



System Installation and Maintenance Guide

AutoMARK Voter Assist Terminal Model A100/A200



PUBLISHED BY

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Our documentation currently references the use of AutoMARK with Diebold AccuVote tabulators. Elections created by Diebold Gems are currently not federally certified for import. And manual entry of data for use with Diebold Accuvote ballots is not federally certified.

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Filename and Number	Revision	DATE	RELEASE APPROVAL
AutoMARK 3210 System Installation and Maintenance Guide AQS-13-5010-001-F.doc	11	1/17/2011	M. Norris

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The most current active version of this document is maintained electronically in the Automark Quality System documentation database. Printed copies are considered obsolete.

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1. INTRODUCTION

Note:

Three types of tabulators work with the AutoMARK VAT—the ES&S M100, the ES&S Optech and the Diebold Accuvote. Sections specific to the Optech tabulator are clearly identified, usually by a text box or other type of box.

A. Purpose

The information contained in this document is to guide election officials using the AutoMARK Voter Assist Terminal through installing and maintaining the system.

B. Scope

1. Content and Format

This document contains an overview of the AutoMARK™ VAT system setup and maintenance procedures and is written in compliance with Federal Election Commission (FEC) Federal Voting System Standards (FVSS Vol. II, Section 2.9 thru 2.9.6),

Where applicable, references to specific FVSS requirements are indicated throughout this document.

2. Primary Use

This document is designed to serve as a guideline for installation and maintenance of the AutoMARK system. The intended audience is state and local election officials and precinct staff.

3. Proprietary Information

The AutoMARK™ system concepts, as well as many implementation and construction details described in this document, are considered proprietary information protected by a series of U.S. and foreign patents pending.

C. Definitions

Term	Definition
FEC	Federal Election Commission
FVSS	Voting System Standards
FMC	Flash Memory Card
VAT	Voter Assist Terminal
GUI	Graphical User Interface
SBC	Single Board Computer
DSP	Digital Signal Processor
SIB	Switch Interface Board
PEB	Printer Engine Board
PSB	Power Supply Board
PSU	Power Supply Unit
GGB	Gas Gauge Board
USD	Ultrasonic Sheet Detector

DSA	Dual Switch Access
CIS	Contact Image Sensor

2. STRUCTURE AND FUNCTION OF THE EQUIPMENT

A. Basic Functionality

The AutoMARK Voter Assist Terminal (VAT) is comprised of a touch screen monitor and an integral ballot printer. To use the device, the voter inserts a preprinted blank ballot into the input tray of the device. The mechanism draws in the ballot, and scans a preprinted bar code on the ballot to determine which form of ballot has been inserted. The VAT then displays a series of menu-driven voting choices on its color screen. The voter uses the touch screen to make voting selections. The VAT stores these choices in its internal memory. When the voter has completed the selection process, the VAT provides a summary of the voter's choices for review. Using the menu on the touch screen, the voter confirms his or her selections, and the AutoMARK VAT marks the ballot using its built-in printer. The print mechanism is a duplex device—it can print on both sides of the ballot. When the printing is completed, the mechanism feeds the ballot back to the voter. Once a ballot has been marked according to the voter's instructions, the AutoMARK VAT clears its internal memory—the paper ballot is the only lasting record of the voting selections made. The voter may visually confirm that the ballot has been marked in accordance with his or her instructions. The voter proceeds to insert the ballot into a ballot box or a standard ballot scanner where it is validated and tallied.

B. Dual-Mode Ballot Concept

The fundamental system concept for the AutoMARK VAT is to provide a means for voters needing assistance in voting to mark a **standard paper ballot**. Voters who are comfortable with hand-marking a ballot will continue to vote in the standard way. As contrasted with competitive systems that use touch screen technology and electronic data capture exclusively, this architecture preserves the safeguard of a human-readable, verifiable, auditable paper ballot. In addition, this architecture does not force election jurisdictions to replace their existing ballot-scanning equipment, or their centralized election software. It reduces equipment costs by avoiding the need to have touch screen terminals for all voters. Based on recent experience that touch screen voting is actually slower for those voters who do not need special assistance, the dual-mode ballot concept speeds up voting and avoids congestion at the polling place, while providing access for those who require it.

C. Alternate Language Support

One purpose of the AutoMARK VAT is to assist voters who are more comfortable with a language other than English. Federal legislation requires certain jurisdictions to provide alternate language support. *(See Section 9.E. for details on alternate language support.)*

D. Functionality for Visually Impaired Voters

The AutoMARK VAT generates audio voting instructions that guide a visually impaired voter through the election sequence. The voter wears headphones to hear the spoken instructions. The voter makes his or her selections by pressing buttons on a specially designed switch panel. The instructions are generated by speech synthesis software or recorded audio files. The voter can adjust the volume to a personally comfortable level and command a phrase or message to be repeated. A tempo (or speed) control is available for those languages generated by speech synthesis.

3. SYSTEM HARDWARE AND OPERATION THEORY

A. Enclosure

The general appearance of the AutoMARK VAT is as shown on the cover page of this document. That picture shows the unit ready to operate, with the LCD screen positioned in front of the voter.

When the system is not in use, the LCD screen folds down and a hinged cover folds over the screen for protection during transportation and storage. (See picture below).



UNIT WITH SCREEN STOWED, TOP COVER DOWN

Preliminary enclosure specifications:

ITEM	ATTRIBUTE	SPEC	UNITS
1.	OVERALL WIDTH	20.8	INCHES
2.	OVERALL DEPTH	26.0	INCHES
3.	OVERALL HEIGHT, DISPLAY IN USE	17.6	INCHES
4.	HEIGHT, DISPLAY STOWED	7.5	INCHES
5.	OVERALL WEIGHT, INCLUDING BATTERIES	48	POUNDS

ENCLOSURE SPECIFICATIONS

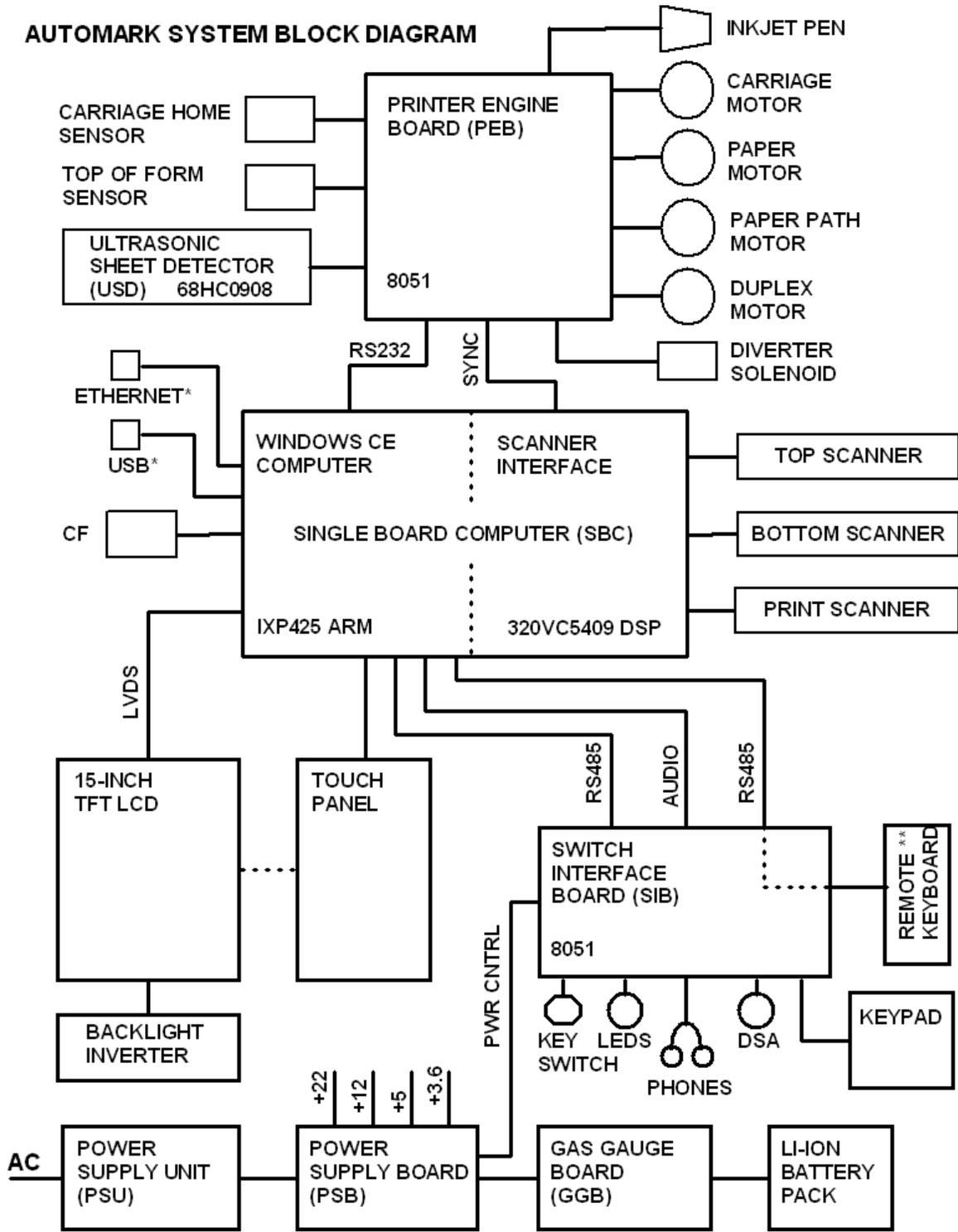
Color scheme for the product:

ITEM	ATTRIBUTE	SPEC
1.	UPPER HOUSING COLOR	GRAY, PANTONE 421
2.	LOWER HOUSING COLOR	GRAY, PANTONE 423
3.	KEYBOARD BACKGROUND COLOR	GRAY, PANTONE 423
4.	KEYBOARD KEY COLOR	BLUE, PANTONE 2945
5.	KEYBOARD LEGEND COLOR	WHITE

COLOR SPECIFICATIONS

B. System Hardware Block Diagram

The following block diagram illustrates the major system elements.



* ETHERNET & USB ARE INTERNAL ONLY, FOR PROGRAMMING & EXPANSION

** FUTURE FEATURE, NOT CURRENTLY IMPLEMENTED

REV. X3

C. Printed Circuit Boards

The following circuit boards are included in the AutoMARK VAT:

ITEM	ABRV.	FULL NAME	FUNCTION	MFG.
1.	SBC	SINGLE BOARD COMPUTER	GUI, APPLICATION SOFTWARE	CUSTOM
2.	SIB	SWITCH INTERFACE BOARD	SWITCH PANEL, AUDIO CONNECTORS	CUSTOM
3.	PEB	PRINTER ENGINE BOARD	PRINTER, PAPER PATH CONTROL	CUSTOM
4.	PSB	POWER SUPPLY BOARD	VOLTAGE AND BATTERY CONTROL	CUSTOM
5.	GGB	GAS GAUGE BOARD	BATTERY STATUS MONITOR	CUSTOM
6.	USD	ULTRASONIC SHEET DETECTOR	PAPER SENSOR	CUSTOM

LIST OF CIRCUIT BOARDS

The above list does not include circuit boards embedded in the brick power supply, the LCD display assembly, or the battery pack.

D. Single Board Computer

The SBC (single board computer) handles the LCD, memory cartridge, audio, and high-level voting application tasks. The following SBC is used in the current design:

ITEM	ATTRIBUTE	SPEC	UNITS
1.	MANUFACTURER	ADS	
2.	PROCESSOR TYPE	INTEL IXP425 XSCALE	
3.	PROCESSOR CLOCK SPEED	533	MHz
4.	PROGRAM MEMORY (HARD DRIVE EQUIV.)	SOLID STATE FLASH	
5.	PROGRAM MEMORY CAPACITY	64	MBYTES
6.	DRAM MEMORY CAPACITY	128	MBYTES
7.	I/O EXPANSION	USB ETHERNET	
8.	COMPACT FLASH CARD INTERFACE, TYPE II	1	
9.	RS-232/RS-422/RS-485 SERIAL PORTS	3	
10.	AUDIO OUTPUT	AC97	

SMALL BOARD COMPUTER SPECIFICATIONS

The USB and Ethernet ports are for factory installation and calibration only and are not externally accessible.

The SBC contains circuitry for interfacing to three contact image sensors (scanners). The SBC generates a clock signal and a start pulse that are sent to each scanner using low-voltage differential signaling (LVDS).

The scanners output clocked digital pixel data which is coupled to serial data interface channels on a digital signal processor (DSP) on the SBC.

The DSP drives a three-channel digital to analog converter (DAC) chip, providing programmable black/white thresholds, allowing calibration software running on the SBC to adjust for variations in scanner performance and production.

The DSP accumulates scanner data in its internal RAM memory which it receives from the three CIS devices. As it receives each complete scan line of 2,048 pixels, it generates a hardware interrupt to the IXP425 main processor. The main processor then copies the scan data by accessing dual-port RAM within the DSP over the DSP's host port interface (HPI), a parallel bus interface.

The SBC contains a 3V lithium coin cell battery. This battery is replaceable only by Authorized Service Personnel.

CAUTION: RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO LOCAL REGULATIONS AND CONVENTIONS.

E. Compact Flash Memory Cartridge

The memory cartridge, which is programmed by the Election Official (or designee) prior to each election, contains all the information necessary to configure the VAT system to an individual precinct and where practical, an entire jurisdiction. It includes the formats of the various ballots, and the settings for the touch screen menus. For languages supported by synthesized speech, the memory cartridge includes ASCII text representing the phonetic elements that are pronounced to generate the audio stream. For certain alternate languages, the memory cartridge includes recorded voice in WAV format. The memory cartridge must be installed into the VAT by an election official. The cartridge is based on re-programmable flash memory. It is a Compact Flash (CF) Type 1 memory cartridge. Detail set-up information of the flash memory cartridge can be found in the Election Officials Guide.

ITEM	ATTRIBUTE	SPEC	UNITS
1.	CARTRIDGE TYPE	COMPACT FLASH	
2.	MEMORY TYPE	FLASH MEMORY	
3.	MEMORY CAPACITY	512	MBYTES

MEMORY CARTRIDGE SPECIFICATIONS

The CF cartridge is plugged into the AutoMARK VAT and left in place during equipment operation. The CF socket is accessible only to an authorized election official, using a mechanical key. A label on the cartridge identifies the election and/or precinct for which the CF has been programmed by election officials. The label is visible through a window in the enclosure when the card is installed in the apparatus. (The CF reader socket is integral to the SBC.)

F. Liquid Crystal Display

The display is a color liquid crystal display, with a portrait orientation. The LCD is a high-contrast device suitable for use in environments with bright ambient light. The LCD is backlit using CCFL (cold cathode fluorescent lamp) devices.

The display is a 15-inch device (measured diagonally). LCD specifications include the following:

ITEM	ATTRIBUTE	SPEC	UNITS
1.	LCD TECHNOLOGY	TFT	
2.	NOMINAL SIZE (DIAGONAL)	15	INCHES
3.	VIEWING AREA, WIDTH	8.9	INCHES
4.	VIEWING AREA, HEIGHT	11.9	INCHES
5.	EQUIVALENT PC SCREEN SPECIFICATION	XGA	
6.	SCREEN RESOLUTION, HORIZONTAL	768	PIXELS
7.	SCREEN RESOLUTION, VERTICAL	1024	PIXELS
8.	COLOR DEPTH	64K	COLORS
9.	DISPLAY BRIGHTNESS	≥250	NITS

LIQUID CRYSTAL DISPLAY SPECIFICATIONS

Current design uses a display panel manufactured by either LG Philips or Sharp.

G. Touch Panel

The LCD display is fitted with a transparent resistive touch panel to allow voter input to the system. Touch panel construction is film over glass.

The system contains touch screen controller circuitry for receiving voter commands. The touch screen controller IC is mounted on the SBC. This integrated circuit continually scans the resistive touch panel and generates commands when it detects that a voter has pointed to a button on the LCD display. These commands are sent over a serial data link to the main processor on the SBC.

H. Audio Subsystem

Visually impaired voters who cannot use the touch panel are guided through the voting process by audio prompts. The AutoMARK terminal is provided with a set of headphones that plug into a headphone jack on the front panel. In order to accommodate headphones that are the personal property of the voter, the terminal provides both a ¼ inch and a ⅛ inch (3.5 mm) headphone jack. These jacks are marked with headphone icons below, and the word **Audio** above.

The AutoMARK terminal comes with a set of headphones for the use of visually impaired voters:

ITEM	ATTRIBUTE	SPECIFICATION	UNITS
1.	TYPE	STEREO	
2.	CORD LENGTH	6	FEET
3.	CONNECTOR	¼" and a 1/8" (3.5mm) headphone jack	
4.	EXPECTED LIFE	10	YEARS

HEADPHONE SPECIFICATIONS

The current design provides headphones with disposable ear covers. Alternately a sanitary kit with alcohol wipes can be provided.

The election sequence using audio is analogous to the visual sequence on the touch screen.

Speech synthesis is used to generate the candidate names and voting instructions for English and many of the alternate languages. Recorded messages are used for certain other languages. (See Section 9.E. for details.)

For audio supported by speech synthesis, messages are encoded as ASCII character strings, stored within the compact flash memory cartridge. The speech synthesis software running on the SBC computer converts these character strings into voice. The SBC provides sufficient processing power to run the voice synthesis program.

The speech synthesis program is Eloquence ETI from ScanSoft. One advantage of speech synthesis as compared to having election officials read and record election prompts is that candidates' names are produced without apparent coloration or bias. In addition, speech synthesis offers the possibility of controlling not only the volume of the audio prompts, but also the tempo (speed) and the sex of the voice (male or female).

Front panel controls allow the voter to modify the characteristics of the synthesized speech:

ITEM	CONTROL FUNCTION	FUNCTIONS	CONTROL TYPE
1.	VOLUME	INCREASE/ DECREASE	ROCKER
2.	SPEED	INCREASE/ DECREASE	ROCKER

SYNTHESIZED SPEECH CONTROLS

The audio controls are incremental (rather than absolute) devices. The user increases or decreases a setting incrementally, and the resulting level is stored in system memory. At the beginning of a voting session, the volume and tempo are set to their default values through microcontroller software. Volume has a range of ten levels; the level defaults to 5 at the beginning of each session. Speed is measured by approximate words per minute and has a range from zero to 250 words per minute, with the default depending on the language. The user can change these settings using the front panel controls. After each voter has concluded a voting session, the settings are restored to their default values.

Each of these two controls is implemented as a two-position rocker switch. When the voter presses the right-hand rocker button, the setting is increased. The left-hand button decreases the setting. (See Section 3.J. for illustration.)

The AutoMARK VAT provides the option of producing either a male or a female voice when speech synthesis is in effect. A voter can toggle from male to female, or female back to male, by holding the REPEAT button down for a preset number of seconds (determined by the election official during set-up of the election), then releasing the button. The sex of the synthesized voice used at the start of an individual voting session may be set by the election official. This preference is stored in the CF cartridge and utilized by the speech synthesis software. The REPEAT button delay time (normally three seconds) is also programmable in the same manner.

I. Switch Interface Board

The SIB handles the keyboard on the AutoMARK front panel, scanning and de-bouncing the switches on the front panel keyboard (Section 3.J.) and generating keyboard codes that it sends to the SBC. The SIB also handles the AT (Assistive Technology) dual-switch access port (Section 3.L).

The key-operated mode switch (Section 4.D.) is also connected to the SIB.

The SIB provides an audible beeper (Section 3.K.) and two status LEDs. Based on the position of this switch, the SIB send control signals to the PSB (Section 4.B.) to turn the system on and off (Section 4.E.), and to provide system feedback to users.

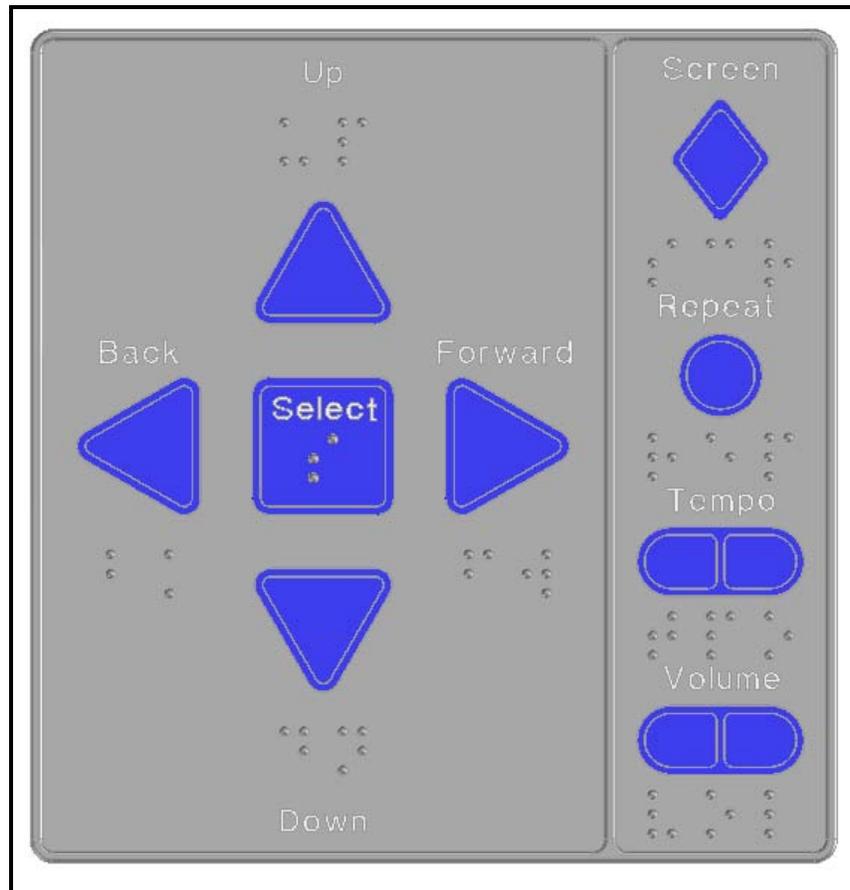
The SIB communicates with the SBC, over an RS-485 serial data link (Section 3.O.).

The SIB utilizes a flash-based 8051 microcontroller to handle the switch inputs and to communicate serially to the SBC.

Audio signals from the SBC are routed to the SIB, which provides audio amplification for the headphones, and houses the headphone connectors.

J. Keypad For Visually Impaired

For use by the visually impaired to input selections in response to the audio commands, the AutoMARK VAT provides a switch panel with layout and contours conducive to voters making selections solely by touch.



SWITCH PANEL FOR VISUALLY IMPAIRED

1. Voting keys

The voting control section of this keyboard contains four arrow keys pointing up, down, back, and forward, with a square SELECT key in the center of the array. The arrow keys are used for navigating through voting menus, and the SELECT key makes a selection.

2. SCREEN key

A visually impaired voter can use the diamond-shaped SCREEN key at the top right of the keyboard to deactivate the LCD display, providing enhanced privacy in the voting process. Pressing this key once blanks the screen; pressing it again activates the screen. The screen is automatically reset to ON at the end of each session. Instructions on the use of this and other keys are provided in the audio voice instructions.

3. REPEAT key

A visually impaired voter can use the round REPEAT key at the right of the keyboard to cause the audio to repeat. The last spoken phrase is repeated. Pressing the key briefly will cause the phrase to repeat after a 5 second delay. Holding down the repeat key for 3 seconds will cause the audio to pause. Pressing the key briefly will resume the audio.

4. TEMPO switches

This pair of switches, arranged like a rocker switch, causes the audio tempo to be retarded or accelerated. (See Section 3.H. for further details.)

5. VOLUME switches

This pair of switches, arranged like rocker switches, is used to increase or decrease the audio volume. (See Section 3.H. for further details.)

Braille legends are provided for all switch functions.

The keyboard legends and switch contacts are rated for 100K actuations or greater over a 10year period.

There is a raised border separating the voter selection section at the left, from the control switch section at the right. (See Section 3.A. for colors.)

The switch array is a purchased assembly, with a pigtail connector that attaches to the Switch Interface Board (SIB).

The entire switch panel assembly is removable as a modular unit for updating as needed to comply with subsequent voter access standards.

K. Audible Feedback

The AutoMARK VAT contains a small audio transducer to provide audible feedback—a beep—to the voter when a function key is pressed on the key pad. However, election officials can override this feature when setting up the election.

The transducer is mounted on the SIB.

L. AT Dual-Switch Access Port

The AutoMARK VAT provides an access port that allows voters with disabilities to plug in a puff-sip or similar input device. The Dual Switch Access (DSA) port provides a 3.5mm audio jack. A voter with disabilities who cannot use either the touch screen or the audio-style system with auxiliary switch panel, can plug a DSA device into this port.

A DSA device provides two contact closures to system ground. On the stereo plug, the common terminal is common (ground). The two switch contacts connect to the tip and ring terminals of the stereo plug.

The following are specifications for a puff-sip device:

ITEM	VOTER ACTION	SWITCH FUNCTION	SWITCH CONTACT	NAVIGATION FUNCTION
1.	SIP	SWITCH 1 CLOSSES	TIP	YES/ SELECT
2.	PUFF	SWITCH 2 CLOSSES	RING	NO/ NEXT

PUFF-SIP FUNCTIONALITY

The following are specifications for a foot pedal device:

ITEM	VOTER ACTION	SWITCH FUNCTION	SWITCH CONTACT	NAVIGATION FUNCTION
1.	LEFT PEDAL	SWITCH 1 CLOSES	TIP	YES/ SELECT
2.	RIGHT PEDAL	SWITCH 2 CLOSES	RING	NO/ NEXT

FOOT PEDAL FUNCTIONALITY

M. Printer Engine Board

The Printer Engine Board (PEB) is a dedicated microcontroller-based board for the print and paper feed mechanisms. It communicates with the SBC over an RS-232 serial data bus.

A separate microcontroller is needed for printer control because the SBC is not well suited for real-time control functions, such as those required for driving a high-speed printer. In addition, a substantial amount of the available processor bandwidth of the SBC computer is typically allocated to LCD data refresh. LCD refresh cycles must occur at very precise intervals to avoid on-screen display artifacts (flicker). These timing requirements tend to conflict with real-time requirements for driving the print and paper-handling mechanisms. In addition, this microcontroller is preferably situated very close to the print head and motor control circuitry, to reduce electrical noise problems.

The PEB is in effect a slave processor that receives text messages and formatting information from the SBC over the serial interface. It actuates the print mechanism elements in such a way to mark the ballot appropriately.

The PEB monitors the printing process, detects a paper jam if it occurs, and provides a message to the SBC in that event.

There is also a single-wire synchronization signal between the PEB and the SBC which is used to signal to the scanner logic each time that the paper has been advanced to the next scan line position.

The following provides specifications for the PEB microcontroller:

ITEM	ATTRIBUTE	SPEC	UNITS
1.	PROCESSOR TYPE	ATMEL AT89C51RB2	
2.	PROCESSOR CLOCK SPEED	24	MHz
3.	PROGRAM MEMORY CAPACITY	16	KBYTES
4.	RAM MEMORY CAPACITY	1.25	KBYTES

PEB MICROCONTROLLER SPECIFICATIONS

N. Program Updates

In order to facilitate continuing evolution of the product—for example, to support new ballot formats—microcontroller firmware can be upgraded after time of manufacture.

ITEM	MEMORY BLOCK	TYPE	PROGRAMMABILITY
1.	WINDOWS CE .NET OPERATING SYSTEM	SBC FLASH MEMORY	REPROGRAM OVER ETHERNET
2.	APPLICATION PROGRAMS IN SBC	SBC FLASH MEMORY	INSTALL SPECIAL CF CARD WITH APPLICATION SOFTWARE
3.	PROGRAM MEMORY FOR PEB MICROCONTROLLER	PEB FLASH MEMORY	INSTALL SPECIAL CF CARD WITH UPGRADED PEB FIRMWARE
4.	PROGRAM MEMORY FOR SIB MICROCONTROLLER	SIB FLASH MEMORY	VIA PROGRAMMING CONNECTOR, SPECIAL PC SOFTWARE
5.	DIGITAL SIGNAL PROCESSOR	SBC FLASH MEMORY	INSTALL SPECIAL CF CARD WITH DSP SOFTWARE
6.	PRECINCT DATA—BALLOTS, AUDIO	COMPACT FLASH 2	BY REPROGRAMMING MEMORY CARD USING PC UTILITIES

MEMORY PROGRAMMABILITY

O. EEPROM Non-Volatile Memory

The AutoMARK VAT contains an EEPROM (electrically erasable programmable read-only memory) array that can be programmed in-circuit by firmware running in the SBC. This EEPROM array is included on the SBC. It is used for storing factory calibrations, as well as data that can change during machine operation, such as a running tally of number of ballots. The size of the EEPROM array available for this purpose is 1,024 bytes.

P. Duplex Print Mechanism

A key element of the AutoMARK VAT is an inkjet print mechanism that allows a single inkjet pen to mark on both the top and bottom sides of a preprinted paper ballot.

The print mechanism is capable of printing on any of the specified existing industry-standard ballot sizes. To accommodate these ballot formats, the AutoMARK VAT can be equipped with different escutcheons on the outside, at the ballot entry port. Different internal paper guide elements are not required.

ITEM	BALLOT TYPE	WIDTH	MIN. LENGTH	MAX. LENGTH	SIDES PRINTED
1.	M100	8.50 IN.	11.00 IN.	19.00 IN.	1 OR 2
2.	OPTECH	3.75, 6.75, 9.75 IN.	11.00 IN.	22.00 IN.	1 OR 2
3.	ACCUVOTE	8.50 IN.	11.00 IN.	22.00 IN.	1 OR 2

BALLOT PRINT SPECIFICATIONS

The voter inserts the paper ballot through the paper tray at the front of the machine. The machine returns the ballot to the voter at the same location.

While a ballot is being printed, it will not be visible or accessible to the voter. In the case of ballots longer than approximately 17 inches, the end of the ballot closest to the voter is diverted 180° into a channel formed between removable access covers beneath the LCD screen recess, to avoid its projecting momentarily into the ballot tray at the front of the machine.

The ballot-marking printer within the AutoMARK VAT uses a standard Ink cartridge for a non-infrared tabulator, and a special cartridge with infrared opaque ink for an infrared tabulator. Both are manufactured for ATS by Hewlett Packard. The pen is positioned by a custom-designed print mechanism capable of printing on media up to 9.75 inches wide and on both sides of an inserted ballot.

ITEM	ATTRIBUTE	SPEC	UNITS
1.	INK CARTRIDGE FOR NON-INFRARED	Type	87002
2.	INK CARTRIDGE FOR NON- INFRARED	Type	87003
4.	INSERTABLE FORM WIDTH, MAXIMUM	9.75	INCHES
5.	HORIZONTAL PRINT DENSITY	140.61	DOTS/INCH
6.	VERTICAL PRINT DENSITY	96	DOTS/INCH

PRINT MECHANISM SPECIFICATIONS

The enclosure provides two means of access to the print mechanism so that election officials can inspect the paper path and clear any paper jams:

1. Top access door

There is a removable door on the top of the unit, beneath the fold-up LCD display, which provides access to the paper path from the front of the unit, up to the input of the print mechanism.

2. Rear access door

There is a removable section at the back of the unit, along the back surface of the print mechanism. When snapped out, access is provided to the curved paper path at the back of the print mechanism.

The design intent is for the inkjet pen to be removed from the system after each election. This avoids deterioration of the ink during storage caused by extreme temperatures, and clogging of the ink apertures in the pen. A new inkjet pen should be installed before each election.

Q. Optical Scanners

Three optical scanners are included within the AutoMARK VAT. Two are mounted close to the front of the machine, so as to identify the ballot orientation and style as soon as possible after it is inserted. One scanner is positioned to read the top surface of the ballot, one to read the bottom. The purposes of these first two scanners are:

1. Alignment

To read the positions of alignment marks on the preprinted ballot (or to register the positions of the edges of narrow-width ballots) so as to provide precise alignment of AutoMARK printed marks to the ballot.

2. Ballot style decoding

To read bar codes on the preprinted ballot that indicate the exact style of ballot that has been inserted into the device.

3. Previously-marked ballot

To check whether a ballot has already been marked.

A third optical scanner is mounted close to the exit path from the inkjet print pen. The purposes of this third scanner are:

1. Mark validation

To validate that the inkjet printer has printed each mark corresponding to the voter's selections, at the correct positions on the ballot.

2. Printer alignment

To provide more accurate alignment of printed ballot marks to the inkjet print pen.

Each optical scanner is a purchased contact image sensor (CIS) assembly. Each CIS is made up of multiple photoelectric sensor integrated circuits with a resolution of 8 pixels per millimeter (203.2 per inch), a standard resolution. Each scanner provides 2,048 pixels, covering 10.08 inches, which is sufficient to handle ballots up to 9.75 inches wide. Each assembly contains its own light source, an array of red LEDs.

ITEM	ATTRIBUTE	SPEC	UNITS
1.	BALLOT WIDTH COVERED BY SCANNER	10.08	INCHES
2.	HORIZONTAL SCANNER RESOLUTION	203.2	PIXELS/IN.
3.	VERTICAL SCANNER RESOLUTION	200	LINES/IN.
4.	PEAK WAVELENGTH, LED ILLUMINATION	660	NM
5.	OPTICAL DEPTH OF FIELD	0.6	MM
6.	INTERFACE TO SBC	SERIAL DIGITAL	
7.	SCANNING SPEED	1	MS/LINE
8.	BALLOT DECODING TIME (FROM BALLOT INSERTION TO FIRST VOTING SCREEN, BASED ON SAMPLE AUTOMARK BALLOT USED AT IACREOT 2003)	≤4	SECONDS

SCANNER SPECIFICATIONS

Because some ballots do not provide preprinted alignment marks, it is necessary to sense ballot alignment within the machine by detecting the edges of the ballot. The scanners detect the area outside the borders of the ballot as a black background, satisfying this requirement.

4. SYSTEM POWER

A. Power Supply

The AutoMARK VAT contains a built-in power supply system that operates from standard AC line voltages. It receives AC line voltage from a standard IEC-320 plug at the rear of the enclosure, which connects to a detachable line cord. Each AutoMARK VAT is provided with a line cord suitable for connection to North American three-wire 120 VAC 60 Hz receptacles.

ITEM	ATTRIBUTE	SPEC	UNITS
1.	INPUT POWER VOLTAGE	93-264	VAC
2.	INPUT POWER FREQUENCY	45-66	Hz
3.	NORTH AMERICAN LINE CORD	6	FEET
4.	BATTERY HOLD-UP TIME, MINIMUM	2	HOURS

INPUT POWER SPECIFICATIONS

The AutoMARK VAT includes a 12-volt brick supply, a line-operated switching power supply that generates a regulated output of +12 VDC.

An internal battery pack is also provided with sufficient capacity to allow continuous operation after loss of AC power, for at least two hours. The power supply automatically switches from the 12 VDC provided by the brick supply to battery power when AC power is lost.

When calculating the required battery capacity, we have assumed that there will be 12 voting sessions per hour. The LCD display and LCD backlight will run continuously when AC power is lost, but the backlight is dimmed during loss of AC power to conserve power. Power to the scanners and printer is switched on only when needed.

The Lithium-Ion Battery Pack is replaceable only by Authorized Service Personnel.

CAUTION: RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO LOCAL REGULATIONS AND CONVENTIONS.

The specifications for the battery system within the AutoMARK VAT are as follows:

ITEM	ATTRIBUTE	SPEC	UNITS
1.	BATTERY CHEMISTRY	LITHIUM ION	
2.	OPERATION FROM BATTERY	>2	Hours
3.	NUMBER OF CELLS	10	
4.	CELL ARRANGEMENT	2 x 5 IN SERIES	
5.	USEFUL VOLTAGE RANGE	7.2 TO 8.4	VDC

BATTERY SPECIFICATIONS

B. Power Supply Board

The PSB is a custom power supply board that provides the following functions:

1. Automatic line/battery switching

Upon loss of AC power, automatically switches from the +12 VDC potential from the line-operated brick supply, to the lower voltage from the battery pack.

2. Battery charging

Charges the lithium-ion battery pack. Charging takes place when the battery pack is low and either the AC line cord is connected to AC power, or an optional battery charger is plugged in. (The LCD Screen must be folded down in its storage position for the external charger to be activated.)

3. Voltage conversion

Converts the single potential available from the brick supply or the battery—which ranges from 7.2 to 12 volts—to all of the multiple regulated voltages needed by the electronics, display, print mechanism, and paper feed motors within the system.

C. Battery Status Indicator

A battery status indicator is located on the rear panel of the AutoMARK VAT. It takes the form of an LED bar graph array that appears through an opening to the right of the power entry connector on the rear of the enclosure. The bar graph is vertically oriented, and has functionality similar to an automotive gas gauge. The circuitry for measuring and displaying battery status is contained on a dedicated circuit card, the GGB (Gas Gauge Board).

The battery status indicator helps election officials prepare a group of AutoMARK VAT devices for an upcoming election. A number of units can be stored on a rack in a warehouse, positioned so that their rear panels are visible from the warehouse aisle. The bar graph provides a simple and clear means of determining whether the battery pack is charged and ready for use.

The bar graph has 10 segments. The bottom segment (segment 1) signals battery charging status, as follows:

SEGMENT 1	CHARGE STATUS
OFF	NOT CHARGING
DIM	TOP-OFF CHARGE
BRIGHT	CONDITIONING OR FULL CHARGE

BATTERY INDICATOR SEGMENT 1: CHARGING INDICATOR

Segments 2 through 10 show progressively higher levels of battery charge status—two segments lit indicate a nearly discharged battery pack, while 10 segments lit show a fully-charged battery pack.

SEGMENTS	CAPACITY	VOLTS
2	4%	7.12
3	10%	7.28
4	25%	7.44
5	50%	7.60
6	70%	7.76
7	80%	7.92
8	90%	8.08
9	99%	8.24
10	100%	8.40

BATTERY INDICATOR SEGMENTS 2-9: CHARGE STATUS

D. External Charger

The bar graph is active when the AutoMARK VAT is connected to a source of AC power, or the external charger is active. It also lights up when a person depresses a small pushbutton on the rear panel, next to the bar graph display. This allows you to check the battery status when the machine is in storage.

A small power jack appears on the rear panel of the AutoMARK VAT. An optional external battery charger can be plugged into this jack. This jack allows the battery pack to be charged even when the main line cord is not connected to AC power.

The main intended use of the external charger is to allow battery packs to be charged when units are stored in a warehouse. With an external charger connected, the back power supply is not needed for battery charging. This allows charging to proceed while the machine is on a rack, in or out of its storage container, whether or not the power switch on the front is turned on. Use of an external charger reduces heat build-up within the unit, as compared to use of the brick supply.

For the external charger to be effective the LCD screen must be folded down into the storage position.

Item	Attribute	Spec	Units
1.	Charging Voltage	12.0	VDC
2.	Maximum Power	50	Watts

CHARGER SPECIFICATIONS

Automark Technical Systems LLC, makes available a commercial off-the-shelf power supply module that is UL-listed and is suitable for use as an external charger.

E. Key-Operated Mode Switch

The AutoMARK VAT has a key-actuated switch at the front of the enclosure that is used by authorized election officials to control the system's operating mode.

ITEM	KEY POSITION	LABEL	KEY REMOVABLE
1.	LEFT	OFF	YES
2.	CENTER	ON	YES
3.	RIGHT	TEST	NO

KEY SWITCH POSITIONS

By default, all AutoMARK systems are shipped keyed alike. Election officials requesting a set of unique keys for their jurisdiction, or different keys for each unit, will require the key lock assembly to be retrofitted at additional cost.

The switch contacts are connected to low-voltage circuits—they do not directly switch the AC or DC (battery) power input sources. When the key-actuated switch is in the RUN or TEST positions, then the AutoMARK terminal is switched on, and power is drawn from the AC power line (if available) or the battery pack (only if AC power is unavailable).

When the system is powered up and the switch is moved to the OFF position, AC power continues to be supplied to the brick power supply. Control logic turns off the secondary power supplies on the PSB.

When the key is in the TEST position, it develops a TEST signal that is made available to the SBC. When in TEST mode, the SBC allows election officials to perform certain set-up, reporting, and maintenance functions.

F. Pilot Light And Power Monitor

The AutoMARK VAT has two LED lamps on its front panel that indicate the current status of the power supply. The ON lamp is located at the ON position of the key-operated switch. It shows power status as follows:

ITEM	LED ATTRIBUTE	POWER SOURCE	BATTERY STATUS
1.	STEADY GREEN	AC POWER	BATTERIES CHARGED
2.	BLINKING GREEN	AC POWER	BATTERIES LOW OR DISCHARGED
3.	STEADY AMBER	BATTERY POWER	BATTERIES CHARGED
4.	BLINKING AMBER	BATTERY POWER	BATTERIES LOW

GREEN/YELLOW POWER ON LAMP

The OFF lamp is located at the OFF position of the key-operated switch. This red LED lights up when the system is turned off, but AC power is plugged in. These pilot lamps are driven by the microcontroller on the SIB, based on switch inputs and power status signals developed by the PSB.

5. EQUIPMENT NAMEPLATE

An equipment label is affixed to the rear panel of the AutoMARK VAT. It provides a model number, serial number, and electrical information required by UL and any other applicable electrical compliance organizations.

6. ENVIRONMENTAL

The AutoMARK VAT is designed for the following environmental conditions:

CONDITION	MINIMUM	MAXIMUM	UNITS
OPERATION	50	104	°F
	10%	50%	RELATIVE HUMIDITY
STORAGE	-4	140	°F
	10%	85%	RELATIVE HUMIDITY

ENVIRONMENTAL SPECIFICATIONS

7. SHIPPING CONTAINER

A shipping container is available for the AutoMARK VAT. It provides sufficient padding and protection to permit long-distance shipment of the unit via common carrier.

When storing the AutoMARK machine, please make sure the machine is stored inside the plastic bag that was shipped with the unit. This will help avoid exposure to moisture and dust.

8. SYSTEM SOFTWARE

A. Aims Software

Automark Technical Systems has created AIMS (AutoMARK Information Management Software) for use by election jurisdictions and service bureaus. This package is a Windows® application that compiles and organizes the data needed to print ballots and prepare the compact flash for the AutoMARK VAT. The functions of AIMS include:

Utilities for entering election data.

Utilities for importing election data from de facto industry standard database formats.

Utilities for generating synthesized speech messages for races, candidate names, and propositions, and for adjusting proper pronunciation of those messages phonetically.

Utilities for storing recorded voice messages in WAV format for audio voice prompts that are not in synthesized format.

Utilities for storing election data on compact flash cards.

B. Memory Cartridge Capacity

A single 256 megabyte memory cartridge can hold all ballot styles, audio text files, language translations, and audio WAV files used in a single jurisdiction.

C. SBC Computer OS

The SBC computer uses the Windows CE.NET operating system, version 5.0 or later.

D. Programming Languages

The graphical user interface (GUI) is written in VB.NET.

Other elements of the embedded firmware running on the SBC-- device handlers and software for handling the election database-- are written in C, C++, and C#.

The firmware for the PEB is written in C, with some assembly language routines to support high-speed print engine functions.

The firmware for the SIB is written in C.

The firmware for the USD is written in C, with some assembly language routines to support high-speed ultrasonic pulse transmission and reception functions.

AIMS is written in Access, SQL, and Visual Basic for Applications, with supporting DLLs in C and C++.

E. Language Support

The AutoMARK VAT currently supports the following languages, both on its screen messages, and through synthesized speech:

- English
- Spanish
- Chinese
- Korean
- Japanese

These languages are supported both by the Eloquence speech synthesis program, and by national character sets for the LCD screen.

The AutoMARK VAT also supports the following three additional alternate languages:

- Vietnamese
- Tagalog
- Haitian Creole
- Cantonese Chinese

Vietnamese, Tagalog, Cantonese and Creole are not currently supported by Eloquence speech synthesis. Voting instructions for these languages are provided as prerecorded files in WAV format. Vietnamese, Tagalog, Cantonese and Creole text appears on the LCD screen.

To support additional languages, election officials must record the voting instructions in the target language, and store these messages as audio files in WAV format on the compact flash cartridge. Optional add-on extensions to the AIMS software package contain appropriate utilities.

9. PRE-ELECTION INSPECTION PROCEDURE

One individual is required to perform the pre-election inspection procedure. ATS recommends that a trained service technician be responsible for this procedure.

The following inspections should be performed prior to each election:

1. Check belts for correct tension.

To perform this task the following steps must be taken:

- A. Remove top cover of VAT. See section 10.B of this Maintenance Guide.
- B. Locate Motor drive belts on the left and right side of the paper path.
- C. Visually and physically inspect belts for absence of sagging.
- D. In event sagging of belts are observed, readjust appropriate motor mount tensioner or tensioner bracket by loosening screws adjusting position of motor or tensioner bracket, and retightening screws.

- E. Power unit, Turn key switch to the ON position, insert ballot election data on to VAT, and run ballot through VAT prior to reinstalling to cover of VAT to confirm that belt does not skip.
- F. Remove power from unit, turn key switch to the OFF position
- G. Re-Install top cover of VAT

2. Check belts for flats due to inactivity.

To perform this task the following steps must be taken:

- A. Remove top cover of VAT. See section 10.B of this Maintenance Guide.
- B. Locate Motor drive belts on the left and right side of the paper path.
- C. Visually and physically inspect belts for absence of flat spots.
- D. In event flat spots in belts are observed, replace belt by loosening screws on tensioner adjusting position of motor or tensioner bracket, removing old belt and installing new belt.
- E. Follow protocol set forth above for tensioning belts to ensure that new belt has proper tension.
- F. Re-Install top cover of VAT

3. Clean scanners.

4. Check roller bearings for wear and free operation.

To perform this task the following steps must be taken:

- A. . Remove top cover of VAT. See section 10.B of this Maintenance Guide.
- B. Locate roller bearings on either side of the paper path.
- C. Visually and physically inspect roller bearings for wear and free operation.
- D. In event the roller bearing is not freely functioning or exhibits wear, replace roller bearing.
- E. Re-Install top cover of VAT

5. Check rollers for wear and free operation.

To perform this task the following steps must be taken:

- A. Remove top cover of VAT. See section 10.B of this Maintenance Guide.
- B. Locate rollers located within paper path.
- C. Visually and physically inspect rollers for wear and free operation.
- D. In event the roller is not freely functioning or exhibits wear, replace roller.
- E. Re-Install top cover of VAT

6. Check drive and idler pulleys for wear.

To perform this task the following steps must be taken:

- A. Remove top cover of VAT. See section 10.B of this Maintenance Guide.
- B. Locate drive and idler pulleys on the left and right sides of the paper path.
- C. Visually and physically inspect drive and idler pulleys for wear, tension, and free operation.
- D. In event the drive and idler pulleys are not freely functioning or exhibits wear, replace.
- E. Re-Install top cover of VAT

7. Check print carriage rod for wear and end to end play.

To perform this task the following steps must be taken:

- A. Remove top cover of VAT. See section 10.B of this Maintenance Guide.
- B. Locate printer assembly on the rear top portion of paper path.
- C. Visually and physically inspect carriage rod for wear and end-to-end play by moving print head along carriage rod.
- D. In event the carriage rod exhibits wear or does not permit end-to-end play of the print head carriage, replace carriage rod or carriage.
- E. Re-Install top cover of VAT

8. Replace ink pad if needed.

To perform this task the following steps must be taken:

- A. Re-Install top cover of VAT
- B. Visually inspect ink pad to determine if saturated.
- C. If saturated remove ink pad and replace.
- D. Close rear battery compartment cover.

9. Replace ink-cartridge.

10. Check print head wiper for proper adjustment.

Note:

This step is **only for Optech users**.

If the Infrared Printing (spit and wipe) functionality has been enabled, it is necessary to make sure that the rubber wiper blade is in the proper position to clear the print cartridge nozzles at each pass.

Follow the steps below to adjust the wiper blade.

1. Loosen the torque screw holding the wiper blade in place,
2. Raise or lower the assembly using the Phillips Head screw on top.
3. Re-tighten the torque screw.

Replacing the 'diaper':

The 'diaper' is a foam mat in a removable plastic tray located under the flap that opens in the back of the VAT. A new 'diaper' should be in place prior to a new election.

11. Check diverter solenoid for proper activation.

To perform this task the following steps must be taken:

- A. Remove top cover of VAT. See section 10.B of this Maintenance Guide.
- B. Apply Power to VAT, insert ballot election data, and turn VAT keyswitch to the ON position.
- C. Insert ballot into the VAT and observe duplexing operation for absence of paper jams and crisp activation of solenoid.
- D. In the event duplexing operation is not completed or diverter comb is not properly actuating check cable connection to solenoid. In the event cable connections are proper, replace diverter solenoid assembly and diverter comb.
- E. Test proper activation of diverter solenoid.
- F. Turn key switch to off position and remove power from unit.
- G. Re-Install top cover of VAT

12. Check diverter comb for wear and proper activation.

To perform this task the following steps must be taken:

- A. Remove top cover of VAT. See section 10.B of this Maintenance Guide.
- B. Apply Power to VAT, insert ballot election data, and turn VAT keyswitch to the ON position.
- C. Insert ballot into the VAT and observe duplexing operation for absence of paper jams and crisp activation of diverter comb.
- D. In the event diverter comb is not properly actuating check cable connection to solenoid. In the event cable connections proper, replace diverter solenoid assembly and diverter comb.
- E. Test proper activation of diverter solenoid and activation of diverter comb.

- F. Turn key switch to off position and remove power from unit.
- G. Re-Install top cover of VAT

13. Check diverter crank for wear and proper activation.

To perform this task the following steps must be taken:

- A. Remove top cover of VAT. See section 10.B of this Maintenance Guide.
- B. Apply Power to VAT, insert ballot election data, and turn VAT keyswitch to the ON position.
- C. Insert ballot into the VAT and observe duplexing operation for absence of paper jams and crisp activation of diverter crank.
- D. In the event diverter crank is worn or is not properly actuating check cable connection to solenoid. In the event cable connections proper, replace diverter solenoid assembly and diverter comb.
- E. Test proper activation of diverter solenoid and activation of diverter crank.
- F. Turn key switch to off position and remove power from unit.
- G. Re-Install top cover of VAT

14. Check Teflon pad on back of diverter comb for wear.

To perform this task the following steps must be taken:

- A. Remove top cover of VAT. See section 15 of this Maintenance Guide.
- B. Apply Power to VAT, insert ballot election data, and turn VAT keyswitch to the ON position.
- C. Inspect Teflon pad located on the back of the diverter comb for wear.
- D. Replace Diverter Comb & Teflon pad assembly if wear on the Teflon pad is observed.
- E. Test proper activation of diverter solenoid and activation of diverter comb.
- F. Turn key switch to off position and remove power from unit.
- G. Re-Install top cover of VAT

15. Check diverter spring for proper pull-back.

To perform this task the following steps must be taken:

- A. Remove top cover of VAT. See section 10.B of this Maintenance Guide.
- B. Apply Power to VAT, insert ballot election data, and turn VAT keyswitch to the ON position.
- C. Insert ballot into the VAT and observe duplexing operation for absence of paper jams and crisp activation of diverter spring.
- D. In the event the diverter spring is not properly actuating replace spring and inspect solenoid, diverter solenoid assembly and diverter comb per steps outlined above.

E. Test proper activation of diverter spring.

F. Turn key switch to off position and remove power from unit.

G. Re-Install top cover of VAT

Check LCD Hinges for proper movement.

To perform this task the following steps must be taken:

A. Remove top cover of VAT. See section of 10.B of this Maintenance Guide.

B. Visual inspect movement of LCD Hinges while moving screen up and down.

C. In the event uneven operation or wear is observed, replace LCD Hinges.

D. Re-Install top cover of VAT.

10. PREVENTIVE MAINTENANCE PROCEDURES

The following table lists the major parts and materials needed to maintain the AutoMARK™ VAT, along with sources.

Parts and Materials Needed					
Type	Size	Value Each (Approximate)	Manufacturer's Designation	Individual Quantity Needed	Sources
TORX Screwdriver	#10 (4-inch minimum length)	\$3.50	Torx T-10-80mm TORX DRIVER	1	West Side Industrial Supply, Inc., Elgin, IL 1-847-931-7200 www.westsidedelivers.com
TORX Right Angle Screwdriver	#10 (2-inch minimum length)	\$1.37	Torx T-10-51mm TORX SHORT ARM L-KEY	1	West Side Industrial Supply, Inc., Elgin, IL 1-847-931-7200 www.westsidedelivers.com
Compressed Air Can	10 oz.	\$5.99	OfficeMax brand 10 oz. gas duster	1	OfficeMax www.OfficeMax.com 1-800-283-7674
Anti-Static Cleaning Wipes	N/A	\$6.99	Fellows 100 Anti-Static Cleaning Wipes	1 pack	OfficeMax www.OfficeMax.com 1-800-283-7674
Conductive, Non-Resistive White Lithium Grease	Tub	4.22 per pound	Renolit ST-80	1 pound	Fuchs Lubricant Co. 1-800-800-OILS
Small Art Paintbrush	Small	\$5	N/A	1	Any office supply store

One individual is required for the preventive maintenance procedures that follow. ATS recommends that an election official at each polling place be responsible for these maintenance procedures. General computer usage skills are required.

A. Installing and Removing the Flash Memory Card

After elections, the preparation for storage involves removing the Flash Memory Card (FMC) from behind the locked door, as the system should not be stored with an FMC installed. The unit cannot operate without an FMC card. For security reasons, removing the card during operation requires that the machine be restarted. See Figure 5.1, below and the AutoMARK Jurisdiction Guide for more information on FMC installation and removal.

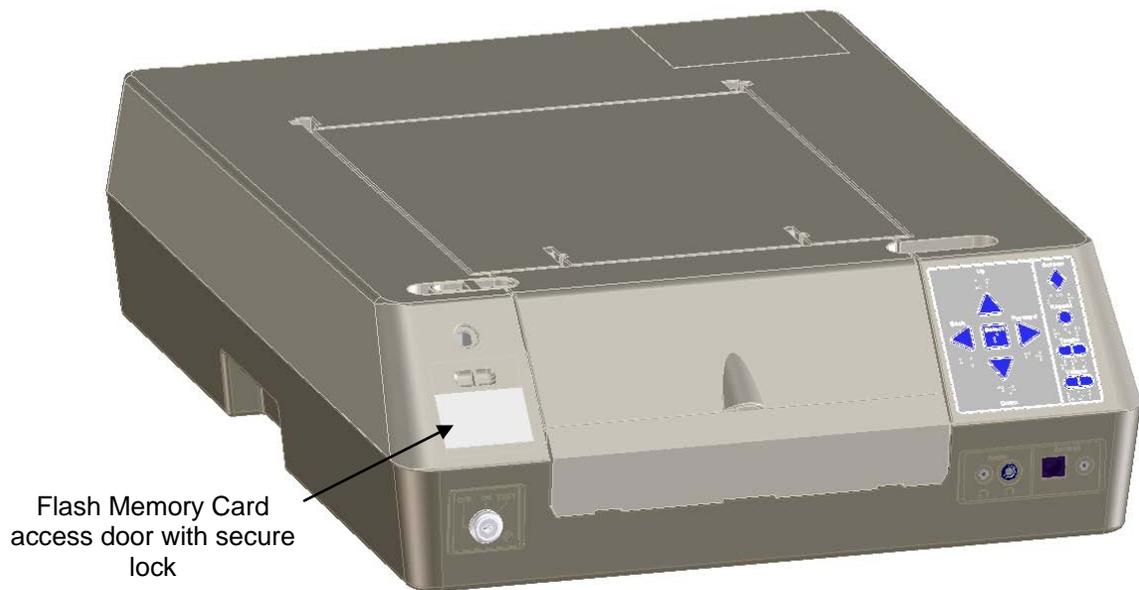


Figure 5.1 Flash Memory Card Access

B. Installing the Ink Cartridge

The AutoMARK system is shipped with no ink cartridge installed. The ink cartridge should be installed prior to using the system for voting. Please refer to the AutoMARK Jurisdiction Guide for information on installing an ink cartridge.

One (1) person with basic computer skills can perform this maintenance task.

Prior to packing the unit in its shipping crate, the used print cartridge should be removed and discarded. It should not be stored with the device between election periods. Refer to the AutoMARK Jurisdiction Guide for more information on this topic.

C. Preventative Maintenance during High Volume Accuracy Testing

A full PM or Preventative Maintenance routine is recommended to ensure the AutoMARK machine is properly prepared. **See section 9: PRE-ELECTION INSPECTION PROCEDURE**

During high volume or accuracy testing preventative maintenance must be done at a higher frequency, at the end of each batch of ballots which may be multiple times per day. A full PM must also be done each morning prior to the start of ballot marking.

Option: During the day after a batch of ballots, a partial PM may be performed but always keep in mind the option to perform a full PM if necessary. A partial PM consists of running a test print to evaluate the position of the mark accuracy.

For accuracy volume testing, an election should be defined as a “Batch” of ballots and the subsequent printing of the operations log.

For accuracy and volume testing, there will be two types of ballots that will be marked. The two ballot styles are: M100 or OVAL style, and the second are Optech or ARROW style.

“An Election” or batch of OVAL style will be 44 ballots plus printing of the Operations Log.

“An Election” or batch of Arrow style will be 51 ballots plus the Operations Log.

After each batch of ballots has been completed and the operations log printed, please do the following in addition to PM routine:

1. Confirm the date on the outside of the ink package.
2. Replace ink cartridge with a new fresh cartridge.
3. Log the number of the ink cartridge and the machine number.
4. Confirm wiper is correctly positioned and contacting the print nozzle. (Jumangi Ink specifically)

CHANGE OVER FROM M100 TO OPTTECH / ARROW STYLE

Before starting accuracy testing for Arrow style ballots, a more stringent PM routine is required due to of the difference in ballot recognition and use of infra-red ink.

The following Printer Calibration routine is recommended prior to each Election / Start of a new batch when marking Arrow style ballots :

1. Use M100 style ballots and election data and perform a printer calibration and enable suggestions (Typically 1-3 ballots will be required)
2. Change machine ink setting to infra-red for Arrow style ballots.
3. Install CF card with ElectionData for Arrow style ballots
4. Perform a test print and make manual adjustments as required based on visual inspection of mark s on ballots.

11. CORRECTIVE MAINTENANCE PROCEDURES

One individual is required for the corrective maintenance procedures that follow. ATS recommends that an election official at each polling place be responsible for these maintenance procedures. General computer usage skills are required.

A. Clearing a Paper Jam

Please refer to Section 16 A, "Top Cleanout Removal and Installation" for information on clearing a jammed ballot from the top of the paper path. Refer to "Clearing a Paper Jam at the Rear of the Unit" in Section 16 G for information on clearing a jammed ballot from the rear of the system.

B. Replacing an Ink Cartridge

Please refer to 3.B, above, and the AutoMARK Jurisdiction Guide for information on replacing an ink cartridge.

C. Calibrating the Printer

Refer to the AutoMARK Jurisdiction Guide for information on calibrating the printer.

D. Incorrect Software or Firmware Malfunction

If the software is corrupt, have the vendor reload the software.

If there is a bug or similar problem with the current, certified software, have the vendor load the new, updated version of the software.

Note: To upgrade the software, see Section 14, "Procedure for Incorporating New Software

Releases" below.

12. PARTS AND MATERIALS

A. Accessories

ATS recommends that the following spare devices/components be kept on hand during system operation. If you need any of these items, please contact your AutoMARK™ VAT vendor.

Location: Jurisdiction Central Location

- 2-3 extra pairs of headphones
- One (1) Brick battery charger
- Print cartridges
 - Extra Table Rock print cartridges for oval ballot sites
 - Extra infrared print cartridges sites using infrared tabulators.

Location: Polling Place

- One Table Rock print cartridge for oval ballot precincts, two infrared print cartridges for sites using infrared tabulators.

M100 Ballot Specifications Summary*		
Paper	Stock	Index card
	Width	8.5 in.
	Height	11, 14, 17, or 19 in.
	Thickness	0.0070 in.
	Shape	Rectangular
	Color	See ES&S documentation*
	Watermarks	NO watermarks in ID mark zones or voting position zones
Orientation	Portrait or Landscape	
Printing	Size	See ES&S documentation*
	Style	See ES&S documentation*
Mark Fields**	Size	0.125 in. to either side of ovals by 0.100 in. above and below center of ovals
	Location	Corresponds to alignment marks
Placement of Alignment Marks		Both sides of ballot, front and back, .250 in. apart from the center of the timing mark.
Ink for Printing		Black (to specification)
Folding Limitations***		NO scoring allowed on timing marks
Bleed-Through Limitations***		See ES&S documentation*
<p>*For more information, see ES&S Ballot Specifications and other publications by ES&S including their <i>Ballot Production Handbook</i>.</p> <p>**Used for vote response fields and to identify unique ballot formats</p> <p>***For preparing ballots that are compatible with the system.</p>		

Expo Ballot Specifications Summary*		
Paper	Stock	Index card
	Width	8.5 in.
	Height	11, 14, 17, or 19 in.
	Thickness	0.0070 in.
	Shape	Rectangular
	Color	See ES&S documentation*
	Watermarks	NO watermarks in ID mark zones or voting position zones
Orientation	Portrait or Landscape	
Printing	Size	See ES&S documentation*
	Style	See ES&S documentation*
Mark Fields**	Size	0.125 in. to either side of ovals by 0.100 in. above and below center of ovals
	Location	Corresponds to alignment marks
Placement of Alignment Marks		Both sides of ballot, front and back, .250 in. apart from the center of the timing mark.
Ink for Printing		Black (to specification)
Folding Limitations***		NO scoring allowed on timing marks
Bleed-Through Limitations***		See ES&S documentation*
<p>*For more information, see ES&S Ballot Specifications and other publications by ES&S including their <i>Ballot Production Handbook</i>.</p> <p>**Used for vote response fields and to identify unique ballot formats</p> <p>***For preparing ballots that are compatible with the system.</p>		

Optech Ballot Specifications Summary*		
Paper	Stock	Index card
	Width	3.75, 6.75, and 9.75 in.
	Height	11-22 in.
	Thickness	110 lb.
	Shape	Rectangular
	Color	See ES&S documentation*
	Watermarks	NO watermarks in ID mark zones or voting position zones
	Orientation	Portrait or Landscape
Printing	Size	See ES&S documentation*
	Style	See ES&S documentation*
Mark Fields**	Size	See ES&S documentation*
	Location	See ES&S documentation*
Placement of Alignment Marks		See ES&S documentation*
Ink for Printing		Black (to specification)
Folding Limitations***		NO scoring allowed on arrows.
Bleed-Through Limitations***		See ES&S documentation*
<p>*For more information, see ES&S Ballot Specifications and other publications by ES&S including their <i>Ballot Production Handbook</i>.</p> <p>**Used for vote response fields and to identify unique ballot formats</p> <p>***For preparing ballots that are compatible with the system.</p>		

4. Accuvote (Diebold) Ballot Specifications Summary

The Expo ballot is used in landscape orientation. The partial image below is shown in portrait orientation. The X-Timing marks are on the left edge of the image shown below. The Y-Timing marks are on the top as shown below.

The timing marks on the back follow the same format.

Y Timing Marks

24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Accuvote (Diebold) Ballot Example, Showing Ballot Target Location

Accuvote (Diebold) Ballot Specifications Summary*		
Paper	Stock	Index card
	Width	8.5 in.
	Height	11, 14, 17, and 18 in.
	Thickness	0.0070 in.
	Shape	Rectangular
	Color	See Diebold documentation*
	Watermarks	NO watermarks in ID mark zones or voting position zones
	Orientation	Portrait or Landscape
Printing	Size	See Diebold documentation*
	Style	See Diebold documentation*
Mark Fields**	Size	0.125 in. to either side of ovals by 0.100 in. above and below center of ovals
	Location	Corresponds to alignment marks
Placement of Alignment Marks		Both sides of ballot, front and back, .250 in. apart from the center of the timing mark.
Ink for Printing		Black (to specification)
Folding Limitations***		NO scoring allowed on timing marks
Bleed-Through Limitations***		See Diebold documentation*
<p>*For this information, see Diebold Ballot Specifications and other publications by Diebold.</p> <p>**Used for vote response fields and to identify unique ballot formats</p> <p>***For preparing ballots that are compatible with the system.</p>		

13. PROCEDURE FOR INCORPORATING HARDWARE UPGRADES

Only authorized ATS personnel should perform hardware upgrades. ATS will determine whether the system may be upgraded by a field service technician onsite, or if it requires the unit to be sent back to ATS. ATS contact information is provided in the AutoMARK Jurisdiction Guide.

14. PROCEDURE FOR INCORPORATING NEW SOFTWARE RELEASES

The vendor is responsible for installing new software releases; general computer skills are required.

To install a new software release: The system is placed in TEST mode and then the system maintenance

menu is accessed via password. On the system maintenance menu is an upload new firmware button. This feature will check the flash memory card for new software updates, will verify that these updates are properly encrypted and will then launch an installation program, which will update the necessary software. Re-boot the unit when finished.

If the system firmware is being upgrade from version 1.0 to 1.1, then a factory calibration of the scanners needs to be performed as well. This calibration should be done by qualified service personnel provided by the vendor. Please see the next section for information about factory calibration of scanners.

Board-level software changes must be performed by ATS personnel.

15. PROCEDURE FOR DOING FACTORY CALIBRATION OF SCANNERS

The AutoMARK VAT requires a factory calibration of the scanners starting with firmware version 1.1. The calibration should be done at the factory or by qualified service personnel.

Items needed –

9.75" input tray

Completely blank white ballot stock. The ballot should be 9.75" wide and at least 15" long.

Completely blank blue ballot stock. The ballot should be 9.75" wide and at least 15" long.

Compact Flash card inserted into VAT with any valid Election Data on it.

Steps to calibrate scanners:

Install 9.75" input tray into VAT. See Section 16.F.

Turn AutoMARK VAT on by turning key to Test Mode.

Select the **System Maintenance** button and input the password.

Select the **Scanner Calibration** button.

You will be presented with the Scanner Calibration screen.

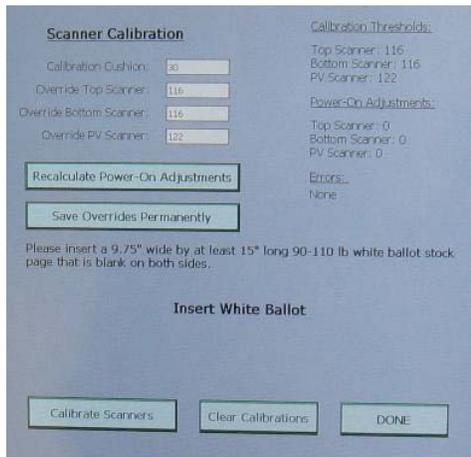
Scanner Calibration	
Calibration Cushion:	30
Override Top Scanner:	116
Override Bottom Scanner:	116
Override PV Scanner:	122
Recalculate Power-On Adjustments	
Save Overrides Permanently	
Calibration Thresholds:	
Top Scanner:	116
Bottom Scanner:	116
PV Scanner:	122
Power-On Adjustments:	
Top Scanner:	0
Bottom Scanner:	0
PV Scanner:	0
Errors:	
None	
Calibrate Scanners	
Clear Calibrations	
DONE	

Recalculate Power-On Adjustments can be pressed to rerun the power on tests that are conducted to counter variations in temperature. Those values are displayed to the right.

Save Overrides Permanently will save any manual entries entered into the text boxes. The text boxes can be adjusted by touching the textbox directly using the touch-screen. These values should not be adjusted unless there are problems with the automatic calibration process.

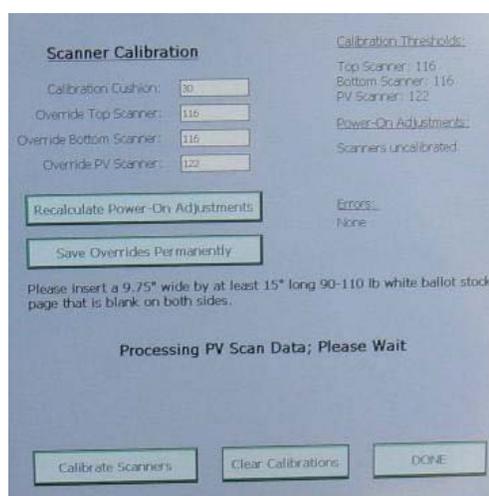
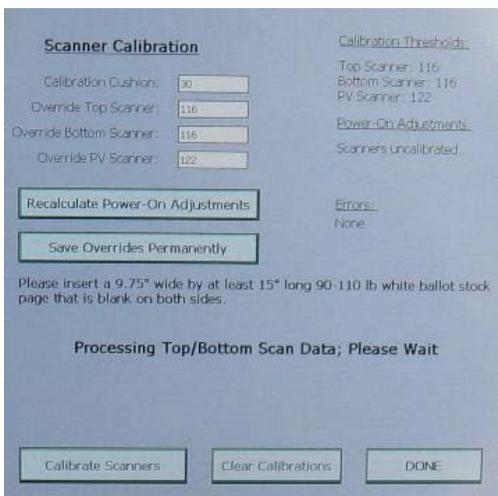
Press Calibrate Scanners.

You will be asked to *Insert White Ballot*.

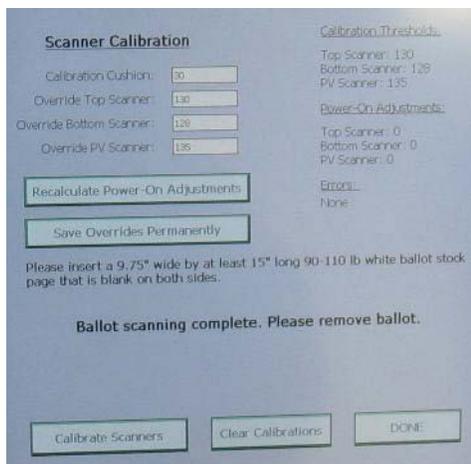


Feed the completely blank white ballot into the input tray.

If the ballot is scanned correctly, you will see the following messages.



The ballot will then be returned to you.



You will be asked to *Insert Blue Ballot*. Repeat step 6 using the completely blank blue ballot.

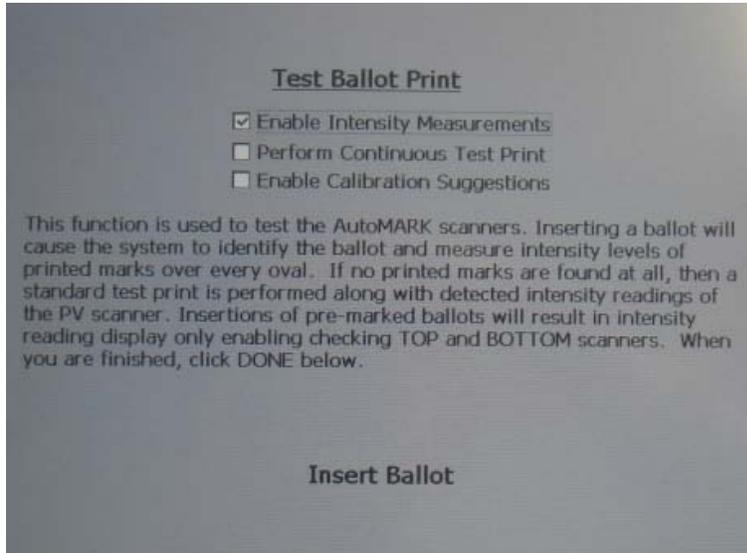
Hit DONE after scanner calibration is complete. If the VAT has problems feeding, scanning or recognizing either the white or blue ballot, manually adjust the *Override Top Scanner*, *Override Bottom Scanner*, and *Override PV Scanner* text fields to the value 110. Press the **Save Overrides Permanently** button. Then redo this Scanner Calibration procedure.

16. PROCEDURE FOR TESTING SCANNER INTENSITY MEASUREMENTS

It is possible to test the internal scanners without disassembling the VAT. This test would generally only be performed at the factory and by qualified service personnel if the VAT is having pre-mark detection difficulties. The VAT should have a Compact Flash card loaded with test ballot Election Data. For best results the Election Data loaded should have many ovals in the horizontal direction in order to test as much of the scanner area as possible.

Steps to perform scanner intensity measurements:

1. Turn AutoMARK VAT on by turning key to Test Mode.
2. Select the **Test Ballot Print** button.
3. Enable the checkbox marked **Enable Intensity Measurements**.



4. Insert a blank ballot. A regular test print will begin.
5. During the test print the PV scanner results will be reported. If this value is below 75%, the PV scanner may be defective.
6. If the ballot has been marked accurately, feed the ballot back into the VAT. This action will test the top and bottom scanners. If either of these values is below 75%, the scanner may be defective.
7. If any of the scanners scored below 75 %, rerun this test from step 1 to confirm. If the scanner(s) fail consistently, replace the defective scanner and repeat the test from step 1.

17. ACCEPTANCE CHECKLIST PROCEDURES

A. UNPACKING AND INSPECTING THE UNIT

1. Personnel Required

Automark recommends that two people lift and remove the VAT from the shipping container.

 **WARNING: Bend your knees and not your back while lifting to avoid injury.**

Only one person is required to perform acceptance testing, however, ATS recommends that a factory trained service technician be present to assist with the testing.

2. Inspecting the Shipping Container and Packaging

Inspect the shipping container for signs of damage or mishandling before opening and unpacking. If damage is evident, do not open and unpack without first notifying the vendor.

3. Unpacking the Unit

1. Using two persons, lift the case from its box, and place the case flat on the floor, correct side up.

CAUTION: Opening the case upside down may result in damage to the unit.

 **WARNING: Bend your knees and not your back while lifting to avoid injury.**

2. Pull up and out to release the two side latches of the hard black case and open.
3. Using two persons, lift the VAT unit from the hard black case, using the molded recesses on either side of the unit. Place the VAT on a suitable table.

 **WARNING: Bend your knees and not your back while lifting to avoid injury.**

4. Remove the clear protective bag from the unit. Retain and use this bag for dust and moisture protection during storage.
5. Locate the accessory box which is shipped in the bottom of the hard black case. Open the box and perform an inventory of the accessories using the checklist located within the box. Immediately notify your vendor of ANY missing accessories.
6. If provided, open the envelope containing the ballot secrecy sleeves and set aside.

4. Inspecting the Unit

1. Inspect the unit for scratches or other signs of damage.
2. Verify all housing screws are securely in place.
3. Locate the left notice on the rear of the unit, and record the serial number.
4. Verify the access door to the Compact Flash memory card is in place.
5. Verify the rear access door is in place above the serial number notice.
6. If your vendor supplies security seals on the VAT, inspect these seals for evidence of tampering. Should any security seal be broken, or any other evidence of tampering is evident (such as missing covers or screws), the refuse the affected VAT unit, and return it to the vendor.

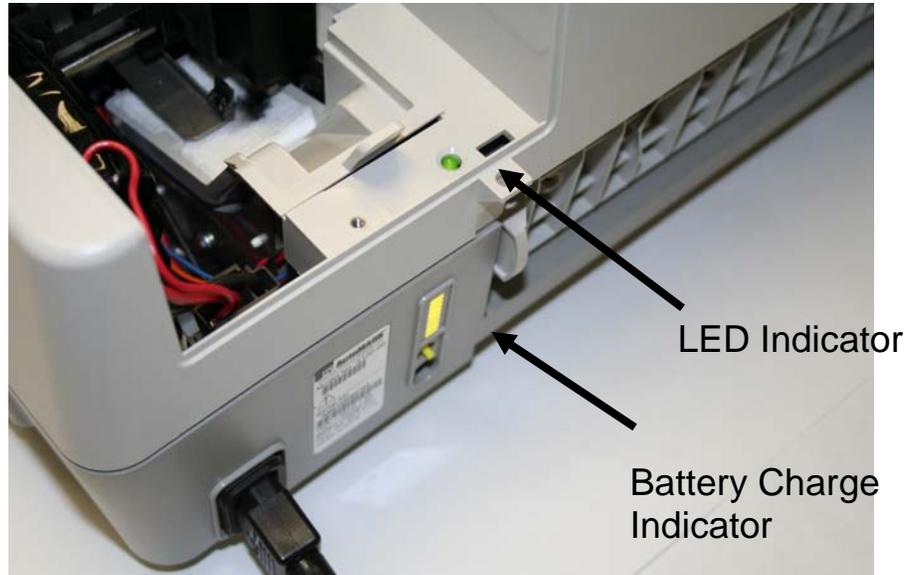
B. SETTING UP THE physical unit

1. Installing the Power Cord

1. Inspect the AC power cord (shipped in the accessory box) for evidence of

physical damage.

2. Open the Rear Access Door at the back of the unit to allow access to the AC power battery charger LED indicator.
3. Insert the female end of the power cord into the back of the AutoMARK™ unit, and plug the male end into a common household 110 volt AC outlet. When the AC power supply or DC battery charger are working properly, the LED indicator and at least 8 bars on the battery charge indicator light up.



2. Installing the Ink Cartridge

1. Remove the protective film tab from the gold-colored electrical contacts on the ink cartridge. **Caution:** Do *not* touch the electrical contacts as this can cause it to work improperly.

- Carefully insert the ink cartridge in the direction as shown in the photo below, and close the rear access cover.



Inserting the Ink Cartridge

3. Installing the Compact Flash (CF) Memory Card

- Unlock the access door to the CF memory card with the round silver key.
- Carefully insert the PRE-PROGRAMMED CF memory card with test election data into the CF memory card port as shown below.

Note: The CF card contained in the accessory box is blank and contains no data. The VAT will not properly boot up with this card installed.

Caution: Always inspect the CF memory card pin openings to ensure that the openings are clear. Inserting a CF card with blocked pin openings will result in VAT damage that is not covered under warranty.

Caution: Insert the Compact Flash card only in the direction shown (with the AutoMARK™ label to the left). Improperly inserting a CF card will result in VAT damage that is not covered under the unit warranty.



Caution:
Label must face left
or the card or units
could get damaged.

Inserting the Compact Flash Card

- Close and lock the Compact Flash access door.

4. Placing the LCD screen and paper tray into service

1. Slide the top cover latches out, and open the top cover.
2. Gently pull the LCD touch screen up and forward.
3. Lower the top cover back down into closed position, leaving the front portion up.
4. Adjust the LCD touch screen to a comfortable viewing angle.
5. Pull the paper feed tray up and forward, and fold it down to a flat position.

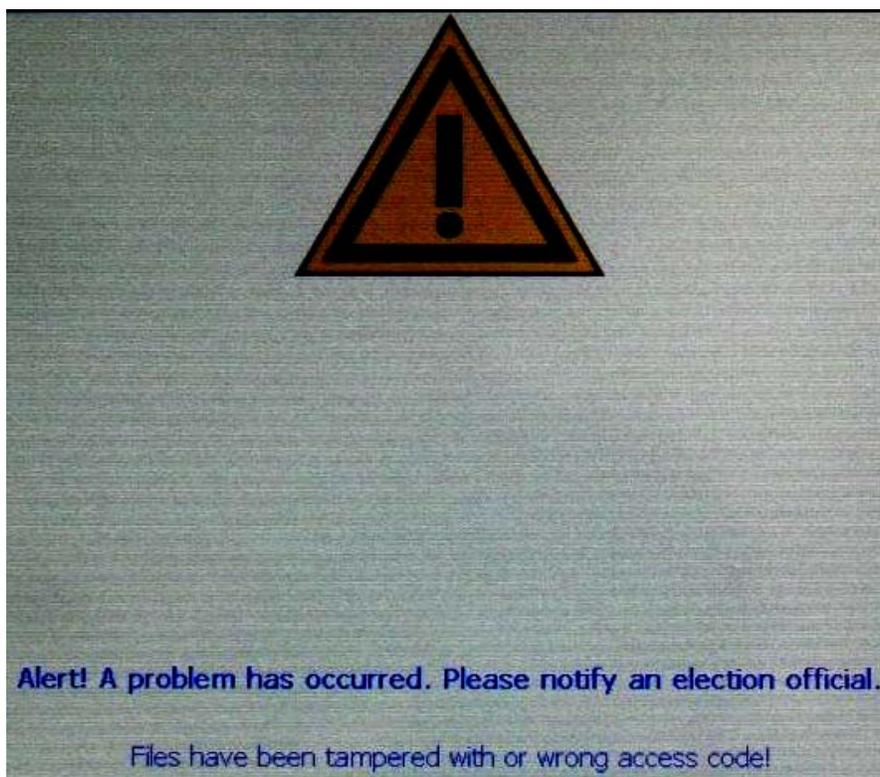
Note: Some VAT configurations ship with more than one size paper tray to accommodate several ballot widths. Your vendor will ensure that the installed paper tray is appropriate to the ballots used for acceptance testing.

C. Starting up the unit

1. Booting Up the First Time

1. Locate the operation key that was shipped in the accessory box.
2. Insert the operation key and turn it fully clockwise to **TEST** mode. The screen should remain dark or blank for as long as one minute while the unit is starting.

Note: Election data used in post-production testing is encrypted with the code 1-2-3-4-5-6-7-8. If the election data used for acceptance testing uses a different encryption code, the VAT will provide the following prompt and will require unlocking (see next step).



2. Unlocking the CF Memory Card Data

1. From the **TEST MODE** menu, press **Unlock Flash Card**.
2. Touch the white horizontal rectangle to display the onscreen number pad.
3. Enter the Compact Flash card's eight-digit encryption code, and press **Done** on the number pad.
4. Press **Unlock**. A message will then appear indicating that the CF card was successfully unlocked.

3. Verifying the Unit Has Certified Firmware

1. From the **TEST MODE MAIN MENU** screen, record the serial number shown in the lower right corner of the screen. This serial number must match the number recorded from the notice in step A.4.3. If not, reject the VAT unit, and notify the vendor immediately.
2. From the **TEST MODE MAIN MENU** screen, press **Display Software Version**. The firmware version indicated must match the certified version for the unit purchased. If the unit appears to have a different version, the unit should be rejected and the vendor immediately notified.
3. Press **DONE** to return to the **TEST MODE, MAIN MENU** screen.
4. If the unit configuration supplied by the vendor allows for hash verification of firmware, print out the loaded file data as follows:
 - i. From the **TEST MODE, MAIN MENU**, Press **Firmware verify** to view the hash code on screen or to print ballot stock.
 - ii. Verify the hash code against the Certified hash code. (See official certification document.)
 - iii. Press **PRINT** to print hash code screen detail to blank ballot.

4. Touch Screen Calibration

1. From the **TEST MODE MAIN MENU**, press **Calibrate Touch Screen**.
2. From the Touch Screen Calibration screen, press **Calibrate**.
3. With a stylus, touch the screen at the on-screen cross-hairs (5 places).
4. When complete, tap the touch screen to register screen calibration data.
5. Press **DONE** to return to Test Mode menu.

5. Setting the Date and Time

1. From the **TEST MODE MAIN MENU**, press **System Maintenance**.
2. Enter system maintenance password
3. Press **Set Date/Time** button.
4. Using MM-DD-YY format, enter the correct date. Press **Apply**.
5. Using HH:MM AM format, enter the correct time. Press **Apply**.
6. Press **DONE** to return to Test Mode menu.
7. Turn the power key to the **ON** position. The unit is now ready to check unit operation.

D. Checking unit operation

1. Checking Audio and Video

1. Insert a single test ballot supplied by the vendor (that matches the CF memory card data).

Note: If the acceptance ballot is shorter than 15 inches in length, the paper

platen rollers will have to be adjusted. See the System Installation and Maintenance Manual for instructions.

2. After several seconds, the initial ballot screen should appear on the LCD screen.
3. Verify the screen block feature works by pressing the diamond-shaped **Screen** button. Press the **Screen** button a second time to restore the screen to normal.
4. Plug the headphones (shipped in the accessory box) into the jack in the front of the unit. Test the operation of the volume control and the tempo control by pressing these buttons.

Note: You may need to press the **Volume** and **Tempo** buttons several times to hear any difference, because pressing the button only makes small, incremental changes.

2. Checking Voting and Printing

1. Navigate through the supplied ballot, using both the LCD touch screen and key pad buttons.
2. When selections are complete, at the final screen press **Print Ballot**.
3. When the ballot is finished printing, verify the ballot is properly and accurately marked.

3. Test Print Verifications and Print Calibration

Note:

The automatic print calibration (enable suggestions) feature **does not apply to Optech style ballots**.

1. Place the operation key in **TEST**.
2. From the **TEST MODE MAIN MENU**, press **Test Ballot Print**.
3. From the **Test Ballot Print** screen, press **ENABLE CALIBRATION SUGGESTIONS** checkbox to place a check the box.
4. Insert a single copy of the acceptance test ballot supplied by the vendor (that matches the CF memory card data). The unit will automatically print the entire ballot and eject it when completed.
5. If the unit determines that you need to adjust the print calibration, a menu will appear with recommended settings. Select **Yes** to accept these settings.
6. Verify the ballot is accurately marked.
7. Turn the power key to the **ON** position.

Note: The **Perform Continuous Test Printing** test is only for factory and government testing.

4. Checking the AT Device

1. If supplied by the vendor, connect the **Sip-Puff** device or **two-switch** paddle to the **AT access port**.
2. Confirm the scroll and select features work correctly on each device.

18. TECHNICAL SUPPORT

AutoMARK Technical Systems provides technical support for the AutoMARK system. Contact information is provided in the AutoMARK Jurisdiction Guide.

One individual is required for the maintenance procedures that follow. ATS recommends that an election official at each polling place be responsible for these maintenance procedures. General computer usage

skills are required.

A. Top Cleanout Removal and Installation

1. Removing the Top Cleanout

In order to remove the Top Cleanout the following steps may be followed. Refer to the following figure for clarification

- 1.) Open Lid
- 2.) Locate two tabs located on the right and left sides of the Top Cleanout towards the rear of the Top Cleanout.
- 3.) Simultaneously push both tabs towards the center of the AutoMARK unit
- 4.) While fully depressing both tabs, lift up on the tabs to remove the Top Cleanout

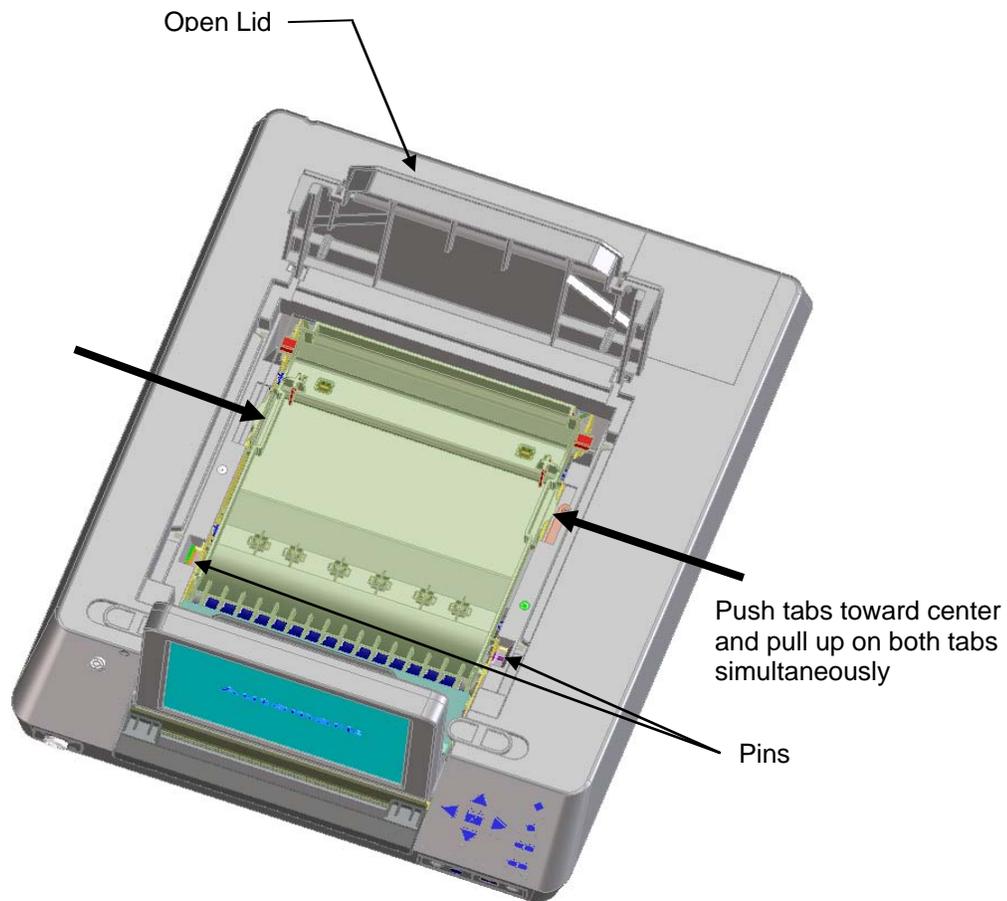


Figure A-1. Top Cleanout Removal and Installation Procedure

2. Installing the Top Cleanout

To install the Top Cleanout, locate the two pins (see figure) protruding out the right and

left sides of the Top Cleanout towards the front. Align the two pins with the vertical guides on the AutoMARK unit. Lower the Top Cleanout pins into the slots and press the Top Cleanout into place. Ensure the Top Cleanout is properly seated.

3. Reversible Roller Guide and Ballot Size

A Reversible Roller Guide allows the AutoMARK unit to be configured for various ballot lengths. It must be configured appropriately to prevent paper jams. The Reversible Roller Guide is located in the Top Cleanout.

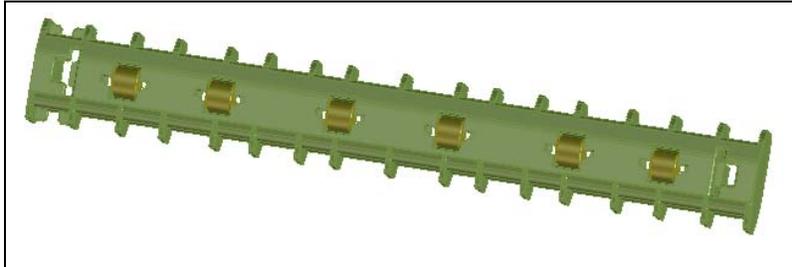


Figure A-2. Reversible Roller Guide

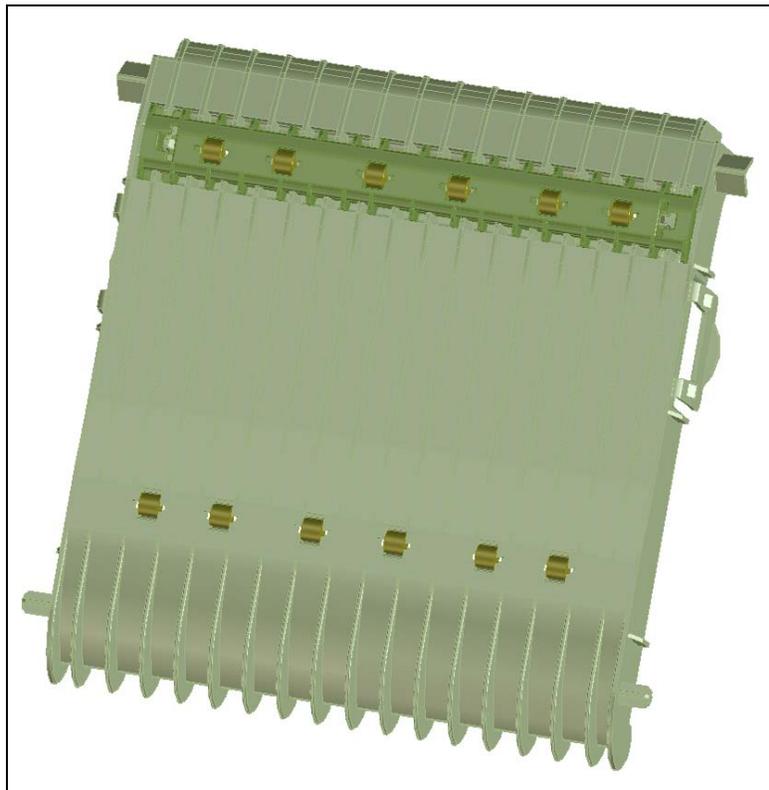


Figure A-3. Reversible Roller Guide Installed in Top Cleanout
(Shown in standard ballot configuration)

Ballot Size	Position of Reversible Roller
Under 15 inches	Reversible roller nip active (roller wheels down)
15 inches or more	Reversible roller nip inactive (roller wheels up)

Table A-4. Roller Guide and Ballot Size

To accommodate long ballots (15" or more), the reversible roller guide must be flipped over so that the black plastic rollers are not exposed. To complete this operation, insert a coin into one of the slots on the Reversible Roller Guide as shown in the picture below.

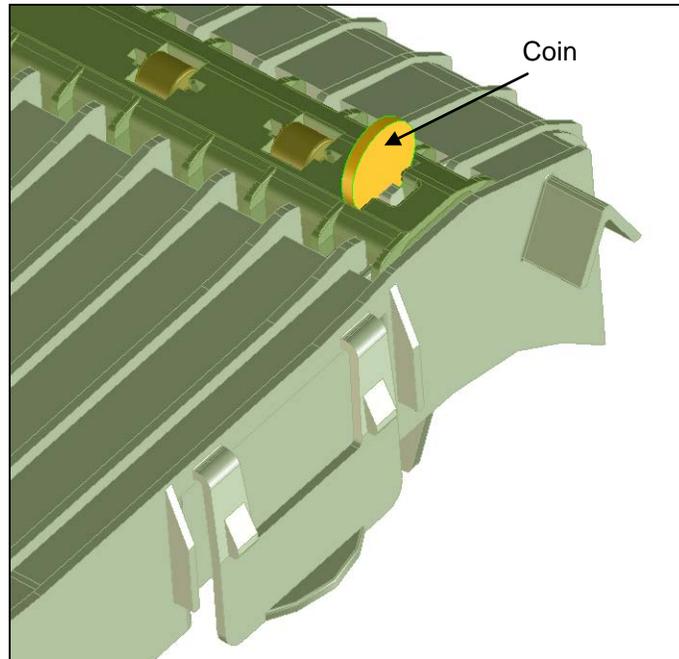


Figure A-5. Removing the Roller Guide

Locate small rectangular window on Top Cleanout opposite to where the coin is inserted. Insert finger through window and push out the Reversible Roller Guide. Repeat removal process for other end of the Reversible Roller Guide.

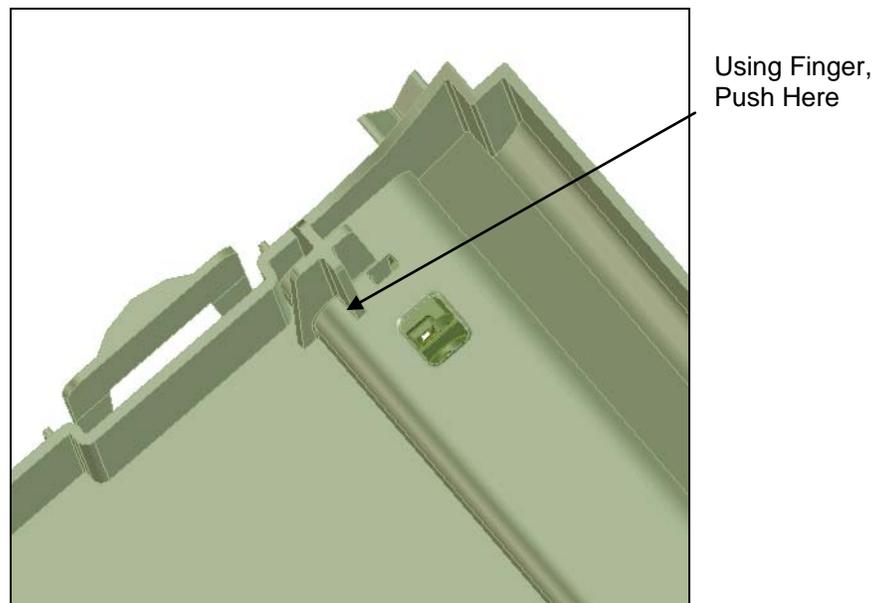


Figure A-6. Reversing Roller Guide

Once the Reversible Roller Guide has been removed it may be flipped over so that the rollers are hidden for long ballots, or installed such that the rollers are exposed for short ballots.

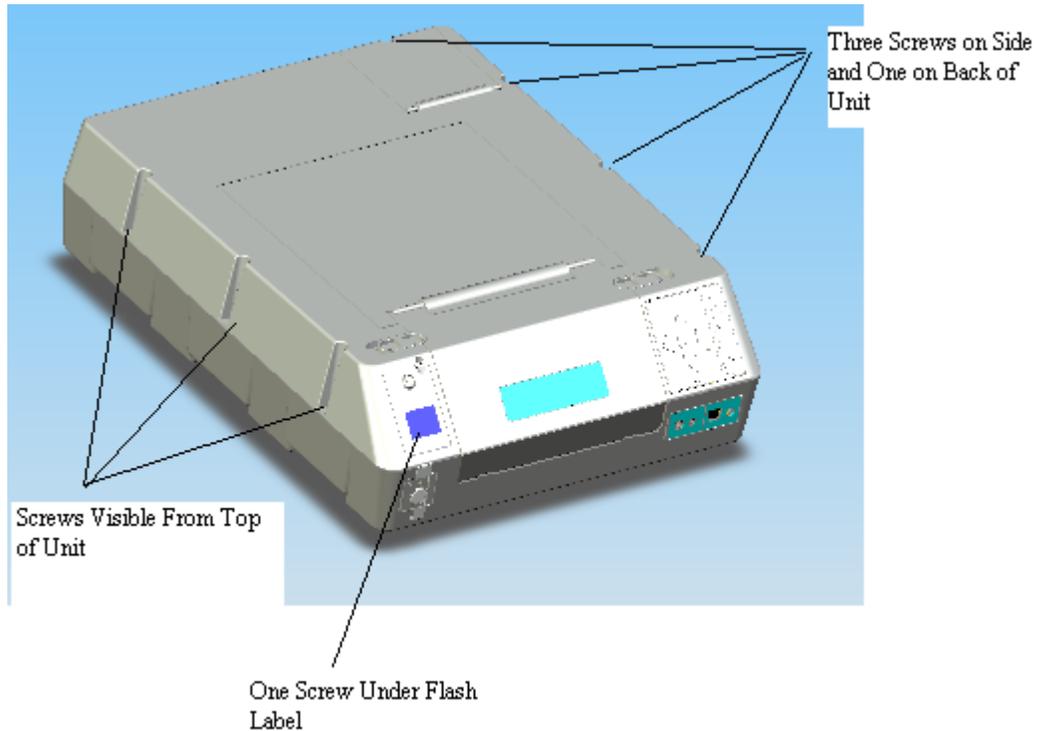
B. Cover Installation and Removal

1. Installation

- 1) Fit the cover over the AutoMARK VAT. Slide opening over key pad.
- 2) Insert and screw 8 screws from top, all are visible except one underneath the security flap.

2. Removal

- 1) To remove the cover, follow the instructions for installation, above, in reverse order.



C. Procedure for Removing the Diverter Support Assembly

The removal of the *Diverter Support Assembly* is fairly simple and straightforward. This assembly would need to be removed in order to clean the front two (2) scanners, or in the event of a paper jam that cannot be cleared any other way.

Required Tools:

Torx T10 Driver, Qty: 1

Prerequisite Tasks:

- 1) The Lid must be open.
- 2) LCD must be tilted forward.
- 3) Remove the Diverter Support Back.

Procedure:

- 1) With the lid open and the LCD tilted forward the *Diverter Support Assembly* should be accessible.
- 2) Disconnect the power cable to the Solenoid. Grip the cable by the connector ends, when disconnecting the Solenoid. Never pull on the wires themselves.
- 3) Disconnect the wires from the insert sensor. Grip the wires by the connector end. Never pull on the wires themselves.
- 4) Disconnect the flat cable going to the Scanner. This cable is on the left side of the *Diverter Support*. Grip the cable by the connector end when disconnecting the scanner. Never pull on the cable itself.
- 5) Unscrew the two (2) screws on the left and right side of the *Diverter Cover* (see Figure C-3). Use the Torx T10 Driver.

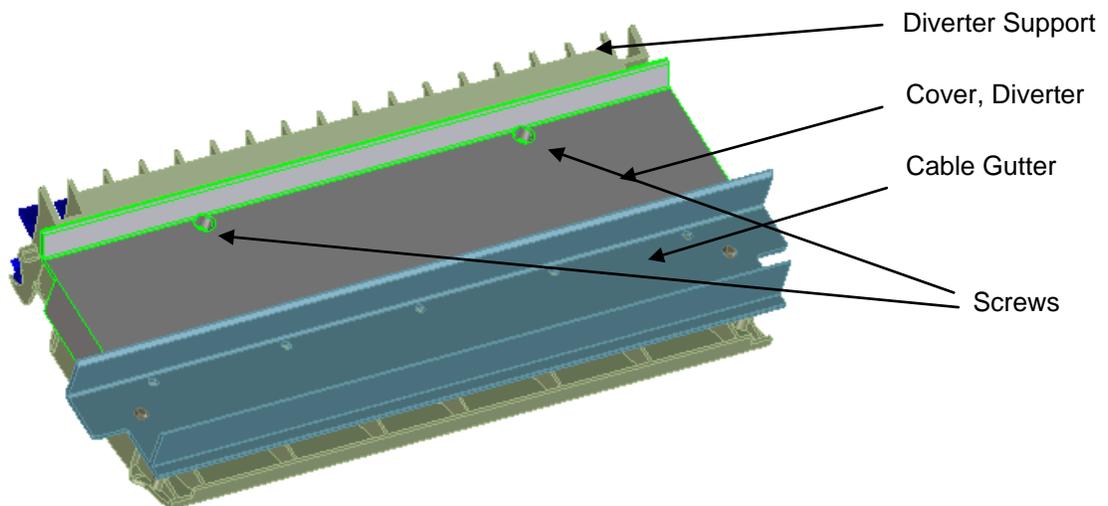


Figure C-3. Location of Diverter Cover and Diverter Support

- 6) With the screws fully removed from the *Cover, Diverter*. Slide the assembly toward the back of the machine until it stops moving forward. Pull the front end up, and continue sliding towards the back. There are four (4) metal tabs coming from the sidewalls, the *Diverter Support* needs to clear these tabs before it can be completely removed. This part can be slightly tricky, just go slow and do not force anything.
- 7) Remove assembly from the unit.

D. Procedure for Installing the Diverter Support Assembly

The installation of the *Diverter Support Assembly* needs to be done before the unit can be used if the *Diverter Support Assembly* had previously been removed.

Required Tools:

- 1) Torx T10 Driver Qty: 1
- 2) RTV (silicone caulk) – Should be non-conductive Qty: 1 Tube

Prerequisite Tasks:

- 1) The Lid must be open.
- 2) LCD must be tilted forward.
- 3) Remove the Top Cleanout

Procedure:

- 1) Connect the cable to the insert sensor.
- 2) Place the assembly down in the correct orientation. There are slots in the *Top Case* on either side that posts on the *Diverter Support* fit into (see Figure D-1). The assembly is oriented with the curved face toward the back of the machine.

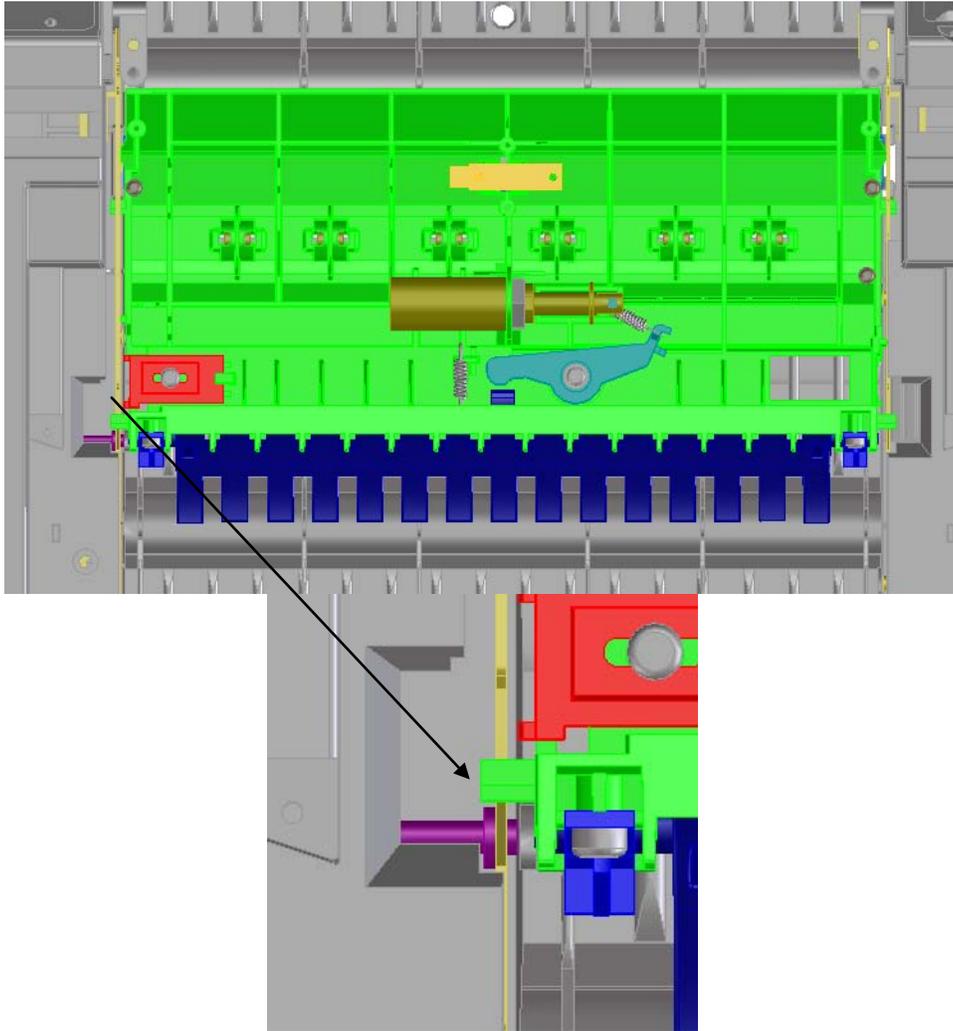


Figure D-1. Slots in Top Case and posts on Cleanout

- 3) Before sliding the assembly into place, make sure that the “Front” of the assembly needs to pass under the two (2) metal tabs on the sidewalls.
- 4) Slide the assembly toward the front of the unit. The assembly will stop when the posts in the *Diverter Support* hit the sidewalls.

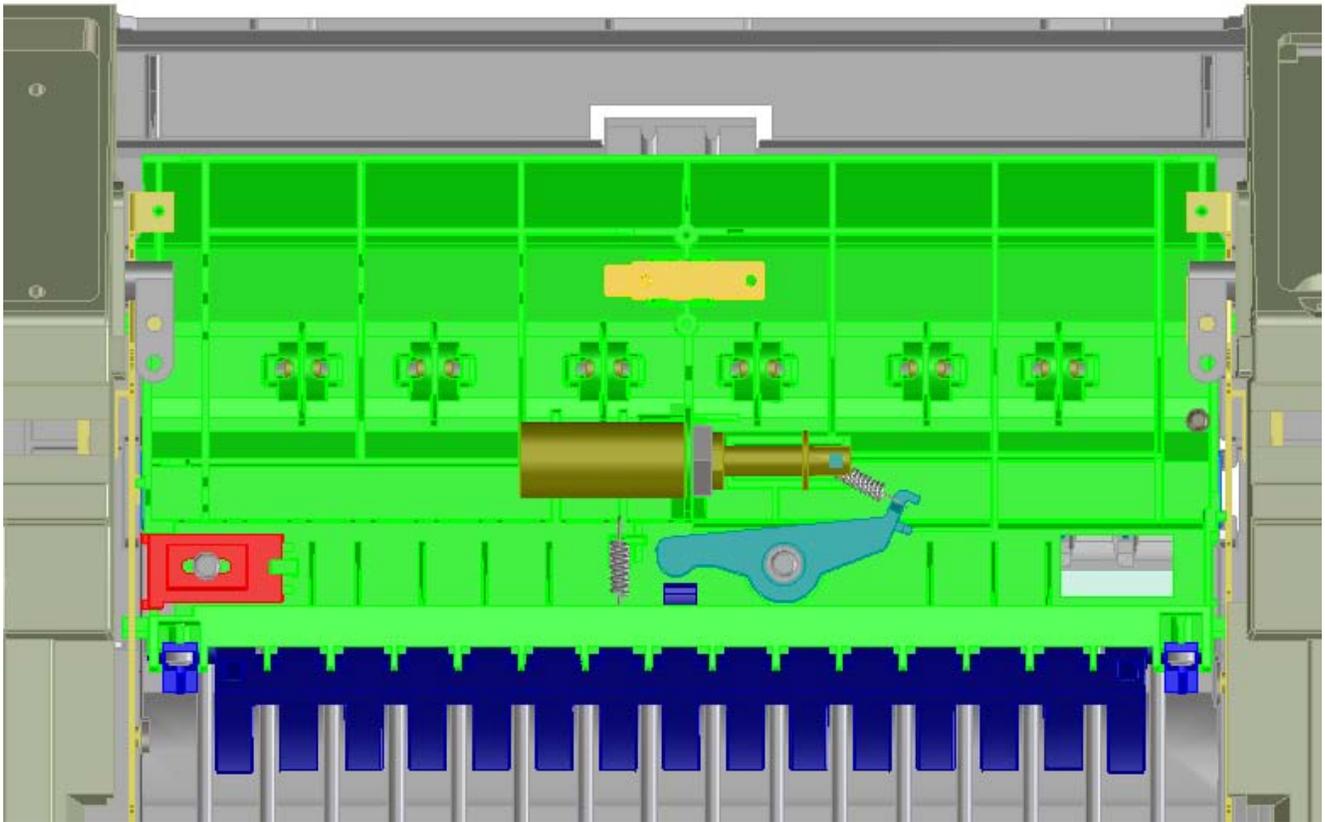


Figure D-2. Diverter Support Assembly in position

- 5) Connect the scanner cable to the scanner located in the *Diverter Support Assembly*. The connection point on the scanner is on the left side of the *Diverter Support Assembly*. Connect the solenoid cable to the *Solenoid, Diverter*. The solenoid is located in the right side of the unit.
- 6) Place the Cover, Diverter into place and screw down using two (2) M3 Plastite Screws.

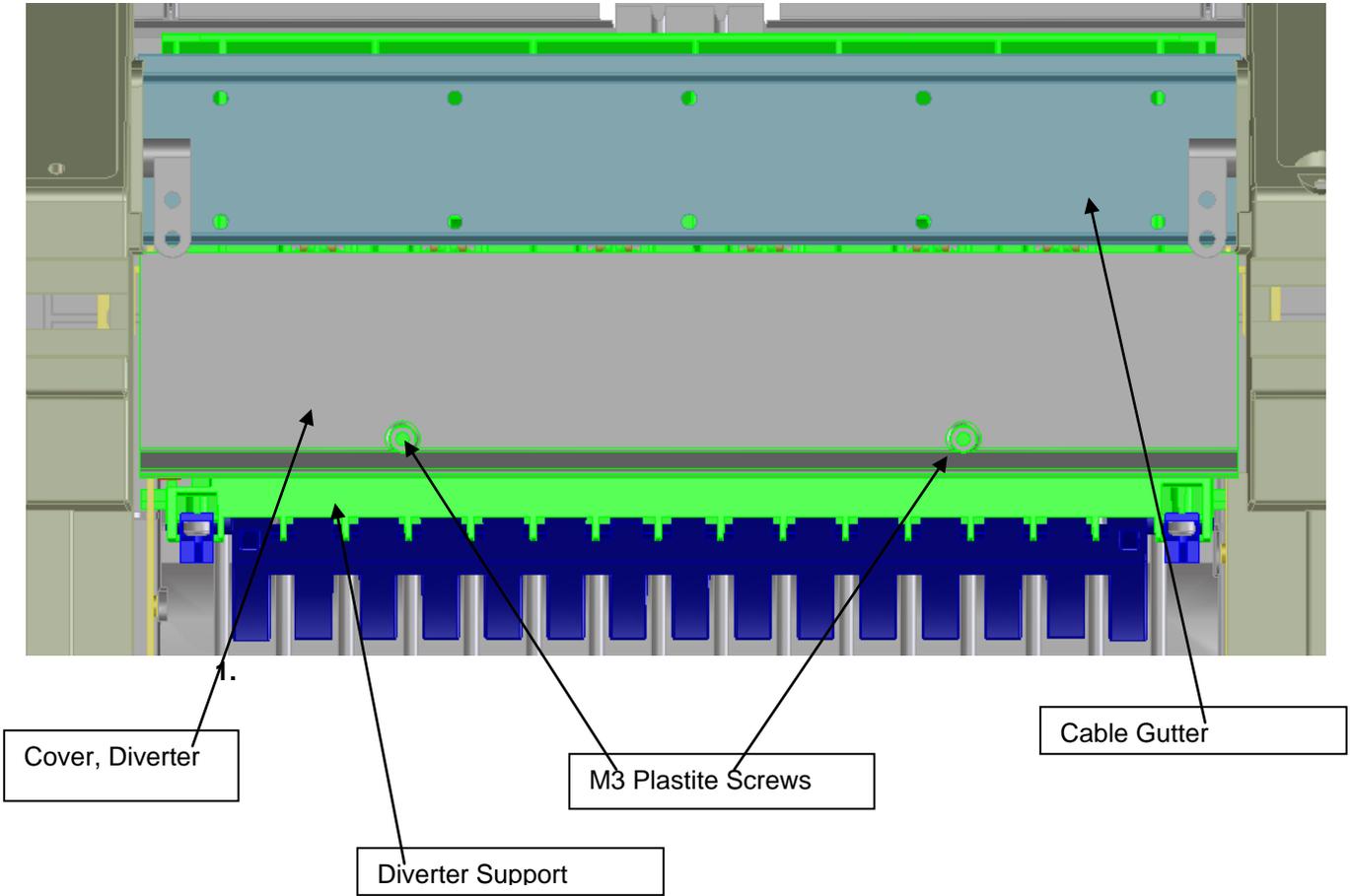


Figure D-3. Fully assembled view with all the parts in their correct locations

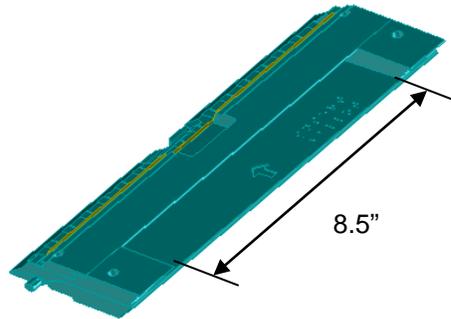
E. Opening and Closing the Input Tray

1. Input Tray Overview

The Input Tray is where the voter inserts their ballot for printing and where the ballot will come from after the ballot has been fully printed on. The *Input Tray Assembly* consists of four (4) parts, the *Input Tray Top* (4 various sizes) and the *Input Tray Bottom, Bridge*, and the *flap - tray*. The *Input Tray Assembly* should be configured for the correct ballot size before each voting period by a technician (See Section 16 F).

There are four (4) different sized Input Tray configurations:

The M100 input tray is 8.5" (215.9mm) wide:



Note:

The 3.75" (95.25mm) 6.75" (171.45mm), and 9.75" (247.65mm) input trays are **only for Optech users**.

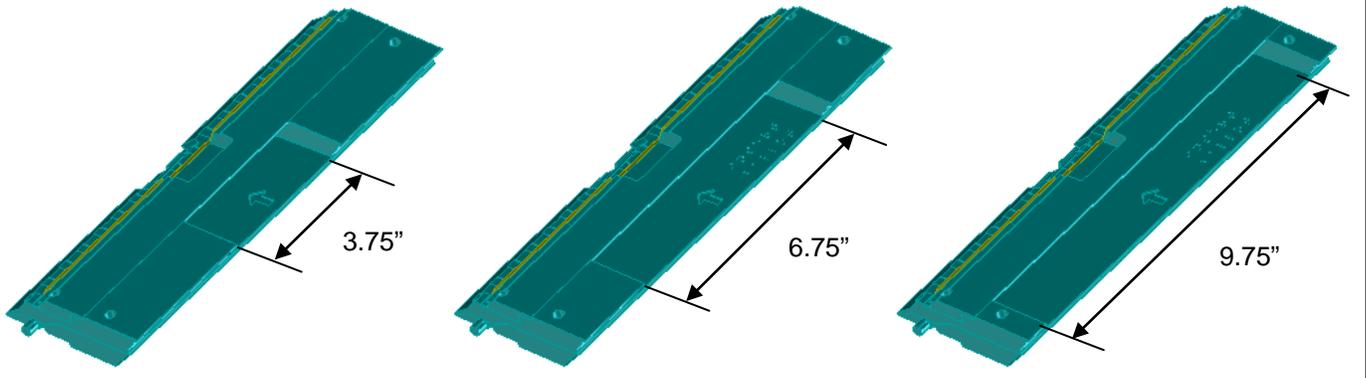


Figure E-1. Pictures of the four different sized input trays

The *Input Tray* has two positions, the stored position and the active position. The *Input Tray* must be in the stored position in order to be transported safely, and must be in the active position for voters to use the unit. There is no sensor on the mechanism to ensure that the *Input Tray* is in the correct position, so care must be taken to ensure proper storage and voting. See the illustrations that follow for details on changing the position of the input tray.

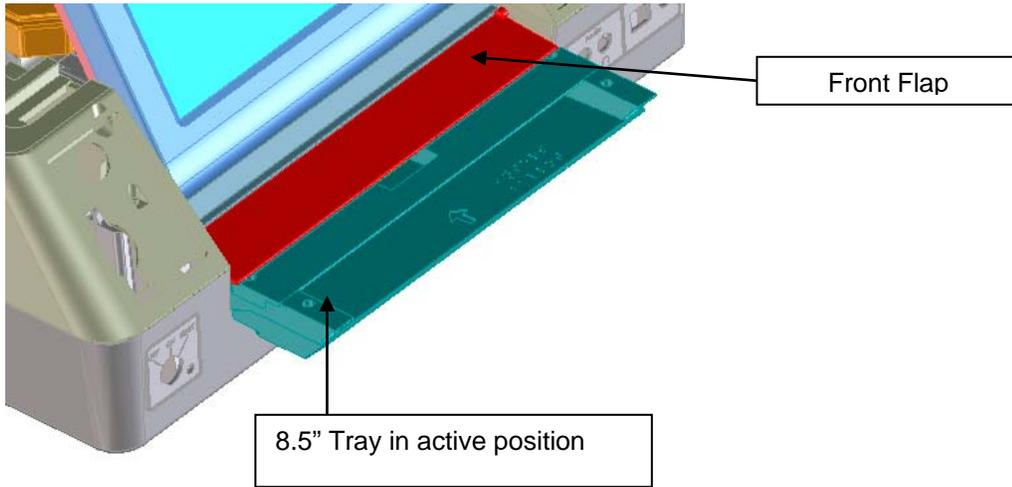


Figure E-2. Tray active. The tray can now be used to feed ballots into the unit.

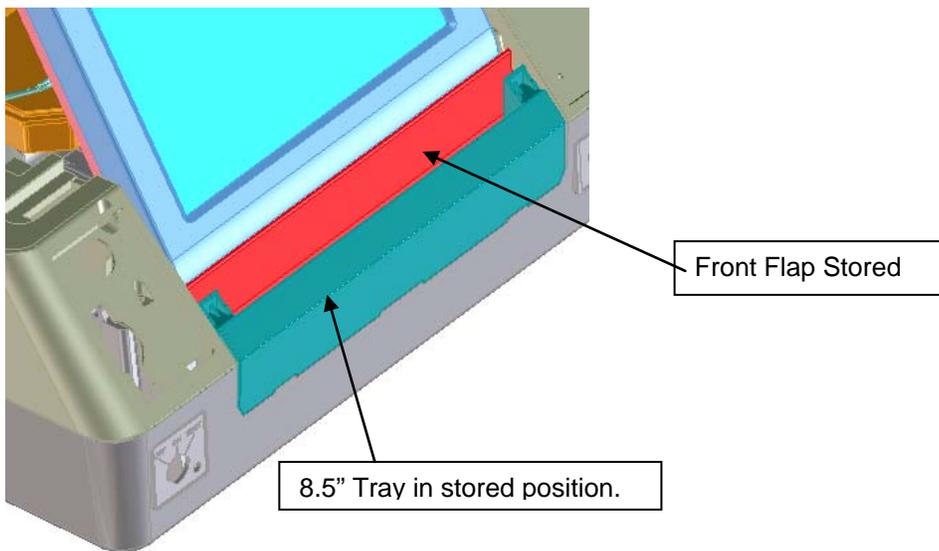


Figure E-3. Tray stored. The tray must be placed in this position before transporting the machine.

2. Putting the Input Tray in the active position.

The *Input Tray* must be in the active position for ballots to be run through the unit.

Required tools:

- None

Prerequisite Tasks:

- Open Lid

Procedure:

- Lift up on the *Input Tray*

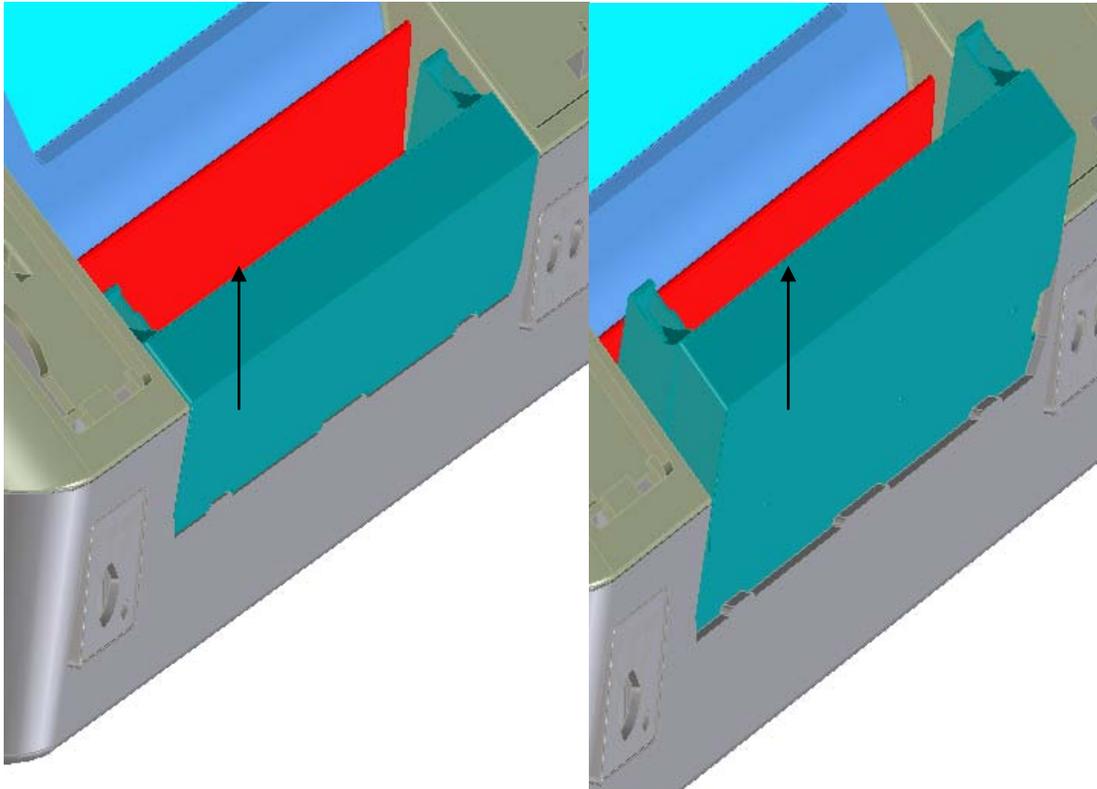


Figure E-4. Input tray being pulled up.

Rotate the top of the *Input Tray* forward until the *Input Tray* is horizontal.

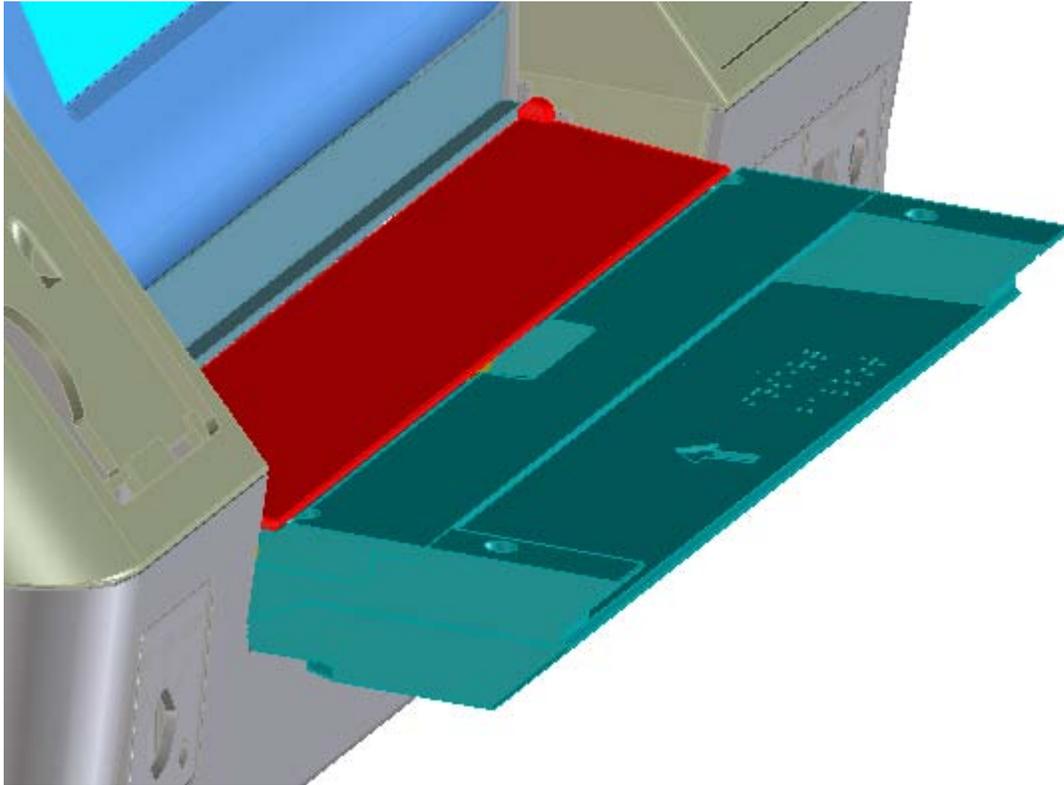


Figure E-5. Input Tray in active (horizontal) position

3. Putting the Input Tray in the stored Position

The *Input Tray* must be placed in the stored position if it is to be transported or stored.

Required tools:

- None

Prerequisite Tasks:

- Open Lid

Procedure:

- Rotate the front *Input Tray* toward the back of unit through approximately 90 degrees.
- Slide the *Input Tray* down until it stops.

F. Procedure for Replacing the Input Tray Top

The Input Tray is a modular design with a different Input Tray Top for each ballot width:

The M100 input tray is 8.5" (215.9mm) wide.

The 3.75" (95.25 mm), 6.75" (171.45mm), and 9.75" (247.65mm) input trays are **only for Optech users**.

The appropriate Input Tray Top should be selected and installed based upon the ballot width to be used.

Required Tools

T10 Torx driver

Required Parts

Input Tray Bottom, Qty: 1

Input Tray Top (of desired width), Qty: 1

Bridge + Flap Assembly, Qty: 1

Procedure

1) The Input Tray Assembly is held together by six (6) M3 Pan Head Phillips Screws. Four (4) of the screws are accessible from the top of the tray and two (2) are accessed from underneath the *Input Tray Top*.

To access these screws the Input Tray Assembly must be placed in the active position, as defined in Section 16 E, paragraph 2.

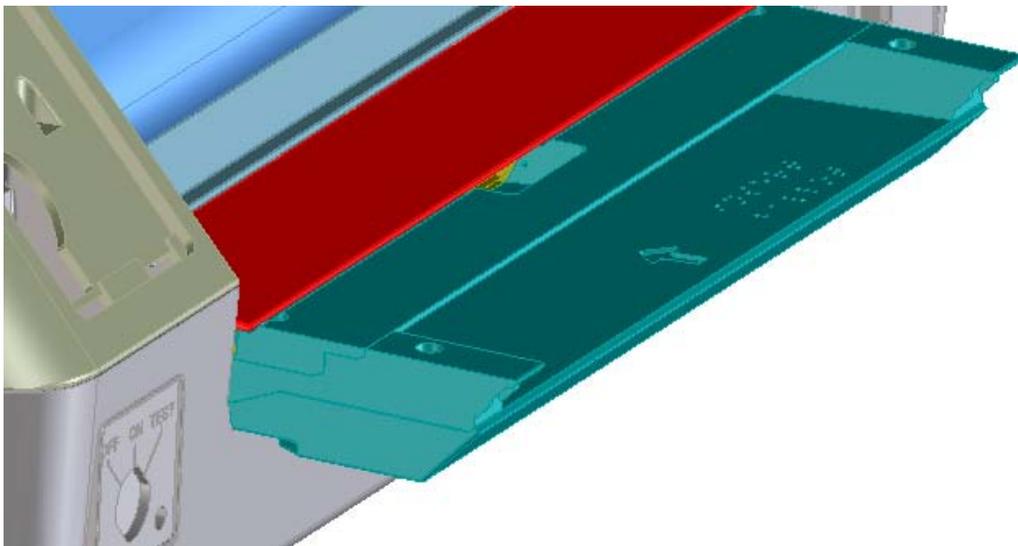


Figure F-1. Input Tray in active (horizontal) position

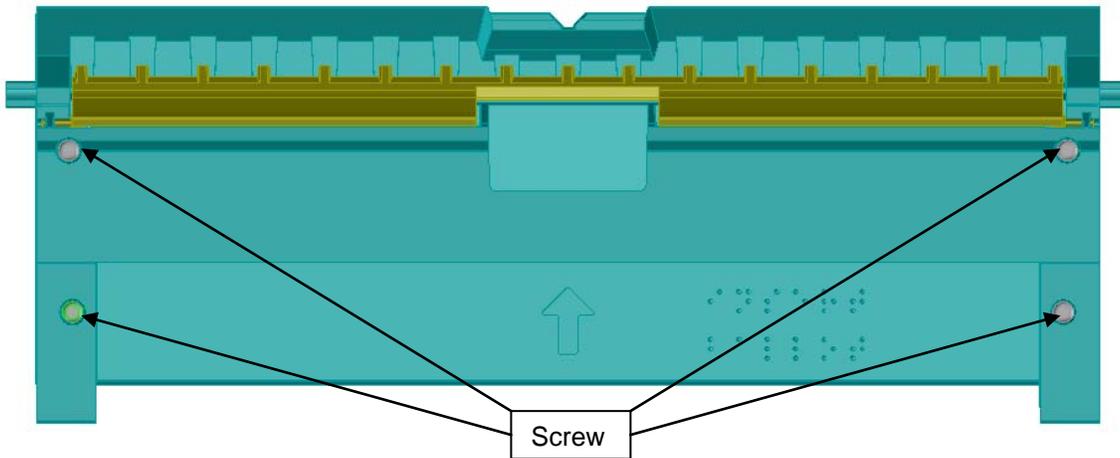


Figure F-2. Top view of the screw locations looking down at the Input Tray

2) Once the Input Tray is placed in the active position, the screws can be removed. Remove the Input Tray Top. Flip the top over and remove the two screws that hold the *Bridge and Flap* assembly to the *Input Tray Top*.

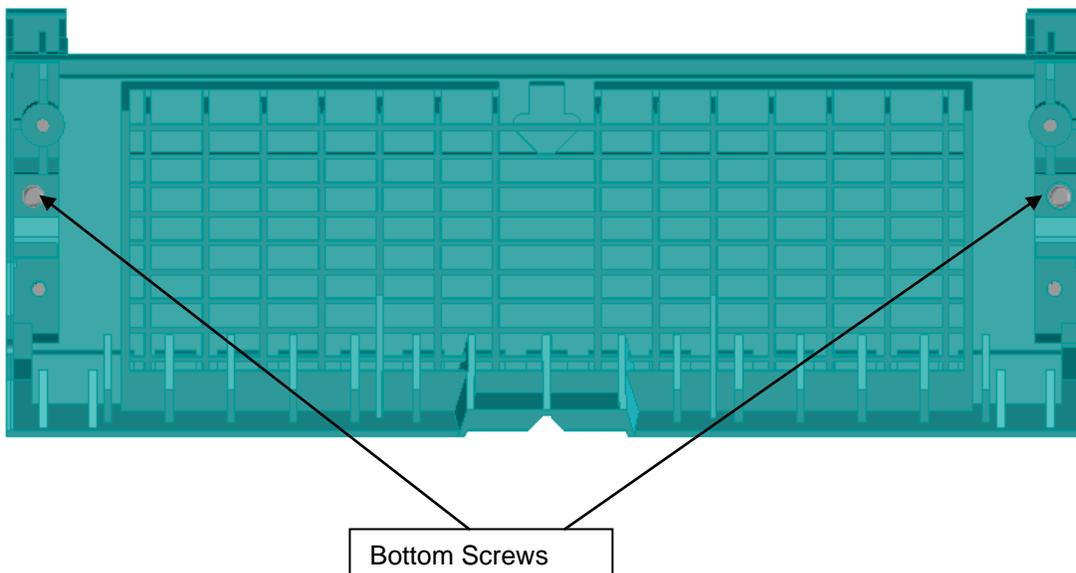


Figure F-3. Bottom view of the screw locations on the Input Tray with top removed

3) Screw the Bridge–Flap Assembly onto the new tray size. Place the new Input Tray Top for the appropriate ballot size. Care should be taken to ensure that the Input Tray Top is oriented correctly (see Figure F-4 below). Screw the Input Tray Top to the Input Tray Bottom using M3 Phillips Head Screws.

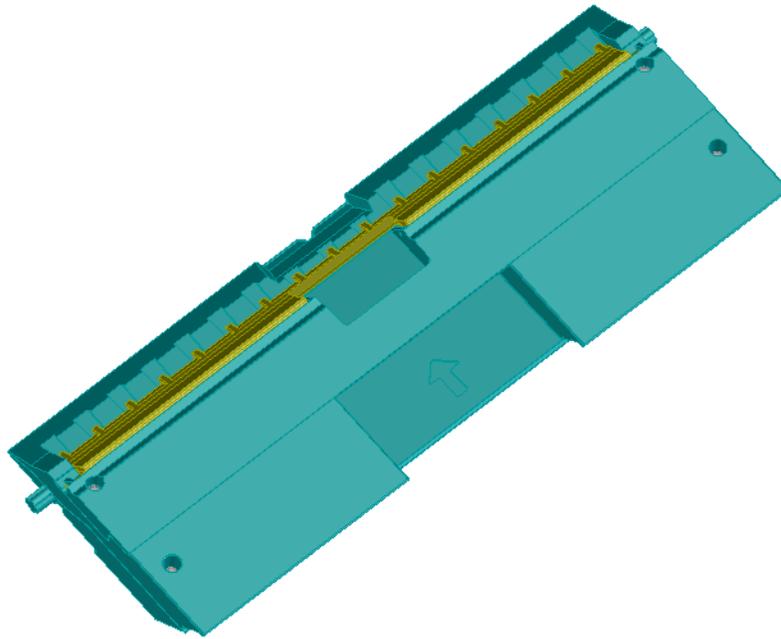


Figure F-4. Input Tray with new Top installed

4) Place the Input Tray Assembly into its stored position (see Section 16 E, paragraph 3) if the unit is to be moved before it is used for voting.

G. Clearing a Paper Jam at the Rear of the Unit

Located at the back of the AutoMARK unit is a removable cleanout that can be used to access the rear-most portion of the paper path. Figure G-1 shows the removable rear cleanout. The AutoMARK system has been designed to give the user access to the entire path of the ballot in order to allow any jam to be easily cleared. If a suspected jam has occurred at the rear of the unit, remove the Rear Cleanout and inspect the inside of the AutoMARK system for the ballot.

To remove the Rear Cleanout, grip the finger tab that extends out from the rear of the unit and apply a sideways force in order to snap it out of its locating holes. As it is shown in the image below, the force would be applied to the right. Once the locating features on the left side have cleared free of their locating holes the cleanout may be removed to the rear. Perform this operation in reverse to reinstall. First align the locating features on the right hand side and then snap the left hand locating features into place to secure. To ensure that the rear cleanout has been properly installed apply a small force to the straight back without the additional sideways force. The rear cleanout should stay in place.

If the ballot cannot be accessed from the Rear Cleanout, attempt removing the Diverter Support (Section 16 C) to access the remaining portion of the paper path.

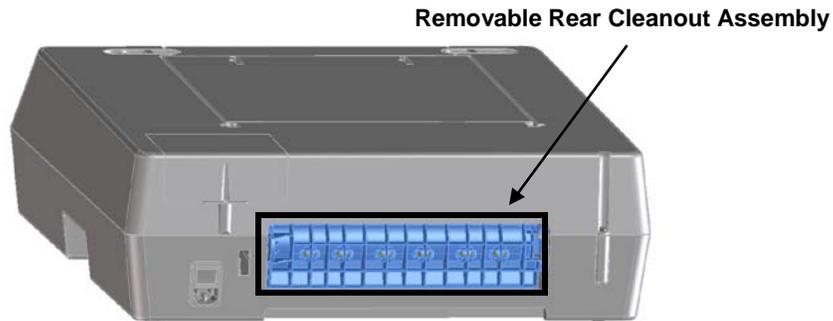


Figure G-1. Removable Rear Cleanout

H. Cleaning a CIS Scan module

1. Overview

There are 3 CIS scan modules in the AutoMARK. Two are located in the diverter area and are accessible once that assembly has been removed.

These scan modules may have diagnostic references as:

Scanner 0 (top):

Located in the diverter assembly looks down on top surface of media

Scanner 1 (bottom):

Located in the lower case below the diverter assembly. Looks up at the back side of the media

Scanner 2 (PV):

Located in the back of the opening used to store the Display. This Print Verification scanner looks at the surface just printed for ink missing issues. This scanner could potentially be contaminated with ink smears if operation is outside the recommended operating conditions (high humidity and cold environment).

2. Removal

The (0) and (1) scanners are accessed by following the above instruction for removal of the diverter assembly (Section 16 C). To clean them leave them in their respective pockets do not disassemble further than what is required to access the glass window.

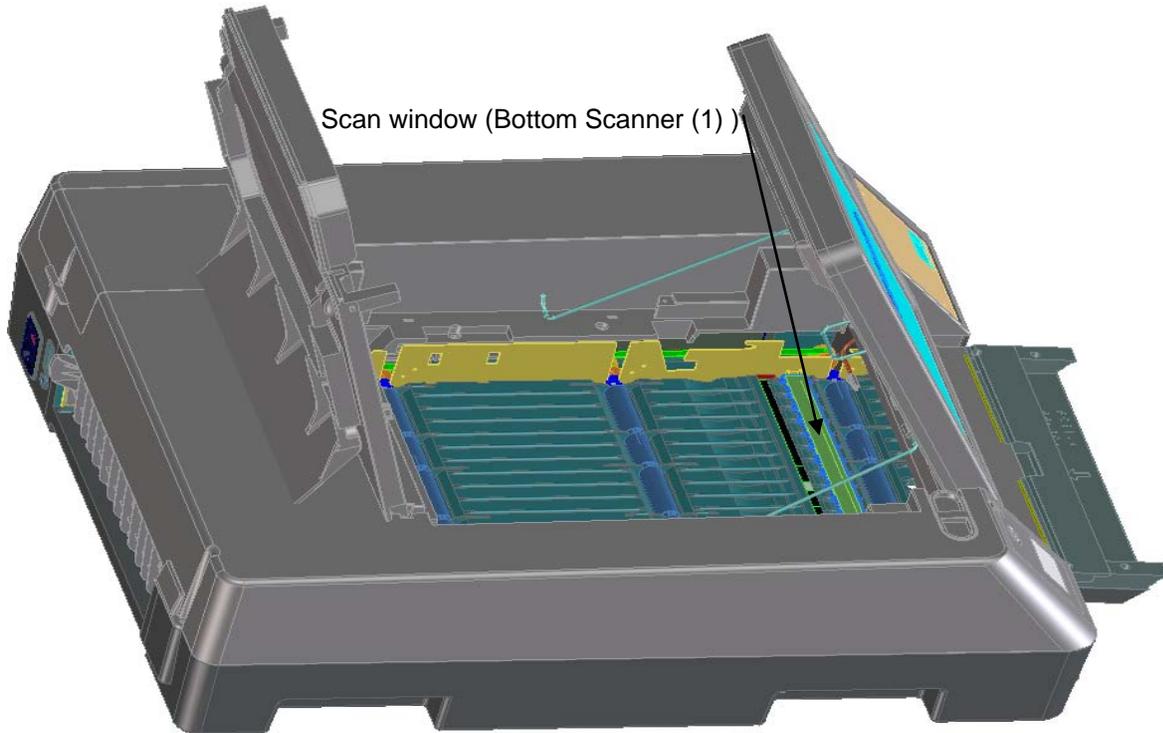


Figure. H-1. Location view of Scanner (1) Diverter Removed

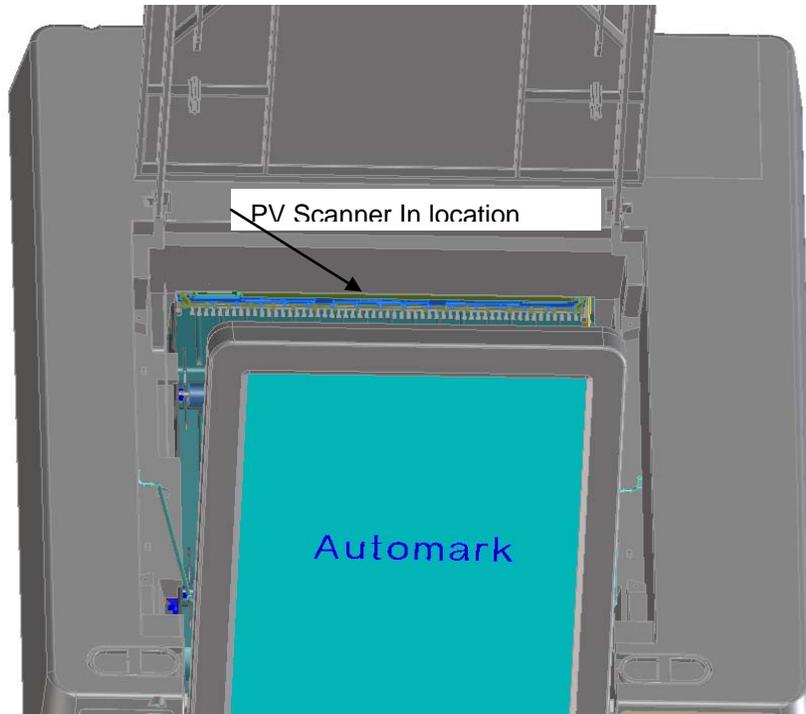


Figure H-2. PV Scanner (2) Shown with top cleanout removed

The (2) scanner is removed by first removing the top cleanout.

The scanner is located in the back of the opening this Cleanout occupied.

The cable is connected to the left side of the scanner and will move with the scanner when pulled from its holder.

There are two tangs at each side of the scanner that are intended to be moved together, outward toward the sheet metal sidewalls. After pushing these outward, pull on them at the same time to dislodge the scanner. This will permit moving the scanner toward the display and out from under the shelf holding it.

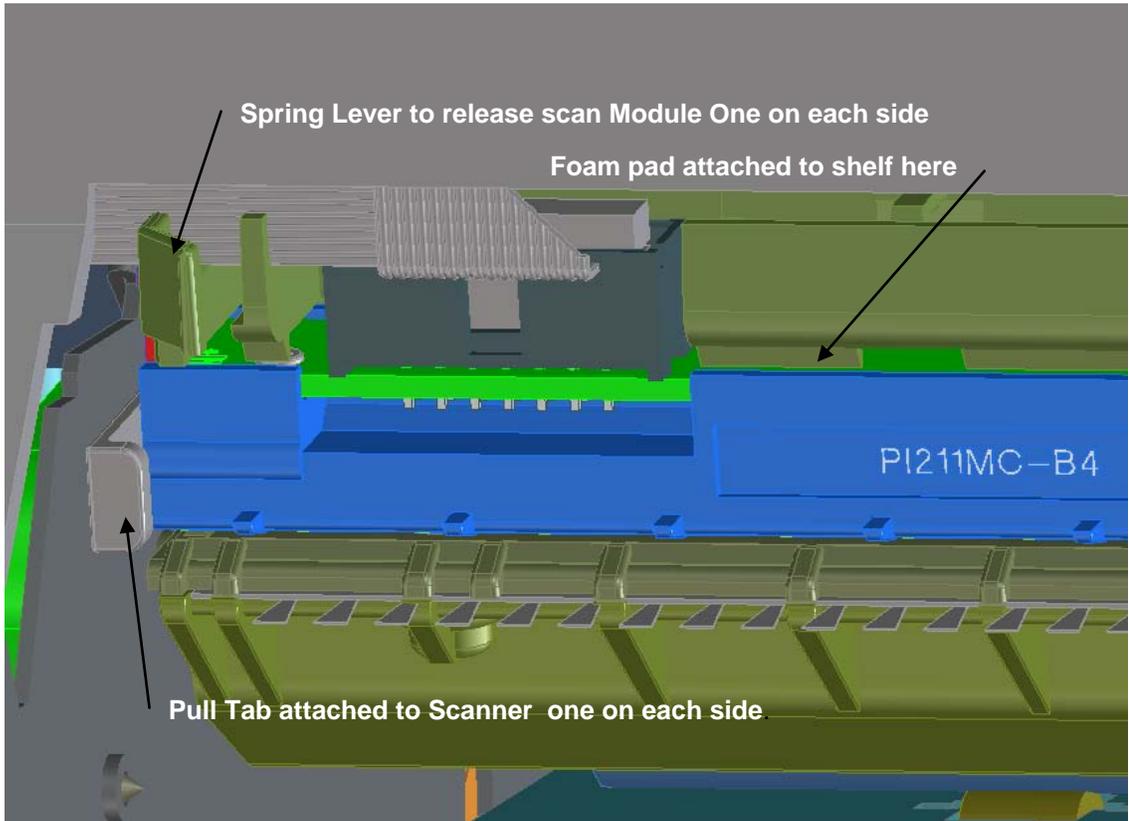


Figure H-3. PV Scanner close up of left side tabs and cabling

3. Cleaning

Use an alcohol wipe (common for eye glasses) and wipe the glass window of the scanner clean. Look carefully for a film reflection and if it exists, wipe again or use deionized water on the wipe to do a final removal.

Paper dust and finger prints are removable with the alcohol. If contamination is from ink or ballot toner, than a combination of alcohol and water may be required.

4. Installation

The two (0) and (1) scanners can be reinstalled by putting the Diverter Support Assembly back in place, as described in Section 16 D.

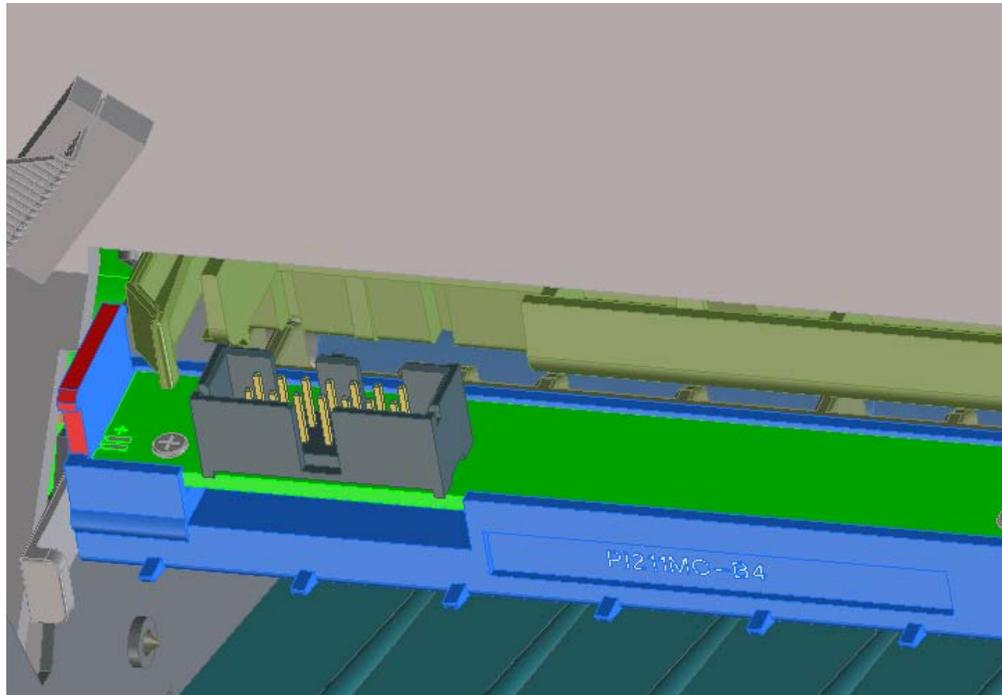


Figure H-4. PV Scanner Pulled out from supporting shelf

The (2) PV scanner needs to be pushed back into its shelf, but foam pads in the pocket somewhat hinder easy insertion. To ensure this is done correctly slip a ballot or heavy card stock (like a business card) between the gap of the scanner and its holder just as the scanner is positioned to be pushed it into its location. This paper should be located just inside of the connector and at the same relative position on other side.

Install the scanner connector and confirm visually that it is seated all the way down. Push the scanner into position under the shelf. Make sure that the two side tabs used to release it are seated over the scanner tabs. Remove the paper that was used as a tool.

Wiggle the scanner using the side handles and verify it is securely in place, while still free to move up or down.

Replace the top cleanout and lid parts.

Run system test and verify scanners are working.

Note that both the printer and the scanners should be calibrated upon initial installation and after any maintenance. See the Jurisdiction Guide for detailed instructions.

19. TROUBLESHOOTING GUIDE

The Operation Log tracks and records all significant operations that have occurred on the VAT. For detail information in retrieving information posted to the Operation Log, see the Jurisdiction Guide.

A. Hardware-Related Problems

The troubleshooting techniques described in this section are designed to aid the Jurisdiction Official in identifying possible hardware related problems. If VAT hardware fails, contact an AutoMARK™ vendor or system maintenance provider.

SYMPTOMS	POSSIBLE CAUSE	REMEDY
The key is in the OFF position, but the RED indicator located on the left control panel is not lit.	<ul style="list-style-type: none"> • The VAT line cord may not be plugged into an AC outlet, or power may not be available because of a defective outlet. • A power outage or power disruption may be taking place. 	<ul style="list-style-type: none"> • If the line cord is unplugged, insert it into an appropriately rated AC wall outlet. If the line cord is already plugged in and there is no power outage, try another outlet. If the problem persists, contact your VAT service provider. • During a power outage, the VAT no longer draws power from the AC outlet. In this case the RED indicator automatically turns off.
The VAT turns ON when powered from an AC outlet, but will not remain ON during a power outage.	<ul style="list-style-type: none"> • The Battery Pack may be discharged, or it was not allowed to sufficiently charge before the power outage. • The Battery Pack may be faulty, or the power distribution circuitry may be faulty. 	<ul style="list-style-type: none"> • Test the Battery Pack charge state by pressing the Battery Charge Test button. If none of the bars light up, the Battery Pack is discharged and therefore not able to power the VAT. When power is restored, allow the Battery Pack to fully charge. • Test the Battery Pack charge state by pressing the Battery Charge Test button. If at least one bar lights up, the Battery Pack should have been able to supply power to the VAT to keep it on. If not, contact your VAT service provider.
Key is in the ON position, but the ON indicator does not change from GREEN to AMBER when the VAT is powered from an AC outlet, and there is a power outage.	<ul style="list-style-type: none"> • The ON indicator AMBER emitter may be faulty, or the VAT power distribution circuitry may be faulty. 	<ul style="list-style-type: none"> • Contact your VAT service provider.
Key is rotated to TEST position, but test screen is not displayed on the LCD panel.	<ul style="list-style-type: none"> • The Key switch may be faulty, or the VAT operation mode control circuitry may be faulty. 	<ul style="list-style-type: none"> • Contact your VAT service provider.
Key is rotated to TEST position, but BEEPER does not generate	<ul style="list-style-type: none"> • The key switch may be faulty, or 	<ul style="list-style-type: none"> • Contact your VAT service provider.

SYMPTOMS	POSSIBLE CAUSE	REMEDY
a short BEEP sound.	the BEEPER and/or the VAT operation mode control circuitry may be faulty.	
Key is in the ON position, but the ON/OFF indicator does not start to blink (AMBER color) when the Battery Pack charge is LOW, or when the Battery Pack reaches a LOW-CHARGE state during VAT operation.	<ul style="list-style-type: none"> • The ON indicator may be faulty, or the BEEPER and/or the VAT operation mode control circuitry may be faulty. 	<ul style="list-style-type: none"> • Contact your VAT service provider.
The Battery charge bar-graph indicator does not light up (to indicate the Battery Pack charge state) when the VAT is powered from the battery Pack and the Battery Test Button is pressed.	<ul style="list-style-type: none"> • The Battery charge, bar-graph indicator or Battery Test Button may be faulty, or the VAT Battery Pack charge status circuitry may be faulty. 	<ul style="list-style-type: none"> • Contact your VAT service provider.
The Battery Pack does not start to charge after the VAT line cord is plugged into a working AC outlet.	<ul style="list-style-type: none"> • The lowest bar of the Battery Charge Bar-Graph Indicator should be brightly lit when the Battery Pack is charged at a fast rate, or dimly lit when it is almost fully charged. Additional bars should light up as the Battery Pack is getting charged (up to the top-most bar, when battery is fully charged). 	<ul style="list-style-type: none"> • Contact your VAT service provider.
The Battery Pack does not reach a FULL charge state after the VAT line cord is plugged into a working AC outlet for a period of approximately 3 to 3 ½ hours.	<ul style="list-style-type: none"> • The VAT Battery Pack or Battery Pack charging circuitry may be faulty. 	<ul style="list-style-type: none"> • Replace the Battery Pack and repeat the charging cycle. • If problem persists, contact your VAT service provider.
The Battery Pack does not seem to maintain a FULL charge state when the VAT is powered from an AC outlet.	<ul style="list-style-type: none"> • When the Battery Pack reaches a FULL charge state, the lowest bar of the Battery Charge Bar-Graph should turn OFF. If not, the Battery Pack may no longer be able to reach/maintain a full charge state (due to aging or fault), or the Battery Pack charging circuitry may be faulty. 	<ul style="list-style-type: none"> • Replace the Battery Pack and repeat the charging cycle. • If problem persists, contact your VAT service provider.
The Battery Pack does not start to charge when the VAT Key Switch is in the OFF position, and the VAT External Battery Charger is powered from a working AC outlet and is	<ul style="list-style-type: none"> • The external Battery Charging circuitry may be faulty. 	<ul style="list-style-type: none"> • If Battery Pack can be charged when the VAT is powered from an AC outlet, replace the External Battery Charger and repeat the charge cycle. If the problem persists, contact your VAT service provider.

SYMPTOMS	POSSIBLE CAUSE	REMEDY
plugged into the VAT Battery Charger Jack.		<ul style="list-style-type: none"> • If the Battery Pack cannot be charged when the VAT is powered from an AC outlet, contact your VAT service provider.
A ballot is inserted, but does not draw into the VAT for processing.	<ul style="list-style-type: none"> • The ultrasonic sheet detector may be faulty, the motors may be faulty, or the printer engine board may be faulty. 	<ul style="list-style-type: none"> • Pull the ballot out, reboot the VAT, and try to insert the ballot again. • If problem persists, contact your VAT service provider.
VAT is non-responsive when any of the keypad keys are pressed in accordance with proper VAT operation.	<ul style="list-style-type: none"> • The keypad or the front panel circuitry may be faulty. 	<ul style="list-style-type: none"> • Contact your VAT service provider.
No audio is heard when a pair of headphones is inserted in the small or large headphones jack on the front panel.	<ul style="list-style-type: none"> • The headphones used by the voter may be defective. • The volume may be set too low. • The circuitry associated with commands entry may be faulty, or the audio processing circuitry may be faulty. 	<ul style="list-style-type: none"> • Replace the headphones. • Try to increase the volume by repeatedly pressing on the Volume Increase Key. • If problem persists, contact your VAT service provider.
VAT is non-responsive when a Puff and Sip device is inserted in the Puff and Sip jack on the front panel.	<ul style="list-style-type: none"> • The Puff and Sip device used by the voter may be defective. • The VAT Puff and Sip interface circuitry may be defective. 	<ul style="list-style-type: none"> • Contact your VAT service provider.
The ballot does not print.	<ul style="list-style-type: none"> • The print cartridge may be out of ink. • The circuitry associated with ballot printing functions is faulty. 	<ul style="list-style-type: none"> • Replace the print cartridge and insert a blank ballot to be processed by the VAT. • If problem persists, contact your VAT service provider.

B. Ballot-Related Problems

The troubleshooting techniques described in this section are designed to aid the Jurisdiction Official in identifying possible ballot related problems.

SYMPTOMS	POSSIBLE CAUSE	REMEDY
<p>Ballot was inserted, but rejected. The VAT screen displays message "Paper misfeed. Please contact an election official."</p>	<ul style="list-style-type: none"> • The ballot may not have fed into the machine properly. • The ballot may be damaged (folded or torn). • The Cleanout Tray Reversible Roller may be in the wrong position for this type of ballot. • The wrong size Insert Tray for the type of ballot may be installed. • The PV scanner may be smeared with ink or paper dust. 	<ul style="list-style-type: none"> • Try feeding the ballot again. • Replace the ballot and try again. • If ballot is 15" or longer, the reversible roller should be in the wheels-up position, otherwise it should be in the wheels-down position. See Section 16A. • The Insert Tray should be just wide enough for the type of ballot being used (not any wider or narrower). Replace Insert Tray with correct type. • Remove the PV scanner and wipe clean with a paper towel or a soft cloth. See Section 16H. • If problem persists, call your VAT service provider.
<p>Ballot was inserted, but rejected. The VAT screen displays message "Ballot not recognized."</p>	<ul style="list-style-type: none"> • The ballot may not have scanned properly. • The ballot may be damaged (folded or torn). • The Cleanout Tray Reversible Roller may be in the wrong position for this type of ballot. • The wrong size Insert Tray for the type of ballot may be installed. • The PV scanner may be smeared with ink or paper dust. • The ballot may not match the data set loaded on the Compact Flash Card. 	<ul style="list-style-type: none"> • Try feeding the ballot again. • Replace the ballot and try again. • If ballot is 15" or longer, the reversible roller should be in the wheels-up position, otherwise it should be in the wheels-down position. See Section 16A. • The Insert Tray should be just wide enough for the type of ballot being used (not any wider or narrower). Replace Insert Tray with correct type. • Remove the PV scanner and wipe clean with a paper towel or a soft cloth. See Section 16H. • Confirm that the correct Election Data is present on the card and matches the ballot.

SYMPTOMS	POSSIBLE CAUSE	REMEDY
	<ul style="list-style-type: none"> • If the ballot has a stub, the stub length may not have been entered into the election setup information. • For ballots, the stub length may not be longer than 18mm. • If the problem persists, the scanner may be faulty. 	<ul style="list-style-type: none"> • Stub length must be entered into the election prior to exporting data to the compact flash memory card. Contact the Election Official; a corrected flash memory card must be created. • If there is a stub on the ballot, remove the stub before inserting the ballot into the AutoMARK. • Contact your VAT service provider.
<p>The ballot prints the first side (face down side), but displays an error message before printing the other side.</p>	<ul style="list-style-type: none"> • There may be an obstruction in the middle of the tray. • The wrong size Insert Tray for the type of ballot may be installed. • The PV scanner may be smeared with ink or paper dust. • The ballot may not match the data set loaded on the Compact Flash Card. • If the ballot has a stub, the stub length may not have been entered into the election setup information. 	<ul style="list-style-type: none"> • Remove the cleanout tray and clean it. See Section 16A. • If ballot is 15" or longer, the reversible roller should be in the wheels-up position, otherwise it should be in the wheels-down position. See Section 16A. • Remove the PV scanner and wipe clean with a paper towel or a soft cloth. See Section 16H. • Confirm that the correct Election Data is present on the card and matches the ballot. • Stub length must be entered into the election prior to exporting data to the compact flash memory card. Contact the Election Official; a corrected flash memory card must be created. • If problem persists, contact your VAT service provider.
<p>The AutoMARK screen displays the message "Bad XML Exception."</p>	<ul style="list-style-type: none"> • One or more of the files on the compact flash card has been truncated or tampered with. 	<ul style="list-style-type: none"> • Contact Election Official for a replacement compact flash card. NOTE: Data in the ElectionData folder on the compact flash card must not be altered in any way. This includes creating new files or subdirectories in the ElectionData folder.
<p>The AutoMARK displays the message "Access code is wrong or files have been tampered with."</p>	<ul style="list-style-type: none"> • Wrong access code was used. • Data on the compact flash card has become corrupted. 	<ul style="list-style-type: none"> • Go to Test Mode by turning the Key switch all the way to the right. Enter the proper access code. Turn the key switch back to Run Mode. • Contact Election Official for a replacement compact flash card.
<p>The ballot prints incorrectly;</p>	<ul style="list-style-type: none"> • Printer requires recalibration. 	<ul style="list-style-type: none"> • Recalibrate the printer. See

SYMPTOMS	POSSIBLE CAUSE	REMEDY
ovals are offset.		Jurisdiction Guide for detail instructions.
Significant Y offset print errors occur on a ballot.	<ul style="list-style-type: none"> • Insert tray is obstructing the ballot. • Print cartridge may not be lodged tightly against the print head. • If the Y offset errors are within 2½" to 5" of the top or bottom edge of the ballot, then the problem could be caused by trying to print too many items within the 2½" to 5" window. 	<ul style="list-style-type: none"> • Make sure the insert tray does not obstruct the feed path of the ballot. • Ensure that the print cartridge is tightly lodged against the print head. May need to replace the print cartridge if some nozzles are bent. • The AutoMARK VAT cannot print more than 35 print items in the 2½" to 5" margins of a ballot without risking significant Y offset print errors. Reduce the number of print items in this area by changing the layout of the printed ballot. See the AIMS Election Officials Guide for more information. • If problem persists, contact your VAT service provider.
Non-English Fonts on VAT screen displaying incorrectly/ Boxes appearing where text should be.	<ul style="list-style-type: none"> • Operating System has become corrupted or was never installed correctly. 	<ul style="list-style-type: none"> • The Operating System needs to be re-installed at the Factory or the SBC (Single Board Computer) needs replacement. Contact your VAT service provider.

20. REVISION HISTORY

Revision	Date	Reason for Revision
1	04/11/2006	Original document based on AQS-31-5010-001-F.doc
2	12/13/2006	Updated address.
3	1/9/2007	Updated section 15. Added Section 17.
4	1/23/2007	Added note to section 4.7 - ph
5	1/29/2007	Modified value in sec 16 - ph
6	5/22/07	Added where to obtain parts in section 12. Added section 11.D "Incorrect Software or Firmware Malfunction." Added vendor references to section 14. Added to section 10 on preventive maintenance a "Parts and Materials Needed" table. Globally Replaced all "Jumanji" references with "infrared." Added Ballot Specifications table to section 12. Updated VAT model number.- gg. Replaced sec 17 on Acceptance Checklist Procedures. Corrected hash code step. Updated copyright date. Updated disclaimer. -gg
7	6/4/07	Clearly identified Optech-specific text.-gg
8	1/11/08	Updated Vss reference. Updated address. -ph
9	3/24/08	Added section 10.C Preventative Maintenance during High Volume Accuracy Testing. - ac
10	06/16/09	Updated configuration boilerplate to replace ATS references with ES&S.
11	1/17/2011	Updated the Project ID in the file name and document footer to U3210 Updated the copyright date

End of Document