AccuVote-OS

AccuVote-OS
Hardware Guide

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Revision 2.0

August 21, 2002

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AccuVote-OS Hardware Guide

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Part number: 733-2311

Document History

Document Number	Date	Remarks
	August 21, 2002	Updated document to Diebold Election Systems Product Document Standard 1.0.

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1. Introduction

1.1. Who this Guide is for

The *AccuVote-OS Hardware Guide* is designed for election administrators, service technicians, or any AccuVote-OS user who needs to install or replace AccuVote-OS components. The guide may be used in conjunction with the *AccuVote-OS Precinct Count User's Guide.*

1.2. Overview

The AccuVote-OS provides an efficient and flexible solution to diverse election needs. Each AccuVote-OS unit is relatively compact, weighing 15 lbs. only and may be easily installed and detached from ballot boxes at the polling place. Modular AccuVote-OS construction provides for easy upgrading and replacement of consumable parts such as the printer ribbon and paper tape.

The AccuVote-OS optically scans paper ballots, maintaining a running tally on its memory card until an AccuVote-OS Ender card is processed at election close. This card electronically locks the unit and automatically generates a report of the vote center's election results. Absentee ballots may optionally be counted after polling ballots at each precinct. Additional results reports can be printed on the AccuVote-OS once the election has been closed.

A variety of ballot counting solutions are available using the AccuVote-OS. Ballots may be counted either at the precinct on Election Day, or as absentee, challenged or early voting ballots. Each of these counting categories may be integrated into precinct and summary election results in a number of ways, using either precinct count equipment, or by manually entering results in the GEMS software.

Memory cards are used in conjunction with precinct count AccuVote-OS units and provide a highly compact and portable medium for storing election results, whereby any memory card may be used with any AccuVote-OS and at any polling place. Memory cards may easily be set to one of three election modes, with additional supportive setup and diagnostic modes.

The AccuVote-OS memory card is initially programmed with all vote center and ballot information. The memory card is loaded with the vote center's election results while ballots are counted. Election results may be transmitted to election central via modem. GEMS provides current consolidated election results and statistics, both online and in printed form as results are received.

Ballots counted on polling AccuVote-OS units automatically drop into one of two compartments in the ballot box, depending on the ballot selection criteria specified in GEMS. The AccuVote-OS is sealed into the ballot box on election day and all ballot box compartments are locked.

Extensive security is employed, be it in the encryption of data transmission at the time of memory card programming or at the time of election results transmission to the host computer. Critical AccuVote-OS functions are protected by password entry, and audit logs may be printed at any point in time, detailing all activities performed on a memory card since the point of programming.

Battery backup means hours of problem-free operation on election day in case of power failure. Furthermore, memory cards and AccuVote-OS units may be easily replaced without compromising the integrity and security of election results in case of equipment failure.

1.3. Other documents

Product documents also offered by Diebold Election Systems, Inc. include:

- *AccuFeed User's Guide*

- ~~AccuVote-HS Central Count User's Guide~~

- ~~AccuVote-OS Central Count User's Guide~~

- *AccuVote-OS Precinct Count User's Guide*

- *AccuVote-TS R6 Hardware Guide*

- *Ballot Station User's Guide*

- *Election Media Processor Hardware Guide*

- *Election Media Processor User's Guide*

- *GEMS System Administrator's Guide*

- *GEMS User's Guide*

- *Voter Card Encoder User's Guide*

- *VCProgrammer User's Guide*

2. AccuVote-OS Hardware

The AccuVote-OS ballot-processing unit is used to count ballots and tally the results either onto a memory card or dynamically update the GEMS database the host computer in the case of central count. Polling machines may send results to the host computer either by means of a direct serial connection or by modem.

The AccuVote-OS measures 14" by 16" by 3" and weighs 15 lbs. AccuVote-OS instructions and messages are displayed on a 2 by 16 character LCD. The thread of processing is established using the Yes and No buttons located underneath the LCD. Memory card labels, Zero Total, Election Results, and Audit reports are printed on the AccuVote-OS printer.

The AccuVote-OS ballot card reader is currently designed to process ballots using visible light sensors - earlier versions of the AccuVote-OS use infrared light emitting diodes to read ballots. The visible light card reader consists of two sets of printed circuit boards for reading both sides of the ballot card.

The AccuVote-OS accepts 8½" by 11", 14", 17, or 18" ballots, in any one of four orientations. Detailed specifications regarding weight, dimensions, color, tolerances, positioning of control marks, etc. is included in the *Ballot Specifications Guide*.

2.1. Product environment

Hardware used in conjunction with the AccuVote-OS may include:

- GEMS host computer
- Optional port expansion device (i.e. a DigiBoard), attached to the host computer
- Optionally, intelligent port server for port expansion functionality
- One modem for each serial port being used for modem transmission
- Cabling necessary for memory card programming and election results transmission
- Power cabling necessary for AccuVote-OS units, modems and any other electronic equipment
- Ballot box for each AccuVote-OS unit
- One or more AccuFeeds for processing large volumes of absentee or mail-in ballots
- Control cards, including AccuVote Ender cards and Diagnostic ballots, and optionally Absentee Count cards and Precinct Header cards
- Ballot box and AccuVote-OS keys

2.2. Looking at the AccuVote-OS

Figure 2-1 provides a detailed, exterior view of the AccuVote-OS ballot-processing unit.
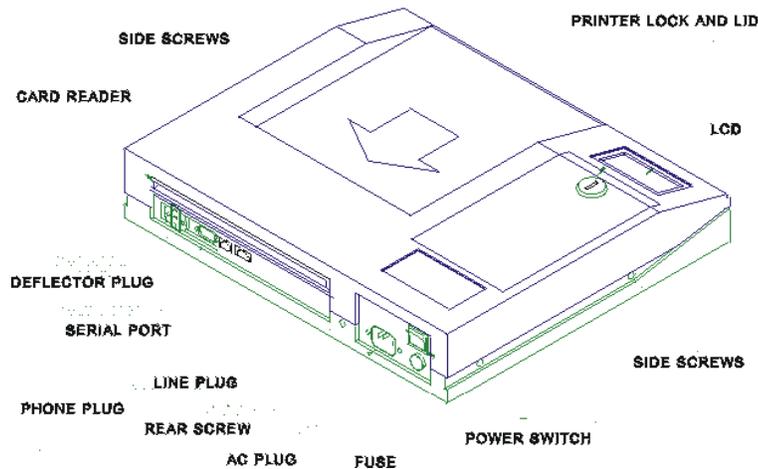
Figure 2-1. AccuVote-OS External Features

Printer Lid

The printer lid covers the printer compartment, which contains the printer, printer ribbon, battery and paper roll.

LCD

The LCD displays all of the system's messages and prompts.

Card Reader

The ballot reader processes varying sized ballots, both sides being simultaneously read by visible light sensors, in any one of four orientations. The voting positions read on each ballot are transmitted to the CPU by means of the card reader serial interface.

Deflector Plug

The ballot deflector plug allows the AccuVote-OS to electronically control the ballot deflector in the ballot box or, with a special adapter, to electronically control an AccuFeed.

Side Screws

The side screws and rear screws keep the top and bottom of the unit locked together. The side screws are located inside a horizontal groove in the casing into which the guide rails slide when the unit is installed in the ballot box.

AC Plug

The power cord plugs into the AC receptacle.

Main Serial Port

The main serial port is used for direct memory card programming and direct results transmission to the host computer.

Line

The Line jack is used for remote memory card programming and election results transmission by modem.

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Phone

The Phone jack is used to attach a standard telephone to assist in manual dialing when the onsite phone system doesn't allow automatic -this jack should be left covered, as it is not commonly used.

2.3. Inside the AccuVote-OS

The AccuVote-OS ballot-processing unit consists of the following components, as illustrated in Figure 2-2:

- Ballot reader
- CPU board
- Read Only Memory (ROM)
- Random Access Memory (RAM)
- Memory card interface
- Liquid Crystal Display (LCD)
- Printer and printer ribbon
- battery and power supply
- Paper roll
- Optional modem.

-
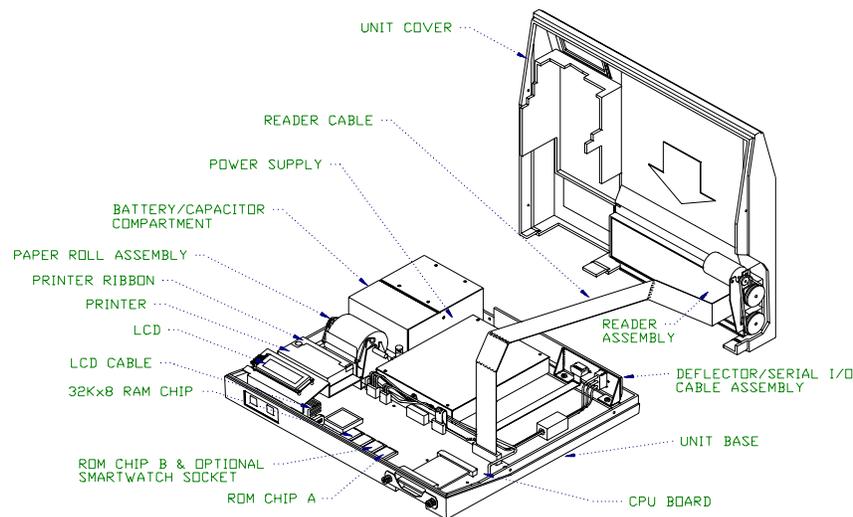
Figure 2-2. AccuVote-OS Internal Features

2.4. Ballot Reader

The ballot reader processes ballots 8½" wide and either 11", 14", 17", or 18" in length. Both ballot sides are read simultaneously by either visible light or infrared sensors, depending on the generation of technology, in any one of four orientations. The optical scanner in the ballot reader comprises several printed circuit boards on each side, which scan 34 columns on each ballot

side. All voting marks are aligned with these columns, which are indicated by diagnostic marks at the top and ballot card ID marks at the bottom of ballots.

Ballots are drawn through the ballot reader assembly by means of a rubber pinch-roller drive system.

2.5. CPU Board

The AccuVote-OS is run with an NEC V-25 single chip microcomputer, which is used primarily to control the peripheral devices, analyze ballot data, update memory card totals, and print reports. Information gathered by the ballot reader is transferred to the CPU's Direct Memory Access (DMA) channel by means of a high-speed serial input connection.

The CPU board includes the following:

- Ballot reader interface
- CPU
- RAM chips
- ROM chips
- memory card interface
- Serial ports
- Ballot box deflector controller
- AccuFeed ballot feeder controller

2.6. Read Only Memory (ROM)

Each AccuVote-OS is operated by the program stored on ROM chips. AccuVote-OS units use either one or two ROM chips depending on the function of the program or the size of the ROM chips. ROM chips provide memory independent of power supply - the information on ROM chips can not be altered. Note that all information concerning a jurisdiction, election, and ballots is stored on the memory card, and not on the ROM chips.

Firmware upgrades are reflected by ROM release numbers

AccuVote-OS units must be loaded with the same version ROMs for programming memory cards as for transmitting election results to the host computer, otherwise election results will be rejected on transmission to the host computer.

2.7. Random Access Memory (RAM)

Two Random Access Memory (RAM) chips provide CPU with dynamic memory for storing temporary results of program execution and other variables prior to final results being stored on the memory card.

The RAM chip installed in both RAM slots is usually 128KB. The firmware is designed to recognize either a 32KB, 64KB or 128KB chip in either slot.

2.8. Memory card Interface

The memory card interface acts as a receptacle for memory cards. A memory card has 40 terminals. These terminals fit into the interface's 40-pin socket.

2.9.   Liquid Crystal Display (LCD)

The AccuVote-OS features a 2 by 16 character LCD unit, which is used to display messages and prompts in each of a memory card's election modes as well as diagnostic and setup information. LCD prompts are synchronized with responses provided on the AccuVote-OS Yes and No buttons.

2.10. Printer

Each AccuVote-OS contains a light-weight EPSON dot matrix printer controlled directly by the CPU, which prints information 24 characters per line on 2¼" wide paper. Both the ink cartridge and paper roll are easily replaceable - refer to the section *Pre-Election Maintenance* in *Chapter 24: Maintenance* for more information. The reports generated by the AccuVote-OS are standard, although it is possible to customize reports using AccuBasic.

When the printer is not in use:

- Paper may be pulled out of the printer in a forward direction only

- The manual knob on the paper feed mechanism may be rotated to feed the printer paper either forward or backward.

Note: Never attempt to turn the manual knob on the paper feed mechanism when the printer is in operation.

2.11. Power Supply and Battery

Power is drawn from a power supply, which is in turn used as a source for all electronic components of the AccuVote-OS, as well as functioning as a battery backup. Visible light units are installed with switching power supplies and infrared units are installed with linear power supplies.

Before every election, each AccuVote-OS should be connected to AC power by means of a power cord and left on overnight. This will ensure that the AccuVote-OS battery is sufficiently charged and will operate in the event of a power failure. Testing the battery for sufficient charge is described in section *24.4 Battery*.
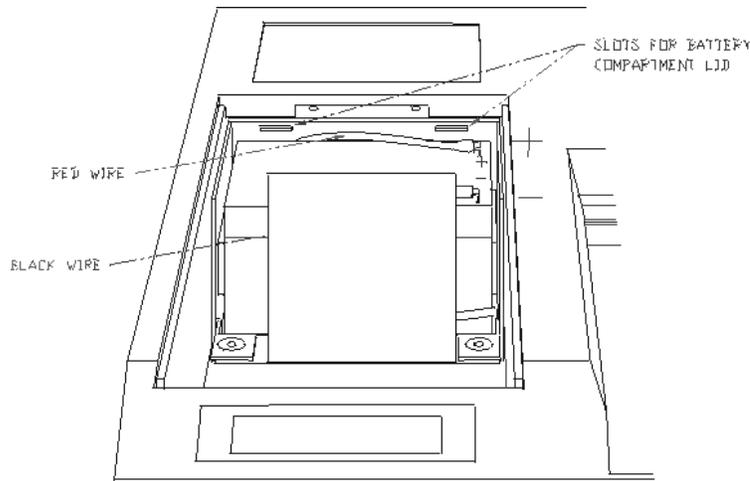
Figure 2-3. AccuVote-OS Battery

2.12. Modems

AccuVote-OS modem allows memory card programming and election results transmission to the host computer by modem. The AccuVote-OS modem is displayed in Figure 2-4.

The modem is connected to the CPU board with a serial connector. Power is supplied by means of a connection to the CPU board, which is in turn connected to the power supply. The Line and Phone jacks at the rear of the AccuVote-OS are connected to the modem by means of RJ-11 connector cables. Line is used to connect the modem to a phone line - the Phone jack may be optionally used to connect the modem to a telephone handset, although normally it is not used and should a dummy phone plug installed
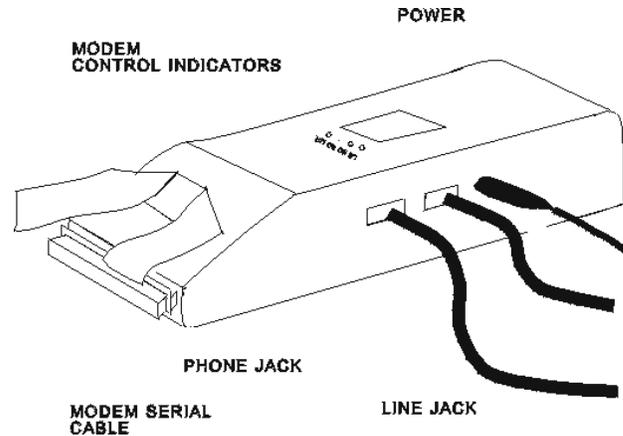
Figure 2-4. Modem

Each modem is pocket-sized, transmits data at a rate of 2400 baud, and weighs approximately four ounces. Modems are set to transmit a full 8-bit ASCII character set by default.

For more information on modems, refer to *Appendix D: Modem Transmission*.

3. How the Unit Works

This section provides a detailed look at the AccuVote-OS and its components.

3.1. Inside the AccuVote-OS
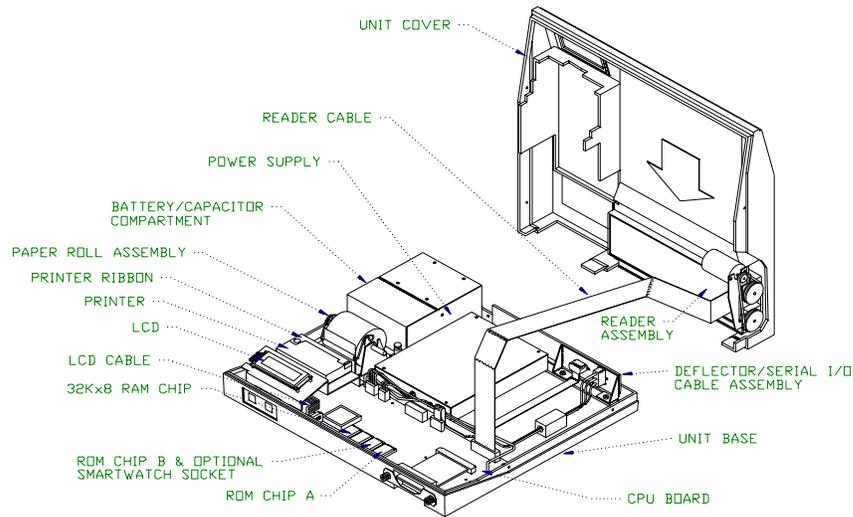
Figure 3-1: The AccuVote-OS

The AccuVote-OS ballot processing unit consists of the following components, as illustrated in Figure 4-1:

- ballot reader
- CPU board
- Read Only Memory (ROM)
- Random Access Memory (RAM)
- memory card interface
- Liquid Crystal Display (LCD)
- printer
- power supply
- optional modem

3.2. Ballot reader electronics

The ballot reader processes ballots 8½" wide and either 11", 14" 17" or 18" in length. Both ballot sides are read simultaneously by visible light sensors, in either one of two orientations. The electronic circuitry of the ballot reader comprises two sets of printed circuit boards, one set above the moving ballot and the other set below. The two sets of circuit board are identical except for connectors and motor drive circuitry on the lower circuit board.

The boards on each side of the reader scan thirty-four columns on each ballot side. All voting marks are aligned with these columns. The column positions are indicated by diagnostic marks

at the top of the ballots and ballot card ID marks at the bottom of ballots. Ballots are drawn through the ballot reader assembly by means of a rubber pinch-roller drive system.

The ballot reader is connected by a twenty-conductor ribbon cable to the CPU board's P20. Control, status, and data signals are sent along this cable. The ballot reader is powered by a three wire cable from the power supply. This provides a 5 volt DC logic supply and a 14 volt DC motor supply.

3.2.1. Scanning the timing marks

The columns on each ballot card are spaced ¼" on-center, and the two outside columns carry only timing marks, while the thirty-two inside columns carry all potential voting positions.

The scanning of each timing mark and voting mark position is done using visible light emitting diodes and silicon photodiodes in a special configuration which monitors the diffuse reflectance of the ballot surface. The red-orange emitters are Aluminum Indium Gallium Phosphide (AlInGaP) and have a peak wavelength of 621 nanometers.

The optical elements are placed behind a quartz rod lens that concentrates the illumination and detection along the scan direction of the ballot. The quartz rod lense also serves as a dust shield to minimize the collection of paper dust on the optical sensors.

3.2.2. White levels

Each voting channel establishes a reflectance reference level during the first ¼" of ballot travel under each side of the sensor. This calibration is accomplished by measuring the leading edge reflectance of the ballot. The reference level is stored for each voting channel. As the ballot is scanned, the reflectance is measured and compared to a threshold percentage of the reference level. Areas of the ballot with reflectance below the threshold are reported as a logic high in the data sequence.

3.2.3. Powering the visible light emitters

The visible emitter portions of the reflective sensors are powered by a multiplexed constant current source to provide a reliable and power efficient illumination source. The voting channel emitters are energized one at a time only when a ballot is being scanned.

3.2.4. Ballot reader to CPU transmission

The data derived from the scanning of the columns of voting marks are transmitted to the CPU board in serial fashion:

- six ID bits for the upper reader board
- the left hand timing bit from the upper reader board
- thirty-two voting bits (left to right) of the upper board
- the right-hand timing bit from the upper reader board
- six ID bits for the lower reader board
- the left hand timing bit from the lower reader board
- thirty-two voting bits (left to right) of the lower board
- the right-hand timing bit from the lower reader board

In the data sequence given above, it is important to note that the two sides of the ballot are read in opposite directions, in the normal visual sense of reading a ballot. Even though both reader boards scan from left to right, the left side of the upper reader board is *looking at* the visual left

side of a ballot which was inserted top-first.   At the same time, the left side of the lower reader board is looking at the visual right side of the reverse face of the same ballot.

3.3.   Ballot reader motor

The motor is connected to the lower reader board by a two-pin connector. The two-wire connection, the twenty-conductor ribbon cable connecting the reader to the CPU and the three-wire power supply cable are the only wiring devices associated with the reader. This allows for simple servicing.

The motor shaft has a pulley to provide motion to two larger pulleys. An O-ring provides enough friction to drive the two larger pulleys, which are attached to two separate drive shafts. Each drive shaft has a rubber roller to move the ballot within the reader assembly.

3.4.   Reader DMA interface

The ballot reader is connected to P20 on the CPU board via a twenty-conductor flat ribbon cable. This cable provides motor control, high-speed serial data transfer, control signals, and status signals between the reader and the CPU. As a ballot card is scanned by the reader, data is transferred into the CPU's memory via a Direct Memory Access (DMA) channel, eight bits at a time for a total of ten bytes of data per scan line. The CPU program analyzes the data in memory to locate the marks on the ballot.

3.5.   Power supply

The AccuVote-OS is powered with a switching 5 and 14 volt power supply which also provides filtering and transient suppression to improve system performance. The AccuVote-OS is supplied with a battery to backup the power supply in the event of an AC power failure.

The reader is powered from the 14 volt DC and 5 volt DC output of the power supply via a three-wire connector to the reader's P3.

The CPU board is powered from the 14 volt DC output of the power supply via a four-wire connector to the CPU board's P4, while a 5 volt linear regulator on the CPU board uses the 14 volt DC supply to generate the 5 volt supply needed for the operation of the CPU logic circuits.

The power supply also provides two additional input signals, one for AC power fail detection and the other for low battery detection. Both of these are fed into the CPU where programmed action is taken if either condition arises.

3.5.1. Battery
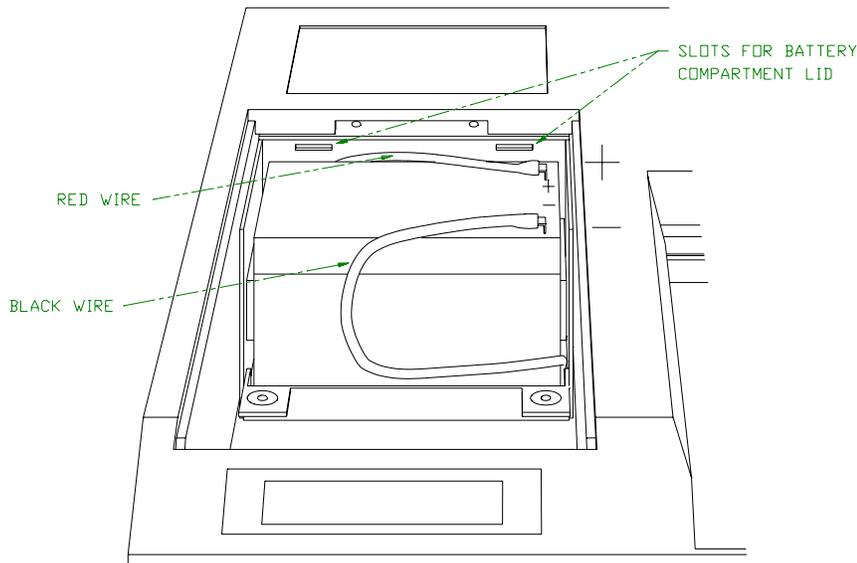
Figure 3-2: Battery

A battery sustains power to allow normal operation without AC power. Battery placement is illustrated in Figure 4-2. A battery will operate for up to two hours.

An AccuVote-OS installed with a battery will reject a ballot being read at the time of the power interruption, but will allow refeeding of the ballot and continued operation under battery power.

3.6. V25 CPU

The AccuVote-OS is run with an NEC V-25 single chip microcomputer. Information gathered by the ballot reader is transferred by means of a high speed serial input connection to an image buffer in the CPU board's RAM. The CPU program analyzes the data in the memory buffer to locate the marks on the ballot.

3.6.1. Devices on the CPU

The CPU board includes:

- the ballot reader interface
- the CPU
- ROM chips
- RAM chips
- the memory card interface
- LCD interface
- internal printer interface
- RS-232 serial interfaces
- ballot deflector/feeder controller
- SmartWatch ROM chip (Clock Chip)

- power monitoring interface

- external button interface

The parallel I/O lines are used to control or monitor the ballot reader interface, power monitoring interface, ballot deflector/feeder controller, internal printer control, and external button interface.

Only one of the two DMA channels is used to transfer the reader data to the CPU board's RAM.

Both serial I/O channels are used, one for direct serial communication and one for the internal modem communications.

Note that the ballot reader interface is discussed in *Reader DMA interface* above.

3.7. ROM memory

Each AccuVote-OS is operated by the program (firmware) stored on EPROM chips. ROM chips are non-volatile memory devices. Note that all information concerning your jurisdiction, election and ballots is stored on the memory card and not on the ROM chips.

Firmware is upgraded by replacing ROM. For a detailed look at the format of the ROM labeling system, see *Appendix E: ROM Labels*. The following is a brief description of the label fields.

- the *release type* as one of General Release (**Rel**), Beta (**Beta**), Alpha (**Alpha**), or Test (**Test**) where General is a general release, Beta is a controlled release, Alpha is a pre-release, and Test has test code enabled and is undergoing pre-release testing,

- the *application* as one of Precinct Counter (**PC**), ~~Central Counter (CC),~~ or Diagnostics Test (**DT**),

- the *base language* which currently is one of American English (**AE**) or Canadian French (**CF**),

- the *EPROM checksum* in a four digit hexadecimal (e.g. B35D) used to verify the correctness of the code on the ROM,

- the *ROM socket* location (**A** or **B**) that the chip resides in, and

- the *date* the release was made in the international format YY-MM-DD.

3.8. RAM memory

The volatile memory used while the program is running is provided by two static RAM chips. RAM capacity can be achieved using two 32KB, 64KB, or 128KB chips or combination of chip sizes depending on the configuration of your AccuVote-OS unit. The RAM stores temporary results of program execution and other variables prior to storage in the non-volatile external memory card.

3.9. 32KB/64KB/128KB memory card interface

Memory cards are used to store precinct, ballot and election results information for each vote center. Memory cards are only required for precinct count (PC) ~~firmware and not for AccuVote units with central count (CC) firmware~~.

The memory card interface accepts 32KByte and optionally 64KByte and 128KByte credit-card sized EPSON memory cards. A memory card has forty terminals which fit into the interface's forty-pin socket. Since the memory card is connected to a live system, protection resistors have been added in series with the socket in order to prevent possible damage from a short circuit on one of the pins, causing an operational failure on the CPU.

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The average life of the battery in the 32KB RAM card is about 10 years. The average battery life for the 64KB RAM card is approximately 8.5 years. The average battery life for the 128KB RAM card is about 5.7 years.

3.10. LCD module interface

The AccuVote-OS features a two by sixteen character LCD (Liquid Crystal Display) unit with an intelligent on-board controller. It is used to display messages and prompts in which each of a memory's card's election modes as well as diagnostic and setup information. LCD prompts are synchronized with responses provided on the AccuVote-OS YES and NO and buttons, which are mounted directly on the CPU board and protrude out the front of the enclosure below the LCD.

The LCD is connected by a fourteen-conductor ribbon cable to the CPU board's P14.

3.11. Printer interface

Each AccuVote-OS contains a light-weight, seven wire dot matrix M-180 Series EPSON printer controlled directly by the CPU, which prints twenty-four columns on 2¼" wide paper. Both the ink cartridge and paper roll are easily replaceable using procedures described in the section titled *Pre-Election maintenance*.

The printer is mounted above the CPU board on a small metal bracket and is connected P15 on the board via a fifteen-conductor flat ribbon cable. All timing and dot matrix information is controlled by the CPU's program. The printer motor is powered by a 5-volt DC regulator which is switched on and off by the CPU via a TIP32 transistor. Parallel drivers provide dynamic braking of the motor whenever the motor power is turned off.

Data to be printed is output via CPU I/O port 0 in the active low state. A strobed hex inverter is used to pulse the data to the 5-volt printer solenoids which require 3 amps of current when energized. The solenoids are powered from the 14 volt DC supply, which is set up to emulate the energy usage required by the solenoids.

3.12. RS232 serial interface

A full duplex serial channel, configured as Data Terminal Equipment (DTE), is provided for communication with a host computer. The interface requires a flat ribbon cable from the CPU board's P10 to a DB9-M (male) connector, which constitutes the main serial port at the rear of the enclosure. An RS232C cable with a nine-pin female connector is used to connect the main serial port to the host computer.

3.13. Ballot deflector

A device for deflecting write-in or blank ballots into the alternate compartment in the ballot box is driven directly from connector P3 on the CPU board.

The deflector motor is driven with 14 volts DC power. Two FET transistors control the motor. One transistor controls the relay that switches the direction that the deflector moves while the other transistor toggles the motor power on and off.

3.14. Modems

The AccuVote-OS modem allows you to program memory cards and transmit election results to the host computer.

The modem is connected to the CPU board with a serial interface. Power is supplied by means of a connection to the CPU board, which is in turn connected to the power supply. The **Line** and **Phone** jacks at the rear of the AccuVote-OS are connected to the modem by means of RJ-11

cables. **Line** is used to connect the modem to a phone line — the **Phone** jack may be optionally used to connect the modem to a telephone handset, although normally it should be loaded with a dummy phone plug.

Each modem is pocket-sized, transmits data at a rate of 2400 baud and weighs approximately 4 oz. Modems are set by default to transmit an eight-bit character, with no parity, and one stop bit.

4. How the Software Works

This chapter discusses the operation of the AccuVote-OS firmware, or software dedicated to AccuVote-OS operation. The following sections are included in this chapter:

- Power-On Modes
- Pre-Election Mode
- Election Mode
- Post-Election Mode
- Communications Protocol

The majority of the software within the AccuVote-OS ballot processing unit has been written in Turbo C — where necessary, 8086 assembly code has been used and interfaced to Turbo C as external procedures. The software has been designed using a single-tasking processing control structure with multiple interrupt driven real time background tasks. Each of the election modes above are implemented as dead-end loops that never return once entered.

To exit from the dead-end loops, it is necessary to turn off the power to the ballot processing unit, then turn it on again. This method of operation has been implemented, since the AccuVote-OS is used in different modes in different locations, requiring powering off and on before and after transport.

The AccuVote-OS adopts the election mode determined by the first memory card installed after the unit is powered on. In order to install a memory card with a different mode, the AccuVote-OS must be powered off and on again.

4.1. Power-on modes

Diagnostics Mode is accessed by powering the AccuVote-OS on while pressing the YES and NO buttons. Diagnostics Mode is used to set the AccuVote-OS clock and test all internal components of the AccuVote-OS, and should only be used by trained service personnel.

Setup Mode is entered if only the Setup button is depressed when powering the AccuVote-OS on. Setup Mode is used to:

- electronically attach the AccuFeed
- change the phone number on one or more memory cards
- redirect output devices

If neither the YES and NO buttons are depressed when powering on, the unit goes through limited power-on tests, and then checks the status of the memory card installed. If the unit has not been loaded with a memory card, the LCD will prompt you to install one. The AccuVote-OS unit reads the card to determine its status once a memory card is installed. Depending on the memory card status, the unit will enter either one of Pre-Election, Election, or Post-Election modes.

For more information on Setup Mode, refer to *Setup Mode* in the *AccuVote-OS Operator's Guide**Precinct Count User's Guide*.

4.2. Pre-Election Mode

The AccuVote-OS enters Pre-Election Mode either when a memory card is uninitialized, before having been programmed, or after being programmed, but before being set to Election Mode.

The program follows an endless loop involving the following 4 modules:

- Preload: Memory cards are tested, initialized and programmed.

- Pre-Test: All voting positions on the ballot cards are tested with this module.

- Pre-upload: Ballot count test results are transmitted to the host computer.

- A memory card is set to Election Mode and a Zero Totals report is printed for certification purposes.

Once all the memory cards have been set to Election Mode, the power to the unit is powered off. Supervisor Functions are also available in Pre-Election Mode, and include the following functions:

- changing setup parameters

- duplicating the memory card

- clearing the memory card

4.3.   Election Mode

A memory card may be set to Election Mode once it has been programmed in Pre-Election Mode. Normally, the AccuVote-OS is set to Election Mode once the Public Accuracy Test has been completed and the memory card sealed into the AccuVote-OS. The AccuVote-OS is powered on at the polling place on election day, at which point the Election Zero report is printed, confirming that all vote center counters are zero before the unit is set to ballot counting mode.

After powering the unit on, the program checks to see if the memory card is in the middle of an election. If it is, the program enters the Count Ballots module and continues counting ballots, otherwise the program executes the Show Ballots module, which is used to print a Zero Totals Report to confirm that all counters have been set to zero.

4.3.1. Count Ballots module

The Count Ballots module runs while election day ballot counting takes place. The deflector is positioned for each ballot as needed. Each ballot is either accepted or rejected according to the options specified in the AccuVote-OS Options dialog in GEMS. A message identifying the rejection condition is displayed on the LCD if the ballot is returned.

4.3.2. Separating ballots into the alternate ballot box compartment

Write-in ballots are dropped into the alternate ballot box compartment if the Write-In Votes option in the AccuVote-OS Settings tab has been checked. Similarly, blank ballots are also dropped into the alternate ballot box compartment if the All Races Blank Voted option is checked.

4.3.3. Closing the polls on the AccuVote-OS

The AccuVote is electronically locked at the end of election day by feeding and AccuVote Ender Card into the ballot reader while pressing the YES and NO buttons.

If absentee ballots are to be counted at the precinct, an Absentee Count card is fed into the AccuVote while pressing the YES and NO buttons and after the polls close, followed by the absentee ballots for the vote center. Once absentee ballots have been read, the AccuVote Ender Card is fed into the reader while pressing the YES and NO buttons.

Once the AccuVote-OS has been electronically locked, the program exits the Count Ballots module and prints the Election Results report using the Print Totals module. You may move the ballot deflector if the AccuVote-OS is installed on a ballot box without a rear door for removing ballots.

The unit is now set to Post-Election Mode, and may be powered off before transmitting election results to the host computer.

4.4. Post-Election Mode

Once the AccuVote-OS has been electronically locked at the end of election day in Election Mode, the memory card is set to Post-Election Mode. Post-Election Mode is used to:

- transmit election results to the host computer
- print the additional copies of the Election Totals report
- audit the memory card
- perform Supervisor Functions
- Supervisor Functions in Post-Election Mode allow you to:

    change setup parameters

    duplicate the memory card

    resume counting ballots

    reset the memory card to Pre-Election Mode

    clear the memory card

4.4.1. Auditing the memory card

The program verifies whether or not election results have already been transmitted to the host computer. If results have already been transmitted, the program enters the Do Audit module which is used to print the memory card audit report. Once the memory card's audit history is printed, the memory card is tagged as audited.

4.4.2. Transmitting election results to the host computer

The AccuVote-OS enters the Send Data module in Post-Election Mode before election results transmission. The AccuVote-OS is carried from its polling place location to the RJ-11 phone jack from which modem transmission is performed. Results are transmitted to the host computer and the memory card is marked as being uploaded.

If election results are being transmitted at election central, an AccuVote-OS is connected to the host computer using a direct serial connection. Each of the memory cards is loaded into the unit and results transmitted. Once results for all memory cards have been transmitted, the unit may be powered off.

4.4.3. Supervisor Functions

Duplicating a memory card in Supervisor Functions creates a memory card copy identical to the original, including all election results. Setting a memory card to Resume Counting Mode effectively places it in Ballot Counting Mode in Election Mode.

Resetting the memory card to Pre-Election Mode clears all election results but does not clear vote center and ballot information programmed onto the memory card in Pre-Election Mode. Clearing the memory card, on the other hand, causes all information to be removed from the memory card.

4.5. Communications protocol

The communications protocol is used for programming memory cards and transmitting election results to the host computer. The protocol is carried over the serial channel at 9,600 baud for

direct communications and 2400 baud for internal modem communications. The AccuVote-OS unit displays Communications Error messages and allows a transmission retry if an incorrect response is detected in transmission. For a list of transmission error messages, see the *AccuVote-OS ~~Operator's Guide~~Precinct Count User's Guide*.

5. Memory cards

Each AccuVote-OS uses a *memory card*, a card-style storage device that records ballot layout information and election counters for a particular vote center. An example of a memory card is displayed in Figure 6-1.

The memory card stores data independent of the AccuVote-OS power supply and may be removed from an AccuVote-OS without losing data. The memory cards are self-powered with an internal battery that has a lifetime of approximately 5 years.

A low memory card battery is indicated by the appearance of the ‡ symbol in the bottom left hand corner of the AccuVote-OS LCD. Once this symbol appears, the memory card battery should be replaced to assure continued and safe use of the memory card. Once the memory card battery is removed, all programming stored on the memory card will be lost. If the memory card data needs to be kept, copy the card before replacing its battery.

Figure 5-1. memory card

memory card dimensions are 2 inches by 3 inches by 3/32 inch. memory card capacities are:

- 32KB
- 64KB
- 128KB.

Although 32KB memory cards are sufficient in most applications; absentee precincts defined with a large amount of ballot styles may require 64KB or 128KB memory cards.

5.1. Care

memory cards should be stored in a secure location. Cards should be inventoried with precinct numbers and the jurisdiction name. The shuttered area of the memory card or contact area should not be covered with tape or damaged in any manner, as they are the electrical connection to the memory card interface.

Gently remove any residue that may be present on the memory card. any alcohol-based tape adhesive removal chemical should be effective. Petroleum based products will destroy the plastic and the label on the memory card.

5.2. Sealing memory cards and AccuVote-OS units

The memory card should be sealed into the AccuVote-OS once the Public Accuracy Test has been performed, and the serial number on the seal recorded. This seal number should be verified before the AccuVote-OS is installed in the ballot box on Election Day. The memory card remains sealed in the AccuVote-OS until the election has closed, and after election results have been transmitted to the host computer if modem transmission is being used.

Commonly, AccuVote-OS units also are sealed into their carrying cases after the Public Accuracy Test has been completed, and remain sealed until election morning. The seal must be broken to install the AccuVote-OS in the ballot box and the seal number recorded.

5.3. Write-Protection

It is possible to *write-protect* a memory card, which prevents:

- it from being programmed

- election results from being transmitted to the host computer

- election results reports from being printed

Each memory card is covered with a label commonly marked *AccuVote-OS Precinct Identification memory card*, covering most of the memory card except for the shutter protecting the contacts. This label may be carefully peeled back to reveal a small switch at the end of the memory card opposite from the contacts. Pushing this switch to its other position will effectively write-protect the memory card and prevent it from being used. Figure 6-2 indicates the position of the write-only switch on the memory card.
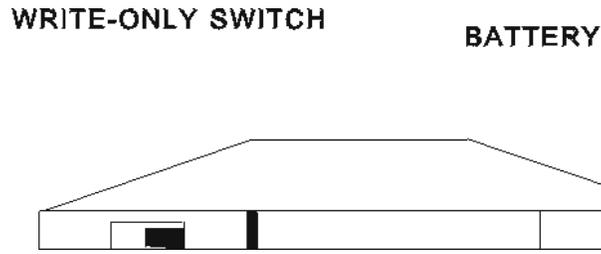
Figure 5-2. Write-Protect Switch on memory card

Set the switch to its original position to return to a usable mode. If the card is taken out of write-protected mode, all information will again be accessible and the election mode will be the same as before having been write-protected.

Loading an AccuVote-OS with a write-protected memory card will result in:

REMOVE WRITE
PROTECTED CARD
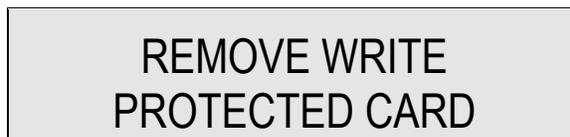
being displayed on the AccuVote-OS LCD. Remove the memory card and take it out of write-protected mode or use another memory card.

6.   Ballot Box

The AccuVote-OS is installed in the lid of a ballot box and secured by key-operated bolts. The ballot box has two compartments used by the AccuVote-OS as well as a side compartment. Blank and write-in ballots may be separated into the alternate ballot box compartment according to parameters specified in the AccuVote-OS Options window in GEMS.

The AccuVote-OS ballot box is 37½ inches high, with a square base of 24 inches. It weighs approximately 43 pounds and can accommodate up to 1500 ballots in each of the two bins. An inset handle that traverses the full width of the box allows for easy gripping of the ballot box from any angle.

No handling of processed ballots is required. However, any ballot that the ballot-processing unit cannot properly read is returned to the voter for reprocessing. It is also possible to have ballots returned if the voter has undervoted, overvoted, or blank voted, depending on the options specified in the AccuVote-OS Options window in GEMS.

Setting up the AccuVote-OS for ballot processing in Chapter 8 provides a detailed procedure for installing the AccuVote-OS in a ballot box.

6.1.   Locating the Ballot Box

Although the ballot box does not require its own power, the ballot box should be situated near a power supply at the polling place to provide power to the AccuVote-OS. An electrical extension cord may also be required. Ensure that all electrical outlets designated to power AccuVote-OS units have been tested before Election Day.

The AccuVote-OS should be positioned so that the LCD is not obscured by glare from overhead lights. The ballot box should not obstruct access to other areas of the polling place such as voting booths or registration desks. The polling place may be set up in a U shape to facilitate traffic flow.

6.2.   Stabilizing the Ballot Box

The ballot box features three fixed legs and one adjustable leg, allowing it to be stabilized in the event of uneven flooring at a polling place. The adjustable leg is the rear, right-hand leg of the ballot box.

1.   To adjust the leg, tilt the ballot box until the adjustable leg can be accessed.

2.   Twist the leg clockwise to shorten it or counter-clockwise to lengthen it.

3.   After adjusting the leg, stand the ballot box upright again.

4.   If the ballot box is still unstable, repeat steps 1 through 3 above and continue to adjust the leg until the ballot box is stable and as level as possible.

6.3.   Ballot Box Lid

The *retaining door* at the front of the AccuVote-OS ballot box lid opens to allow installation of the AccuVote-OS ballot-processing unit. The ballot box lid has a large recessed area with metal guide rails along each side of this opening. The ballot-processing unit slides along these guide rails and fits flush against the back of the recessed area. The retaining door can then be locked to secure the unit into place.

The AccuVote-OS *power cord tube* is located at the back left hand side of the ballot box lid and is used to house the AccuVote-OS power cord once the AccuVote-OS has been installed in the ballot box.

At the rear of the ballot box lid is a small electrical connector. When the AccuVote-OS is secured in place, the *deflector connector* plugs into the back of the unit. The connector connects the AccuVote-OS's power supply with the ballot deflector in the ballot box.

The ballot box lid houses the:

- Ballot entry slot
- Deflector connector
- Ballot chute
- Power cord tube.

See Figure 7-1.
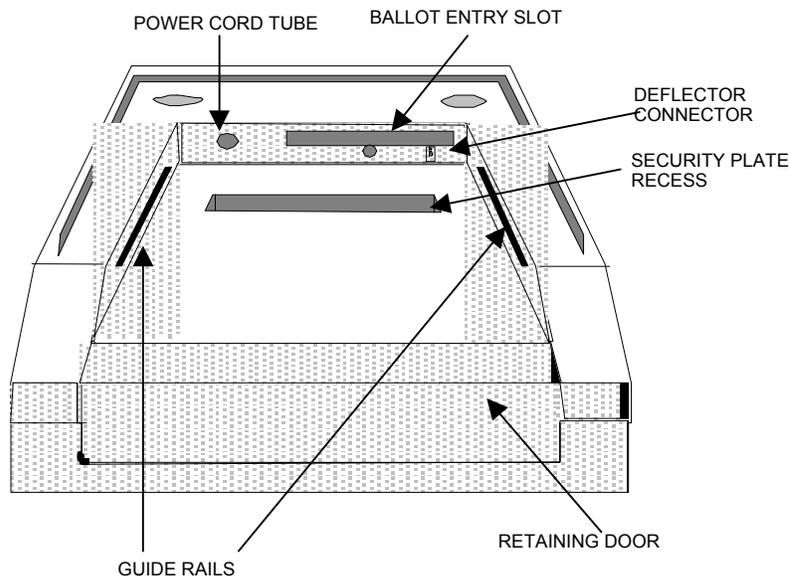
Figure 6-1: Ballot Box Lid

6.4.   Security Plate

The *security plate* should be locked into the *ballot entry slot* at the back of the ballot box lid whenever the ballot box is not in use. This will prevent unauthorized insertion of unprocessed ballots from taking place.

The security plate must be removed from the ballot entry slot before the AccuVote-OS is installed into the ballot box. The security plate may be locked into place or unlocked using one of the ballot box keys. The security plate is placed in the *security plate recess* on the ballot box lid.

If the security plate has not been removed before installing the AccuVote-OS in the ballot box on Election Day, or the metal bar on the lock has not been rotated to a horizontal position, it will not be possible for ballots to pass through the card reader into the ballot box.

Another indicator of the security plate remaining locked in the ballot entry slot is the difficulty that should be experienced in locking the retaining door with the AccuVote-OS installed. This information should be included in the *Pollworkers' Training Guide*.

When a ballot box has reached its capacity of ballots, and is replaced by an empty ballot box, the security plate must be locked into the ballot box entry slot of the full ballot box. This will prevent unprocessed ballots from being inserted into the full ballot box's main compartment.

6.5.   Ballot Box Compartments

The four doors that access the ballot box compartments are locked using either of the ballot box keys. All ballot box compartments should be verified as being empty before the polls open on Election Day. *Ballot box keys should be secured from the point of verification that the ballot box is empty before the polls open to the removal of ballots after the polls close*.

A small opening on the upper left side of the ballot box provides access to an auxiliary compartment. This compartment is designed to hold ballots that could not be counted by the AccuVote-OS during the election process. The door to this compartment should be kept locked at all times and only unlocked when non-processed ballots are being *inserted*.

The door on the lower left side of the ballot box also provides access to the auxiliary compartment, but this door should only be opened to *remove* ballots from the auxiliary compartment at the end of Election Day or to be counted on the AccuVote-OS.

The back door of the ballot boxes only exists in newer model ballot boxes and is designed to allow the removal of ballots at the end of Election Day or in case of an AccuVote-OS failure (where ballots are transferred to the side compartment). The back door should be kept locked at all times on Election Day.

6.6.   Inside the Ballot Box

Attached to the top of the wall dividing the side compartment from the main compartments of the ballot box is a *lift arm,* which may be turned upward to support the ballot box lid in a 45E open position. Inside the ballot box are two main compartments. The *ballot box deflector* is located above the divider that separates the two main compartments. The *ballot deflector motor* housing and the *deflector cable* are located at the back of the ballot box—the cable connects the deflector motor with the deflector connector on the ballot box lid.

The ballot box deflector is electronically activated by the AccuVote-OS and should not be manually rotated. The deflector is automatically rotated to allow ballots to drop in the correct compartments. Refer to Figure 7-2 for a detailed view of the inside of the ballot box.

DIEBOLD
ELECTION SYSTEMS
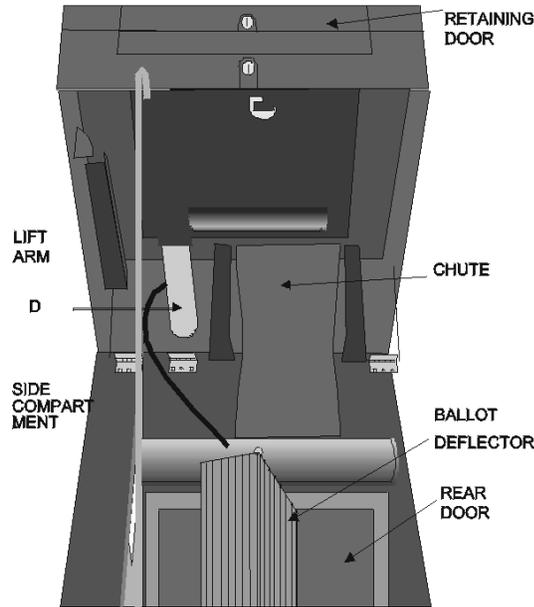
Figure 6-2: Inside the Ballot Box

Installation and removal of the following ballot box components is detailed in *Chapter 3: Maintenance and Repair* in the *AccuVote-OS Hardware Guide*:

- deflector
- deflector connector motor
- deflector connector cable

6.7.   Separating Ballots in the Ballot Box

Ballots drop into only one of the main compartments of the ballot box only if no separation of blank or write-in ballots is specified in the AccuVote-OS Options window in GEMS, or into either one of the ballot box's two principal compartments if separation is specified. Once a ballot is determined to be blank or contain write-ins, the ballot deflector automatically rotates to cause the ballot to drop into the ballot box's alternate main compartment.

In ballot counting mode, the AccuVote-OS will display a " � " symbol when separating write-in or blank ballots from all other ballots, otherwise a "⊔" symbol will be displayed on the LCD. The ballot counter is incremented with each ballot that is read by the AccuVote-OS, irrespective of which compartment it is dropped into, excepting ballots that are rejected. See Figure 6-3.
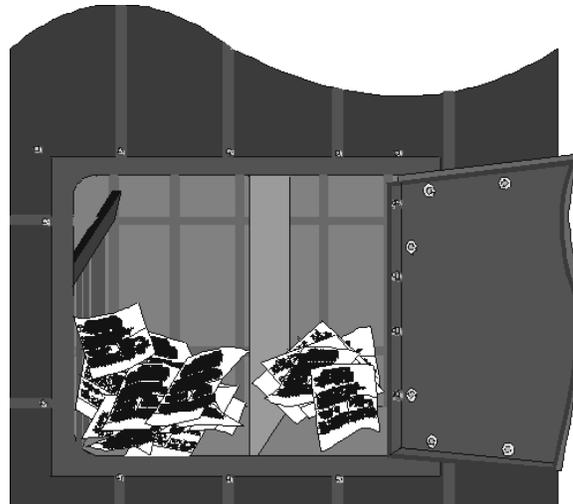
Figure 6-3: Separating Ballots in the Ballot Box

6.8. Removing Ballots from the Ballot Box

Ballots are removed from the ballot box either by opening the ballot box lid or by using the back door of the ballot box. Earlier ballot box models do not have a back door and require removal through the ballot box lid. *Caution should be exercised to not manually rotate the ballot deflector while removing ballots*.

Refer to *Removing ballots from the ballot box* in *the AccuVote-OS ~~Operator's Guide~~Precinct Count User's Guide* for a procedure detailing ballot removal from ballot boxes without rear doors.

6.9. Replacing a Full Ballot Box

Each ballot box holds up to 1500 ballots in each of the main compartments. Spare ballot boxes should be provided to polling places anticipating heavy voting. We recommend checking the contents of the ballot box when the ballot counter reaches 1000, and using the following procedure to replace the ballot box once it is full.

Shaking a full ballot box may allow ballots to settle, creating more space inside the box. If an AccuVote-OS seems to be jamming on a continuous basis, verify that ballots have not become stacked up to the chute or ballots are not jammed in the chute (look up through the back door into the chute area).

5. Unlock and open the rear door of the empty ballot box. Polling officials of different political parties should verify that the box is empty.

6. Close and lock the lid of the empty ballot box.

7. Unlock and remove the security plate of the empty ballot box. Place it in the security plate recess of the ballot box lid and verify that the metal tongue used to lock the security plate into place is in horizontal position. See Figure 7-4.
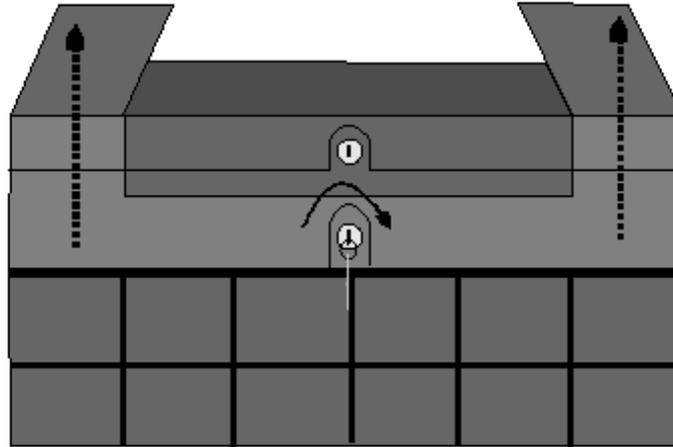
Figure 6-4: Unlocking and Opening the Ballot Box Lid

8. Unlock and open the retaining door on the lid of the full ballot box.

9. Slide the AccuVote-OS partially off the ballot box lid and power the AccuVote-OS off. Unplug the power cord from the AccuVote-OS and thread it out of the power cord tube.

10. Remove the ballot entry slot cover from the security plate recess of the full ballot box and insert it in the ballot entry slot, locking it into place.

11. Thread the power cord through the back of the power cord tube of the empty ballot box.

12. Remove the AccuVote-OS from the full ballot box and slide it halfway onto the ballot box lid of the empty ballot box. Plug the power cord into the back of the AccuVote-OS and power the unit on.

13. Slide the AccuVote-OS to the back of the ballot box lid and close and lock the retaining door.

DIEBOLD
ELECTION SYSTEMS

7.   Setting Up the AccuVote-OS

This chapter describes the following AccuVote-OS installation and removal procedures:

- Setting up the AccuVote-OS without the ballot box for memory card programming

- Installing the AccuVote-OS in the ballot box for ballot counting

- Installing the AccuVote-OS in the ballot box for ballot counting on Election Day

- Closing the polls with the AccuVote-OS on Election Day.

7.1.   Setting up the AccuVote-OS to Program memory cards

This procedure describes setting up the AccuVote-OS for direct memory card programming. The AccuVote-OS should not be installed in a ballot box.

14. Unzip the carrying case, remove the AccuVote-OS and place it on a clean work surface.

15. Unlock and remove the printer cover. Make sure the following items are installed:

- Printer ribbon

- Printer paper roll

- Battery.

    For more information on installing any one of the above refer to *Chapter 20: Maintenance.*

16. Connect the AccuVote-OS to AC power.

17. Connect one of the computer's serial ports or port expansion devices to the COMM. PORT jack at the back of the unit using a null modem cable. Refer to Figure 8-1.

SERIAL CABLE CONNECTOR

DEFLECTOR CONNECTOR
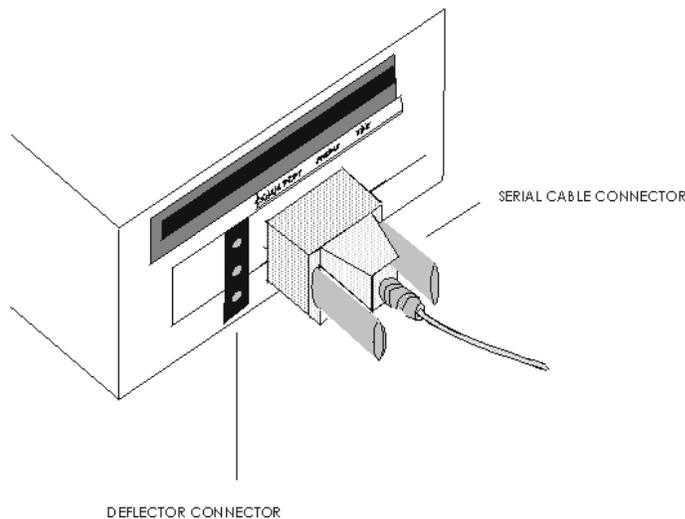
Figure 7-1. Rear View of AccuVote-OS Unit

18. Power the AccuVote-OS on.

7.2. Setting up the AccuVote-OS for Ballot Processing

Ballot counting should be tested with the AccuVote-OS installed in the ballot box in Pre-Election Mode. Installing the AccuVote-OS in a ballot box proceeds as follows:

1. Unzip the carrying case and remove the AccuVote-OS ballot-processing unit. Place it on a clean work surface.

2. Unlock and remove the printer cover. Make sure the following items are installed:

    - printer ribbon

    - printer paper roll

    - battery

      For more information on installing any one of the above, refer to *Chapter 24: Maintenance* in this guide.

3. Replace and lock the printer cover. See Figure 8-2.
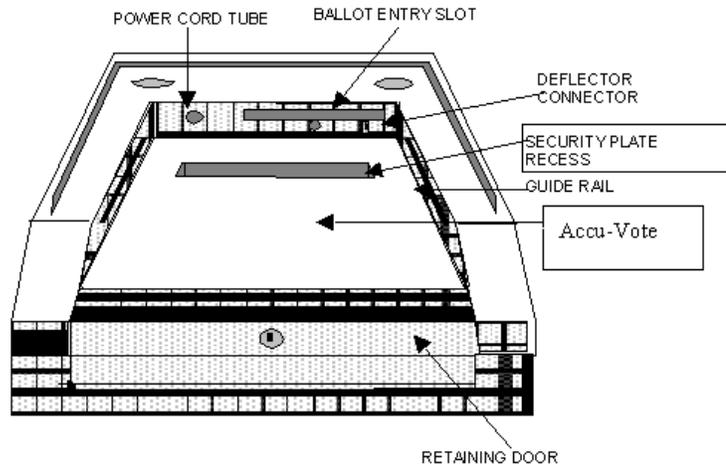
Figure 7-2: AccuVote-OS Ballot Processing Unit

4. Unlock and open the ballot box lid and verify that the ballot box compartments are empty.

5. Unlock and open the retaining door at the front of the ballot box lid.

6. Remove the security plate from the ballot entry slot and place it in the security plate recess on the ballot box lid. Make sure that the metal tongue that locks the ballot box security plate in place is in *horizontal position* to not obstruct the flow of ballots.

7. Slide the AccuVote-OS unit onto the guide rails in the recessed opening in the ballot box lid. Do not slide the unit all the way to the back. Note the positioning of the AccuVote-OS prior to being slid onto the ballot box lid in Figure 8.2.

8. Thread the female end of the power cord through the back of the ballot box power cord tube and plug it into the AccuVote-OS. Plug the male end of the power cord into an AC power outlet.

9. Power the unit on.

10. Slide the AccuVote-OS unit to the back of the ballot box.

11. Install the memory card if in Pre-Election Mode. If in Election Mode, the memory card should have been sealed into the AccuVote-OS.

12. Close the retaining door at the front of the ballot box lid over the lip of the AccuVote-OS unit and lock it into place. If the retaining door is difficult to close and lock, the security plate may not have removed from the ballot entry slot.

13. Place the memory card in Count Test following the prompts in *Chapter 10: Testing Ballot Cards* in the *AccuVote-OS Operator's GuidePrecinct Count User's Guide*.

Each AccuVote-OS should have been charged overnight prior to Election Day, ensuring that the batteries are sufficiently charged and will operate in the event of a power failure. AccuVote-OS units are charged by leaving powered on while connected to AC power. *Ensure that all power and extension cords are properly connected, and that AC power is constant and uninterrupted, as disruption in power will cause batteries to be drained rather than be charged.*

7.3. Setting up the AccuVote-OS on Election Day

AccuVote-OS units are delivered by the precinct workers to the polling places, either the day before or the morning of Election Day. Ballot boxes are commonly delivered to the polling place several days before Election Day. Note that printer ribbons and paper rolls should be properly installed and batteries sufficiently charged prior to Election Day.

The number of the seal on each AccuVote-OS carrying case is recorded when the carrying case with the AccuVote-OS is opened. memory card seal numbers are verified against the memory card seal list.

AccuVote-OS units should be installed in the ballot boxes near electrical outlets. They should be positioned so that the LCD is not obscured by glare from overhead lights. Ballot boxes should not obstruct access to other areas of the polling place such as the voting booths or registration desk.

Arrange to have ballot boxes emptied and replaced with empty ballot boxes in a secure fashion during Election Day if heavy voting is anticipated at any polling place. *Replacing a full ballot box* in *Chapter 7: Ballot Box* details the steps required to replace a full ballot box on Election Day.

The *Poll Workers' Training Guide* should contain step-by-step instructions for:

- installing the AccuVote-OS in the ballot box
- closing the polls on Election Day
- removing the AccuVote-OS from the ballot box after the polls close

Refer to *Appendix C: AccuVote-OS Election Day Preparation Checklist* in the *AccuVote-OS Operator's GuidePrecinct Count User's Guide* for a list of suggested AccuVote-OS preparation activities prior to Election Day.

7.4. Opening the Election on the AccuVote-OS

Unlock the ballot box lid and verify that the ballot box is empty.

Perform steps 1 through 11 in section *8.2 Setting up the AccuVote-OS for ballot processing*. Do not replace the printer cover in step 3.

The Election Zero report will print automatically when the AccuVote-OS is powered on. Poll workers should verify that all candidate totals are zero and sign the bottom of the tape. See Figure 8-3.
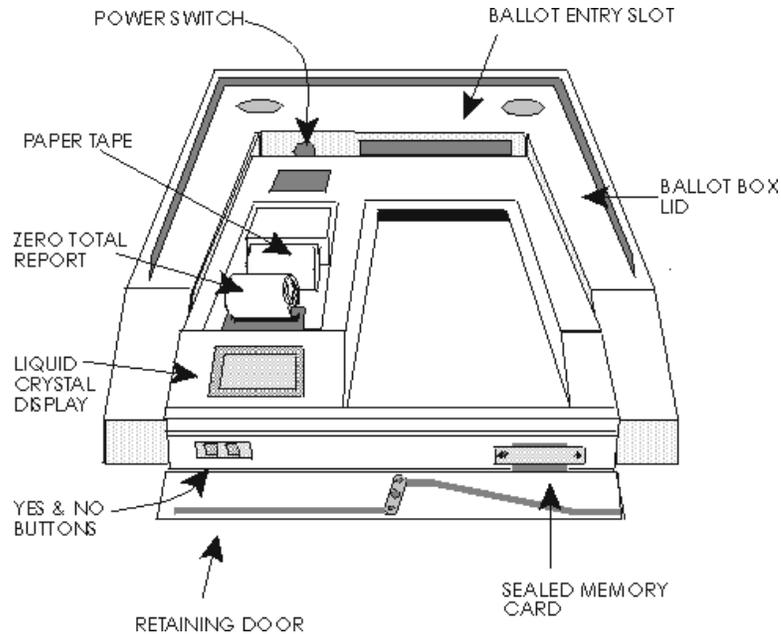
Figure 7-3: Internal View of AccuVote-OS

Do not tear the tape off. Roll it up and leave it in the printer compartment. The Election Zero report should be detached together with the Election Results report once the AccuVote-OS has been electronically locked at the end of Election Day. Replace and lock the printer cover.

7.5. Closing the Polls on Election Day

Closing the election at the polling place may vary from jurisdiction to jurisdiction. This section lists the most common closing procedures used with polling AccuVote-OS units.

1. Unlock the AccuVote-OS printer cover.

2. Unlock and open the ballot box retaining door.

3. If absentee ballots are being processed at the precincts, feed the Absentee Count card into the AccuVote-OS while pressing the YES and NO buttons on the AccuVote-OS. Open the envelope or container with the absentee ballots and feed them into the AccuVote-OS.

4. Electronically lock the AccuVote-OS with the AccuVote-OS Ender card after the absentee ballots have been counted.

5. The Election Results report will be printed automatically. Once the report has printed, Pollworkers should sign the report, and the Election Results report together with the Election Zero report detached.

6. Replace and lock the printer cover.

7. Slide the AccuVote-OS unit half way out of the ballot box lid and power the unit off.

8. Unplug the power cord from the wall outlet and thread it out of the power cord tube.

Remove the AccuVote-OS from the ballot box and place the unit in its carrying case.

8. Modem transmission

Election results may be transmitted to the host computer by modem.

8.1. Programming a memory card

The AccuVote-OS first signals to the host computer that it is ready to receive information. Once ports have been readied in the AccuVote-OS Server 1 console in GEMS, ballot and vote center information is programmed to memory cards at the remote site.

Commonly, memory cards are programmed directly, although memory card programming by modem is useful if memory card difficulties arise on Election Day.

8.2. Transmitting Election Results

The AccuVote-OS signals to the host computer that it is ready to transmit information. Once ports have been readied in the AccuVote-OS Server 1 console in GEMS, election results may be transmitted to the host computer.

Both AccuVote-OS units and host computer are equipped with modems which allow the AccuVote-OS to send and receive information over a telephone line.

Appendix F: Modem transmission checklist provides a suggested log for tracking polling place telephone numbers, line information, special codes required as well as site information relating to election results transmission.

8.3. Supplies

The following supplies are required for modem transmission:

- One modem for each telephone line
- Power transformer and cable used to power each host computer modem
- port expansion card, providing multiple port transmission capability
- Internal AccuVote-OS pocket modems, one supplied with each AccuVote-OS
- RJ-11 telephone cord for every AccuVote-OS
- RJ-11 telephone cord connecting every election central phone line to a modem
- Serial cables connecting the host computer to modems
- Dummy plugs for the Phone jack of each AccuVote-OS.

8.4. AccuVote-OS Modems

Each AccuVote-OS is supplied with a pocket modem, which allows the unit to communicate with the host computer over telephone lines—this modem is displayed in Figure 9-1.

These modems are:

- Pocket-sized, transmit data at a rate of 2400 baud and weigh approximately 4 oz. each
- Set to transmit data with *no parity*, meaning that they are capable of transmitting the full 8-bit ISO extended character set, without the last bit of each character representation being used for parity checking

- Use one *stop bit* at the end of each character, signifying the end of the bit string representing the character (N-8-1)
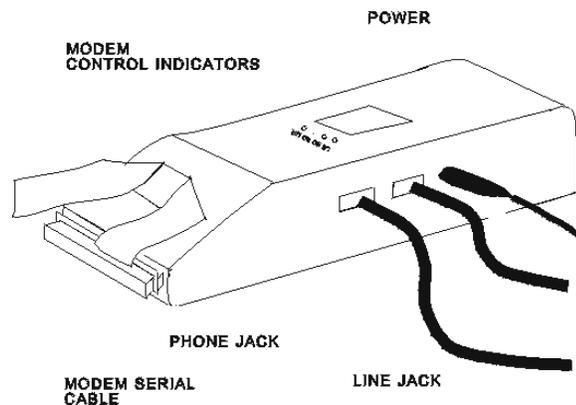
Figure 8-1: AccuVote-OS Modems

8.5.   Setting Up Host Computer Modems

Each telephone line used to perform modem transmission at election central must be connected to a modem. A modem can transmit or receive data at speeds between 110 bps (bits per second) and 56 kilobps. The speed used will depend on either the speed of the incoming transmission or the capacity of the receiving device. Each modem should:

- Have factory settings changed to E0, Q1, &C1 and S0=1

- Be connected to a power supply with a transformer and cable

- Be connected from the Line jack to a wall telephone jack or the PBX using an RJ -11 cable

- Be labeled with the port and telephone numbers

- Be attached to a host computer serial port by means of an RS-232C cable.

The front and backs of the typical modem used are displayed in Figure 9-2 and Figure 9-3.
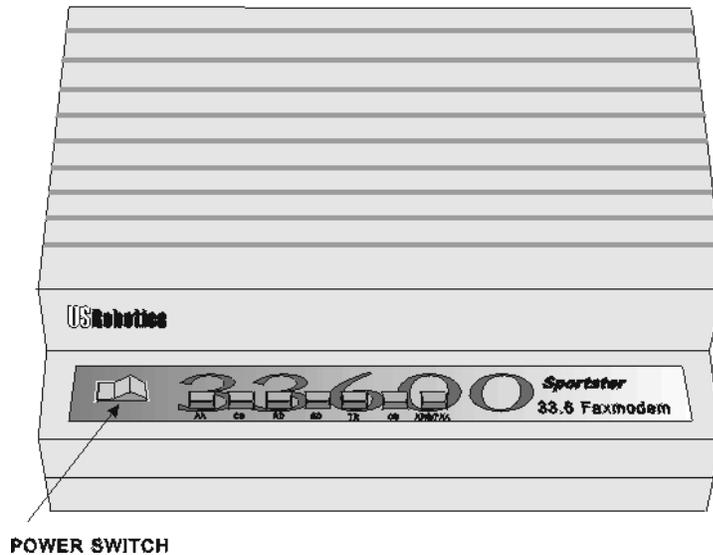
Figure 8-2: Front of Modem
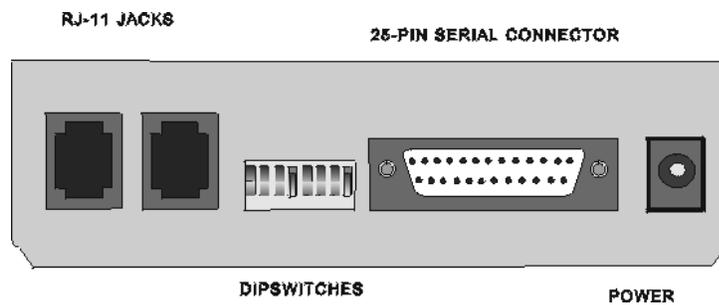
Figure 8-3: Back of Modem

8.6.   Multiple Serial Port Cards

The *multiple serial port card* is a device which provides a computer with additional serial ports, so that election data may be sent to and received from the host computer over several telephone lines. The multiple serial port card will transmit data at 2400 bps (bits per second), reflecting the speed of the pocket modem inside the AccuVote-OS units.

We recommend using an eight-port, multiple serial-port card, although four-port and 16-port cards are also available. Each port is connected to a 25-pin connector cable. The 8 25-pin connections merge as one single cable which terminates with a 50-pin connector that is connected to the back of the computer's multiple serial port card.

8.7.   Election Central

- Modems are connected to host computer serial ports

- Modems are connected to AC power using the transformer supplied with the modem

- Modem settings should be set to E0, Q1, &C1 and S0=1

- Fourth and eighth host computer modem dipswitches are down—remaining dipswitches are up

- A multiple-serial–port card must be installed on the host computer to directly connect several AccuVote-OS units to the host or to use more than one telephone line.

8.8. Telephone Lines

Approximately one phone line should be installed for every 10–20 AccuVote-OS units used at the polling places. Study the existing system to determine which of the following solutions is most suitable.

8.8.1. Cascading Lines

Multiple telephone lines are linked to one telephone number—each incoming call rolls over to another line associating with the cascading phone number if the prior line is occupied. AccuVote-OS units dial in from the polling places using one phone number only.

8.8.2. Single Lines

Each line installed has a unique number. AccuVote-OS units must be grouped by telephone number, so that each group is programmed with a different phone number, which corresponds to one of the single-line phone lines. An AccuVote-OS will redial a phone number if a line is busy, rather than the cascade the call to the next free line.

Keep a list of all polling places with election central phone numbers at the ready. The list should be ordered either by polling place name or by phone number.

8.8.3. Switches

Both solutions listed above require additional telephone line installation at election central and may involve an expensive restructuring of the phone system. A third alternative involves temporarily using existing telephone lines that are dedicated to other tasks, such as faxing election results to the host computer on election night. This temporary use can be accomplished using *switches* installed by the local telephone provider.

8.9. Polling Places

- Every polling place performing modem transmission in a jurisdiction has a single-line telephone or fax line available

- Telephone lines are not defined with any special services which may cause potential transmission interruptions

- Test transmissions should be performed from each polling place using the designated phone line

- Modem adapters and AC/DC power jacks are necessary if using cellular phones to transmit data.

8.9.1. AccuVote-OS units

- Each AccuVote-OS is defined with the correct phone number

- Telephone numbers must be properly defined as being either *tone* or *pulse*, depending on the type of telephone line being used at the polling place

- Telephone numbers include any necessary external access digit if dialing out from a PBX or long distance dialing code—for a full list see section *14.11.1Telephone number options* below

- **Line** jack at the back of each AccuVote-OS is connected to the designated RJ-11 phone jack with an RJ-11 cable when transmitting results

- Coupler plugs and additional RJ-11 phone cords are available as required

- Dummy plug is attached to the **Phone** jack at the back of each AccuVote-OS.

8.9.2.   Poll Workers

- Poll workers at each polling place are clear as to which phone line will be used on Election Day

- Poll workers understand how to send election results to election central when the polls close

- Poll workers understand any special dial-out requirements at the time polls close

- Poll workers are optionally trained to verify and change the phone number

- Poll workers know how to disconnect a phone line from a fax machine and attach it to the AccuVote-OS where applicable

- Poll workers have access to the area where the phone line is located after the polls close

- all Necessary information for election results transmission is included in the *Pollworkers' Training Guide.*

8.10. Special Services

The phone lines being used should not have special services such as *Call Waiting* or *Call Forward*, as these features usually disrupt the transmission of election results.

In many jurisdictions there are products available such as *VIP Alert*, *Smart Call* or *Priority Ring* whereby a single telephone line may be combined for voice, fax and data transmission such as the transmission of election results from an AccuVote-OS to the host computer. These products permit *Call Forward* or *Call Waiting* to be suspended for the duration of the data transmission.

8.11. Security

The AccuVote-OS and host computer perform a number of verification functions to check the authenticity of the transmission. Both the AccuVote-OS and GEMS validate an encrypted password, which must correspond on both ends for the duration of a modem transmission session. In order for either GEMS or an AccuVote-OS to accept information the transmission source must be in designated Communication mode.

9.   Pre-Election Maintenance

This chapter discusses servicing of the AccuVote-OS printer, paper roll, and battery prior to Election Day. It also describes equipment storage requirements.

Appendix B contains two tables, one for logging AccuVote-OS inventory, and a second for tracking unit problems and repairs. Record the serial number, date purchased, firmware, card reader type, and whether a unit is equipped with a modem for each AccuVote-OS on hand. When problems are encountered, record a description of the problem, the date the problem occurred, the initials of the person logging the problem, when the problem is resolved, a description of the repair, the date, and the initials of the person logging the repair.

Always ensure that the AccuVote-OS unit is powered off and unplugged prior to servicing components.

Note: The AccuFeed limits access to the components located in the printer compartment. It should be removed from the AccuVote-OS prior to servicing, if it is installed.

9.1.   Pre-Election maintenance activities

The following maintenance activities should be performed on each AccuVote-OS prior to an election:

- Check the printer paper and ribbon
- Charge the battery
- Conduct a full Diagnostics Test

Ensure that the system clock is set so that the date and time will be correct on Election Day, taking into account any time zone and daylight savings time changes. The ballot deflector must only be tested if blank or write-in ballots are separated in the ballot box.

The auxiliary serial port must be tested only if election results will be transmitted to the host computer by modem. Perform test transmissions from all polling places—only these jacks should be used for election results transmission on Election Day. Also, verify that the power jacks and cords designated for powering AccuVote-OS units on Election Day are functioning. Perform all tests with the same cabling that will be used on Election Day.

9.2.   Printer Paper

Ensure that the printer paper roll contains sufficient paper prior to Election Day. The roll should be replaced if necessary, particularly in the case of a large election. Print sample reports to ensure that the paper roll spools properly.

The AccuVote-OS should be powered off before the paper roll is replaced.

9.2.1.   Removing the Paper Roll

1. Unlock and remove the printer cover, and position the AccuVote-OS so that person replacing the paper is facing the front panel.

2. Note how the paper comes off the paper roll and threads through the printer assembly.

3. Remove the paper from the printer by turning the printer thumb wheel counter-clockwise until the paper drops from the printer assembly.

4. Carefully lift up the clips from the metal bar that holds the paper roll. If the clips are too taught to lift with bare fingers, carefully lever a Flathead or comparable screwdriver into the clips and lift them off the metal bar.

5. Push back the bar to free it from the mounting bracket.

6. Lift the paper roll out of the unit, and remove the metal bar that holds the paper roll in place.

9.2.2. Installing the Paper Roll

1. Unlock and remove the printer cover, and position the AccuVote-OS so that the person installing the paper is facing the front panel.

2. Slide the metal bar into the center of the paper roll, and set the roll into the paper roll housing, guiding the metal bar into the slots. The paper roll should be inserted so that paper feeds from the bottom of the roll.

3. Snap the paper roll shaft retainer clips over the metal bar. In the case that the clips are too tight, carefully splay them outwards before snapping them over the metal bar.

4. The ends of new paper rolls are lightly sealed onto the roll with adhesive. Peel the end of the roll and clip off the glued portion, as it will cause reports to print roughly and unevenly.

5. Fold the last 1/2 inch of the paper roll upward and feed it into the printer's paper entrance slot. Turn the thumb wheel clockwise to feed the paper through the printer ribbon.

6. Replace and lock the printer cover.

9.3. Printer Ribbon

Ensure that the printer ribbon is adequately inked prior to Election Day. Replace the ribbon if the type is very light or illegible in spots. The AccuVote-OS should be powered off before the printer ribbon is replaced.

9.3.1. Removing the Printer Ribbon

1. Unlock and remove the printer cover and position the unit so that the person removing the printer ribbon is facing the front panel.

2. Note of the orientation of the ribbon.

3. Gently push on the end of the ribbon casing marked with the word PUSH, opposite the thumb wheel.

4. Lift the printer ribbon up and slide it until it is free of the printer paper.

9.3.2. Installing the Printer Ribbon

1. Unlock and remove the printer cover, and position the AccuVote-OS so that the person installing the printer ribbon is facing the front panel.

2. Increase the amount of paper extending over the printer to approximately 1/2 inch, by turning the thumb wheel clockwise.

3. Slide the new printer cartridge over the paper in the orientation noted above and snap into place. The paper should be located between the cartridge and the ribbon.

4. Replace and lock the printer cover.

9.4. Battery

Charging the battery involves leaving the unit connected to an AC power source while powered on, preferably overnight.

The battery should be charged before and after every election. The battery should be charged again once every six to eight months to ensure that it would hold a sufficient charge. In the case that the battery is no longer sufficiently charged, it should be replaced. Note that the low battery symbol (‡) that may appear in the lower left-hand corner of the LCD, applies only to the memory card battery.

Ensure that all power and extension cords are properly connected, and that AC power is constant and uninterrupted, as a disruption in power will cause batteries to drain rather than charge.

This procedure tests the battery's ability to hold a charge—*the battery should always be fully charged before testing*.

9.4.1. Recommended Battery Test

The battery's ability to hold a charge may be tested by printing three Printer Test reports in Diagnostics Mode without AC power. A weak battery will be indicated if the printer runs but does not print anything. A weak battery may also be indicated by the continuous display of the battery low message.

1. Enter Diagnostics Mode by powering the AccuVote-OS on while pressing the YES and NO buttons.

2. Remove the AccuVote-OS power cord.

3. Press NO four times until

```
TEST PRINTER?
```

is displayed, then press YES.
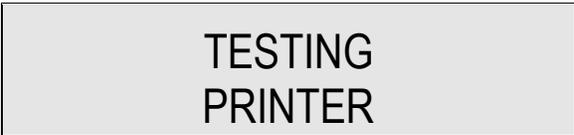
4.
```
TESTING
PRINTER
```

is displayed while the Print Test is in progress.
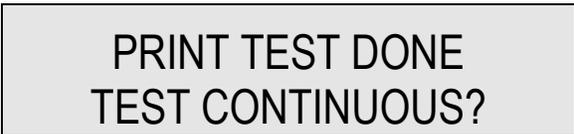
5.
```
PRINT TEST DONE
TEST CONTINUOUS?
```

will alternate with

```
**  POWER FAIL  **
```

once the Printer Test has completed. Press **YES**. Repeat this test twice.

9.4.2.   Power Fail

The AccuVote-OS unit is connected to AC power and is powered on.

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** POWER FAIL **

</div>

flashes alternating with the memory card's election mode prompts. Even though the unit is connected to a wall power jack, it is not receiving any AC power.

1. Plug the AccuVote-OS into an alternate power source. If the unit receives AC power, the initial power source is faulty and should not be used.

2. If the Power Fail message persists, try several other AC power sources at the site. If one that works, then several power jacks on site are faulty and only the working power jack should be used. Ensure that all Pollworkers are aware of which power jacks are reliable on Election Day.

3. If the power Fail message persists, replace the AccuVote-OS power cord. If the unit now receives AC power, mark the initial cord as faulty and set aside.

4. If the Power Fail message persists, replace the extension cord, if one is being used. If the unit now receives power, mark the initial extension cord as faulty and set aside.

5. If the message persists, verify that the unit's external fuse is intact. The fuse is located underneath the power switch, at the back of the AccuVote-OS. Using a thin flat-head screwdriver, press the fuse inward and rotate counterclockwise approximately 20º. Release and remove the fuse. If the wire thread inside the glass tube is broken, the fuse must be replaced.

6. If the fuse is intact, the AccuVote-OS must be serviced.

9.4.3.   Low battery

The AccuVote-OS has a lifetime of several hours when running only on battery power. If the battery has been discharged beyond a certain floor level

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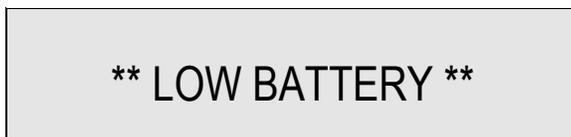
** LOW BATTERY **

</div>

will be shown on the LCD. The unit will only be able to provide sufficient power for several more minutes before shutting down. Once the unit has insufficient power, it will no longer be possible to read ballots.

Recharge the battery by reconnecting it to AC power and leaving it powered on. Note that once the unit's battery has been excessively discharged, it will not be hold the same charge as before.

The

<div style="border:1px solid #000; text-align:center; padding:40px; background:#e5e5e5;">
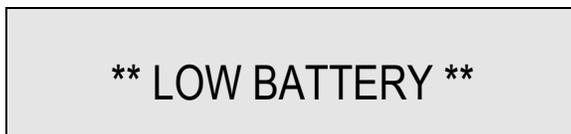
** LOW BATTERY **

</div>

message should clear up momentarily for visible light units and after several minutes for infrared units.

9.4.4. Removing the Battery

Ensure that the unit is powered off and that the power cord is disconnected from the unit before attempting to remove the battery. The position of battery terminals is illustrated in Figure 10-1.

1. Remove the printer cover and position the unit so that the person removing the battery is facing the front panel.

2. Using a flathead (-) screwdriver, loosen the two screws holding the battery compartment's cover plate in place, located on either side of the back of the paper roll. Note that these screws cannot be removed completely from the cover plate.

3. Raise the cover plate slightly and slide it towards the front of the unit, until the tabs are clear of the housing.

4. Rotate the top of the cover plate toward the front of the unit, and lift it up to clear the paper holder. Set the cover plate aside.

5. Note the battery's orientation, then disconnect the spade lug connectors from the terminals on the battery, and remove the battery from its housing.

Do not pull on the wire when disconnecting the spade lug connectors from the battery's terminals—pull only on the connector. Using a side-to-side tugging motion may ease removal. A pair of needle nose pliers may supply a better grip, but do not pull with too tight of a grip or the connector may become damaged.
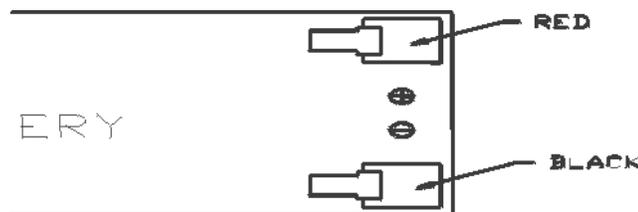
Figure 9-1: AccuVote-OS Battery Terminals

9.4.5. Installing the Battery

Ensure that the unit is powered off and the power cord is disconnected from the unit before attempting to remove the battery.

6. Place the battery into its housing in the orientation noted upon removal. Ensure that the wires are clear.

7. Plug the spade lug connectors into the appropriate terminals on the battery.

8. Position the cover plate with the screws lined up above the flanges behind the paper holder, then lower the cover place into the back of the housing.

9. With the cover plate in position, slide the tabs into their slots in the housing, and tighten the two screws to secure the cover plate in position.

10. Replace and lock the printer cover.

9.5. Replacing the memory card battery

A low memory card battery is indicated by the appearance of the ‡ symbol in the bottom left corner of the AccuVote-OS LCD. Replace the memory card battery when the battery low symbol appears on the LCD.

Two replacement scenarios exist:

- memory card is blank

- memory card is programmed.

9.5.1. Blank memory card

Use the following procedure to replace a blank memory card's battery.

1. Carefully peel the memory card sleeve from the memory card and completely remove the sleeve.

2. The battery fixture may be removed from the back of the memory card and the battery removed with a thumbnail. Note the battery's orientation in the fixture as well as the fixture's orientation in the memory card.

3. Insert a new battery in the fixture and replace it in the memory card.

4. Carefully attach a new memory card sleeve, ensuring that the sleeve is properly aligned on the card and is positioned evenly and flatly over the entire card.

9.5.2. Programmed memory card

Use the following procedure to replace a programmed memory card's battery. This procedure will not cause any information on the memory card to be lost

1. Carefully peel the memory card sleeve from the memory card and completely remove the sleeve.

2. Insert the memory card into a powered-on AccuVote-OS. The AccuVote-OS must supply power to the unit while the battery is being replaced to retain data integrity.

3. Use a thumbnail to remove the battery fixture from the back of the memory card while it is installed in the AccuVote-OS, and remove the battery, noting the battery's orientation in the fixture as well as the fixture's orientation in the memory card.

4. Insert a new battery in the fixture and replace the fixture in the memory card.

5. Remove the memory card from the AccuVote-OS.

6. Carefully attach a new memory card sleeve, ensuring that the sleeve is properly aligned on the card and is positioned evenly and flatly over the entire card.

9.6. Storage

AccuVote-OS units should be stored away from direct sunlight and at room temperature, where humidity is above 65 RH. Do not store the unit near organic solvents or corrosive gases. AccuVote-OS units may be stored either in the AccuVote-OS carrying cases or in boxes.

The ballot box features a lip running around the back and sides of the ballot box lid that fits into a groove at the back and the sides of the bottom of the ballot box, allowing ballot boxes to be stacked in a stable manner up to three high. Two indents in the back of the lid accommodate the legs of the box stacked on top of it and prevent the box from slipping forward.

10. Equipment Maintenance and Repair

This chapter describes AccuVote-OS maintenance and repair issues. It includes a general description of AccuVote maintenance required during the different stages of the election management process as well as descriptions of the installation and removal of all components of the AccuVote-OS.

10.1. Election maintenance

The topic of election maintenance is subdivided into:

- pre-election maintenance
- election day
- post-election maintenance

10.1.1.   Pre-Election Maintenance

The following pre-election maintenance should be performed on each AccuVote-OS:

- the printer paper and ribbon should be checked
- the battery should be charged
- a full system test of the unit should be conducted with Diagnostics Mode, as described in *Chapter 6: Diagnostics Mode* in the *AccuVote-OS Operator's GuidePrecinct Count User's Guide*.

Pre-election maintenance is described in detail in *Chapter 10: Maintenance*.

10.1.2.   Election day

Election day troubleshooting in *Chapter 24: Election Day* in the *AccuVote-OS Operator's GuidePrecinct Count User's Guide* describes several common problems that may arise on election day accompanied by detailed resolution procedures.

Contingency procedures should be developed to replace faulty AccuVote-OS units with tested replacements on election day, when timing is critical. If an AccuVote-OS fails on election day, it should be powered off and on again and the unit should be replaced if the apparent failure persists. Refer to the sections titled *AccuVote-OS failure* and *Resolving AccuVote-OS failure* in *Chapter 24: Election Day* in the *AccuVote-OS Operator's GuidePrecinct Count User's Guide* for more information.

Memory card failure may be resolved using one of the following options:

- replacing the memory card with a memory card master if the election is being run with memory card copies
- replacing the memory card with a newly programmed memory card
- replacing the entire vote center unit, including the AccuVote-OS, memory card and ballot box
- replacing the AccuVote-OS and memory card only
- manually counting ballots for the remainder of election day

The first 4 options are described in detail in the section titled Resolving memory card failure in *Chapter 24: Election Day in the AccuVote-OS Operator's GuidePrecinct Count User's Guide*.

10.2. Post-election Maintenance

When the election is over the AccuVote-OS batteries should be recharged and the units cleaned and stored. For more information on AccuVote-OS and ballot box storage, refer to the section titled *Storage* in *Chapter 23: Maintenance* in the *AccuVote-OS Operator's GuidePrecinct Count User's Guide*.

10.3. Repair

This chapter includes procedures for removal and replacement of the following AccuVote-OS components:

- removing and replacing the unit cover

- removing and installing the card reader assembly

- removing and installing the CPU board

- removing and installing the battery

- removing and installing the power supply

- removing and installing the LCD module

- removing and installing the printer

- removing and installing the ROM chips

- removing and installing the RAM chips

- removing and installing the SmartWatch ROM chip

- removing and installing the modem

- removing and installing the ballot deflector

- removing and installing the ballot deflector motor

- removing and installing the ballot deflector cable

The AccuVote-OS must be powered off before installing or removing AccuVote-OS components. The battery should be removed in order to prevent possible damage to components in the event the power switch is accidentally turned on.

Ensure that these operations are performed in a static, electrically controlled environment. For example, use a conductive and grounded work surface when removing and installing components.
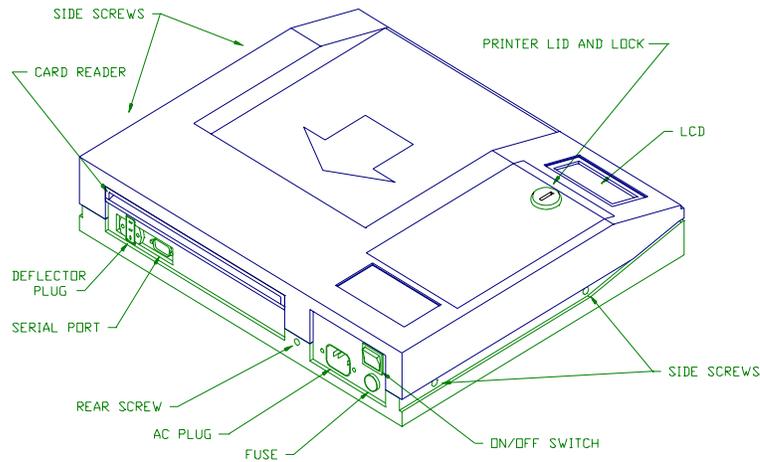
Figure 10-1: The AccuVote-OS

10.3.1. Removing the cover

Ensure that all external cables are disconnected from the unit and the unit is powered off before removing the cover.

1. Position the unit on a work surface that provides access to the sides, front and rear of the unit.

2. Using a Phillips (+) screwdriver, remove the four screws on the sides of the unit and the one screw from the rear of the unit illustrated above.

3. With the front panel facing you, raise the AccuVote-OS cover and place it on its back immediately behind the AccuVote-OS. Ensure that there is enough slack in the card reader's ribbon cable and the three-wire power supply cable to prevent damage to connections. The card reader's ribbon cable and the three-wire power supply cable should not be detached at this time.

10.3.2. Replacing the cover

Ensure that all external cables are disconnected from the unit and the unit is powered off before replacing the cover.

1. Place the unit cover face down, behind the back of the base of the AccuVote-OS.

2. Check that all internal cables, including the card reader's ribbon cable and the three-wire power supply cable, are connected. Ensure that the internal cables are clear from being pinched or damaged by the installation of the unit cover.

3. Lower the unit cover so that the lip on the rear and sides of the cover will sit inside the edge of the unit chassis.

4. Replace the four screws on the sides of the unit and the one screw at the rear of the unit. Refer to Figure 11-1.

5. Reconnect all external cables that were disconnected before removing the AccuVote-OS cover.

10.3.3. Removing the card reader assembly

Ensure that all external cables are disconnected from the unit and the unit is powered off before removing the card reader assembly.

1. Remove the unit cover using the procedure previously described in *Removing the cover* and position it face down on the work surface, behind the AccuVote-OS base. Note that in this orientation, the ballot reader is located at the bottom, right hand corner of the AccuVote-OS lid.

2. Note the orientation of the three-wire power cable connector. Remove the three-wire power cable connector from the card reader by gripping the connector and pulling outward.

3. Remove the ribbon cable from the reader by placing 2 fingers on the locking eject levers on either side of the ribbon cable connector and pushing outward. This will release the ribbon cable connector from the header.

Perform this activity with the connectors on both ends of the ballot reader ribbon cable.

4. Using a Phillips (+) screwdriver, remove the four screws from the corners of the reader assembly. The screw in the top, right-hand corner of the assembly should be left in the ballot reader, since easy removal and installation of the screw is prevented by the ballot reader motor.

Do not remove the screws from the circuit boards or reader motor mounts.

5. Remove the reader assembly by lifting it up from the cover.

6. Set the reader aside on a piece of foam or other static discharge safety material, with the connector facing up.

10.4. Installing the card reader assembly

This procedure requires the use of a torque screwdriver with a Philips (+) bit. This is a specialized tool that can be calibrated to specific torque settings. This application requires a calibration of 4.0 in-lbs (inch-pounds). The screwdriver's torque settings must be checked annually by a certified calibration testing agency.

Ensure that all external cables are disconnected from the unit and the unit is powered off before installing the reader.

1. Lower the reader assembly into place with the cover oriented as previously described in *Removing the card reader assembly*. Use the position of the motor as a guide to orient the assembly. The reader motor should be oriented to the top right of the reader mounting area.

2. Ensure that the reader assembly housing is properly aligned with the slots in the cover, then press the reader assembly firmly against the mounting surfaces.

3. Replace the screws in the corners of the reader assembly — the screw in the top, right hand corner should already be present on the ballot reader. Using a Philips (+) torqueue screwdriver (calibrated at 4.0 in-lbs), tighten the screws.

4. Connect the ribbon cable to the reader. Press the connector on one end of the ribbon cable into the header on the AccuVote-OS base and the connector on the other end of the ribbon cable into the header on the reader. The locking eject levers on both sides of the headers should snap into place once the connectors have been installed.

The polarization tabs on the sides of the connectors should fit into the polarization slots on the sides of the headers. Select the ribbon cable connector for the AccuVote-OS reader header that causes the ribbon cable to travel towards the center of the lid when connected, rather than towards the outside of the lid.

5. Connect the three-wire power cable to the reader using the previously noted orientation.

6. Reinstall the AccuVote-OS cover using the procedure previously described in *Replacing the cover*.

10.5. Removing the CPU board

Ensure that all external cables are disconnected from the unit and the unit is powered off before removing the CPU board Also, ensure that no memory cards are installed into the CPU board.

1. Remove the unit cover using the procedure previously described in *Removing the cover* and position it face down on the work surface, behind the AccuVote-OS base.

2. Remove the paper from the printer feeding mechanism by turning the printer thumb wheel counterclockwise.

3. The following cables are connected to the top of the CPU board, in left-to-right order:

    - static discharge strap

    - four-wire power supply cable

    - three-wire deflector connector cable

    - main serial port cable

    - modem serial port cable

    - two-wire modem power cable

    - ballot reader serial cable

    - static discharge strap

Note that it is not necessary to remove the ribbon cables connecting the LCD and the printer assembly to the CPU board.

4. Grip the four-wire power supply connector next to the printer assembly and remove from the CPU board.

5. Grip the three-wire deflector connector cable connector to the right hand side of the four-wire power supply cable and remove from the CPU board.

6. Place two fingers on both lock eject levers on either side of the main serial port connector and push outwards in order to release the connector from the header located on the CPU board. The main serial port connector is located to the right hand side of the three-wire deflector connector cable.

7. Place two fingers on both lock eject levers on either side of the modem serial port connector and push outwards in order to release the connector from the header located on the CPU board. The modem serial port connector is located to the right hand side of the main serial port header.

The modem serial cable need only be removed if a modem is installed in the AccuVote-OS.

8. Grip the two-wire modem power connector located between the modem serial cable and the ballot reader connector and remove from the CPU board. The two-wire modem power cable need be removed only if a modem is installed in the AccuVote-OS.

9. Place two fingers on both lock eject levers on either side of the ballot reader serial cable connector and push outwards in order to release the connector from the header on the CPU board. The ballot reader serial connector is located in the right hand corner of the CPU board.

10. There are two static ground connectors located on the CPU board. One is located between the printer assembly and the four-wire power supply connector and the other is located on the

right hand side of the CPU board. Grip each static ground connector and pull outwards in order to remove it from the CPU board.

11. Remove the AccuVote-OS YES and NO button pads by pushing out on the button pads from the inside of the chassis, using a small, flat blade (—) screwdriver.

12. Using a ¼" nut driver, remove each of the six nuts connecting the CPU to the chassis. Do not remove the nuts connecting either the memory card cover or the printer/LCD bracket to the CPU board. After the nuts have been removed, remove the lock washers and the nylon washers remaining on the screws by either pulling them upwards or by carefully rotating these washers counterclockwise on the screws. Use a fine flat blade (—) screwdriver for assistance in removing the less easily accessible washers.

13. Gently lift the CPU board from the rear, sliding it upwards and back. This will prevent damage to the front panel pushbutton posts. Pay particular attention to the front, right hand portion of the CPU board, as it may be blocked by the right hand memory card security plate post.

14. Place the nuts, washers and AccuVote-OS buttons in a secure location. Ensure that the six nylon washers underneath the CPU board on the standoffs are all present and not stuck to the underside of the CPU board.

10.6. Installing the CPU board

Ensure that all external cables are disconnected from the unit and the unit is powered off before installing the CPU board. No memory card should be loaded into the AccuVote-OS before installing the CPU board.

1. Ensure that six nylon washers are in place on the standoffs before installing the CPU board. Ensure that the standoffs are tight on the chassis. Tighten any loose standoff by using a ¼" nut driver on the standoff and a Philips (+) screwdriver on the screw head on the bottom of the chassis.

2. With the front edge of the board angled downward, slide the board into place, making sure the pushbutton posts are properly aligned with their holes in the chassis. Clear any of the wires blocking the installation of the CPU board assembly.

3. Lower the CPU board onto the standoffs and secure in place, in the following order:

   - the nylon washers

   - the lock washers

   - the nuts

Push the washers down over the threads or rotate the washers clockwise as you install them. Using a ¼" nut driver, tighten each of the six nuts in order to connect the CPU board to the chassis.

4. Replace the AccuVote-OS YES and NO button pads on the pushbutton posts, ensuring that the pads have freedom of movement in the chassis holes, and that they do not stick. Push these in from the chassis exterior.

If the pushbutton pads do not have freedom of movement, remove the pads and gently align the pushbutton posts towards the center of the chassis holes. *The pushbutton posts should be aligned with care as their connection to the CPU board may become damaged if excessive force is applied*.

5. The following cables must be reconnected to the CPU board:

   - static discharge strap

   - four-wire power supply cable

- three-wire deflector connector cable

- main serial port cable

- modem serial port cable

- two-wire modem power cable

- ballot reader serial cable

- static discharge straps

Before reconnecting the ribbon cables ensure that all locking eject levers are splayed outwards.

6. Plug the four-wire power supply connector into the male connector next to the printer assembly on the CPU board.

7. Plug the three-wire deflector connector cable connector into the male connector on the right hand side of the four-wire power supply cable.

8. Press the main serial port connector into the header located on the right hand side of the deflector connector cable.

The connector should be oriented so that the ribbon cable travels towards the back of the chassis, rather than the front of the chassis. The locking eject levers on both sides of the headers should snap into place once the connector has been installed.

9. Press the modem serial port connector into the header located on the right hand side of the main serial port cable. Installation of the modem serial port connector is unnecessary if no modem is installed in the AccuVote-OS.

The connector should be oriented so that the ribbon cable travels towards the back of the chassis, rather than the front of the chassis. The locking eject levers on both sides of the headers should snap into place once the connector has been installed.

10. Plug the two-wire modem power connector cable into the male connector located between the modem serial port cable and the ballot reader cable header.

11. Press the ballot reader serial cable connector into the header located in the right hand corner of the CPU board.

The connector should be oriented so that the ribbon cable travels towards the back of the chassis, rather than the front of the chassis. The locking eject levers on both sides of the headers should snap into place once the connector has been installed.

12. Reconnect the two static ground connectors located on the CPU board. One is located between the printer assembly and the four-wire power supply connector and the other is located on the right hand side of the CPU board.

13. Reinsert the paper into the printer by folding the last ½" of the paper roll upward and feeding it into the printer's paper entrance slot — turn the thumb wheel clockwise in order to feed the paper through the printer ribbon.

14. Reinstall the AccuVote-OS cover using the procedure previously described in *Replacing the cover*.

10.7. Removing the battery

Ensure that the unit is powered off before removing the battery and the power cord is disconnected from the unit. The position of battery terminals is illustrated in Figure 11-2 — red is positive, black is negative.

RED

BLACK

ERY
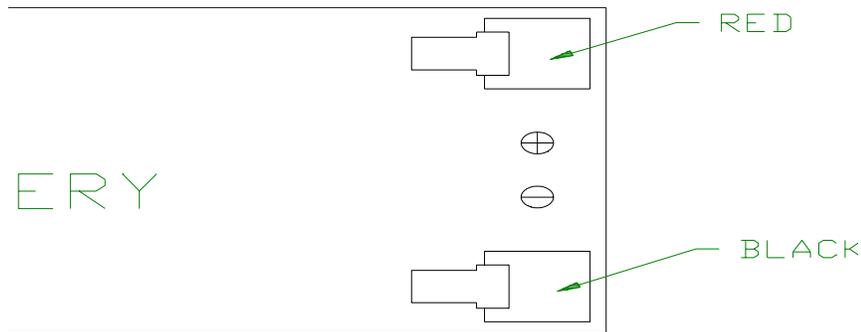
Figure 10-2: Battery terminals

1. Remove the printer cover and position the unit so that you are facing the front panel.

2. Using a flat blade (—) screwdriver, loosen the two screws holding the battery compartment's cover plate in place, located on either side of the back of the paper roll.

Note that these screws cannot be removed completely from the cover plate.

Raise the cover plate slightly and slide it towards the front of the unit until the tabs at the rear of the cover plate are clear of the power supply housing. Make sure that the flanges with the screws clear the paper roll holder.

3. Rotate the top of the cover plate toward the front of the unit, and lift it up to clear the paper roll holder. Set the cover plate aside.

4. Make a note of the battery's orientation, then disconnect the spade lug connectors from the terminals on the battery and remove the battery from its housing. See Figure 11-3.

SLOTS FOR BATTERY COMPARTMENT LID

RED WIRE

BLACK WIRE
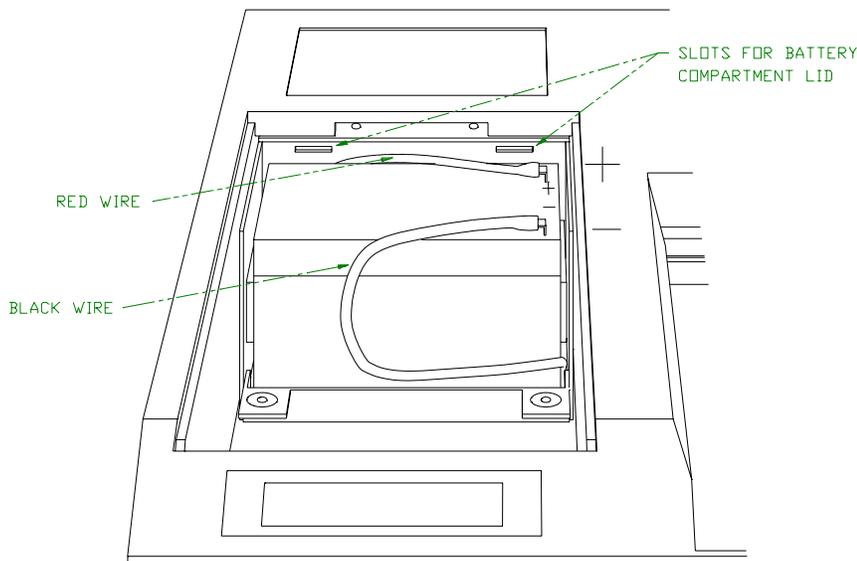
Figure 10-3: Battery compartment

Do not pull on the wire when disconnecting the spade lug connectors from the battery's terminals — pull only on the connector. Pulling on the connector using a side-to-side tugging motion may ease removal. A pair of needle nose pliers may supply a better grip on the connector — do not pull with too tight of a grip to avoid damaging the connector.

10.8. Installing the battery

Ensure that the unit is powered off and is disconnected from the power cord before attempting to install the battery.

1. Place the battery into its housing in the orientation noted during removal. Make sure that the wires are clear from being pinched by the battery.

2. Plug the spade lug connectors into the appropriate terminals on the battery.

3. Position the cover plate with the screws lined up above the flanges behind the paper holder, then lower the back of the cover. Make sure that the wires are clear from being pinched by the cover plate.

4. With the cover plate in position, slide the tabs into their slots in the housing and tighten the two screws to secure the plate to the chassis.

5. In case a fold of paper from the paper roll has been pinched by the battery cover plate, loosen the two screws on the battery cover plate, clear the paper from under the cover plate, and tighten the two screws again.

6. Relace the printer cover.

10.9. Removing the power supply

The power supply consists of the following components:

- primary power supply area

- secondary power supply area

- battery

The primary power supply area houses the high voltage AC and the secondary power supply area houses the low voltage AC and DC power. The battery provides a backup power source in case of AC power failure. The primary power supply area is behind the battery compartment. The primary power supply housing and secondary power supply housing are welded together and completely enclosed with protective covers.

Before attempting this procedure, ensure that all external cables have been disconnected from the unit, and the AccuVote-OS has been powered off.

1. Prepare the work surface with a thick, soft, non-abrasive layer of material such as foam, in an area large enough for the chassis. This precaution is to prevent any damage to the LCD, printer, or connectors.

2. Remove the cover using the procedure previously described in *Removing the cover*. Position the chassis with its front panel facing you.

3. You need to disconnect the following cables:

- the three-wire power supply cable connecting the power supply with the card reader

- the four-wire power supply cable connecting the power supply with the CPU board

- the two static ground cables connecting the power supply to the CPU board

- the card reader ribbon cable connecting the card reader to the CPU board

4. Note the orientation of the three-wire power supply cable connector located below the motor on the card reader and remove it from the card reader.

5. Note the orientation of the three-wire power supply cable connector next to the printer assembly and remove from the CPU board.

6. Note the orientation of the static ground cable connectors located between the printer assembly and the four-wire power supply header on the right hand side of the CPU board and remove them from the CPU board.

7. Place two fingers on both lock eject levers on either side of the card reader ribbon cable connector located on the CPU board and push outwards in order to release the cable from the CPU board.

Once you have removed the cables, place the unit cover to one side.

8. Position the chassis face down on the protective material with the front panel facing you. Make sure that the LCD display and the printer are protected and will not be damaged.

9. Using a Phillips (+) screwdriver, remove the eight screws securing the power supply housing assembly onto the unit chassis.

10. Lift the chassis up in order to remove from the power supply housing assembly and set it aside, face up, ensuring that no power supply wires remain tangled in the chassis.

10.10.   Installing the power supply

Before attempting this procedure, ensure that all external cables have been disconnected, and the AccuVote-OS has been powered off.

1. Prepare your work surface with a thick, soft, non-abrasive layer of material such as foam, in an area large enough for the chassis. This precaution is to prevent any damage to the LCD, printer, or connectors.

2. Place the power supply housing assembly face down on your work surface, with the battery compartment facing towards you.

3. With the chassis positioned face down, and its front panel facing you, gently lower it onto the power supply housing assembly, making sure that the LCD and printer will not be damaged.

4. Position the chassis so that the chassis mounting holes for the power supply housing assembly are properly aligned with the mounting holes in the power supply.

5. Using a Phillips (+) screwdriver, replace the eight screws to secure the housing assembly to the chassis. The screws may be replaced in any order.

6. Position the unit chassis face up, with the front panel facing you.

7. Position the unit cover face down, behind the unit chassis.

8. Using the previously noted orientation, plug the three-wire power supply connector into the male connector below the motor on the card reader.

9. Using the previously noted orientation, plug the four-wire power supply connector into the male connector next to the printer assembly on the CPU board.

10. Press the ballot reader serial cable connector into the header located in the right hand corner of the CPU board.

The connector should be oriented so that the ribbon cable travels towards the back of the chassis, rather than the front of the chassis. The locking eject levers on both sides of the header should snap into place once the connector has been installed.

11. Reconnect the two static ground connectors located on the CPU board.

DIEBOLD
ELECTION SYSTEMS

12. Replace the unit cover using the procedure previously described in *Replacing the cover*.

10.11.　　Removing the LCD module

Before attempting this procedure, ensure that all external cables are disconnected from the unit and the AccuVote-OS is powered off.

1. Remove the cover using the procedure previously described in *Removing the cover*. Position the chassis with its front panel facing you.

2. Grip the ribbon cable connector on the left side of the LCD and remove it.

3. Using a small Phillips (+) screwdriver, loosen the two screws on one side of the LCD but do not remove them.

4. Remove the remaining two screws on the other side of the LCD.

5. Gently free the LCD from its mounts. Place the LCD on a piece of conductive foam or other static discharge safety material.

10.12.　　Installing the LCD module

Before attempting this procedure, ensure that all external cables are disconnected from the unit and the AccuVote-OS is powered off.

1. Place the LCD in position with the ribbon cable connector on the left hand side.

2. Slide the LCD under the two screw heads that are still threaded on one side of the LCD.

3. Thread the two remaining screws previously removed into the standoffs on the other side of the LCD.

4. Using a small Phillips (+) screwdriver, tighten all four screws on the LCD.

5. Press the ribbon cable connector onto the header on the left hand side of the LCD.

6. Carefully fold any slack cable from the LCD module under the sheet metal frame on which the LCD is mounted.

7. Gently clean the LCD glass with isopropyl alcohol on a soft cloth.

8. Replace the unit cover using the procedure previously described in *Replacing the cover*.

10.13.　　Removing the printer

Before attempting this procedure, ensure that all external cables are disconnected from the unit and the AccuVote-OS is powered off.

1. Remove the cover using the procedure previously described in *Removing the cover*. Position the chassis with its front panel facing you.

2. Remove the paper from the printer by turning the printer thumb wheel counterclockwise until the paper is completely removed from the printer.

3. Gently push on the end of the printer ribbon casing marked with the word PUSH, opposite the thumb wheel, in order to remove the printer ribbon. Note the orientation of the printer ribbon before removing.

4. Loosen and remove the screw located in the far right hand corner of the printer, under the printer ribbon, used to connect the printer to the metal frame. Use a small Philips (+) screwdriver.

5. Loosen but do not remove the two screws on the side of the printer facing you using a small Philips (+) screwdriver.

6. Slide the printer assembly backwards and out of the metal frame on which the assembly is mounted.

7. The printer ribbon cable is soldered to the bottom of the printer and attached to the CPU board by means of a connector. The ribbon cable connector is accessible through the cavity in the metal frame once the printer is detached.

Carefully insert a small flat blade (—) screwdriver into the cavity, to one side of the connector and pry upwards. Then insert the screwdriver into the cavity on the other side of the connector and pry upwards.

8. Repeat this activity several times until the connector is sufficiently loosened to remove by hand. Remove the printer assembly from the CPU board.

10.14. Installing the printer

Before attempting this procedure, ensure that all external cables have been disconnected and the AccuVote-OS is powered off.

1. Feed the printer ribbon cable connector into the metal frame cavity. Locate the cable connector onto the header on the CPU board so that the ribbon cable travels towards the rear of the chassis.

2. Press the connector down, ensuring that it attaches firmly to the header. Verify that the connector is properly in place and not shifted over by one pin.

3. Slide the printer onto the metal frame so that the printer ribbon cable fits into the underlying cavity and the two tabs at the front of the printer fit under the heads of the screws on the mounts.

4. Replace the single screw that was positioned under the right side of the ribbon.

5. Using a Phillips (+) screwdriver, tighten the three screws.

6. Snap the printer ribbon into place in the orientation noted previously in *Removing the printer*.

7. Fold the leading ½" of paper upward and feed into the printer ribbon. Advance the paper in the assembly by turning the printer thumb wheel clockwise.

8. Replace the unit cover using the procedure previously described in *Replacing the cover*.

10.15. Removing the ROM chips

ROM chips contain the version of firmware being used by the unit. The AccuVote-OS firmware is upgraded by replacing existing ROM chips with new ones.

There are two ROM chips on the CPU board:

- ROM A, installed in the ROM A socket

- ROM B, installed in the EXP ROM B socket, on top of the SmartWatch ROM chip

Appendix E: ROM Labels in this guide provides a precise description of ROM labeling.

Before attempting this procedure, ensure that all external cables have been disconnected and the unit is powered off.

1. Remove the cover using the procedure previously described in *Removing the cover*. Position the chassis with its front panel facing you.

2. Using an integrated circuit chip pulling tool, gently pry up both ends of the ROM A chip and the ROM B chip.

3. Once the chips are loosened from the CPU board, lift the chips up and out of the unit. Ensure that the SmartWatch ROM chip, which is attached to the EXP ROM B socket and to which ROM B is attached, remains properly in place as ROM B is removed.

10.16.   Installing the ROM chips

Before attempting this procedure, ensure that all external cables have been disconnected and the unit is powered off.

1. With the cover removed, position the chassis with the front panel facing you.

2. Orient ROM A chip with the notch on the chip facing toward the rear of the AccuVote-OS unit (in the same orientation as the rest of the chips in the unit).

3. Line up the flat end of ROM A with the end of the ROM A socket facing you. Note that the ROM chips should be installed in the same orientation and position as the neighboring RAM chips.

It is usually easiest to set one row of pins in place and then set the chip down so the other row of pins fit into place. Then gently but firmly push the ROM A chip into the socket.

Carefully verify that the pins on the chips are seated properly and are not bent under the chip or splayed outside of the ROM socket.

4. Install ROM B in the SmartWatch chip using steps 2 and 3.

5. Replace the unit cover using the procedure previously described in *Replacing the cover*.

10.17.   Removing the RAM chips

The RAM chips in the AccuVote-OS are used to provide run-time storage as firmware programs are being processed. The AccuVote-OS is loaded with two of these chips:

- RAM, installed in the slot marked RAM

- EXP RAM, installed in the slot marked EXP RAM

Before attempting the following procedure, ensure that all external cables have been disconnected and the unit is powered off.

1. Remove the cover using the procedure previously described in *Removing the cover*. Position the chassis with its front panel facing you.

2. Use an integrated circuit chip pulling tool to gently pry up both ends of the RAM and EXP RAM chips.

3. Once the chips are loosened from the CPU board, lift the chips up and out of the unit.

10.18.   Installing the RAM chips

Before attempting this procedure, ensure that all external cables have been disconnected and the unit has been powered off.

1. Remove the cover using the procedure previously described in *Removing the cover*. Position the chassis with its front panel facing you.

2. Orient the RAM chip with the notch on the chip facing toward the rear of the AccuVote-OS unit (in the same orientation as the rest of the chips in the unit).

3. Line up the flat end of the RAM chip with the end of the RAM socket facing you. Note that the RAM chips should be installed in the same orientation and position as the neighboring ROM chips.

It is usually easiest to set one row of pins in place and then set the chip down so the other row of pins fit into place. Then gently but firmly push the RAM chip into the socket.

Carefully verify that the pins on the chips are seated properly and are not bent under the chip or splayed outside of the RAM socket.

4. Install EXP RAM in the EXP RAM socket using steps 2 and 3.

5. Replace the unit cover using the procedure previously described in *Replacing the cover*.

10.19.   Removing the SmartWatch ROM chip

The SmartWatch ROM chip is a small clock chip capable of time- and date-stamping AccuVote-OS reports.

1. Before attempting this procedure, ensure that all external cables have been disconnected from the unit and the unit is powered off.

2. Remove the cover using the procedure previously described in *Removing the cover*. Position the chassis with its front panel facing you.

3. Remove the EXP ROM B chip using the instructions provided in the section titled *Removing the ROM chips*.

4. Use an integrated circuit chip pulling tool to gently pry up both ends of the SmartWatch ROM chip.

5. Once the chip is loosened from the CPU board, lift the chip up and out of the unit.

10.20.   Installing the SmartWatch ROM chip

The SmartWatch ROM chip is a small clock chip capable of time- and date-stamping AccuVote-OS reports. Once installed, the time and date must be set in Diagnostics Mode. Refer to the procedure titled *Setting the system clock* in *Chapter 6: Diagnostics Mode* in the *AccuVote-OS Operator's GuidePrecinct Count User's Guide*.

1. Before attempting this procedure, ensure that all external cables have been disconnected and the unit is powered off.

2. Remove the cover using the procedure previously described in *Removing the cover*. Position the chassis with its front panel facing you.

3. Line up the flat end of the SmartWatch ROM with the end of the EXP ROM B socket facing you. Note that the SmartWatch ROM should be installed in the same orientation and position as the ROM chips. Push the chip into the socket.

4. Replace the EXP ROM B chip using the procedure described in *Installing the ROM chips*.

5. Replace the unit cover using the procedure previously described in *Replacing the cover*.

10.21.   Removing the modem

An AccuVote-OS may be installed with a modem used to program memory cards and transmit election results. The modem is used to communicate memory card information and election results at 2400 baud over telephone lines.

Before attempting this procedure, ensure that all external cables have been disconnected and the unit is powered off.

1. Remove the cover using the procedure previously described in *Removing the cover*. Position the chassis with its front panel facing you.

2. Place two fingers on both lock eject levers located on either side of the modem serial port connector and press outwards in order to release the connector from the header on the CPU board.

3. On the right hand side of the modem you will see the following three cables, in the following front to back sequence:

   - Phone

   - Line

   - two-wire modem power

4. Detach the Phone cable plug from the jack on the modem in the same manner you would detach a standard RJ-11 telephone plug.

5. Detach the Line cable plug from the jack on the modem in the same manner you would detach a standard RJ-11 telephone plug.

6. Detach the two-wire modem power cable connector from the modem by pulling the connector outwards from the modem.

7. Firmly grip the modem and pull out of the AccuVote-OS. Alternatively, you may use a flat blade (—) screwdriver to pry the modem away from the chassis. The modem is attached to the bottom of the chassis using double-sided adhesive tape, which should be carefully peeled off from the bottom of the modem and the chassis. Clean any remaining material from the adhesive tape using isopropyl alcohol.

8. Disconnect the modem serial interface connector from the modem.

9. Power the modem off.

10. If the AccuVote-OS is to be powered up without the modem ensure that the two-wire modem power cable connector barrel is not touching any conductive surfaces, including the inside surface of the chassis as it is covered with a conductive coating. We recommend removing the two-wire modem power cable connector from the CPU board. Note the orientation of the connector before removal.

10.22.   Installing the modem

An AccuVote-OS may be installed with a modem used to program memory cards and transmit election results. The modem is used to communicate memory card information and election results at 2400 baud over telephone lines.

Before attempting this procedure, ensure that all external cables have been disconnected and the unit is powered off.

1. Before installing the modem in the AccuVote-OS chassis, you must ensure that no residual adhesive tape remains on either the bottom of the modem or the AccuVote-OS chassis. Clean any remaining material from the adhesive tape using isopropyl alcohol.

2. Connect the modem serial interface connector to the modem before installing the modem.

3. A replacement modem comes with the two-sided adhesive mounting tape already on the bottom of the modem. Note that this tape may be easily repositioned within 24 hours of application. Firmly press the modem into the space provided for the modem in the AccuVote-OS chassis.

When mounting the modem into the chassis, position it so that the body of the modem is up against the power supply housing and the front of the modem — as opposed to the modem serial interface connector — is flush with the front of the of the power supply housing. The main serial port ribbon cable should travel partially under the power supply side of the modem but not interfere with the two-sided mounting tape on the modem.

4. Press the modem serial port connector into the modem serial port header on the CPU board. The lock eject levers should click into place once the connector has been installed.

5. Three cables need to be attached to the right hand side of the modem, in the following front to back sequence:

    - Phone

    - Line

    - two-wire modem power

6. Press the Phone cable plug into the Phone jack on the modem.

7. Press the Line cable plug into the Line jack on the modem.

8. If the two-wire modem power cable connector has been removed, you must reconnect the cable to pin P2 on the CPU board. Plug the connector on the other end of the cable into the power jack on the modem.

9. Power the modem on before replacing the AccuVote-OS cover.

10. Replace the unit cover using the procedure previously described in *Replacing the cover*.

10.23.   Removing the ballot deflector

The AccuVote-OS must be removed from the ballot box in order to remove the ballot deflector.

1. Unlock the ballot box lid.

2. Lift the lid and prop it up on the lift arm by inserting the end of the arm into the notch in the lid of the ballot box.

3. Use a stubby Phillips screwdriver (+) to loosen the two set screws on the motor coupler. The motor coupler is located at the end of the ballot deflector and connects the deflector to the motor.

4. Grasp the end of the ballot deflector with each hand holding the end of each deflector flap, the thumbs propped against the deflector motor housing. Push against the deflector motor housing with your thumbs as the remaining fingers grip the deflector flaps in order to release the motor coupler from the motor shaft.

The front of the ballot box may flex as a result of this action.

5. Angle the deflector up slightly and move it toward the rear of the ballot box until the pivot pin at the front of the ballot box is withdrawn from the pivot socket.

6. When the deflector is completely free, lift the deflector out of the ballot box.

7. Remove the lift arm from the ballot box lid and close and lock the ballot box.

10.24.   Installing the ballot deflector

The AccuVote-OS should not be installed in the ballot box before installing the ballot deflector. After the deflector is in position, an AccuVote-OS can be installed into the ballot box in order to verify ballot deflector alignment in Diagnostics Mode.

Exercise caution while working inside the ballot box with an AccuVote-OS installed in the ballot box lid. If you knock the lift arm free the lid will drop on to you with the weight of both the lid and the AccuVote-OS.

1. Unlock the top lid of the ballot box.

2. Open the lid and prop it up on the lift arm by inserting the end of the arm into the notch in the lid of the ballot box.

3. Low r the deflector into the ballot box and orient it with the pivot pin toward the front of the ballot box.

4. Tilt the deflector so that the motor coupler is slightly raised above the motor shaft at the back of the ballot box.

5. Insert the pivot pin into the pivot socket at the front of the ballot box.

6. Press the deflector towards the front of the ballot box until the motor coupler clears the end of the motor shaft at the back of the ballot box.

7. Insert the motor shaft into the motor coupler and release the ballot deflector. This should allow the motor coupler to slide completely over the motor shaft and away from the front of the ballot box.

8. Position the left side of the deflector so that it is in near vertical alignment with the divider separating the right and left bins of the ballot box.

9. While holding the deflector in this position, use a stubby Phillips screwdriver (+) to lightly tighten one of the set screws that secure the motor coupler to the motor shaft.

10. Using the procedure described in *Testing the ballot deflector* in *Chapter 6: Diagnostics Mode* in the *AccuVote-OS Operator's GuidePrecinct Count User's Guide*, verify that the left and right bin open positions correspond to those displayed on the LCD. Monitor the AccuVote-OS LCD on the open ballot box lid as the deflector is shifted from left to right open position and back again.

11. The deflector should operator symmetrically around an imaginary center line drawn through the motor coupler from the top to the bottom of the ballot box.

12. If the deflector is not shifting properly to the positions indicated on the LCD, adjust the deflector by loosening the lightly tightened set screw, repositioning the deflector and lightly tighten the screw. Repeat step 10.

13. When the deflector is properly positioned, install the second screw on the motor coupler. Firmly tighten both set screws.

14. Remove the lift arm from the ballot box lid and close and lock the ballot box.

10.25. Removing the ballot deflector motor

The AccuVote-OS should not be installed in the ballot box while removing the ballot deflector motor.

1. Unlock and open the ballot box lid and support on the ballot box lift arm.

2. Remove the ballot box deflector using the procedure previously described in *Removing the ballot deflector*.

3. Note that the ballot box deflector connects to the ballot box motor shaft at the back of the ballot box. The ballot box deflector motor is concealed behind a plastic motor mount bracket that extends across the ballot box. The ballot box deflector cable connects the deflector connector on the ballot box lid to the ballot box deflector motor.

Detach the ballot box deflector cable from the ballot box deflector motor cable.

Using a Philips (+) screwdriver, loosen and remove all six screws holding the ballot box deflector motor onto the plastic motor mount bracket. You must grip the motor firmly against the plastic motor mount bracket in order to remove the screws. Cradle the motor in your hand as you are removing the last of the screws in order to prevent the motor from dropping into the ballot box.

4. Remove the motor from the plastic motor mount bracket once it has been freed from the motor mount bracket.

5.   Remove the lift arm from the ballot box lid and close and lock the ballot box.

10.26.   Installing the ballot deflector motor

The AccuVote-OS should not be installed in the ballot box while installing the ballot deflector motor.

Unlock and open the ballot box lid and support on the ballot box lift arm.

1.   Position the ballot box deflector motor housing against the inside wall of the plastic motor mount bracket so that all six screw holes in the mount bracket line up with those of the motor.

2.   Grip the motor tightly against the plastic motor mount bracket with one hand while inserting a screw into the housing using a Philips (+) screwdriver.

3.   Once the first screw is place, replace the remaining five screws using the Philips (+) screwdriver. Grip the motor firmly against the plastic motor mount bracket in order to fully tighten the screws. Do not over tighten as you may strip the threads in the motor case.

4.   Reconnect the deflector motor cable with the deflector cable.

5.   Install the ballot box deflector using the procedure previously described in *Installing the ballot deflector*.

6.   Once the ballot deflector has been installed, remove the lift arm from the ballot box lid and close and lock the ballot box.

10.27.   Removing the ballot deflector cable

The AccuVote-OS should not be installed in the ballot box while removing the ballot deflector cable.

1.   Unlock and remove the security plate from the ballot box entry slot. Do not place in the security plate recess on the ballot box lid as it may fall off once the lid has been opened.

2.   Open the ballot box lid and support it on the lift arm.

Note that the deflector cable is attached to the ballot box lid by means of a bracket on the lower right hand side of the ballot box entry slot. Two screws hold this plate into place. These screws are connected to nuts which are visible on the right hand side of the area between the security plate recess and the ballot box deflector inside the ballot box lid.

Detach each of these screws using a Philips (+) screwdriver in one hand to remove the screw and a 5/16" nut driver so keep the corresponding nut in place.

3.   Inside the ballot box, detach the ballot box deflector cable from the deflector motor cable.

4.   Cut the tie strap that holds the deflector cable onto the plastic motor mount bracket.

5.   Cut the tie strap attaching the deflector cable onto the power cord tube.

6.   Cut the tie attaching the deflector cable onto the right hand side of the ballot box chute.

7.   Once the ballot box deflector cable has been freed, thread it around the power cord tube, between the chute and the ballot box lid and out of the deflector connector hole on top of the lid.

8.   Remove the lift arm from the ballot box lid and close and lock the ballot box.

9.   Replace and lock the security plate into the ballot entry slot.

10.28.   Installing the ballot deflector cable

The AccuVote-OS should not be installed in the ballot box while installing the ballot deflector cable.

1. If it is in place, unlock and remove the security plate from the ballot box entry slot. Do not place in the security plate recess on the ballot box lid as it may fall off once the lid has been opened.

2. Open the ballot box lid and support it on the lift arm.

3. Thread the ballot box deflector cable through the cavity on the lower right hand side of the entry slot on the ballot box lid, so that the end of the cable attached to the deflector connector bracket remains outside the ballot box lid.

4. Thread the deflector cable between the ballot chute and the ballot box lid, behind the power cord tube and down towards the deflector motor.

5. Pull the cable tight and connect to the deflector motor cable.

6. Position the deflector connector bracket with the screw holes lining up with those in the ballot box lid. Insert the screws using a Philips (+) screwdriver.

7. Thread the nuts onto these screws on the inside of the ballot box lid. Tighten the nuts by fixing the screws with the Philips (+) screwdriver in one hand and a 5/16" nut driver in the other.

8. Attach the cable with a tie strap to the right hand side of the ballot deflector.

9. Attach the cable with a tie strap to the power cord tube.

10. Attach the cable with a tie strap to the motor mount bracket.

11. Once the deflector cable is in place, replace and lock the security plate into the ballot entry slot.

12. Remove the lift arm from the ballot box lid and close and lock the ballot box.

11.   Points to Remember

This section lists important points to remember when conducting an election with the AccuVote-OS:

- Ensure that AccuVote-OS units are installed with the proper version ROM chips

- Ballot rejection parameters have been fully tested in Pre-Election Mode

- Define a supervisor password in GEMS to restrict AccuVote-OS access

- Label each memory card after it is programmed

- Test every ballot type with the Blank Ballot Test, Fully Marked Test and Count BallotsTest in Pre-Election Mode

- Ensure that phones lines at the polling places are dedicated to modem transmission on election night

- All telephone lines dedicated to modem transmission at the polling places must be tested prior to the first election and after any renovation activities occur at a particular polling place

- Set up the AccuVote-OS units with the proper election central phone numbers

- Set the AccuVote-OS clocks to the proper local time on Election Day

- Charge the AccuVote-OS batteries before Election Day

- Restock the AccuVote-OS paper rolls and ribbons as required before Election Day

- Remove the ballot box security plate before installing the AccuVote-OS on Election Day

- Check each ballot box on Election Day when the ballot counter reaches 1000

- Count absentee ballots on the AccuVote-OS units after polling ballots if ballots are being counted and tallied at the precincts.

12. Parts List

The Parts List provides the part numbers, part names and a brief description of parts. Be sure to have this information handy when ordering replacement parts.

12.1. AccuVote-OS unit parts list

Part #	Part Name and Description

312-2112   Modem Upgrade Kit

This kit includes the modem, the modem power and serial cables, a new I/O Bracket with the phone and line jacks, deflector cable and main serial cable already attached. This kit also includes the modem mounting hardware.

411-2716   CPU Board Assembly (board with metalwork)

Replacement mother board, fully populated except for the LCD and the printer. The Printer/LCD Mounting Bracket and memory card Cover are included. This part does not include the CPU board mounting hardware (453-1111).

411-3716   CPU Board Assembly (complete)

Replacement mother board, fully populated including the LCD, the printer, and the metalwork. This part does not include the CPU board mounting hardware (453-1111).

421-2332   Power Supply Assembly

Replacement 120 volt AC switching power supply for the AccuVote-OS Unit. This part does not include the power supply mounting hardware (453-4111).

442-1111   Infra-red Reader Assembly

AccuVote-OS reader fully assembled including the reader motor. The mounting screws (453-2111) and reader interface cable (541-2311) are not included.

442-5111   Visible Light Reader Assembly

AccuVote-OS reader fully assembled including the reader motor. The mounting screws (453-2111) and reader interface cable (541-2311) are not included.

450-1111   Enclosure Assembly

AccuVote-OS enclosure assembled including the memory card security plate and label set. It does not include the serial number label. The mounting screws (453-4111) for the internal components are not included.

452-1111   Internal I/O Cables Assembly (non-modem unit)

Serial and deflector internal cables attached to an I/O bracket. This part does not include the I/O bracket mounting hardware (453-4111).

452-2111   Internal I/O Cables Assembly (modem unit)

Serial cable, deflector internal cable, and modem cables attached to an I/O bracket. This part does not include the I/O bracket mounting hardware (453-4111).

453-1111   CPU Board Mounting Hardware Kit

This kit consists of screws, standoffs, washers and nuts required for mounting the CPU board to the AccuVote-OS enclosure.

453-2111   Reader Mounting Hardware Kit

This kit consists of screws required for mounting the reader to the AccuVote-OS enclosure.

453-3111   Printer/LCD Mounting Hardware Kit

This kit consists of screws required for mounting the printer and LCD to the printer/LCD bracket.

453-4111   Enclosure Mounting Hardware Kit

This kit consists of screws required for mounting the power supply, paper roll holder, and I/O bracket to the AccuVote-OS enclosure. It also includes the screws required to attach together the AccuVote-OS enclosure's lid and chassis.

453-4121   memory card Security Plate Mounting Hardware Kit

This kit consists of screws and Ny-lok nuts required to mount the memory card security plate to the AccuVote-OS enclosure.

454-2111   Paper Roll Assembly

This assembly consists of the paper roll holder and paper roll shaft. This part does not include the mounting hardware (453-4111).

461-1122   LCD Assembly

LCD module with right angle connector. This part does not include the mounting hardware (453-3111).

471-1111   Printer Assembly

The internal printer mechanism with fifteen-conductor ribbon cable attached. Mounting screws not included. This part does not include the mounting hardware (453-3111).

510-1112   Internal Modem

This is the internal 2400 baud pocket modem that is installed into the AccuVote-OS. The mounting hardware is included with this part. There are no cables included.

512-4111   32K x 8 RAM IC

32KB Static RAM chip.

512-4131   128K x 8 RAM IC

128KB Static RAM chip.

521-2111   memory card Security Plate

This part mounts onto the AccuVote-OS's enclosure. It limits access to the memory card after it has been inserted. This part does not include the mounting hardware (453-4121).

541-0111   Loopback Connector

This connector is used for testing the main serial port of the AccuVote-OS unit.

541-1111   Internal Modem Power Cable (2400)

This is the special cable that powers the modem from a connection on the CPU board.

541-1121   Internal Modem Power Cable (14.4)

This is the special cable that powers the modem from a connection on the CPU board.

541-2211   LCD Interface Cable

This fourteen-conductor ribbon cable connects the LCD to the CPU board.

541-2311   Reader Interface Cable

This twenty-conductor ribbon cable connects the reader to the CPU board.

621-3311   Diagnostic Test Ballot Cards

Twenty-five special cards for use in testing whether the AccuVote-OS unit is reading all of the potential voting positions on the ballot cards.

621-6111   Demonstration Test Ballot Cards

A package of 25 demonstration ballots for use in testing whether the AccuVote-OS unit is reading marks on ballot cards during a test election. These ballots can be used with a test memory card (641-1112) loaded with the demonstration ballot card data.

641-2111   Test memory card

A memory card containing preloaded data that is recognizable by the AccuVote-OS ballot processing unit. This memory card is used to test whether or not a problem exists in a test election mode using the demonstration test ballot cards (621-6111).

701-1111   ROM Set (64K x 8)

64KB EPROM chip(s). This chip(s) are programmed with a specific version of the firmware.

721-1211   128K x 8 ROM IC

128KB EPROM chip. This chip(s) are programmed with a specific version of the firmware.

12.2. Ballot box unit parts list

Part #   Part Name and Description

445-1111   Deflector Motor

This motor moves the ballot deflector. This part has a cabling harness attached to it which connects to the ballot box cable. This part does not include the mounting hardware. (453-7111)

453-7111   Deflector Motor Mounting Hardware Kit

This kit consists of screws for mounting the ballot box deflector motor to the motor mount bracket and two plastic tie straps for anchoring the slack cable.

453-7121   Ballot Box Cable Mounting Hardware Kit

This kit consists of screws, nuts, and plastic tie straps required for mounting the ballot box cable.

533-2113   Deflector

A gate inside the ballot box, which may be used to deflect either blank ballots or ballots containing write-in votes into a separate compartment in the ballot box. This component includes the motor coupler and set screws.

542-1121   Ballot Box Cable

This cable has the ballot box deflector connector and bracket on one end and the ballot box motor interface connector on the other end. This part does not include the mounting hardware (453-7121).

13. Unit Specifications

This chapter covers the mechanical and electrical specifications of the AccuVote-OS ballot processing unit.

13.1. Mechanical

Size:	16" x 14" x 3"
Weight:	15 lbs.

13.2. Electrical

Power Supply Input:	120 VAC, 60/50 Hz @ 0.3 A
Power Supply Output	
Capacity:	14.8 volts DC @ 2.5 A
	5.0 volts DC @ 1.0 A
Operating Current:	0.3 A nominal @ 14VDC (idle)
	2.4 A peak @ 14VDC (printing)
Deflector Motor	
Current:	0.3 A nominal @ 14 VDC

13.3. Communications

Modulation:	RS-232C
Protocol:	XON/XOFF
Baud Rate:	9, 600
Data Bits:	8
Parity:	None
Stop Bits:	1
Pin Definition:	See Appendix F

13.4. External connections

Power Input:	120 VAC, 50/60 Hz, suitable for Belden 17250 cable
Communications:	DB9-M 9-pin plug (DTE)

13.5. Operating environment

Temperature:	+40° F to +100° F
	+5° C to +38° C
Humidity:	30% to 90% non-condensing
Vibration:	0.25 G

13.6. Storage environment

Temperature:	+5° F to +104° F
	-15° C to +40° C
Humidity:	5% to 95% non-condensing
Vibration:	2.0 G

13.7. Transportation environment

Temperature:	+5° F to +122° F
	-15° C to +50° C
Humidity:	5% to 95% non-condensing
Vibration:	2.0 G

13.8. Ballot cards

Length:	11, 14, 18 in. (+ 0.030 in. - 0.000 in.)
Width:	8.50 in. (+ 0.030 in. - 0.020 in.)
Thickness:	7 point (0.007 in.)
Weight:	Nominal 90 lb. Index stock

For more information on ballot cards, see the *GEMS User's Guide*.

Appendix A: Glossary

Listed below are definitions for some of the more technical terms included in this manual. They appear in alphabetical order.

ABSENTEE COUNT card

A special card that when inserted in the AccuVote-OS unit, signals the unit to begin reading absentee ballots. Any ballot inserted after this card will be read as an absentee ballot.

AccuVote-OS ballot processing unit

A unit, the size of a laptop computer, that uses mark-sense technology to read both sides of a ballot simultaneously. All ballot information is stored on a removable, 32kB, 64kB, or 128kB memory card.

ACK code

Shortened form of Acknowledge Character.

Audit Report

A record of the processes performed, and/or the changes made to the system's data.

ballot box

The sealed box used to secure voted ballots and carry them from the precinct to the central vote counter. This box is also used to house the AccuVote-OS ballot processing unit during the ballot-counting process.

ballot card

A single piece of paper on which is printed race and candidate information for the voters to vote on. Each ballot type is made up of one or more physical ballot cards.

ballot deflector

A gate located inside the ballot box, which is activated by the AccuVote-OS ballot processing unit. When signalled, the deflector moves to direct the ballot into the appropriate storage slot within the ballot box.

blank voting

Blank voting is when a voter does not vote for any candidates in the race.

card identification marks

These are small black boxes that appear along the width of the ballot card opposite the diagnostic marks on both the front and back of the ballot card.

The ID marks identify the card sequence, card number, precinct number, ender mark, election type and election date.

CPU (Central Processing Unit)

The part of a computer where commands are received, decoded, and carried out. Every computer has a CPU.

delimiter

A special character used to separate parts of data such as strings of characters.

diagnostic marks

> The small black boxes set at regular intervals across the width of both the top front and top back of the printed ballot card.

download

> To transfer data from the central computer down to the AccuVote-OS memory cards.

downloaded text

> Text in the Precinct Summary Total that can be customized to meet your jurisdiction's requirements.

ENDER card

> A special card that when inserted in the AccuVote-OS ballot processing unit, signals the end of the election. The AccuVote-OS unit responds by printing a Totals Report, and electronically locking the ballot reader to prevent further ballot processing.

host computer

> A large, central computer to which the AccuVote-OS ballot processing unit is connected.

interface

> The liaison between the computer and the user, by way of handling information in different formats.

landscape

> Landscape is a horizontal orientation in which the long end of the card is the top, and the narrow ends are the sides.

LCD (Liquid Crystal Display)

> An alphanumeric display, like that on a digital clock. A liquid crystal is sealed between polarizers and glass, and when activated by external light, it forms characters.

LF code

> Shortened form of Line Feed.

loop

> A sequence of program commands that are executed repeatedly.

mark-sensing

> The reading of (voting) marks by way of scanning with an optical scanner.

memory card

> A small card used in the AccuVote-OS ballot processing unit to store precinct information and to record ballot results.

override

> To force the AccuVote-OS unit to accept a rejected ballot card, such as an overvoted card, by pressing the YES button while the card is being read.

overvoting

> Overvoting is when a voter votes for more candidates than he/she is eligible to vote for in a race.

port

> The connector on a host computer where a terminal (printer, AccuVote-OS unit, or other such device) is connected, and by means of which information can be transferred.

portrait

> Portrait is a vertical orientation in which the narrow end of the card is the top, and the long ends are the sides.

protocol

> A set of parameters governing the communication and transfer of information between **the host computer and the AccuVote-OS ballot processing unit.**

RAM (Random Access Memory)

> A type of memory that can be accessed directly without having to follow a particular path of storage locations.

ROM (Read-Only Memory)

> A type of memory chip that can be read but cannot be written on or altered.

RTS code

> **An abbreviation for Request to Send.**

test cards

> Two test cards are available for testing the AccuVote-OS unit. The *marked test card* test that the ballot reader is reading all the marks that it should. The *blank test card* tests **that the ballot reader isn't reading extraneous marks.**

timing marks

> Small black boxes set at regular intervals down the outside edges of the length of the printed ballot card. All voting boxes that are printed on the ballot must be aligned with the timing marks (and the diagnostic marks) so that the AccuVote-OS ballot processing unit can recognize each race and candidate for ballot-counting.

Totals Report

> The Totals Report lists all the vote counts currently recorded for the present election. Depending on when it is printed, the Totals Report can have any of seven titles: Zero Totals Report, Test Zero Totals Report, Test Results Report, Test Totals Report, Election Zero Totals Report, Election Results Report, or Election Totals Report.

undervoting

> Undervoting is when the voter votes for fewer candidates than he/she is eligible to vote for in a race.

upload

> To transfer data from the AccuVote-OS memory cards up to the central computer.

voting mark

> The mark on the ballot created by a voter selecting his preferred candidate.

workstation

A computer monitor and keyboard, with associated software, which has a direct line of communication with the central computer.

write-ins

Write-ins are the blank lines on the ballot where the voter writes the name of a candidate that was not nominated to run in this race.

Appendix B: AccuVote-OS Inventory and Maintenance Logs

Table 1 presents an AccuVote-OS form that can be used to log the serial number, the purchase date, the firmware release (currently) installed, the reader type (i.e. visible light, infrared), as well as whether a modem is installed for each AccuVote-OS.

Serial Number	Date Bought	Firmware	Reader Type	Modem

Table 1. AccuVote-OS Inventory Log

Store the AccuVote-OS Inventory Log in a clear plastic sleeve near the AccuVote-OS. Use the AccuVote-OS Maintenance Log to record all maintenance or upgrades to units. See Table 2.

Initials					
Date					
Solution/ Repair					
Initials					
Date					
Problem					

Table 2: AccuVote-OS Maintenance Log

DIEBOLD
ELECTION SYSTEMS

Appendix C: Ballot Box Inventory and Maintenance Logs

Table 3 presents a log sheet that can be used to log ballot box inventory information, including the serial number; which security plate is installed; whether keys are on hand, the deflector and locks are working, and the movable foot is attached; and if any damage has been incurred.

Damage						
Foot						
Locks						
Deflector Working						
Security Plate						
Keys						
Serial Number						

Table 3: Ballot Box Inventory Log

Store this sheet in a clear plastic sleeve near the ballot box.

Table 4 presents a ballot box log form that can be used to record all maintenance or upgrades to the ballot box.

Initials						
Date						
Solution/Repair						
Initials						
Date						
Problem						

Table 4: Ballot Box Maintenance Log

Appendix D: Modem Transmission Checklist

Table 5 is suggested for logging polling place telephone numbers, supplies required for sending election results by modem, as well as special transmission requirements. For every AccuVote-OS, record:

- Name of the polling place where the unit will be used

- Telephone number to be used for performing results transmission

- Whether line is tone or pulse (prefix telephone number defined on AccuVote-OS either with *T* or *P*)

- Whether line used is a voice line or a fax line

- Whether line is direct or requires dialing through a switchboard

- Any special codes such as long distance or wait required to access election central

- Whether an extension cord is required to make call

- Whether a key is required to access telephone jack on election night

- Whether a test transmission has been performed on site

- Whether a conventional ground line will be used to perform the transmission or whether a cellular telephone will be used.

Copy this table or adapt it for local usage.

DIEBOLD
ELECTION SYSTEMS

Ground/Cell						
Line Tested						
Key						
Ext.						
Special Codes						
Direct/PBX						
Voice/Fax						
Tone/Pulse						
Phone No.						
Polling Place						

Table 5: Modem transmission checklist

Appendix E: ROM Labels

The ROM chips are located at the front of the AccuVote-OS between the LCD and the memory card interface. Each ROM is labeled in the following manner:

<div align="center">

Accu-Vote LL

AA RRRRR #####

I-CCCC YY-MM-DD

</div>

LL   This refers to the language type represented:

        AE   American English

        CF   Canadian French

AA   The election application:

        PC   Polling or Precinct Counter

        ~~CC   Central Counter~~

        DT   Diagnostic Testing

RRRRR   The release type, one of:

        Rel   General release

        Test   A test release that is provided with general diagnostic capabilities

        Alpha   A release for the purpose of Diebold Elections internal testing

        Beta   A third party test release

I   This indicates the ROM socket. If this character is not present, assume that the ROM is type A.

        A   Main

        B   Expansion

CCCC   The ROM checksum, used to verify the contents of the ROM chip

YY-MM-DD The release date in international format

Appendix F: RS-232 Pin Definitions

The following table defines the signals and corresponding pins on the rear DB9-M serial connector which is wired as a DTE. This table represents a complete definition of all the pin assignments for the connector.

Note that not all of these pins are used by the AccuVote-OS ballot processing unit.

DB9-M PIN NO.	SIGNAL NAME	SIGNAL FUNCTION	SIGNAL DIRECTION	USED BY ACCUVOTE-OS?
1	DCD	Data Carrier Detect	From Host	N
2	RXD	Receive Data	From Host	Y
3	TXD	Transmit Data	To Host	Y
4	DTR	Data Terminal Ready	To Host	N
5	GND	Signal Ground	Both	Y
6	DSR	Data Set Ready	From Host	N
7	RTS	Request to Send	To Host	N
8	CTS	Clear to Send	From Host	N
9	RI	Ring Indicator	From Host	N

13.9. Adapter cable

The following table defines the signals and corresponding pins on the DB9-F to DB25-M external adapter cable (Diebold PN 192-1121):

SIGNAL NAME

	SIGNAL FUNCTION	DB9-F PIN NO.	DB25-M PIN NO.
DCD	Data Carrier Detect	1	8
RXD	Receive Data	2	3
TXD	Transmit Data	3	2
DTR	Data Terminal Ready	4	20
GND	Signal Ground	5	7
DSR	Data Set Ready	6	6
RTS	Request to Send	7	4
CTS	Clear to Send	8	5
RI	Ring Indicator	9	22