

Creating Security Documents on the MECCA™ 2000 System

by

Raymond L. Garner
Security Document Specialist
Amgraf, Inc.
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The MECCA 2000 System is the next generation of Amgraf's MECCA III - the world's premier business forms composition system. The MECCA 2000 software offers graphic designers a comprehensive suite of tools to create multi-color, multi-part forms with graduated screens, borders and pantographs, scanned logos, barcodes, and fine typography. For label manufacturing, the software includes trapping, flexographic distortion, and a unique step-and-repeat feature.

MECCA 2000 also contains a comprehensive set of design tools to add copy-resistant graphical safeguards to certificates, coupons, titles, tickets, monetary or legal documents, and other valuable forms, labels, and tags. Our graphical effects are easy to create but virtually impossible to duplicate.

Finished designs are output via PostScript to monochrome and color proofing printers, or as flawless color-separated negatives or plates for printing presses.

Security documents are special because of their function in representing negotiable value, legal ownership, and official status. Because of their value, these documents are subject to counterfeiting and tampering.

Four classes of security technologies are often utilized to protect a document. Three are material-based. First, manufacturers can choose security papers from controlled sources or papers that have verifiable characteristics such as watermarks or embedded threads. Second, special inks and coatings can be used which have fluorescent or thermal characteristics, or which discolor if tampered with. Third, appliques such as holograms and foils can be affixed to the document to distinguish it. The fourth class of safeguarding technology, which is what Amgraf provides, is complex graphical imaging for the body, background, and borders of the document. The safest document is one that includes all of these four technologies in its makeup.

You will be hearing from other speakers about the most effective papers, inks, and foils. In this presentation we'll take a closer look at what is involved in the creation of security graphics.

We will review MECCA 2000's security capabilities starting with the easiest to create and following through to the most complex. The first technique is not really a unique graphical feature, but its importance should not be overlooked.

Warning Bands

The warning band is a simple statement of the security technologies that are present within the document. Although it is the simplest thing to add, the warning band is one of the most effective deterrents to a potential counterfeiter. Every security feature in the document must be defeated and criminals are more likely to abuse an unsecure document than one boasting of multiple security features. Most often, the warning band identifies measures such as colored backgrounds, the appearance of microprinting, artificial watermarks, thermochromatic ink, foil stamps, and other overt features.

Warning bands are common on checks, stocks, and titles, because they alert the receiver of the document as to what features should (or should not) be present in a valid original document. Warning bands on titles and certificates typically state that the document may become null and void with any attempt to erase or alter information.

Phantom Logos and Images

The inclusion of a phantom logo on any document is another easy method to add security. However, the phantom must be used in contrast with other graphical effects. For example, place a lightly screened logo image within a document's background adjacent to fine-line borders. This combination can quickly frustrate an amateur counterfeiter's attempt in copying. When adjusting the brightness level on the copier or scanner to pick-up the phantom image, the borders of the document become muddy and lose definition.

To further enhance the appearance and complexity of the document, include gradient screens within the phantom image. Again, this will make the effort of photocopying even more tedious and frustrating. Whether the gradient effect is contained within a single image, or applied to a step-and-repeat background, the digital capture process can become too cumbersome for the amateur counterfeiter.

With MECCA 2000, phantoms can be generated from simple line art, scanned images, or from photographic sources. When placed at strategic locations on the document, such as signature lines, amount boxes, or name fields, these areas are less likely to be altered on the original document.

Prismatic Color Blending

The above techniques also apply to Prismatic Color Blending.

Prismatic Color Blending is the technique of overprinting multiple ink colors to create a blended color effect. The overprinting of 2 ink colors will visually blend together forming a third blended color. When applied to a document, this effect can become quite difficult to match during color copier reproduction.

MECCA 2000 creates the prismatic color effect by generating multiple printing plates. These in turn are overprinted, creating a new blended color. Due to the nature of overprinting screened images, each separation must contain complementary dot angles to avoid moiré patterns on the final product.

Prismatic color blending is visually similar to that of split-fountain printing, however, differences between the two printing methods become apparent during magnification of the final printed material.

The prismatic printing method requires that a minimum of 2 ink towers overprint screens on the final product. Whereas split fountain printing require that 1 ink tower be loaded with multiple ink colors printing from a single plate. The multiple colors on the ink tower are separated by a "dam" at the inking rollers.

When magnified, the prismatic blend method shows multiple sets of ink dots on the printed product. Magnifying the split fountain method shows that only 1 set of ink dots are present. As the dots are viewed across the blended area, the color of the ink dot actually changes. Color consistency throughout a large print-run is more difficult to control with split-fountain printing than with prismatic color blending.

Again, when placed at strategic locations on the document, such as signature lines and dollar amount boxes, these areas then become less likely to be altered on the original document.

Microtext and Microprinting

As color copier technology improves, some of the most popular graphical security effects (such as Void Pantographs) are being defeated. Not so with microprinting. Created from type that is too small for the naked eye to clearly see, it is perceived as a printed line. When viewed under magnification, the line becomes legible as tiny letterforms spelling out a message. Most attempts to photocopy or scan micro-text produce illegible results due to its small character size.

Micro-text in its simplest form is typically used for a line or a box frame. It is now commonplace for signature lines on checks to be made up of microprinting. In more elaborate documents, micro-text is used within the background image itself. With MECCA 2000, the application of micro-text is as simple as picking a path to follow and inputting the wording. Also revisions to the wording of the micro-text are minor edits with MECCA 2000.

To increase the level of security within a document through the use of microprinting, the illusion of a background screen or inside fill can quickly be created. Since micro-text can follow any path or shape with MECCA 2000, the creation of these complex backgrounds is quick and easy.

By combining the usage of micro-text with MECCA 2000's relief print feature, the level of complexity within the security document greatly increases. A relief print pattern is generated within a document's background. Micro-text is then applied to the pattern resulting in an incredibly complex background image.

Fine Line Relief

The addition of relief lines can instantly increase a document's level of design complexity. MECCA 2000's relief pattern is a series of lines and curves that originate from a high resolution scanned image. The resulting lines are overlain upon the original image, creating the illusion of depth similar in appearance to that of embossing. Once the relief lines have been generated from the high resolution image, that image is typically discarded.

With MECCA 2000, the characteristics of the relief lines are controlled through a visual dialog panel. Attributes such as line spacing, drape height, front and back angle, drape effect, and draw direction are controlled by the user. Other characteristics available to the operator are line thickness, density and ink color. Once the designated image is identified, the application of the relief pattern is almost instantaneous. For further complexity, the relief lines can be solid or screened, and can be reversed-out of another background color or image.

Altering the origin offset allows the relief lines to be shifted to any position for final pattern adjustment. Overlaying multiple sets of relief lines at varying angles and spacings creates intricate background images that are extremely difficult for the counterfeiter to reproduce.

Adjusting values such as positive and negative drape angles, often create very interesting effects within the relief patterns. The relief pattern can alternate between positive and negative drape angles through the use of an oscillate feature.

Once created, relief lines can be further enhanced if desired, such as replacing with micro-text or by applying a distortion effect to the overall relief pattern.

Hidden Messages or Images

To make a document even more complex, you can insert hidden images within a pattern. The use of hidden or latent images within a document can be an effective tool in its verification process. Images or words can be embedded within a document's border, background, or ornament where only a trained document receiver knows to look.

Visually subtle, the hidden message is often overlooked by the untrained eye. Under magnification, it becomes obvious that a message is present within the document. The MECCA 2000 software has the ability to create these hidden images or messages.

For example, a series of multi-angled rules are often used to create a hidden message as a graphic object. Then the area surrounding the message is covered with lines at a contrasting angle. Adjustment to the thickness of the rules allows the message to become more or less hidden within the background pattern.

Void Pantographs

Although not fail-safe due to enhancements in copier technology, the void pantograph background is effective against the casual counterfeiter using a photocopier. Messages hidden within the background appear when attempts to duplicate the original are made. This feature is most commonly found in checks, but many additional applications for the void pantograph exist in documents today.

The Void phenomenon is based on the copier's inability to accurately reproduce screen densities of differing resolutions and dot angles. The naked eye sees an even color density while the copier sees a glaring difference. Several techniques of the void background feature exist, some are patented processes requiring licensing, while others are in the public domain. Amgraf's MECCA 2000 software allows a wide variety of void background methods to be generated.

A large library of standard pantograph patterns exist with MECCA 2000 for use in the superimposition of a void message, but unique custom security background patterns can be created for use with voids as well. Messages that are to be hidden in the background, can vary in font, style, and point size.

The designer has full control over the final appearance of the Void text and background pattern during its creation. Variables such as screen density, lines per inch, dot shape and dot angle are fully adjustable. All are important factors in obtaining optimum results whether the void background is designated for black- and-white or color copier protection.

Guilloche Patterns

The Guilloche pattern is a unique non-repeating spiral design. The usage of a Guilloche pattern as a background can be an effective deterrent against a counterfeiter's attempt to cut-and-paste information since the pattern is non-repeating and unique, especially in areas of critical concern.

With the powerful tools available in the MECCA 2000 software, the creation of a Guilloche pattern can be achieved easily and quickly. You begin with a single pattern cell drawn through the use of MECCA's standard drawing tools. The ability to scale and copy simultaneously allow for an individual segment of the Guilloche to be created. Then using the rotation feature, the base section can be duplicated to create the Guilloche background. Simple shapes such as circles or ovals can be quickly converted into a complex background Guilloche pattern. Simply

copying a single circle and then using the Shearing feature to distort the section creates a unique pattern segment. Mirroring the segment creates a pattern section for the final Guilloche. Again, using the rotation feature this section is then replicated around a central point of origin.

Once the desired background effect has been generated, the powerful clipping mask tool allows the Guilloche pattern to be applied to any document as a background or within an individual shape.

Custom Geometric Patterns.

The MECCA 2000 can transform a simple geometric shape into a highly complex design pattern. Due to the fact that the originating shape can be freely designed, each resulting transformation then becomes a unique custom creation.

Almost any shape that can be created on MECCA 2000 can quickly become a complex design pattern. Items such as curves, ovals, circles, spiral shapes and even straight lines can create some of the most unique designs. By simply adjusting the amount of rotation and cell spacing, a single shape can create many varying and interesting results.

Once a geometric pattern has been generated, it can quickly be used for several different purposes. By merging several patterns, the complexity level of a design increases. Using MECCA's masking feature allows a geometric design pattern to be quickly produced for use as a one of a kind custom border for any document.

Point Shaker

The point shaker feature can take a computer-generated geometric design and give it human imperfections. A custom uniform pattern can be very effective when placed upon a document, but sometimes it is desirable to disrupt the uniform pattern with a small imperfection that a trained document receiver is knowledgeable about. This then becomes a visual indicator of the document's authenticity.

The Point Shaker option within the MECCA 2000 software allows a designated region to receive a distortion effect. This effect can be applied as a global feature or constrained within a specific region. The amount of both horizontal and vertical displacement becomes user-defined as well as the method of displacement.

When applying the feature to a uniform patterned background, a new custom non-repeating background pattern is generated. Using the effect within a constrained circular region, the amount of displacement can be maximized to either the center or tangent edge of the designated boundary.

If used in a situation that requires the overprinting of multiple colors to create a color blend, the effect can be applied to a single color if desired. This in turn creates the illusion of misregistration at the press, but only within the designated area. As a document receiver, this becomes a visual key as to whether the document is an original or counterfeit attempt.

Custom Patterns

Other types of backgrounds, borders and ornaments can be created through the Spiro and sine wave generators. As we have seen, the inclusion of a custom created ornamental design to a document reduces its chances of being successfully counterfeited. Images which contain highly detailed fine line designs and patterns become extremely difficult to digitally or photographically capture.

The creation of a new ornamental design is achieved through the use of MECCA 2000's Spiral and Sine Wave Generator features. Originating with a base contour design of the ornament, either a spiral or sine-wave pattern can quickly be applied. The appearance of the generated pattern is fully controllable by the designer during the creation process. Features such as wave height, wave width, cycle count and boundary offset are just a few of the controls available. Additionally, other options allow the appearance of the wave shape, spiral perimeter, and pen position to be adjusted if needed. In addition, the geometry that generates the pattern can never be replicated, even by the same designer using the same MECCA 2000 system.


While generating sine-wave patterns, controls allow the wave to follow along a simple outline path or be contained within the framing of an inside and outside boundary. Both the spiral and wave patterns can be applied either to the interior or exterior of any path designated.


Within an ornamental design, combining both the spiro and sine wave features, result in a highly complex image which can be quickly customized for any document.

The use of fine-line relief printing, superimposing hidden messages, original fine-line detailed borders, unique geometrical designs, prismatic color blending, and also quick touches such as microprinting and phantom photo images, create a highly effective counterfeiting deterrent, especially when used in conjunction with security papers, inks and other treatments.

Keep in mind that graphical effects can be used to add security to almost any document. Unlike special papers, coatings, and inks, graphical effects in general do not add to the overall manufacturing unit cost of a document. Given two documents which have the same value, a forger will most likely try to counterfeit the one with the least number of security features. In many cases, just adding a few of the graphic effects described in this presentation will protect the document and keep it safe from criminals.

Note: A video that accompanies this white paper is available from Amgraf, Inc. Please contact the author for a copy.


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Computer Generated Security Patterns

Raymond L. Garner
 Amgraf, Inc.
 1501 Oak Street
 Kansas City, MO 64108


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Who is Amgraf, Inc.?

- ◆ Founded 1976
- ◆ Publishing Systems Integrator
- ◆ Business Forms Composition Software Developer
- ◆ Product Families - MECCA, OneForm Designer, Triton


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Amgraf Business Forms Composition Strategy

**Compose forms once and output many times:
 to paper, film, plate, digital press,
 computer displays, and the Internet.**

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Key Software Technologies

- ◆ MECCA 2000 for Custom Composition
 - Business Forms
 - Labels
 - Security Documents
- ◆ MECCA Merge Forms for Batch Composition
- ◆ OneForm Designer to Produce Electronic and Internet forms from Paper Form designs
- ◆ Triton for Customer Proofing


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MECCA 2000 Workstation



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MECCA 2000 Graphical User Interface




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Security Document Composition Features

- ◆ Warning Bands
- ◆ Phantom Logos and Images
- ◆ Prismatic Color Blending
- ◆ Microtext and Microprinting
- ◆ Fine Line Relief


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Security Document Composition Features

- ◆ Hidden Messages or Images
- ◆ Void Pantographs
- ◆ Guilloche Patterns
- ◆ Custom Geometric Patterns
- ◆ Point Shaker
- ◆ Custom Patterns


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Sample Security Document



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Stop by our Tabletop Display for a Demonstration of MECCA 2000

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Amgraf, Inc.



AMGRAF, INC.
1501 OAK STREET
KANSAS CITY, MO 64108
(816) 474-4797
<http://www.amgraf.com>

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