The following is a guide designed to provide 3M digital graphic license plate customers with information relating to digital graphic license plate artwork, design and production.

PRINTING CAPABILITIES

To better understand the design process, the digital license plate printing process will be explained. The digital license plate printing process is unique and as such, requires different design specifications than those used in conventional printing.

Medium
All 3M digital license plates are printed on reflective sheeting. The sheeting is not as dimensionally stable as paper and therefore stretching may occur. This medium also has some limits in thermal transfer graphic printing due to the high heat required to transfer the ribbon media to the sheeting.

Registration
Registration of each of the 4 color stations is plus or minus 4.5 mils (.0045) per color. The sheeting has a tick mark used for printer registration. The printer uses a Top-Of-Form (TOF) sensor to read the tick mark and locate the graphic. The registration of the printer to the tick mark is plus or minus 5 mils (.005)

Coverage
The coarseness of the sheeting may cause halftones over 75% tint value, to fill in. Halftones under 5% tint value may not print at all. Most images are printed at 45-55 lpi for optimum coverage and printability, but some images can be printed up to 75 lpi. Graduated halftones are especially better at the lower 45-55 lpi. The designer, in certain instances, may need to adjust the separation angles, the separation technique and/or dot shape to optimize printing of the design. Thin lines less than 1/32 of an inch, may break up or print unevenly.

Colorants
The colorants used for digital license plate printing are resin ribbons manufactured to be UV fade resistant. These ribbons produce colors that are transparent, in order to meet reflectivity standards. The digital license plate printing process does not use the PANTONE® Color Match System. For optimum color matching, colors should be selected from the 3M Digital Graphic License Plate Color Book.

DESIGN

Keep the following parameters in mind before starting any digital license plate design.

Size
The finished plate size for digital license plates is 12 x 6 inches. Designs for use in the United States, Canada and Mexico must fit into an 11.44 x 5.44 inch rectangle, with radius corners sized to match the debossing rim in the blanking press. The resulting .28 inch margin is needed to ensure acceptable finished license plates, given the requirements of the sheeting and the production process. Bolt holes are .3125 inches in diameter and each are spaced (to bolt hole center) +/- 3.5 inches horizontal and +/- 2.375 inches vertical from the center of the plate. Please check with the local regulatory agency for specific plate geometry and design requirements (i.e. size and location of the alpha-numerics, sticker pockets, etc.). See Figure 1 for a graphic representation of these parameters.

Line Art
Avoid thin lines under 1/32 of an inch in width. Intricate solid shapes are acceptable. However, a loss of detail may occur. Design elements (shapes), smaller than .008 x .008 inches and/or .008 inches in any dimension, may fail to print.

Color

Typical 4-color designs should be designed and setup using the CMY colors only. The 1st color station, typically the black color, will usually be used for a separate spot color for printing the alpha-numerics. While halftones and graduated tones can be used, a shift in these tones may result, due to the unique properties of the reflective materials, ribbons and printing processes. At a 300 x 300 dpi resolution and a 53 lpi line screen, the printer is capable of printing a maximum of 32,768 colors. The actual color palette size is somewhat smaller due to limitations of the thermal transfer process and the reflective sheeting.

Due to the excessive heat that could be generated by producing plate designs with large color fill areas, the graphic design should be limited in the amount of color saturation. If designs of large color fill area must be used, the number of plates able to be printed at a time may be limited in number. For best results, the following guidelines and test are suggested:

- **1 Pixel Test** - The total tonal value of all colors should not exceed 50 %. This can be found through Adobe PhotoShop. After bringing the design into Photoshop, select the bilinear image resample and then reduce the size of the image to 1 pixel. Use the magnify tool to enlarge the pixel. Make sure the image is in CMYK mode. Place the Magic Wand tool over the pixel and add up the % values in the Info box. Any one color is over 25% or if the total coverage is over 50%, the length of a print run could be limited and the life of the print heads could be shortened below warranty levels.

The designer should seek to balance the use of color in the design across the license plate. Designs with color on one side of the plate but not on the other side, or uneven color distribution across the plate, could cause ribbon wrinkling during printing.

Graphic Placement and Legibility

Since size and spacing of the alpha-numeric vary, check with the local regulatory agency for exact specifications. Avoid heavy coverage of colorant in the alphanumeric areas. Heavy coverage in these areas reduces legibility for law enforcement. Design elements (text and logos) dark in color, should be spaced at least 1/4 of an inch away from the alpha-numerics.

Trapping

Because of the transparent properties of the thermal transfer ribbons, trapping between colors and halftones is not recommended.

COMPUTER CAPABILITIES

3M TSS uses Adobe Illustrator and Adobe Photoshop on both Macintosh and PC computers and CorelDraw on PC computers.

Compatibility

3M TSS accepts Adobe Illustrator files, Adobe PhotoShop files, CorelDraw files and Adobe Acrobat files. All placed or parsed bitmap files must be included separately. For Adobe Illustrator files, save in the Illustrator 6.0.ai format. For Adobe Photoshop files, save in the .psd format. Save with elements on separate layers and do not flatten before saving. For CorelDraw files, save in the .cdr format and for Adobe Acrobat files, save in the .pdf format. Include all placed or embedded bitmaps as separate files. All files, in any format, must have anti-aliasing and color profiles turned off.

If you believe there may be a compatibility issue between your system and 3M TSS's, also send black and white color separation printouts on paper or film, or composite prints, at 100%. 3M TSS will scan and recreate artwork to match the original design. Before making printouts, fill all halftones 100% so that its shape can be clearly delineated. Include a composite print of the design at 100%. Specify all fonts used, color call outs, and halftone tint values if halftones are used. If photographs are incorporated into the design, please submit. 3M TSS will scan them for placement into the design.

Do not use compression software of any kind for vector files.

3M TSS does not use 3D or CAD software.

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ELECTRONIC DESIGN

The following guidelines are for customers sending electronic files.

All license plate designs are completed in vector form (Adobe Illustrator or CorelDraw), with placed photographs if any. 3M TSS prefers that customers send original photographs and/or traditional illustrations for scanning and converting to spot color. 3M TSS will accept Adobe PhotoShop files or tiff files of scanned or created material. However, the resolution cannot be increased. Acceptable disk formats are listed on page 3.

Vector Artwork

Fonts, logos, halftone areas, gradient fill areas, and line art in general, should be constructed in a vector drawing program such as Adobe Illustrator or CorelDraw. This makes file sizes small, editing, trapping, and color separation easier. For example, crisp type done in a paint program would need to be at 300 dpi resulting in horrendous file sizes.

Convert all fonts to vector form by using Create Outlines or convert text to paths, according to whatever vector program is being used. Or send the True Type Font used in the design, on the disk with the design.

Bitmapped Artwork

Bitmapped artwork is any image such as a scanned photograph or traditional illustration that is in pixel form, commonly used or created in a paint program such as Adobe PhotoShop or Corel Paint. Bitmapped artwork can be successfully incorporated into a license plate design using a variety of methods. Again, 3M TSS prefers that the customer send continuous tone photographs and/or traditional illustrations for scanning, clipping path creation, spot color conversion, placing, and color separating. 3M TSS can accept scanned or created images from the customer with a resolution of 300dpi at 100% size. Do not use any anti-aliasing in Photoshop. This includes tools such as the magic wand, paint bucket, lasso, and marquee tools. Anti-aliasing will only result in a blurry image when printed.

3M TSS will scan and convert any line art on paper or film.

3M TSS will not scan halftones for reuse.

Customers sending in pictures for scanning, should keep in mind that photographs and/or illustrations from previously printed materials such as books, magazines, and brochures will not scan well due to halftone dot patterns. Scanning such material may constitute a copyright violation for which the customer, not 3M TSS will be held liable. Do not send website images or printouts thereof. Website images are typically at the lowest possible image quality (8-bit color at 72dpi). These images are not usable.

Since color photographs and illustrations will be converted to CMY and one spot color, this will limit the number of colors to four. The finished result is basically a compilation of monochromatic (single spot color) areas. Save bitmapped artwork in the tiff file format. 3M TSS does not recommend image compression. If image must be compressed, use only LZW compression. JPEG compression permanently degrades the image.

Please include a hardcopy or detailed layout for each design. This can be color, black and white laser prints, or drawn layouts. Include color call outs, identify the fonts used and specify halftone values. This avoids any confusion concerning the design and its elements.

ELECTRONIC DISK FORMATS

Compact Disk (CD)
Files may be e-mailed, but problems may arise due to file size and format. If too large, a Web Dropbox will be set-up for the designer to transfer artwork to 3M.
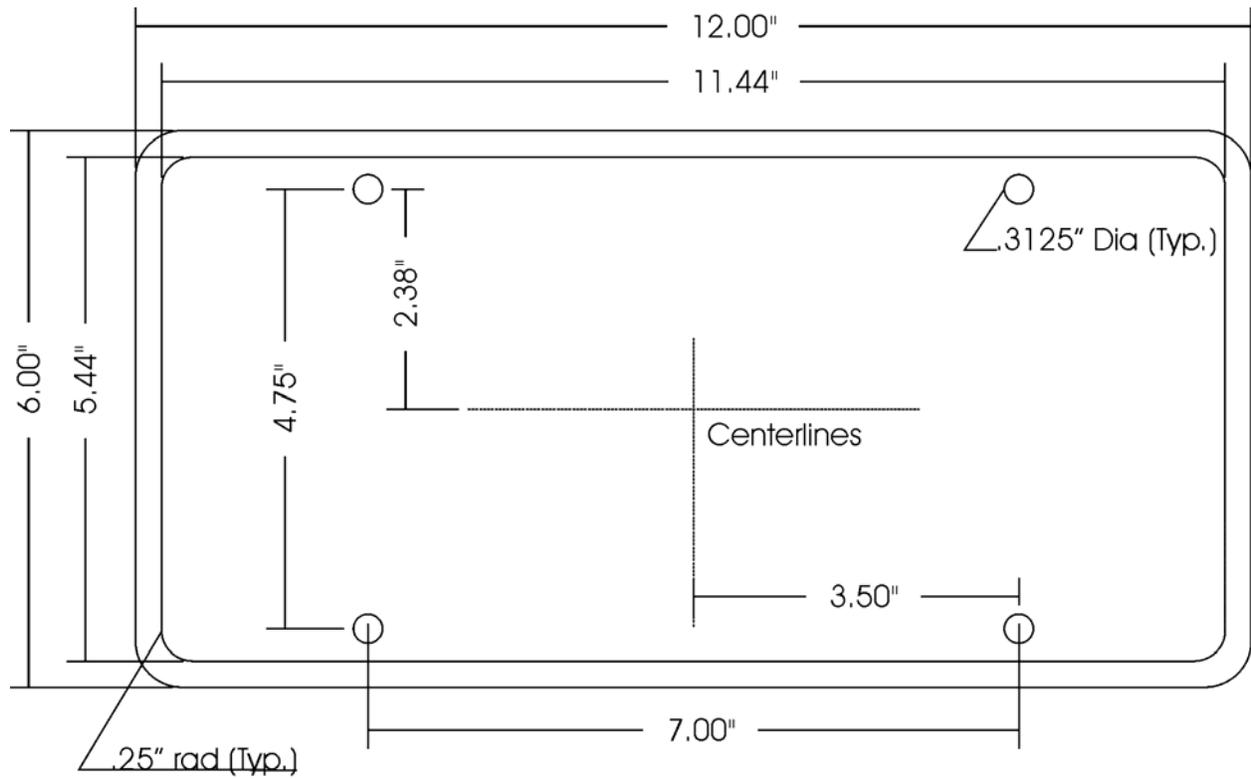
Figure 1 – Digital License Plate layout

= Graphic Area 3.0 W" x 3.6" H = Plate Image Area 5.4" H x 11.4" W

3rd Position is number or stacked character

00 BK 00000

Place Month Sticker Here

South Carolina

Place Year Sticker Here

Debossed Rim