Ballot Production Guide

Printing Guidelines for ES&S Ballots

Disclaimer

Election Systems & Software, LLC ("ES&S") does not extend any warranties by this document. All product information and material disclosure contained in this document is furnished subject to the terms and conditions of a purchase, lease or other agreement. The only warranties made by ES&S are contained in such agreements. Users should ensure that the use of the product complies with all legal or other obligations of their governmental jurisdictions.

All ES&S products and services described in this document are registered trademarks of Election Systems & Software, LLC. All other products mentioned are the sole property of their respective manufacturers.

Document Distribution

This document may contain product information and/or procedures that are confidential or sensitive to ES&S and is intended only for the use of the individual or entity named below. The information may not be used, disclosed or reproduced beyond the indicated entity without the prior written authorization of ES&S and those so authorized may only use the information for the purpose of evaluation consistent with such authorization.

Table of Contents

Chapter 1: Introduction to the Ballot Production Guide

The ES&S Ballot Production Guide provides specific instructions for printing ES&S ballots. Printers use the specifications in this manual to set up, print, and proof election ballots.

If a using a non-ES&S printer, please direct any questions or concerns to that particular printer, as ES&S cannot provide support for non-ES&S associated printers. The non-ES&S associated ballot printer (and the jurisdiction requesting the ballots) should maintain a database of the ballot printing laws and regulations for the state where the ballots are being printed. By maintaining such a database, the ballot design and order specifics can be checked against it to ensure compliance prior to the printing of ballots, thus ensuring their legality.

Note

The ES&S Ballot Production Guide is an internal document that includes ballot specifications for all ES&S products and software, including under development and supported legacy products that are no longer available for purchase.
Therefore, this document may reference software and hardware not included in the current system.

1.1 Contact ES&S for Technical Support

This guide provides assistance in printing ES&S ballots. However, if you need additional assistance, or if a processing issue or system error occurs, ES&S technical support staff can provide advice and help you resolve the situation.

When you contact ES&S for technical support, have the equipment on hand and be prepared to provide the following information to the support representative:

- The version number of the product you are using (for example, Electionware version x.x.x.x).

- The exact wording of any messages that appeared.

- A description of what was happening when the problem occurred.

Support representatives are available Monday through Friday, between 8:00 A.M. and 5:00 P.M. Central time.

Telephone:	877-377-8683 (USA & Canada) 402-593-0101 (International) (Select option #4)
Fax:	402-593-8107
Write:	Election Systems & Software 11208 John Galt Blvd. Omaha, NE 68137 USA
Email:	Firmware@essvote.com Hardware@essvote.com

ES&S's support services are subject to ES&S's prices, terms and conditions in place at the time the service is used.

For more information about ES&S Technical Support, click the **Contact ES&S** tab on the ES&S secure website, then click or scroll to **Technical Support (Hardware & Support)**.

1.2 Warnings

- Allow sufficient printing time to dry ballots without the use of wax or offset powder.

  - Do not use offset powder to prevent ink from offsetting as finished documents fast dry.

  - Do not use cornstarch to thicken ink and add to the grain of documents.

- Toner processing, heat transfer or other pressure fusing techniques to print ballots must have prior approval from ES&S.

- Do not spray wax onto printed documents to prevent offsets during drying. Wax adds to the caliper (thickness) of the ballot stock and interferes with the application of a second color or additional ink to the ballot.

- Do not shift the voting tracks or change the orientation of the tracks with improperly produced ballot art or incorrectly cut ballots.

Chapter 2: Scanners and Ballots

2.1 Optical Ballot Scanners

ES&S optical scanners recognize marks in the read area of the ballot and record voter selections. As a ballot passes through the scanner, light reflects from the ballot surface, filters through several lenses, and is recorded by various photo-transistor channels in the ballot scanner. The photo-transistors convert the optical image of the ballot into an electronic signal. The scanner interprets the signal as votes according to an election definition created by an election programmer. The scanner then adds the election results from the ballot to the count for the entire jurisdiction.

ES&S supports central count voting systems and precinct count systems.

2.1.1 Central Count Voting Systems

Jurisdictions with central count systems generally collect ballots at multiple polling places and transport them back to election headquarters for scanning after the polls close. During the voting process, the scanners record votes from each ballot and add results to an internal results total. The results are then loaded into Election Reporting Manager (ERM). ERM consolidates the voting totals into final election reports.

2.1.2 Precinct Count Voting Systems

Jurisdictions that use precinct count systems record election results at individual polling places as voters cast ballots. Voters place their ballots directly into precinct scanners such as the DS200. The scanners record votes from each ballot and add the data to an internal results total. At the end of the day, election workers load ballot data from the precinct scanners into ERM from memory devices such as PC cards or flash drives, or over the Internet. ERM combines results from all of the precinct scanners in a jurisdiction to produce final election reports.

2.2 Image Manager Ballots

Scanners will reject ballots that are printed incorrectly. A jam can occur if the ballots are damaged or cut too wide. Ballots produced out of specification may cause scanners to reject, jam, or incorrectly tabulate. Check the ballots against the specifications in this guide to ensure correct functionality.

ES&S has two different ballot image managers to produce two types of ballot artwork:

- ES&S Image Manager (ESSIM) produces the 3-column ballot.

- Electionware Paper Ballot produces the 24-column ballot, which provides greater layout efficiencies for the newest ES&S tabulators.

The following examples show that the ESSIM and Electionware ballots have the content and ballot information arranged slightly differently, but all ES&S ballots are printed and finished in the same manner.

This specification is valid on any ballot length or style.
This specification is valid for any ES&S tabulator.
This specification is valid for any version of firmware..

← **Title Text Zone** | All title text or stamps must remain in this zone. It is .1" below the lead edge of the ballot, and .2" above the Black Check Marks | .35"

Tint shade cannot exceed 10%.

Tint cannot be printed outside of the inner column borders, or within .1" of the Black Check Marks.

Oval width .24"

Oval height .10"

Data channel extends .20" from right side of ovals
or
.32" right of oval center.

Oval outlines are .25 point or .003" thick.

CONTEST

Candidate 1
Candidate 2
Candidate 3
Candidate 4

Data Channel can be breached only if all printed information and tint is at least .20" above or below all active oval positions.

CONTEST

Candidate 1
Candidate 2
Candidate 3
Candidate 4

Text can be printed in the timing band with a font size that should not exceed 3/4 of the height of the timing band. Text cannot be bold.

Tint cannot be printed outside of the inner column.

Tint cannot be printed outside of the inner column borders, or within .2" of the Black Check Marks.

← **Text Zone** | All text or stamps must remain in this zone. It is .1" above the bottom edge of the ballot, and .2" below the Black Check Marks | .20"
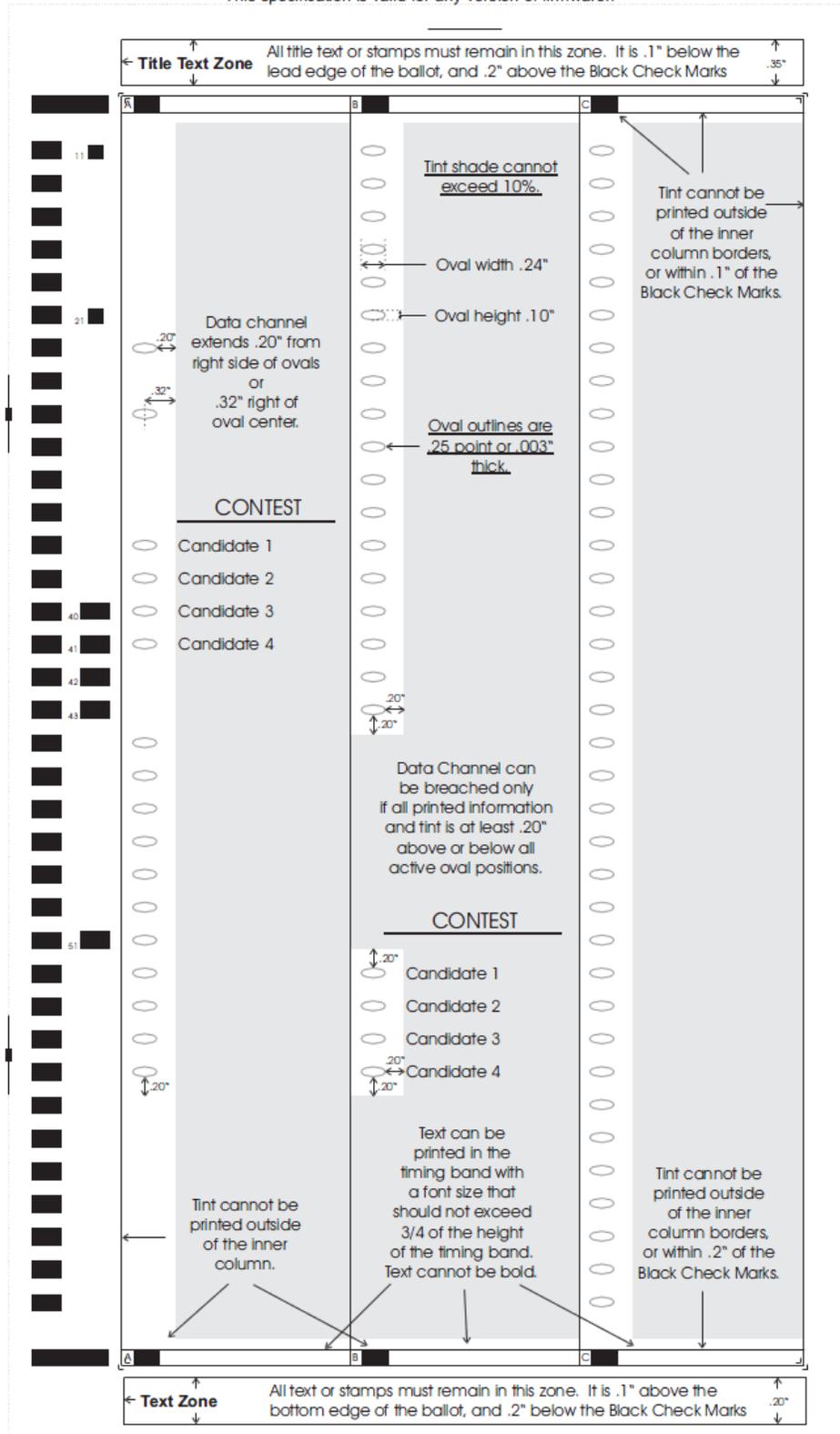
Figure 2-1: ESSIM Ballot

Machine-readable components are areas of the ballot that scanners recognize to record marks (such as voting targets and code boxes). Each ballot has four machine-readable components, as shown below.
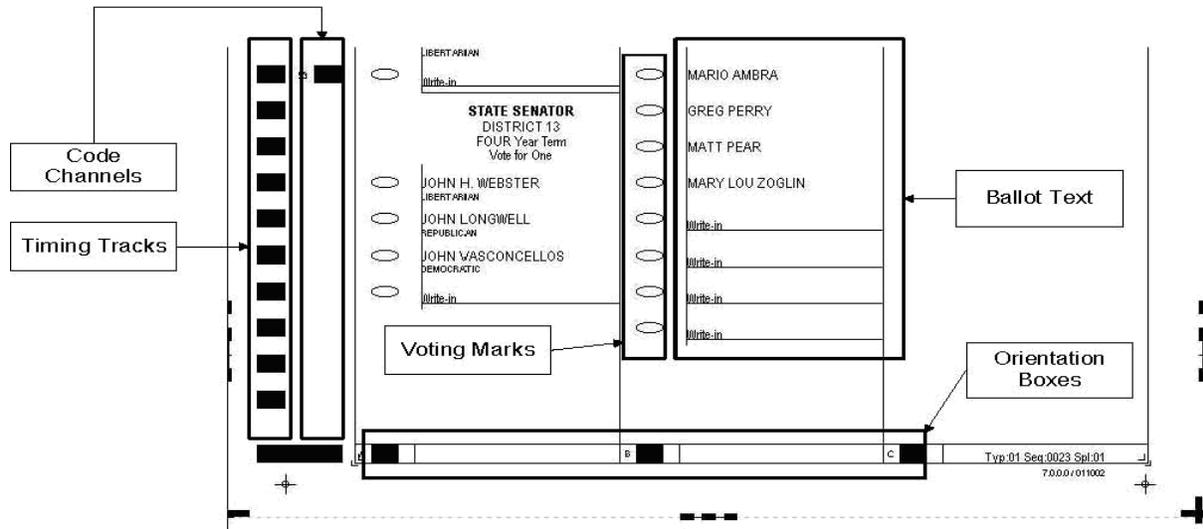

Figure 2-2: Machine-Readable Components on ESSIM Ballot

Code Channel – The scanner reads the code channel to identify the precinct, split, type, and style of the ballot. It is a bar code that differentiates one ballot from another.

Orientation Boxes (Black Check Marks) – Black checks appear above and below each ballot column, timing track, and code channel. The locations of black check marks correspond to sensor locations on ES&S ballot scanners (sensor "A" on your scanner reads the black check mark above and below column "A" on the ballot). Ballot scanners read black checks to calibrate sensors. Where the timing track intersects the vertical column, a potential voting mark can be programmed. Tracks A, B, and C are on the front of the ballot while D, E, and F are on the back.

Timing Track – The left-most column of boxes on the edge of the ballot. The boxes correspond to the vertical positions of the voter response areas and inform the scanner where to look for votes.

Voting Marks (Voting Targets) – A voting mark or target is the selection area next to a ballot response that voters mark to indicate ballot choices. Properly printed voting targets are invisible to optical sensors. Depending on the type of election equipment, the targets appear as ovals, incomplete arrows, touch screen boxes or punch areas. Place ballot text, tint, or ruling lines no closer than 0.20 inches (0.508 cm) from the oval voting mark and 0.06 inches (.152 cm) from the arrow voting mark. Make sure the oval pixel setting is set at 0.003 in ESSIM and that the printed oval is not thicker than 0.005."

2.3 Electionware Paper Ballot

Electionware ballots are one or two-sided and contain 24 columns on each side, and up to 91 rows. A voting target appears next to each candidate name (or referendum response). Voting targets are ovals that voters mark to indicate selection.
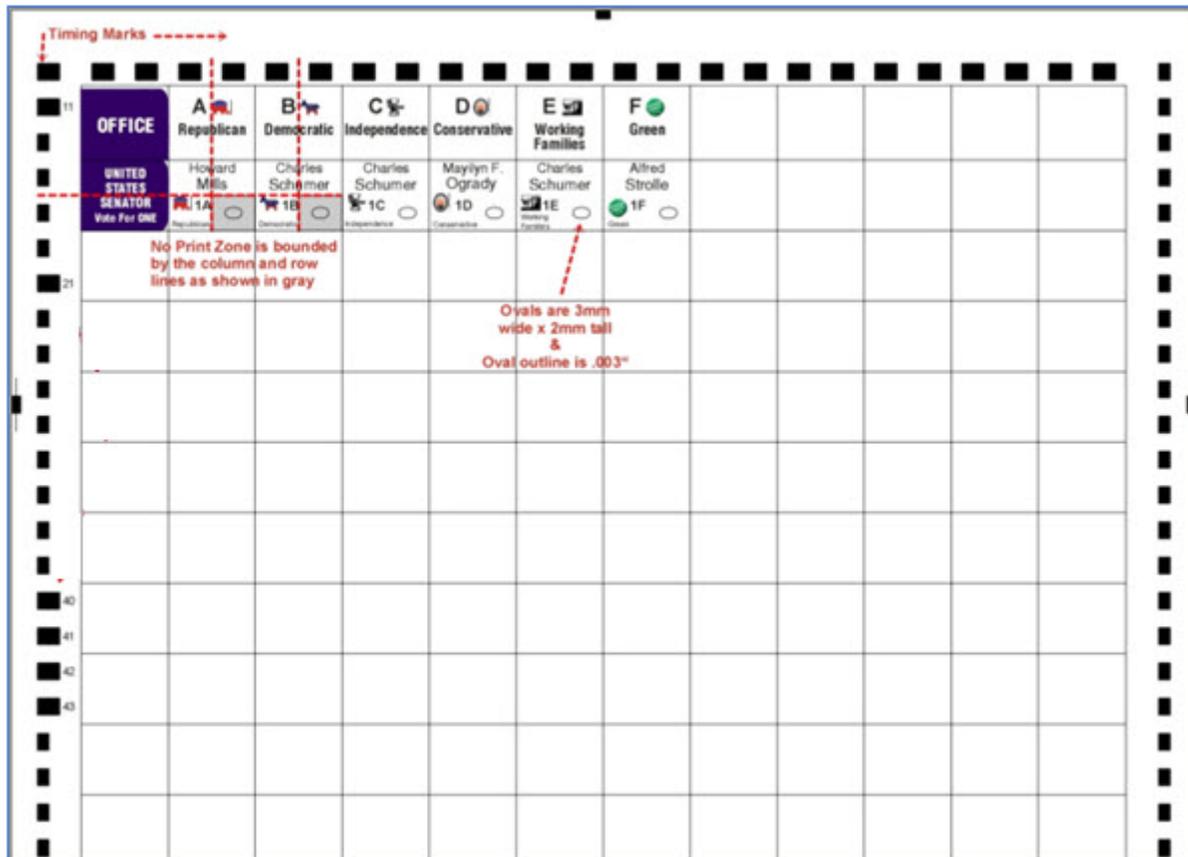

Figure 2-3: Electionware Paper Ballot

Machine-readable components are areas of the ballot that scanners recognize to record marks (such as voting targets and code boxes). Each ballot has four machine-readable components:

Timing Track – The timing tracks are the vertical columns of black boxes on the far-left and right edges of the ballot, front and back.

Voter Marks (Voting Targets) – A voting target is the selection area next to a ballot response that voters mark to indicate ballot choices. Properly printed voting targets are invisible to optical sensors. Place ballot text, tint or ruling lines no closer than 0.20 inches (0.508 cm) from the oval voting mark. Make sure the oval pixel setting is set at 0.003 in Paper Ballot and that the printed oval is not thicker than 0.005."

Chapter 3: Ballot Paper

3.1 ES&S CountRight Ballot Stock

ES&S CountRight™ Ballot Stock has been specially engineered to run on ES&S tabulators and meets all ES&S specifications for the ES&S tabulators.

Important

CountRight Ballot Stock MUST be used when printing for ES&S equipment.

As the manufacturer of the scanning equipment, ES&S understands the critical synergy required between the ballot paper, the ink on the paper, and the tabulator logic. As a result, CountRight Ballot Stock was designed with specific consideration regarding the following measurements:

Caliper – Thickness of the paper

Opacity – Amount of light absorbed vs. reflected by the paper

Brightness – Reflectance of the paper when measured under a calibrated wave of light

Smoothness – Measurement of surface "roughness" of the paper

Basis Weight – Mass (expressed as weight) per number of sheets

ES&S tabulators are designed to use digital CountRight Ballot Stock, which is blank with no pre-printing for the DS200 and DS850.

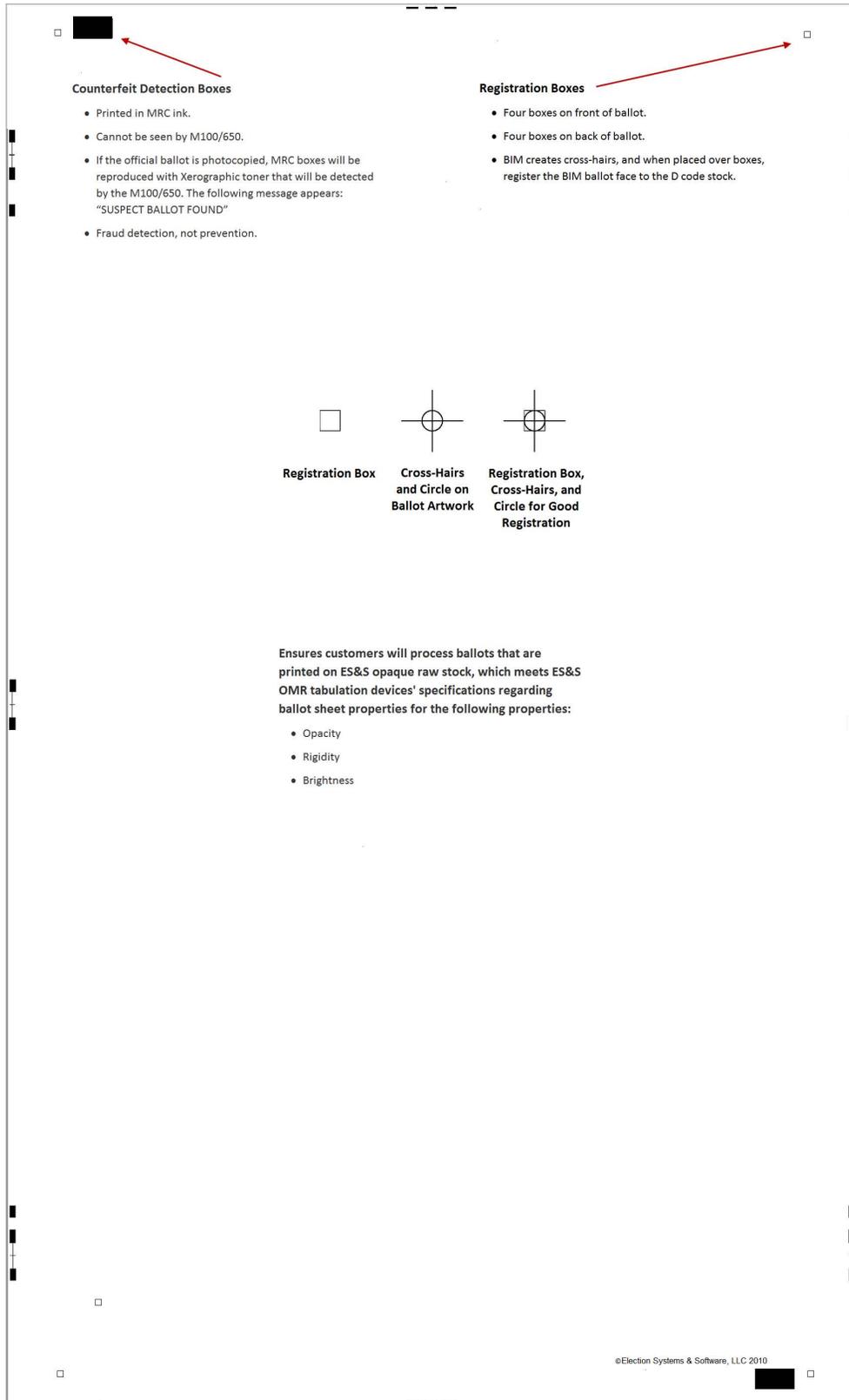The figure on the following page is an example of generic ballot stock.

Counterfeit Detection Boxes

- Printed in MRC ink.

- Cannot be seen by M100/650.

- If the official ballot is photocopied, MRC boxes will be reproduced with Xerographic toner that will be detected by the M100/650. The following message appears: "SUSPECT BALLOT FOUND"

- Fraud detection, not prevention.

Registration Boxes

- Four boxes on front of ballot.

- Four boxes on back of ballot.

- BIM creates cross-hairs, and when placed over boxes, register the BIM ballot face to the D code stock.

Registration Box

Cross-Hairs and Circle on Ballot Artwork

Registration Box, Cross-Hairs, and Circle for Good Registration

Ensures customers will process ballots that are printed on ES&S opaque raw stock, which meets ES&S OMR tabulation devices' specifications regarding ballot sheet properties for the following properties:

- Opacity

- Rigidity

- Brightness

©Election Systems & Software, LLC 2010

Figure 3-1: Generic Ballot Stock

3.1.1 Ordering CountRight Ballot Stock

When ordering stock, it is critical to tell ES&S what type of tabulator(s) you are using in order to ensure that correct stock is ordered. CountRight is available two ways:

- As the only authorized distributor of CountRight, Xpedx offers parent sheets and rolls in several sizes and formats.

- ES&S stocks and markets CountRight Ballot Stock and CountRight Digital Ballot Stock in several sizes and formats.

CountRight is only available from ES&S. Any production of any ES&S Ballot stock without written authorization from ES&S will be considered a copyright violation.

Contact ES&S Customer Service at 1-877-377-8683 with any questions or orders. Allow four weeks for delivery. Visit myES&S Supply Store at http:/ shop.essvote.com for a list of available products.

Table 3-1: Ballot Specifications

Grain Direction on Finished Ballot	Long
Basis Weight	80# text weight (36.2874 kg)
Thickness	0.0061 in. (0.015494 cm)
Smoothness	130 Sheffields
Moisture	5.5 percent
Opacity	97.0
Brightness	92 to 94
PPI	338

Table 3-2: Tolerances

Band Width	8.5 in. (+.027, -.02)
Ballot Length	11, 14, 17, 19 in. (+/- 0.03)
Ink Density	1.15 to 1.25 wet ink density; 1.10 to 1.15 dry ink density
Oval Thickness	Oval thickness is 0.003 (maximum oval thickness is 0.005)

Important   The AutoMark, DS200, and DS850 can accommodate narrower ballots.

The DS200 and DS850 cannot read colored ballot stock.

Avoid using adhesive stickers or labels and avoid embossing or embellishing when printing ballots. Any technique that changes the caliper of the ballot stock will cause read errors during scanning.

3.2 Color Strip Specifications

ES&S ballots use a color strip instead of full color tinting, which further protects the anonymity of a voter's ballot. The strip can be any color and darkness as it is placed on a part of the ballot that the scanner does not read. See the figure on the following page for exact specifications.

This specification is valid on any ballot length or style for the ES&S AutoMARK.
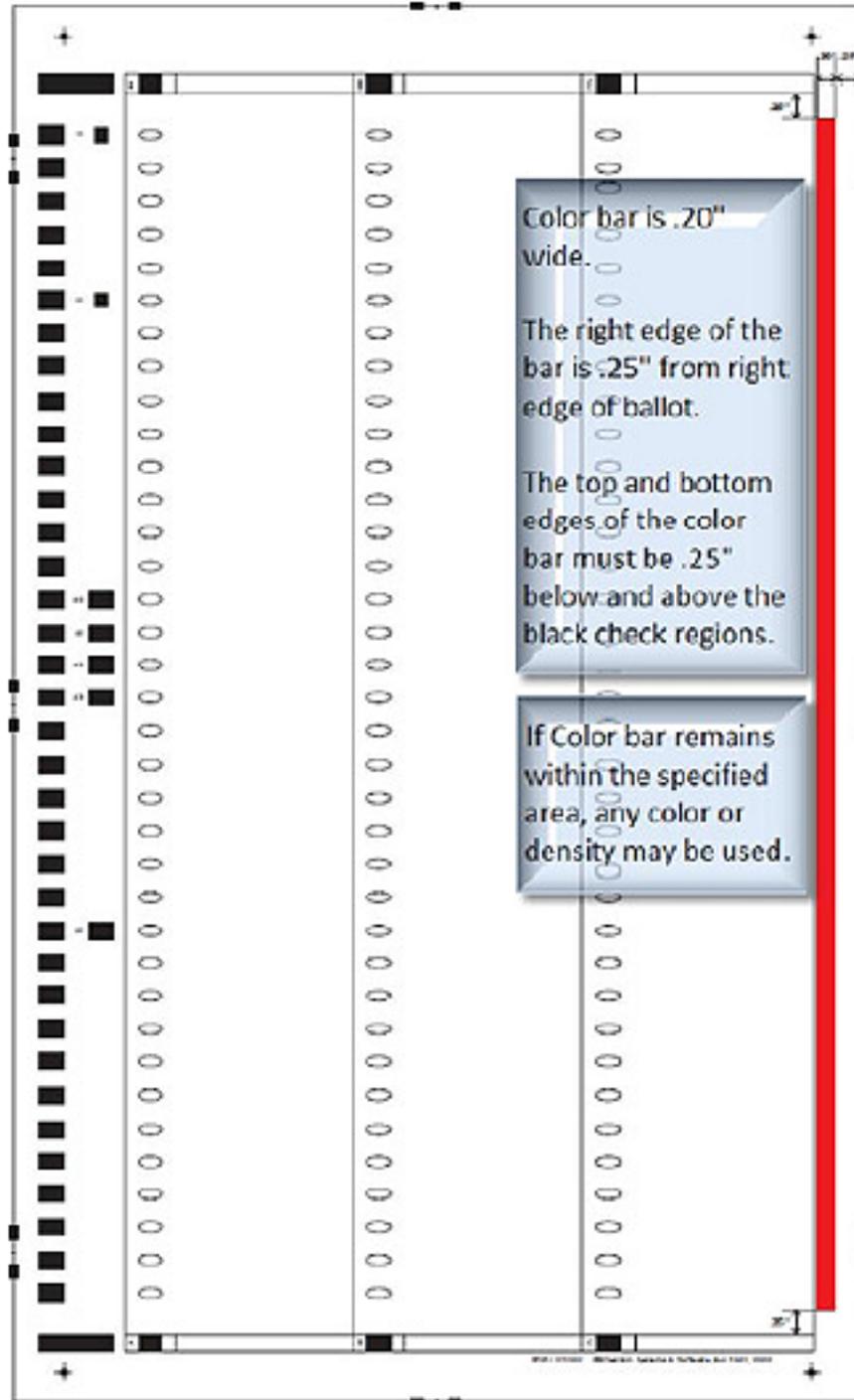
Figure 3-2: Color Strip

3.3 ExpressVote Card Stock

The ExpressVote® uses specially manufactured thermal paper to record printed images such as bar codes and contest selections. The unit's thermal printer selectively heats the paper on one side to activate the dye(s) in the paper. The paper stock is processed to prevent moisture from causing the paper to curl.

ExpressVote card stock is only available from ES&S. Any production of any ES&S Ballot stock without written authorization from ES&S will be considered a copyright violation.

Contact ES&S Customer Service at 1-877-377-8683 with any questions or orders. Allow four weeks for delivery. Visit myES&S Supply Store at http:/ shop.essvote.com for a list of available products.

Table 3-3: ExpressVote Paper Specifications

Type	Thermal heat-sensitive paper
Color	White
Thickness	134 Microns ± 6 Microns (0.005275" ± 0.000236")
Lengths Available	11, 14, 17, and 19-inches ± 0.015" tolerance for all lengths
Width Available	4.270 +0.005 -.025" tolerance for all paper lengths
Die-cut Corner	.750 ± 0.015" tolerance on two sides (see Figure 3-3)

ExpressVote paper specifications are illustrated in Figures 3-3 and 3-4 on the following pages.
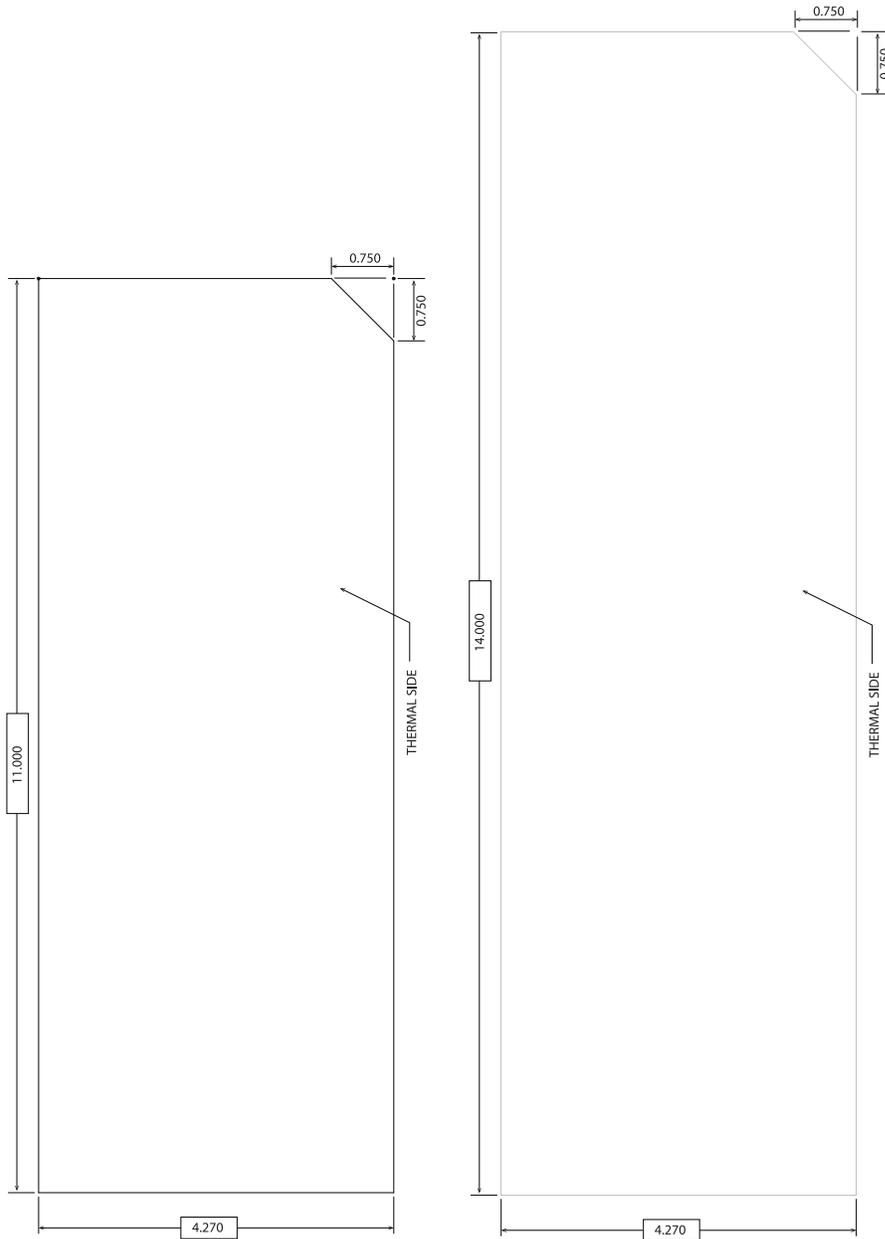
0.750

0.750

0.750

0.750

14.000

THERMAL SIDE

11.000

THERMAL SIDE

4.270

4.270

Figure 3-3: ExpressVote thermal paper stock: 11 inch & 14 inch

0.750

0.750

0.750

0.750

19.000

17.000

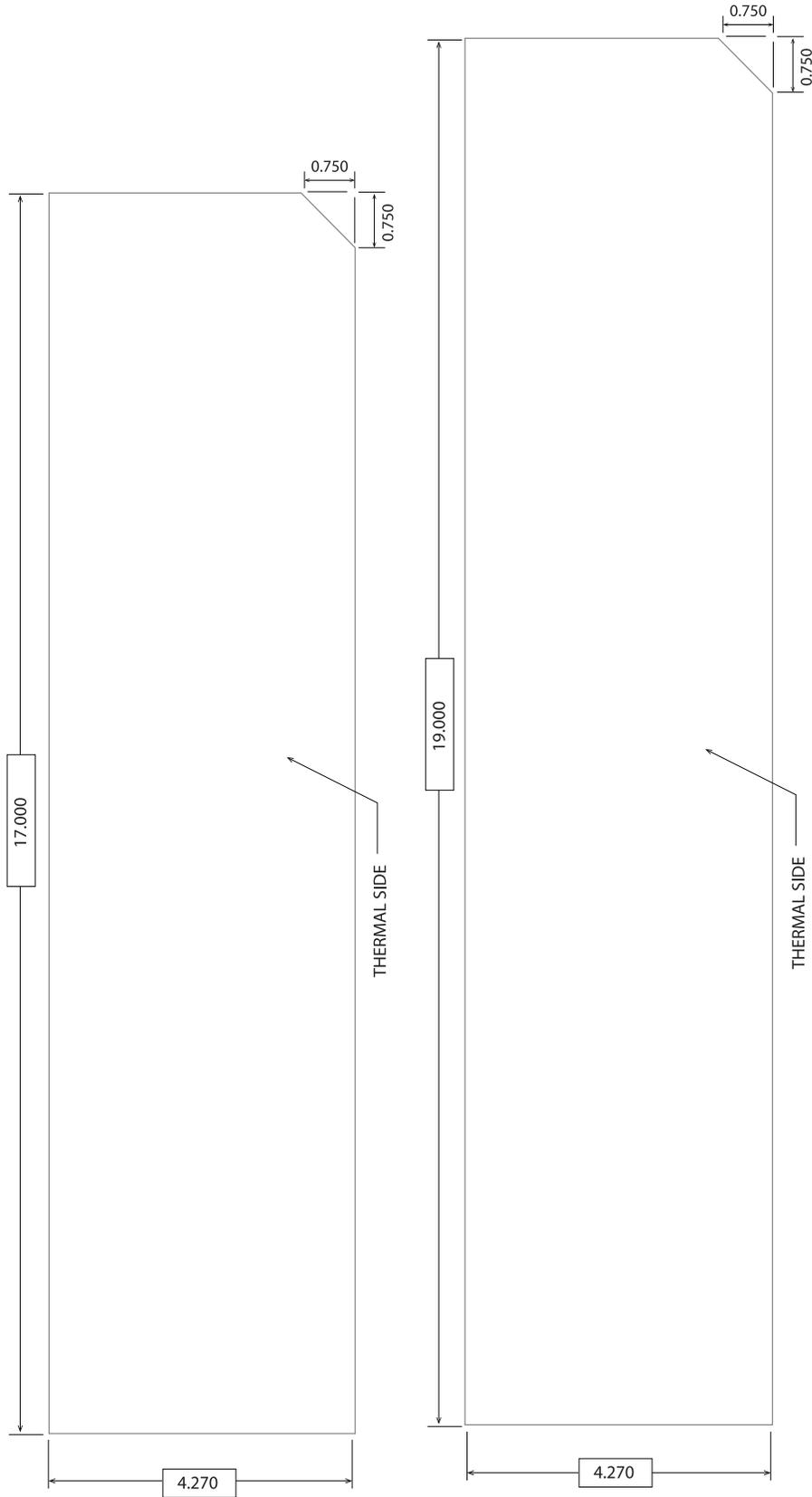THERMAL SIDE

THERMAL SIDE

4.270

4.270

Figure 3-4: ExpressVote thermal paper stock: 17 inch & 19 inch

Chapter 4: Offset Production

4.1 Ballot Ink for Offset Production

Print all of the machine-readable components with high quality, commercially available black ink (extra or double-black) and note the following guidelines:

- Use inks with high tack.

- Only use readable black ink to print ballot components.

- Make sure that all offset is solid and dense without voids, breakthroughs, dirt, foreign particles, white hickies in the timing track, or gray lines.

- Print with a minimum density of 0.95 and a maximum density of 1.5.

- For best results, use a density of 1.15.

- Do not use powder or varnish.

- Do not smear, smudge, or spray the ink when handling the ballots.

- Test the ballot ink on the press with a densitometer.

- Do not print text in the active voting tracks.

4.2 Offset Pre-Press Preparation

Before going to press:

Use the following instructions to prepare the ballot layout for mass printing:

1. Image the PDF file to film negatives or direct to plate at 100%. A PDF file can vary as much as ½ of 1%, depending upon how the software is handled by the output devices. Overlays are required because of the potential for variation.

2. Use the Mylar® overlay provided by ES&S to verify that the PDF is sized correctly, that all machine-readable components are aligned, and that all cut marks and score marks appear on the ballot.

3. Inspect the ballot for accuracy with Mylar master overlays, hard copy laser prints (if one is sent) and a visual inspection of the document image. Check the ballot for wrapping, overprinting, dropping lines, text outside the text areas, or other signs of a corrupt file.

Note

Call ES&S Printing Services at 1-877-377-8683 if you have any questions.

4.2.1 Prepare the Printing Plate

In offset printing, use diazo-coated aluminum or high quality vinyl plates to preserve the integrity of the film image. Paper plates do not maintain the side-to-side dimensions of the ballot image.

4.2.2 Prepare Ballot Stock

Only use ES&S CountRight Ballot Stock and ballot ink that adheres to the specifications in this manual.

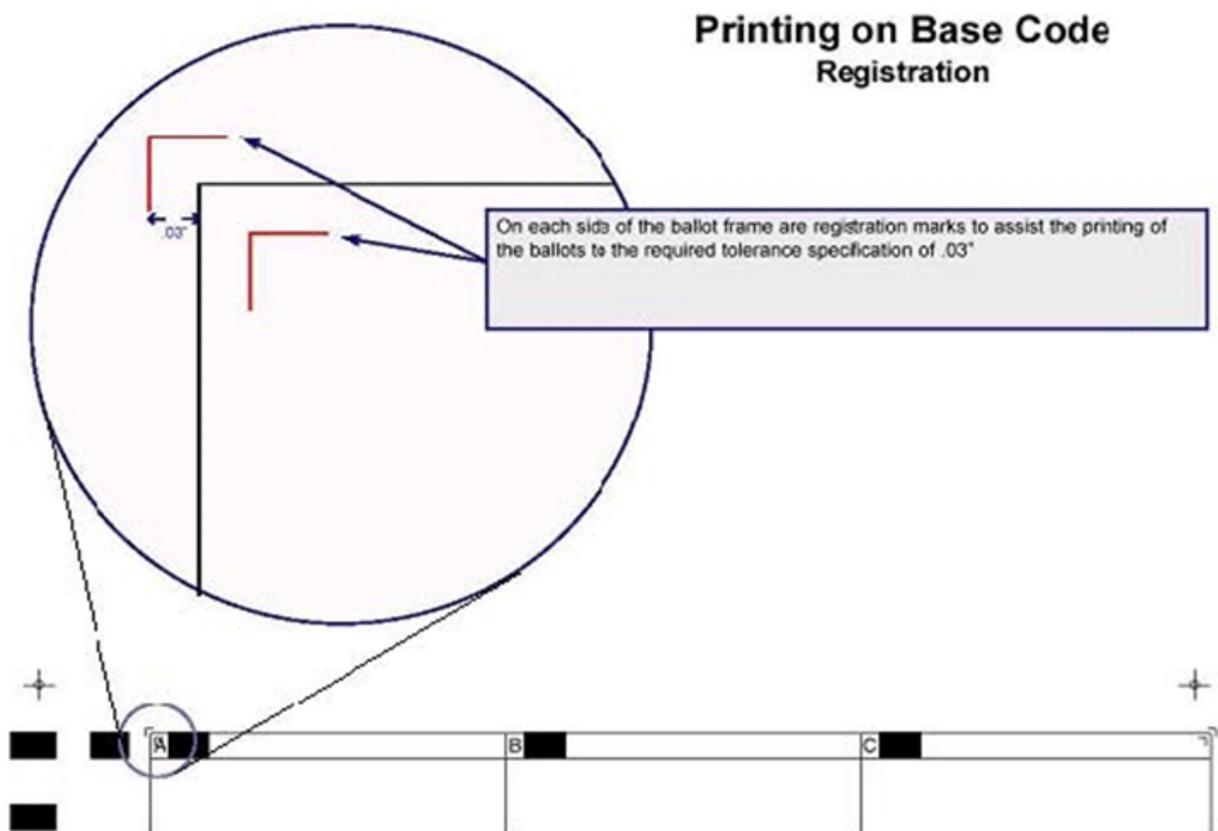Refer to *Chapter 3: Ballot Paper* for paper stock specifications.

Refer to *4.1 Ballot Ink for Offset Production* for ballot ink specifications.

Square the stock before sending it to the press.

4.3 Offset Preparation, Printing, and Proofing

1. Print 150 make-ready sheets and cut to the final size. Check the following:

   • Ballots are square.

   • Front-to-Back registration is accurate by holding ballot to the light.

   • Width is accurate by a using Go/No-Go Gauge.

   • Any visible spots or scratches on the ballot or printing plate.

Printing on Base Code
Registration

On each side of the ballot frame are registration marks to assist the printing of the ballots to the required tolerance specification of .03"

2. Turn the ballot over and do the tests again on the back of the ballot. If all three tests on each side fall within tolerances, the scanner will be able to read the ballot.

3. After performing registration checks, print and inspect the ballots. Allow the ballots to dry.

4. For every 500 sheets printed on the main production run, check the following and initial accordingly:

- Ink density with a densitometer.

- Overall print quality – visible flaws, spots, or marks on the ballot or printing plate.

- Make any corrections/adjustments necessary to the printer. Reprint, and replace ballots as needed.

Note

The large frame on the ballot does not align front to back. They must be off by 0.030 inch (.076 cm).

Caution

In elections where most ballots are printed on a single side, if one or more precincts have a ballot that is duplex printed, all precincts must be printed duplex. ES&S code stock is already printed duplex.

4.4 Offset Cutting, Scoring and Folding

4.4.1 Cutting

To ensure that ballots are the proper width, ES&S has created a Go/No-Go Gauge that will easily measure whether or not a ballot is the right width.

ES&S CountRight Ballot stock is already cut to size; however, check the ballot stock with a Go/No-Go Gauge to ensure that it is properly cut.

If printing from a roll-fed machine, check with the Go-No-Go Gauge to make sure the ballots are cut to the correct width.

4.4.2 Scoring and Folding Ballots

Scoring the ballots before folding them is *not* recommended. A folding machine should be used to expedite the process. In addition, roller pressures should be reduced to about 2 – 3X thickness of ballot stock.

Caution Do not fold across timing marks, ovals, or arrows, as this may cause tabulation errors. Scoring followed by folding may result in the ballot separating at the score/fold line.

4.4.3 Perforating and Numbering Ballot Stubs

A ballot stub is a non-readable portion of the ballot that election workers remove at the polling place for auditing purposes. Stubs usually contain at least one identification number (such as a precinct identification number or sequence code number) and a sequentially printed number that matches the number on the ballot, used to audit ballots that have been cast. Ballots should be perforated for easy separation. Use a micro-perfing wheel to place perforations on the ballot for one 3-inch (7.62-cm) stub or two 1.5-inch (3.81-cm) stubs.

Note Stubs should always be at the bottom of the ballot.

4.4.4 Squaring

The first few sheets should be taken to the cutter immediately to determine if all is square. Stack ballots in lift sizes of 3 to 5 inches (7.62 to 12.7 cm). The weight of the ballot stock may cause offset during the drying process if stacked in higher than 5 inches (12.7 cm).

Note Keep ballot stock clean before, during, and after printing. Avoid grease, water, ink splatter or spray, and dirt. Always wash hands before handling ballot stock.

Chapter 5: Digital Printing

After receiving the files, all ballot sequences need to be proofed to ensure information on the ballot is correct.

5.1 Preparation and Proofing

5.1.1 Overlays and Registration

A PDF can change, depending upon the software used, and although the change may not be visible (about ½ of 1 percent), it could be enough to cause read errors or ballot rejection on ES&S equipment. Using the provided Mylar overlays and the registration boxes, which are preprinted on the ballot stock, will ensure that the ballots being produced are within ES&S specifications.

5.1.1.1 Registration Boxes

Inspect the ballots using the registration marks as a guideline. Registration targets must appear entirely within the registration boxes. If one mark is out of position, the entire ballot is out of registration. Make adjustments to the machine and reprint any misaligned ballots.

5.1.1.2 Using Registration Overlays

- Make sure that you have a "front" and a "back" overlay.

- Align the top and right edges of the ballot with the "edge of paper" lines on the overlay and inspect the printed ovals. The ovals must be printed entirely inside the boxes. If any part of the oval is outside the box, the ballot is not in registration and the PDF or printer must be adjusted and the ballots reprinted until the sizing and registration are correct.

- Verify that the black check boxes at the top and bottom of the ballot, and the timing tracks and code channels along the left side of the ballot, are within the boxes printed on the overlay. The left and bottom edges of the ballot must fall between the Min. and Max. lines when the top and right edges are on the "edge of paper" line. If any part of the boxes is outside the box, the ballot is not in registration and the PDF or printer

must be adjusted and the ballots reprinted until the sizing and registration are correct.

Caution

Check front-to-back registration on the ballot by holding it up to a light. The timing track should line up evenly.

5.2 Printing

When printing, use the following tools to check the following:

- Mylar Overlay

- Registration

- Ballot width

- Ballot length

- Go/No-Go Gauge

- Ballot width

- Densitometer

- Ink/toner density

- Micro-ruler

- Oval thickness

On every ballot inspected, make sure to check the following:

- Overall print quality – any visible flaws, spots or marks

- Front-to-back registration

• Proper toner/ink adhesion

Important   If any of the above measurements are out of ES&S specifications,
make any corrections/adjustments necessary to the printer, reprint,
and replace ballots as needed.

5.3 Packaging

Before shrink-wrapping and shipping the ballots, perform these final tasks:

- Fan through the pages (both front and back) to visually identify any
  visible errors or marks. Reprint and replace ballots as necessary.

- Use chipboard when shrink-wrapping quantities of fewer than 50
  ballots.

- Do not shrink-wrap quantities greater than 250.

- Include a packing list or label each ballot box that clearly shows what
  ballots are in each specific box for easy customer recognition.

5.4 Binding and Shipping

- Bind, number, and box the ballots for shipping. If the ballots are to be glued or stitched, do so at the bottom of the ballot stub.

- Do not bind ballots at the top.

- Ship the exact number of ballots that have been requested in shrink-wrapped packaging.

- Package ballots with a backer to provide support and prevent damage.

- Ship ballots in containers large enough to hold in the ballots and strong enough to withstand damage that may occur during normal shipping and handling.

- Label the outside of the cartons "ELECTION MATERIALS" and include a shipping manifest unless directed to do otherwise.

Note

Call ES&S or the client for labels or for further assistance.

Appendix A: Revision History

Ballot Production Guide Document Version: 1.2 4/30/15	
Chapter(s)	**Description**
3	Updated physical specifications for ExpressVote card stock. Added spec drawings for each length of ExpressVote card stock.

Ballot Production Guide Document Version: 1.1 3/9/15	
Chapter(s)	**Description**
3	Added ordering information to paper & card stock. Added statement of exclusivity to EV card stock.

Ballot Production Guide Document Version: 1.0 10/1/14	
Chapter(s)	**Description**
All	New guide, built from EVS5300 manual (does not refer to telecom)
1	Corrected call tree menu instructions Moved warnings to this chapter
2	Updated memory device description
3	Moved ExpressVote card stock information into Paper chapter
5	Moved shipping information to this chapter
Index	New index

Index