will inform the operator if the proper printer type for a given operation is not present. This will be via enhanced text in the "Printer Not Responding" alert message that indicates to check that the proper printer is installed. The dual-printer operational mode was tested during the required functional testing.

In depth discussion of the Software System Concepts are documented in the Sequoia Voting Systems AVC Edge Software Technical Description, Release 5.0.

4.2.2 Card Activator Firmware

The Card Activator uses an AMD Elan 486 processor. The software is compiled and linked as a single object module approximately 110K in size using C language. The source is compiled using Borland C/C++ compiler, and the executable is loaded into the Card Activator using a PCMCIA card. The resulting module runs on the MS-DOS operating system. In-depth discussion of the Software System Concepts are documented in the Sequoia Voting Systems Card Activator Software Specification, Release 5.0.

5.0 MATERIALS REQUIRED FOR TESTING

5.1 Equipment

Sequoia provided a sufficient number of Edge Model I and Model II machines, Card Activators, VeriVote Printers, and ADA Handsets to ensure that parallel testing where feasible could be performed.

5.2 Test Materials

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

5.0 MATERIALS REQUIRED FOR TESTING (Continued)

5.3 Deliverable Materials

Sequoia 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 or Document Control Number or Release Date. Reference Paragraph 2.0 for a listing and version of the applicable documentation.

6.0 TEST SPECIFICATIONS

6.1 Functional Qualification Test Matrix

The Edge DRE machines were subjected to a series of tests to simulate Election Day activities at the precinct level. These tests were performed to ensure compatibility of voting machine functions at the precinct level using the 5.0.14 firmware.

These included activities to simulate:

- (a) verification of hardware status via diagnostic reports prior to election
- (b) performing procedures required to prepare hardware for election operations
- (c) obtaining 'zero' machine report printouts on all contest fields
- (d) performing procedures to open the polling place and enable ballot counting
- (e) casting of ballots to demonstrate proper processing, error handling, and generation of audit data
- (f) performing hardware operations required to disable ballot counting and closing the polls
- (g) obtaining machine reports and verifying correctness
- (h) obtaining machine generated audit logs and verifying correctness

Additionally, logic and accuracy tests were performed and functionality of the following Ballot Logic types were verified:

- General Election
- Closed Primary Election
- Open Primary Election
- Partisan/Non-Partisan
- Straight Party
- Recall Issues w/Options
- Cumulative Ranking
- Split Precincts
- Vote N-of-M
- Write-In Voting
- Overvotes (disallowed) and Undervotes
- Blank Ballots

6.0 TEST SPECIFICATIONS (Continued)

6.1 Functional Qualification Test Matrix (Continued)

- Provisional Ballots (including after hours)
- Candidate Rotation
- Cross-Party Endorsement
- Multi-Language Ballots (English, Spanish, Vietnamese, Chinese, Tagalog, Creole, Japanese, Korean)

Attachment A contains an overall functional qualification matrix addressing those precinct level hardware characteristics reviewed during hardware qualification testing.

6.2 Electrical and Environmental Tests

Hardware qualification testing and a technical data package documentation review were performed to ensure that the Edge DRE Voting Machines and associated machine resident firmware were in compliance with the Voting Systems Standards 2002 functional requirements.

The Edges were functionally tested, as they would be configured for use in an election precinct.

The Edges were subjected to the following hardware environmental and electrical tests:

- Transit Vibration, Mil-Std-810D, Method 514.3, Category 1 – Basic Transportation, Common Carrier⁽¹⁾
- Humidity, Mil-Std-810D, Method 507.2, Procedure I – Natural Hot-Humid⁽¹⁾
- Bench Handling, Mil-Std-810D, Method 516.3, Procedure VI⁽¹⁾
- Low Temperature, Mil-Std-810D, Method 501.2, Procedure I - Storage⁽¹⁾
- High Temperature, Mil-Std-810D, Method 502.2, Procedure I - Storage⁽¹⁾
- Environmental Operating, 163 Hr Reliability⁽¹⁾
- Product Safety, UL60950, Product Safety, Information Technology Equipment
- FCC Part 15 Emissions
- Electrostatic Discharge, IEC EN 61000-4-2
- Electromagnetic Radiation, IEC EN 61000-4-3
- Electrical Fast Transients, IEC EN 61000-4-4
- Lightning Surge, IEC EN 61000-4-5
- Conducted Immunity, IEC EN 61000-4-6
- Magnetic Fields, IEC EN 61000-4-8

⁽¹⁾ Note that the Edge had previously been qualified to the environmental test requirements as required by the 1990 Voting Systems Standards. The environmental tests required by the 2002 Voting Systems Standards are equivalent or less severe than the 1990 test requirements. Therefore, where applicable, the previous environmental qualification test data has been applied toward the 2002 environmental test requirements.

Attachments C through J contain the resultant test data of the above referenced tests.

6.0 TEST SPECIFICATIONS (Continued)

6.3 Firmware

The precinct-level Edge machine level firmware 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 that 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.

Attachment B contains the Edge Source Review Report, Firmware Version 5.0.14.

6.0 TEST SPECIFICATIONS (Continued)

6.4 Operating Test

6.4.1 Operating Environmental Test

The Edge Models I and II DRE Voting Machines configured with VeriVote Printers, Card Activators, and ADA Handset were subjected to a Temperature and Power Variation Test in accordance with section 4.7.1 of Volume II of the 2002 FEC Voting Systems Standards.

To perform the test, four Edges 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 the hardware varied from 40F to 100F and from 105 VAC to 129 VAC. During test, three Edges were configured to exercise an automated Logic & Accuracy test script that printed a voter receipt on the VeriVote Printer. The fourth Edge was loaded with an audio ballot generating continuous audio through the ADA Handset. The Card Activator was activating a card during test performance.

The environmental test profile and Chamber Thermal Circular Charts are presented in Attachment G.

There were no hardware failures encountered during the 163 Hr Mean-Time-Between-Failure demonstration.

6.5 Non-Operating Environmental Tests

The Edge Models I and II DRE Voting Machines, VeriVote Printer, Card Activator, and ADA Handset were subjected to various Non-Operating Environmental Tests. Prior to and immediately following each test environment, each Edge was powered and subjected to operability functionals to verify continued proper operation. The Edges were not powered during the performance of any of the non-operating tests.

6.5.1 Low Temperature Test

The Edge Models I and II DRE Voting Machines, VeriVote Printer, Card Activator, and ADA Handset were subjected to a Low Temperature Test in accordance with section 4.6.4 of Volume II of the 2002 FEC Voting Systems Standards.

The equipment was subjected to a baseline operability checkout to verify system readiness. Upon completion, the equipment was 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 equipment was removed from the chamber and inspected for any obvious signs of degradation and/or damage. None were observed. The equipment was successfully subjected to a post-test operability checkout.

Attachment C contains a Low Temperature Thermal Circular Chart.

6.0 TEST SPECIFICATIONS (Continued)

6.5 Non-Operating Environmental Tests (Continued)

6.5.2 High Temperature Test

The Edge Models I and II DRE Voting Machines, VeriVote Printer, Card Activator, and ADA Handset were subjected to a High Temperature Test in accordance with section 4.6.5 of Volume II of the 2002 FEC Voting Systems Standards.

The equipment was subjected to a baseline operability checkout to verify system readiness. Upon completion, the equipment was 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 equipment was removed from the chamber and inspected for any obvious signs of degradation and/or damage. None were observed. The equipment was successfully subjected to a post-test operability checkout.

Attachment C contains a High Temperature Thermal Circular Chart.

6.5.3 Vibration Test

The Edge Models I and II DRE Voting Machines, VeriVote Printer, Card Activator, and ADA Handset were subjected to Vibration Tests in accordance with section 4.6.3 of Volume II of the 2002 FEC Voting Systems Standards.

The equipment was subjected to a baseline operability checkout to verify system readiness. Upon completion, the equipment was secured to an electrodynamics shaker. One control accelerometer was affixed to the shaker table. Vibration and control was performed with an HP5427 Shock/Vibration Controller. The equipment was subjected to the Basic Transportation, Common Carrier profile as depicted in Mil-Std-810D, Method 514.3, Category I. The equipment was subjected to vibration for 30 minutes in each orthogonal axis. Upon test completion, the equipment was removed from its carrying case and inspected for any obvious signs of degradation and/or damage. None were observed. The equipment was successfully subjected to a post-test operability checkout.

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

6.5.4 Bench Handling Test

The Edge Models I and II DRE Voting Machines, VeriVote Printer, Card Activator, and ADA Handset were subjected to Bench Handling Tests in accordance with section 4.6.2 of Volume II of the 2002 FEC Voting Systems Standards.

The equipment was subjected to a baseline operability checkout to verify system readiness. Upon completion, the equipment was 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 equipment was inspected for any obvious signs of degradation and/or damage. None were observed. The equipment was subjected to a post-test operability checkout and continued operability verified.

Attachment D contains the Bench Handling Test Data Sheets.

6.0 TEST SPECIFICATIONS (Continued)

6.5 Non-Operating Environmental Tests (Continued)

6.5.5 Humidity Test

The Edge Models I and II DRE Voting Machines, VeriVote Printer, Card Activator, and ADA Handset were subjected to a Humidity Test in accordance with section 4.6.6 of Volume II of the 2002 FEC Voting Systems Standards.

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

Attachment F contains Humidity Circular Charts.

6.6 Electrical Tests

The Edge Models I and II DRE Voting Machines VeriVote Printer, Card Activator, and ADA Handset were subjected to various Electromagnetic Compatibility tests to ensure continued system operation and reliability in the presence of abnormal electrical events. The Edge Models I and II DRE Voting Machines were powered and actively running a logic and accuracy test routine that generated a voter receipt on the VeriVote Printer during all electrical tests. The Card Activator was powered and activating a card and the ADA Handset was running a continuous stream of audio during test performance.

All Electrical Tests were performed on both the Edge Model I and Model II.

6.6.1 Electrostatic Discharge

Electrostatic Discharge Testing was performed in accordance with the 2002 Voting Systems Standards to ensure that should an electrostatic discharge event occur during equipment setup and/or voting, whether by a poll worker or by a voter touching the DRE, that the DRE would continue to operate normally. A momentary interruption is allowed so long as normal operation is resumed without human intervention or loss of data.

The Edge was configured to run in an automated logic and accuracy test mode, whereas continual ballot processing would occur during the testing without operator intervention. The Edge was then subjected to electrostatic discharges of +/- 8 kV contact and +/- 15 kV air. Discharges were performed at areas typical of those, which might be touched during normal operation, including the touchscreen, user buttons, and other likely points of contact.

There was no loss of normal operation and or loss of data as a result of the applied discharges.

An Electrostatic Discharge Data Sheet and a test setup photograph are contained in Attachment J.

Attachment K contains the ESD Instrumentation Equipment Sheet.

6.0 TEST SPECIFICATIONS (Continued)

6.6 Electrical Tests (Continued)

6.6.2 Electrical Fast Transients

Electrical Fast Transients (EFT) testing was performed in accordance with the 2002 Voting Systems Standards to ensure that, should an electrical fast transient event occur on a power line, the Edge would continue to operate without disruption of normal operation or loss of data.

The Edge was configured to run in an automated logic and accuracy test mode, whereas continual ballot processing would occur during the testing without operator intervention. The Edge was then subjected to electrostatic fast transients of 2 kV applied to its AC power lines.

There was no loss of normal operation and or loss of data as a result of the applied transients.

An EFT Data Sheet and a test setup photograph are contained in Attachment J. Attachment K contains an Instrumentation Equipment Sheet.

6.6.3 Lightning Surge

Lightning Surge Testing was performed in accordance with the 2002 Voting Systems Standards to ensure that, should a surge event occur on a power line due to a lightning strike, the Edge will continue to operate without disruption of normal operation or loss of data.

The Edge was configured to run in an automated logic and accuracy test mode, whereas continual ballot processing would occur during the testing. The Edge power input lines were then subjected to the following surges:

- +/- 2 kV AC line-to-earth
- +/- 2 kV AC line-to-line

There was no loss of normal operation and or loss of data as a result of the applied surges.

A Lightning Surge Test Data Sheet and test setup photograph is contained in Attachment J. Attachment K contains a Surge Instrumentation Equipment Sheet.

6.0 TEST SPECIFICATIONS (Continued)

6.6 Electrical Tests (Continued)

6.6.4 Electromagnetic Susceptibility

Electromagnetic susceptibility testing was performed in accordance with the 2002 Voting Systems Standards. This testing was performed to ensure that the Edge would be able to withstand a moderate level of ambient electromagnetic fields without disruption of normal operation or loss of data.

The Edge was configured to run in an automated logic and accuracy test mode, whereas continual ballot processing would occur during the testing without operator intervention. The Edge was then subjected to ambient electromagnetic fields up to a maximum of 10 V/m over a range of 80 MHz to 1000 MHz.

There was no loss of normal operation and or loss of data as a result of the applied electromagnetic fields.

An Electromagnetic Susceptibility Data Sheet and test setup photograph is contained in Attachment J. Attachment K contains an Electromagnetic Susceptibility Instrumentation Equipment Sheet.

6.6.5 Conducted RF Immunity

Conducted RF Immunity testing was performed in accordance with the 2002 Voting Systems Standards. This testing was performed to ensure that the Edge will be able to withstand conducted RF energy onto its power lines without disruption of normal operation or loss of data.

The Edge was configured to run in an automated logic and accuracy test mode, whereas continual ballot processing would occur during the testing without operator intervention. The Edge was then subjected to conducted RF energy of 10 Vrms applied to its power lines over a frequency range of 150 kHz to 80 MHz.

There was no loss of normal operation and or loss of data as a result of the applied conducted RF energy.

A Conducted RF Susceptibility Data Sheet and test setup photograph is contained in Attachment J. Attachment K contains a Conducted RF Susceptibility Instrumentation Equipment Sheet.

6.0 TEST SPECIFICATIONS (Continued)

6.6 Electrical Tests (Continued)

6.6.6 Magnetic Fields Immunity

Magnetic Fields Immunity testing was performed in accordance with the 2002 Voting Systems Standards. This testing was performed to ensure that the Edge will be able to withstand AC magnetic fields without disruption of normal operation or loss of data.

The Edge was configured to run in an automated logic and accuracy test mode, whereas continual ballot processing would occur during the testing. The Edge was then subjected to AC magnetic fields of 30 A/M at a 60 Hz power line frequency.

There was no loss of normal operation and or loss of data as a result of the applied conducted RF energy.

A Magnetic Fields Data Sheet and test setup photograph is contained in Attachment J. Attachment K contains a Magnetic Fields Instrumentation Equipment Sheet.

6.6.7 Electrical Power Disturbance

Electrical Power Disturbance testing was performed in accordance with the 2002 Voting Systems Standards. This testing was performed to ensure that the Edge will be able to withstand electrical power line disturbances (dips/surges) without disruption of normal operation or loss of data.

The Edge was configured to run in an automated logic and accuracy test mode, whereas continual ballot processing would occur during the testing. The hardware was then subjected to the voltage dips and surges over periods ranging from 20 ms to four hours.

There was no loss of normal operation and or loss of data as a result of the applied electrical disturbances.

An Electrical Power Disturbance Data Sheet and test setup photograph is contained in Attachment J. Attachment K contains a Power Disturbance Instrumentation Equipment Sheet.

6.6.8 FCC Part 15 Emissions

Electromagnetic Radiation emissions measurements were performed in accordance with the 2002 Voting Systems Standards. This testing was performed to ensure that emissions emanating from the unit do not exceed the limits of FCC Part 15, Class B emissions. The results of the FCC Part 15 testing are documented in Attachment I.

The Edge was configured to run in an automated logic and accuracy test mode, whereas continual ballot processing would occur during the testing.

The Edge was found to comply with the required emissions limits. The results of the emissions testing are contained in Attachment J.

7.0 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 2540-1, 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 K contains Instrumentation Equipment Sheets.

8.0 WYLE QUALITY ASSURANCE

All work performed on this program was completed in accordance with Wyle Laboratories' Quality Assurance Program Manual, Revision 2.

Wyle Laboratories is accredited (Certificate No.: 845.01) by the American Association for Laboratory Accreditation (A2LA), and the results shown in this test report have been determined in accordance with Wyle's scope of accreditation unless otherwise stated in the report.

Pages 22 through K-18 of the 3/16/06 Wyle Report No. 51884-03 have been redacted because they contain trade secrets of Sequoia including proprietary source code and related materials.