UNITED STATES PATENT AND TRADEMARK OFFICE

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DRAWINGS AND ILLUSTRATIONS

SECURITY DOCUMENT MANUFACTURING METHOD USING HALFTONE DOTS THAT CONTAIN MICROSCOPIC IMAGES

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By

HUVER HU

Assigned To

AMGRAF, INC.
1501 Oak Street
Kansas City, MO 64108

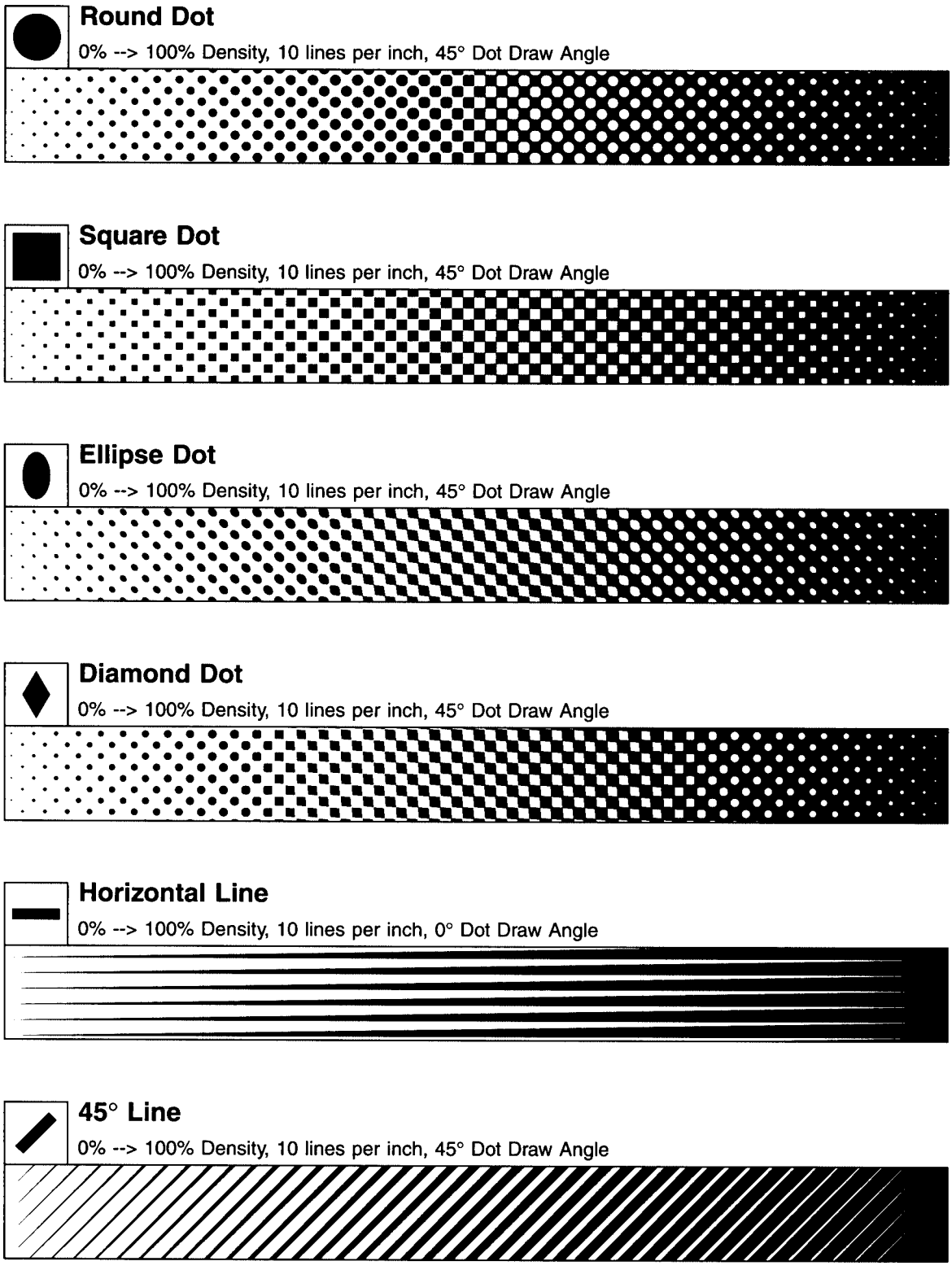


Figure 1 – Examples of conventional halftone dot and line screens.

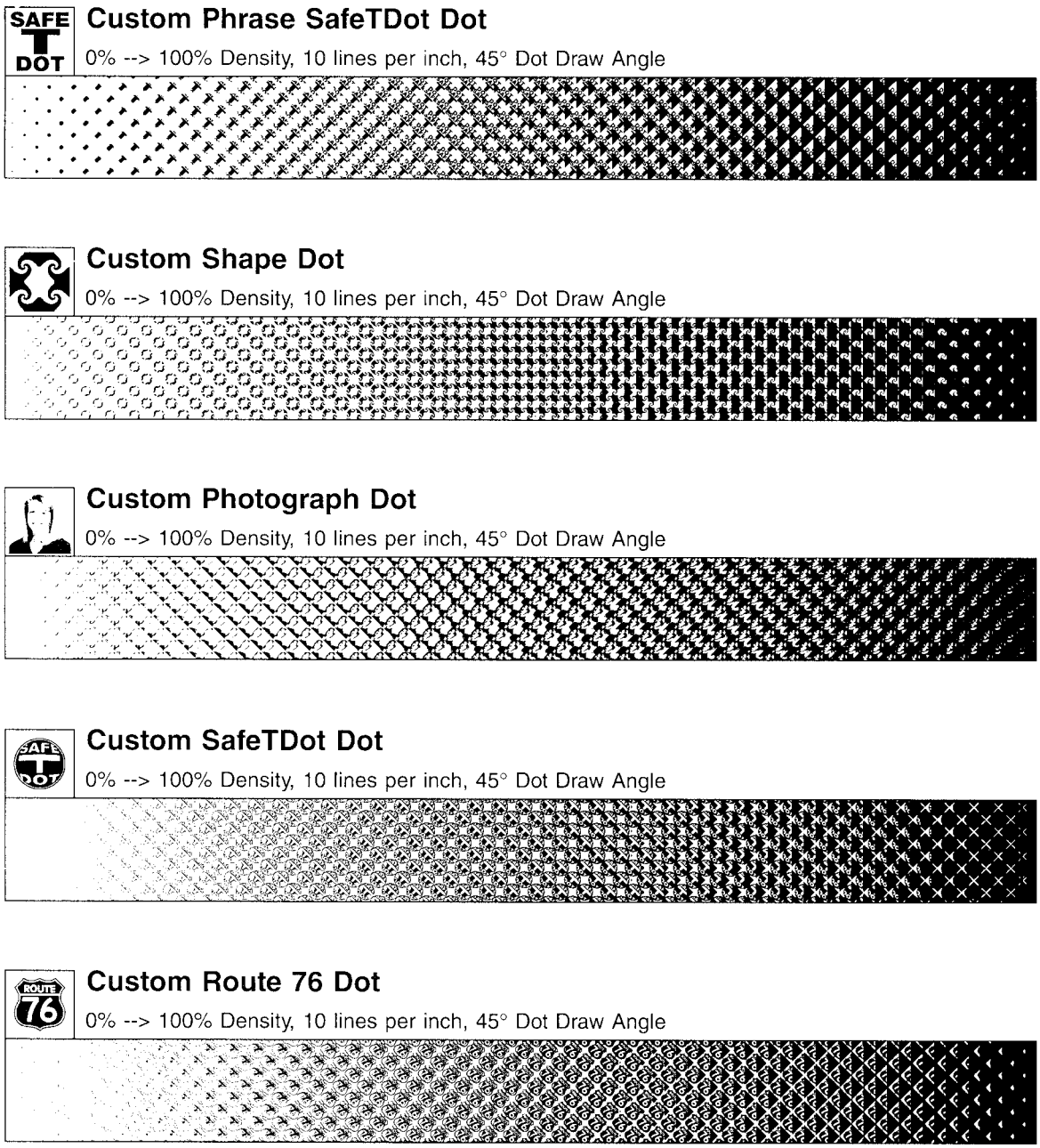
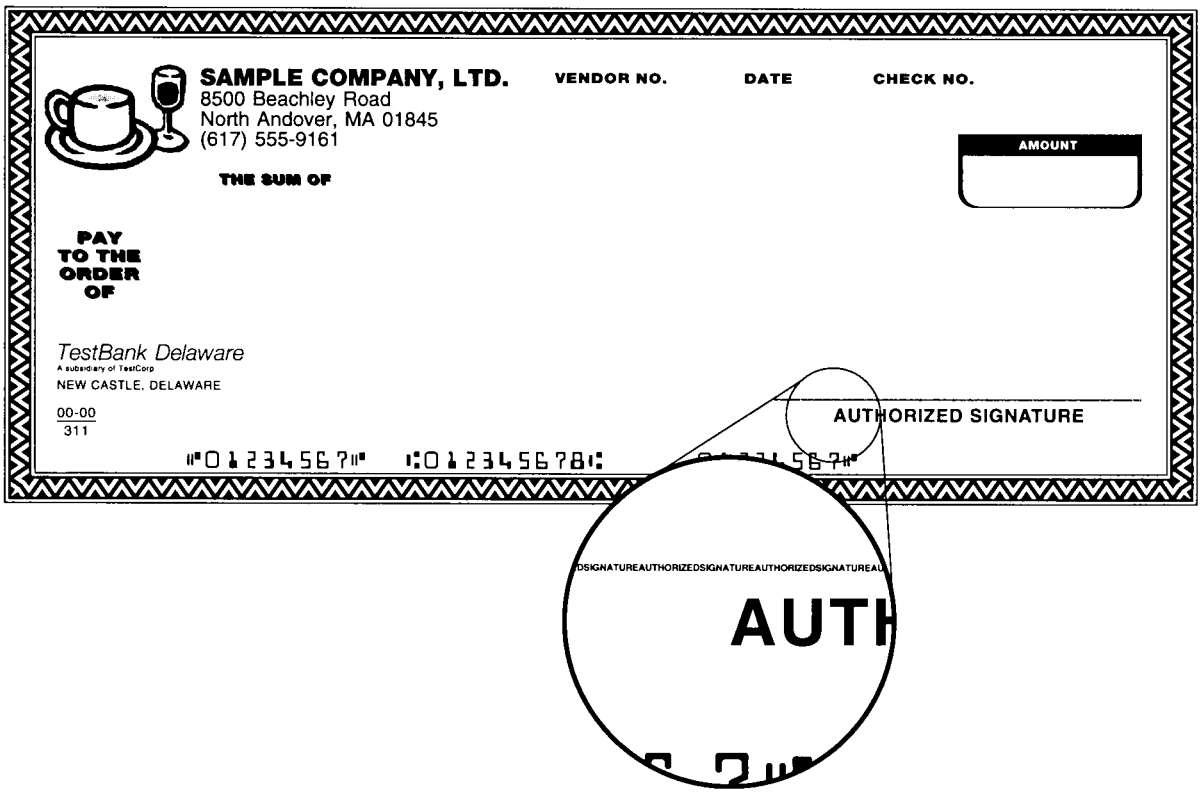


Figure 2 – Examples of custom halftone dots (“logodots”).

Original Microtext Document



Photocopied Microtext Document

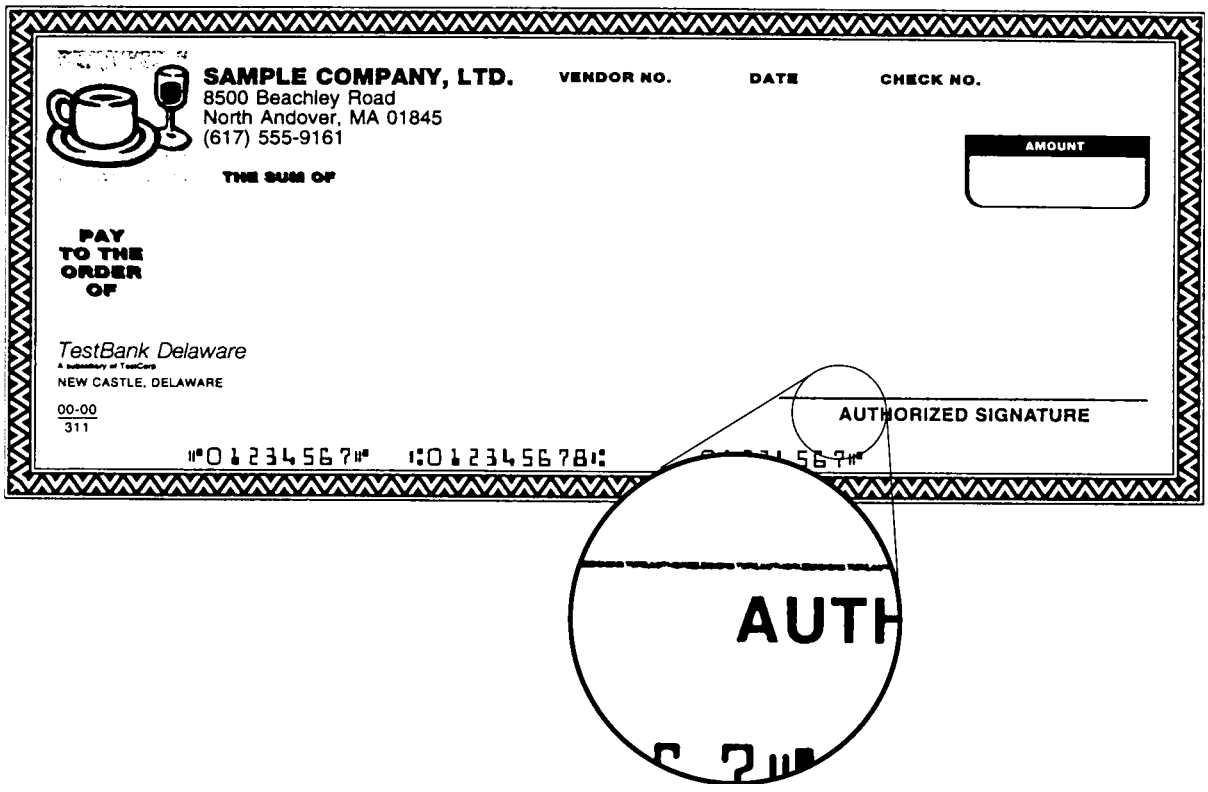


Figure 3 – Enlarged examples of microtext before and after a photocopy.

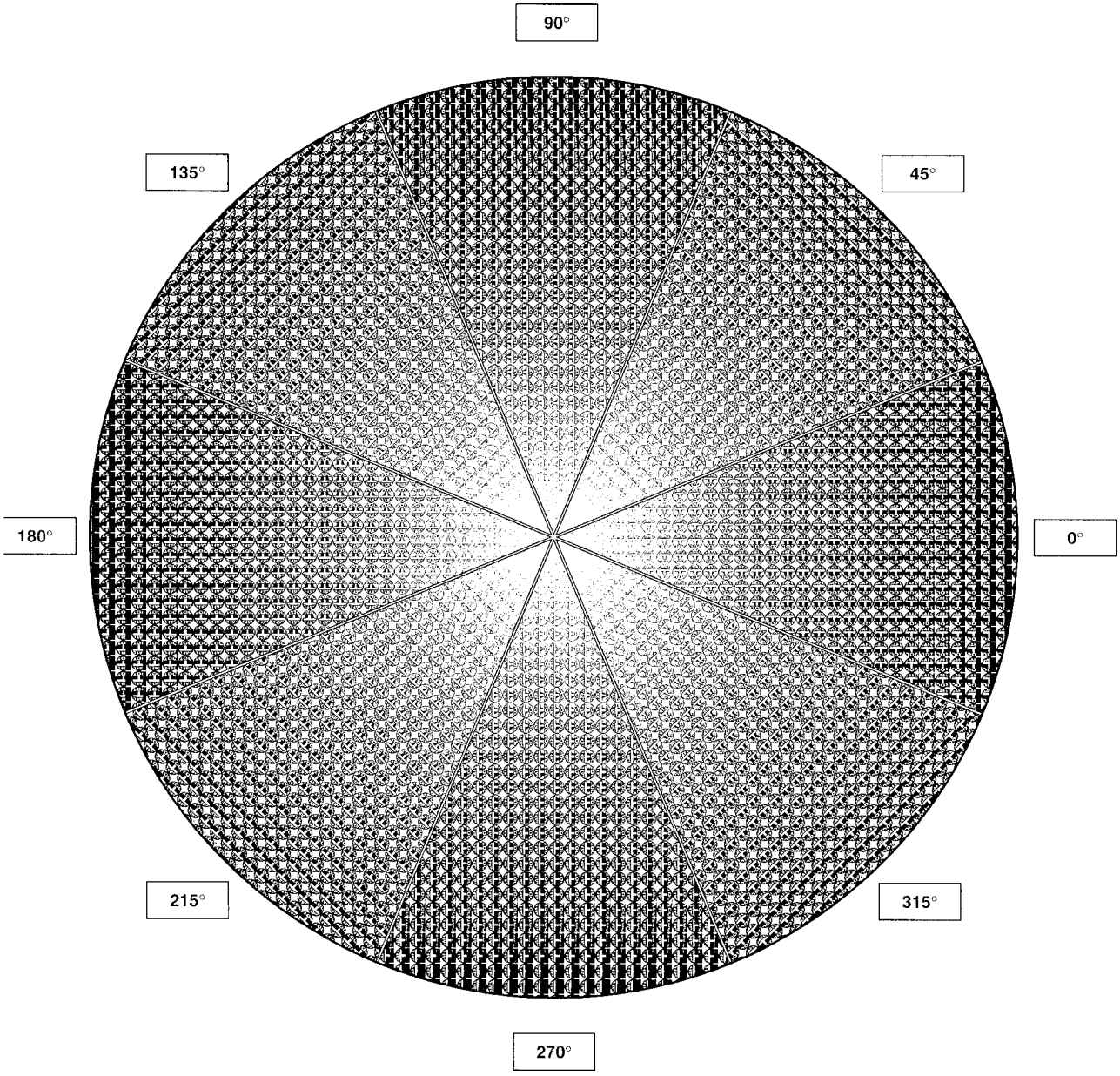


Figure 4 – Examples of custom halftone dots (“logodots”) at various screen angles.

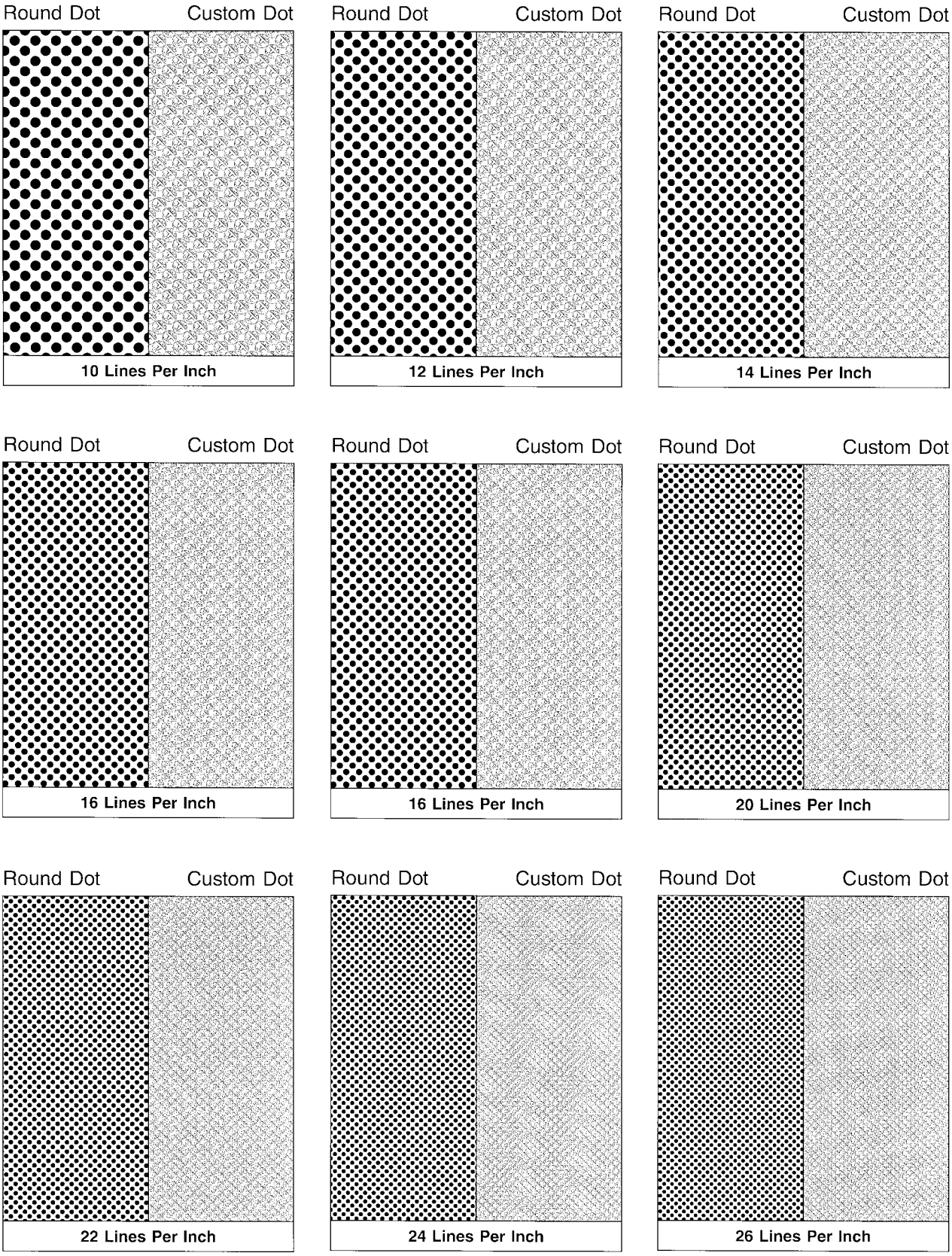


Figure 5a – Side-by-side examples of conventional halftone dots and custom halftone dot ("logodots") screens with 40% density at several line frequencies.

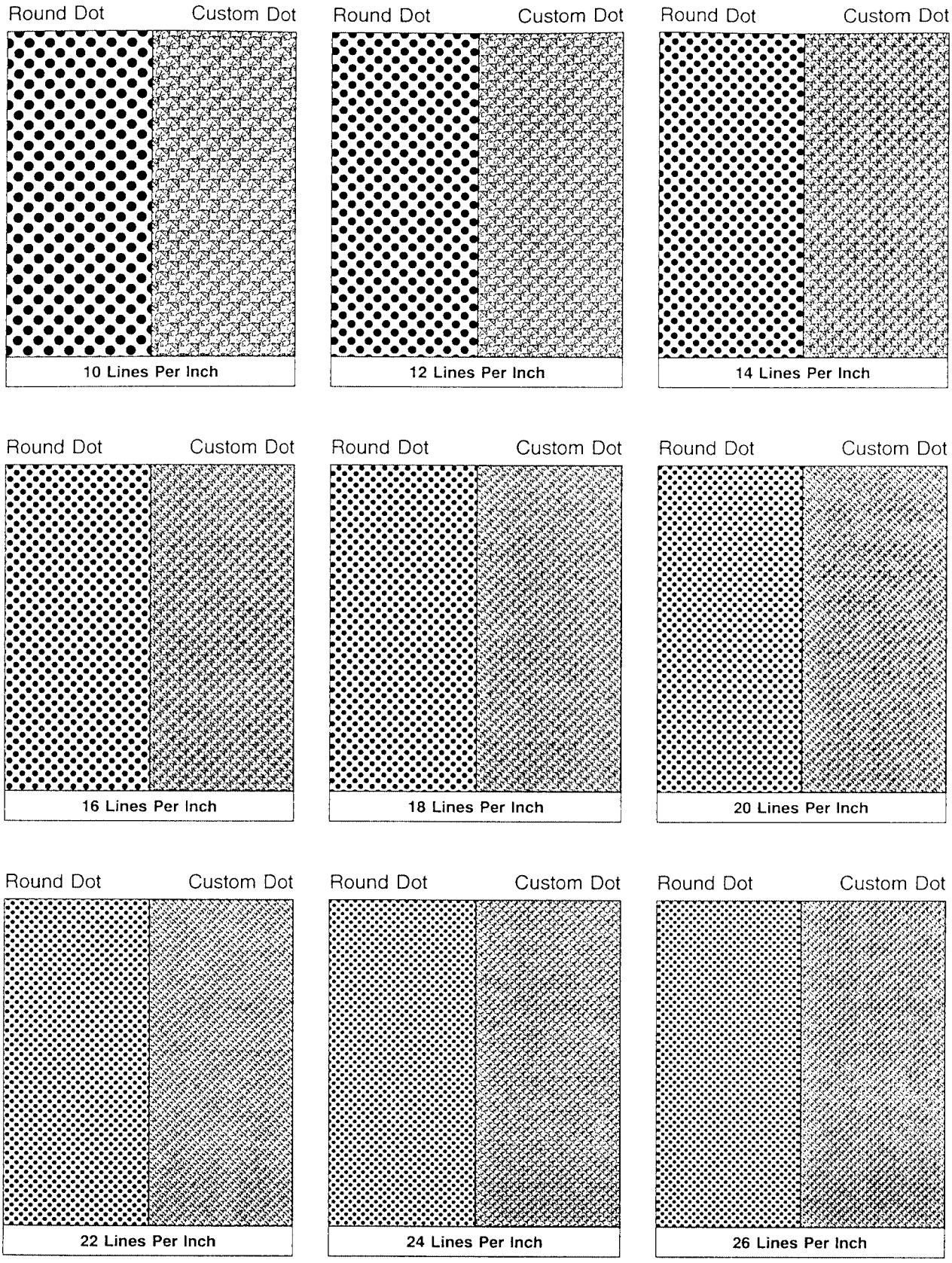
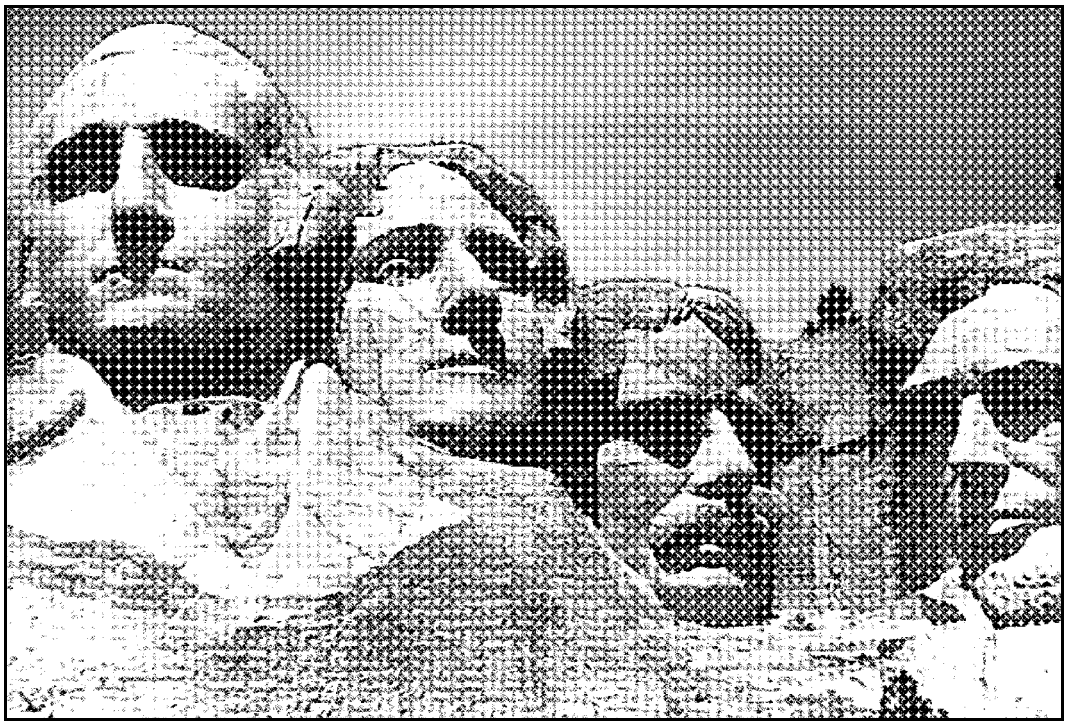
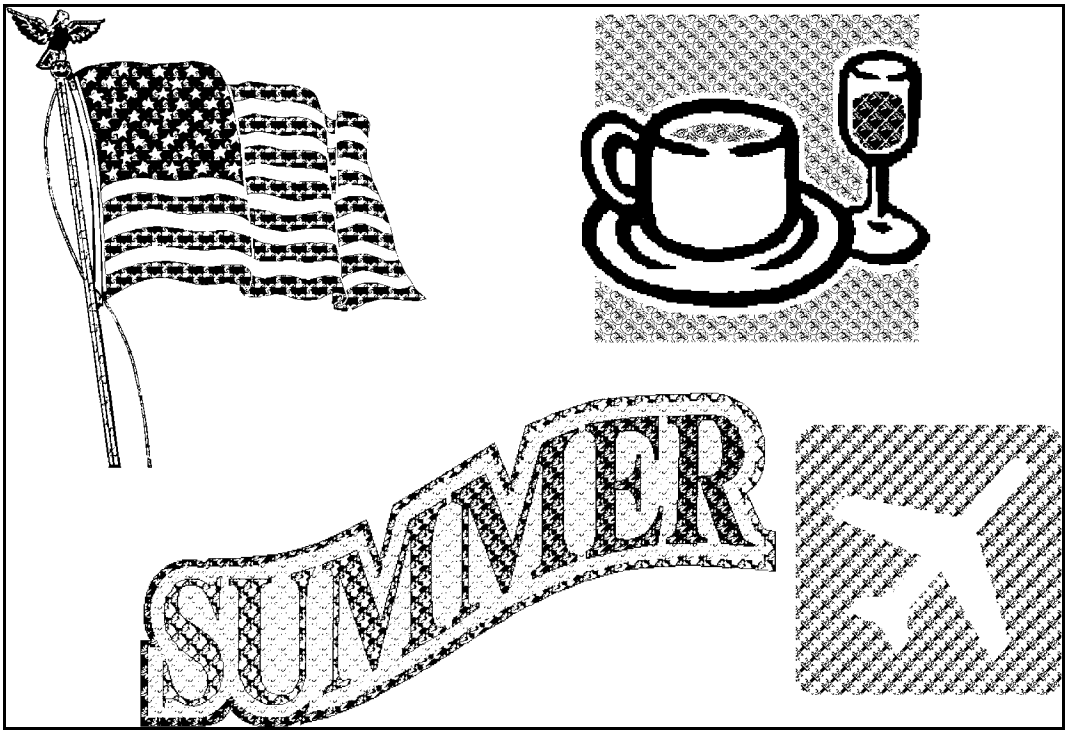


Figure 5b – Photocopy of Figure 5a specimen.

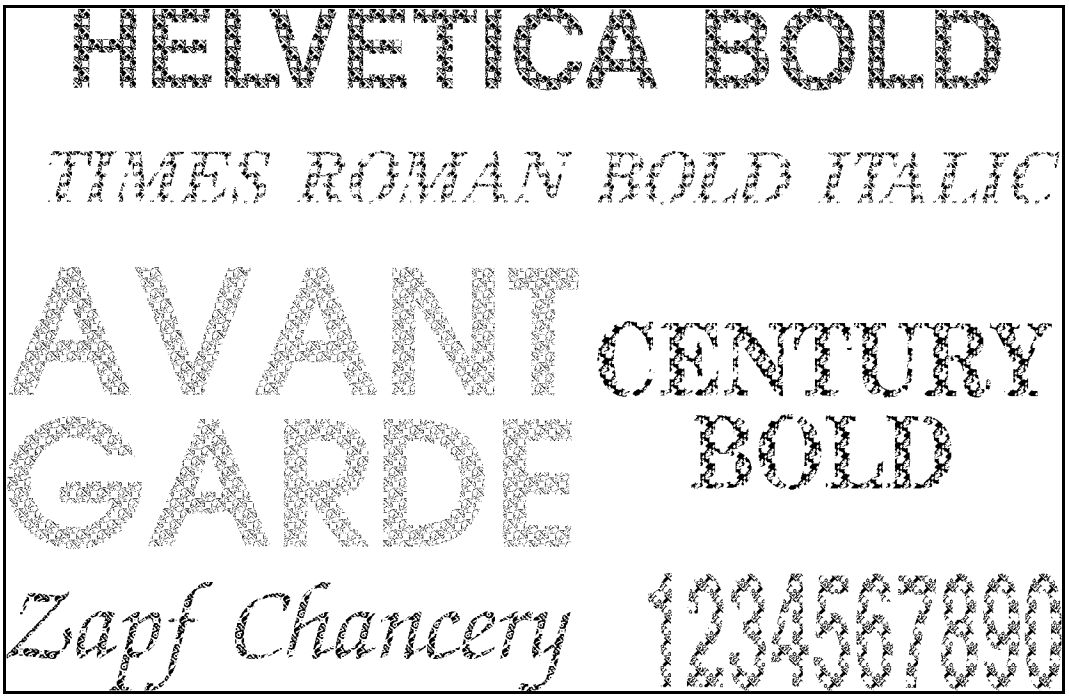


Photographs

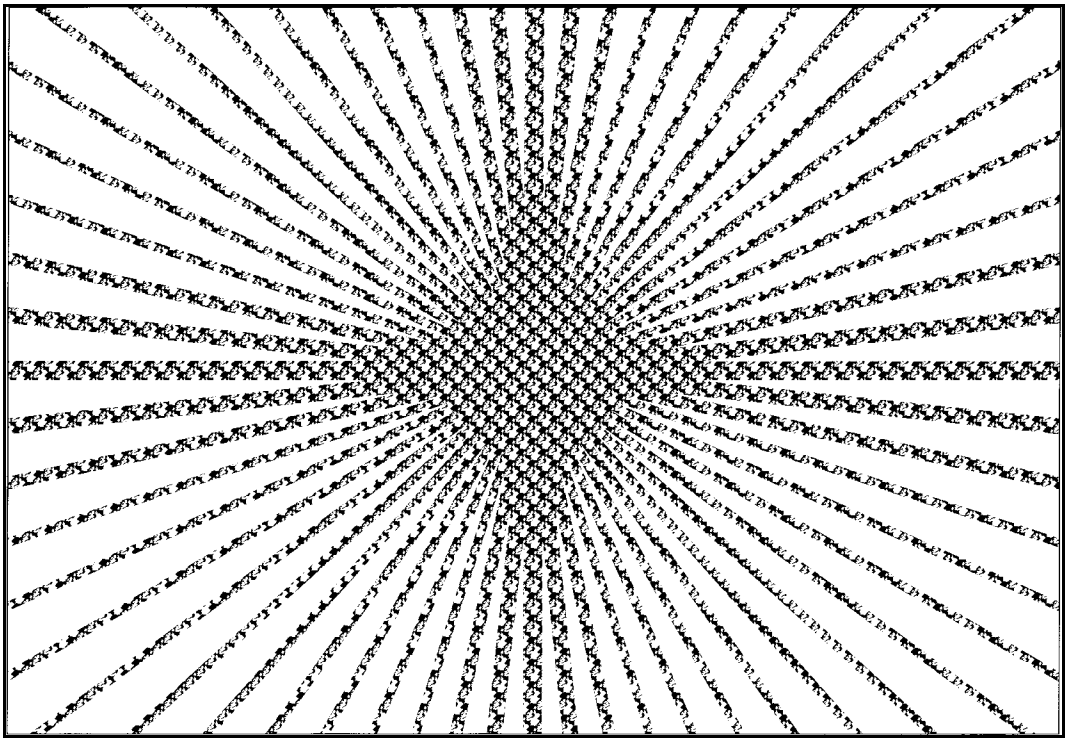


Raster Images, Logos, and Symbols

Figure 6a – Custom halftone dots (“logodots”) assigned to individual graphical elements that may be used within a composite image.

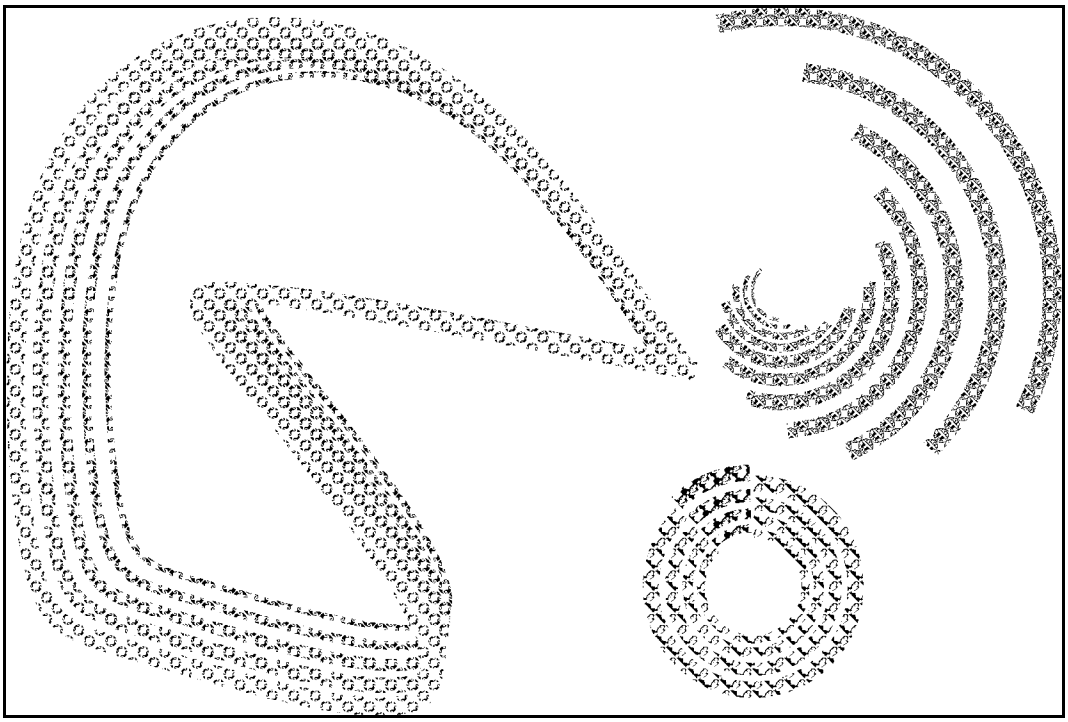


Typefaces and Textual Objects

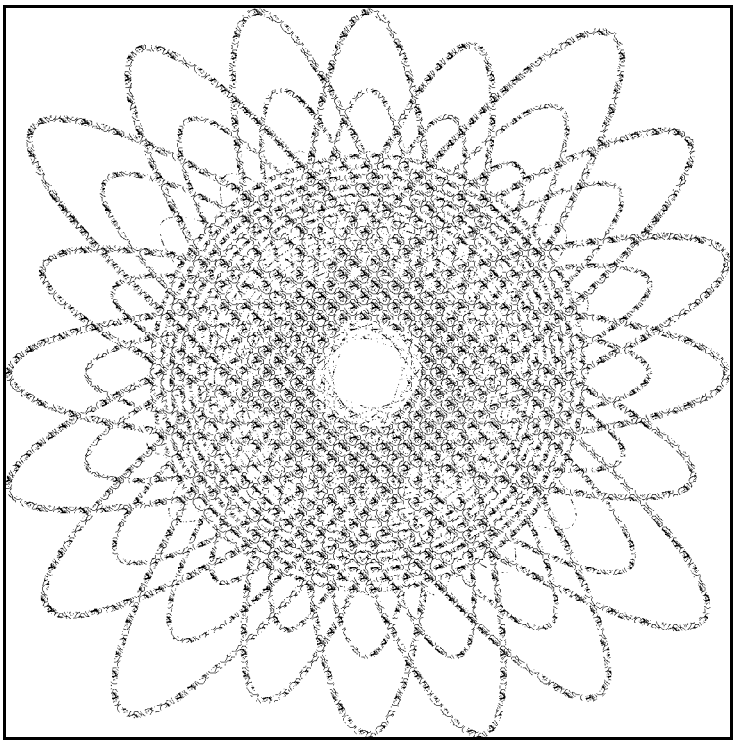


Rules and Lines

Figure 6b – Custom halftone dots (“logodots”) assigned to individual graphical elements that may be used within a composite image.

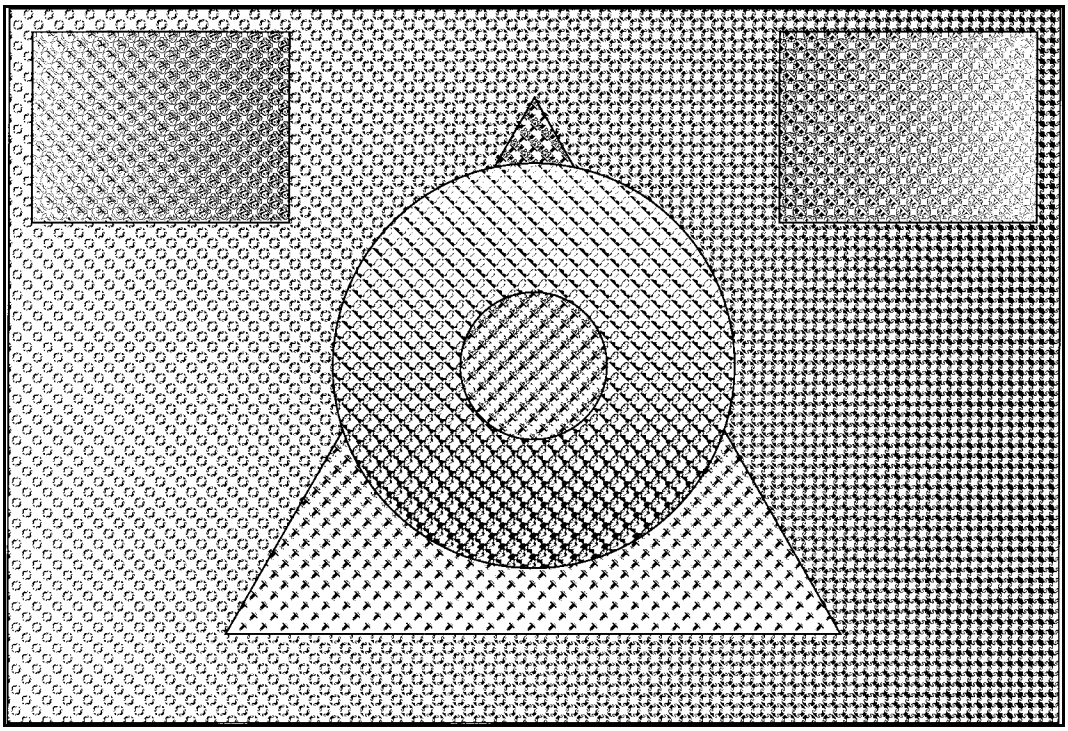


Arcs and Splines

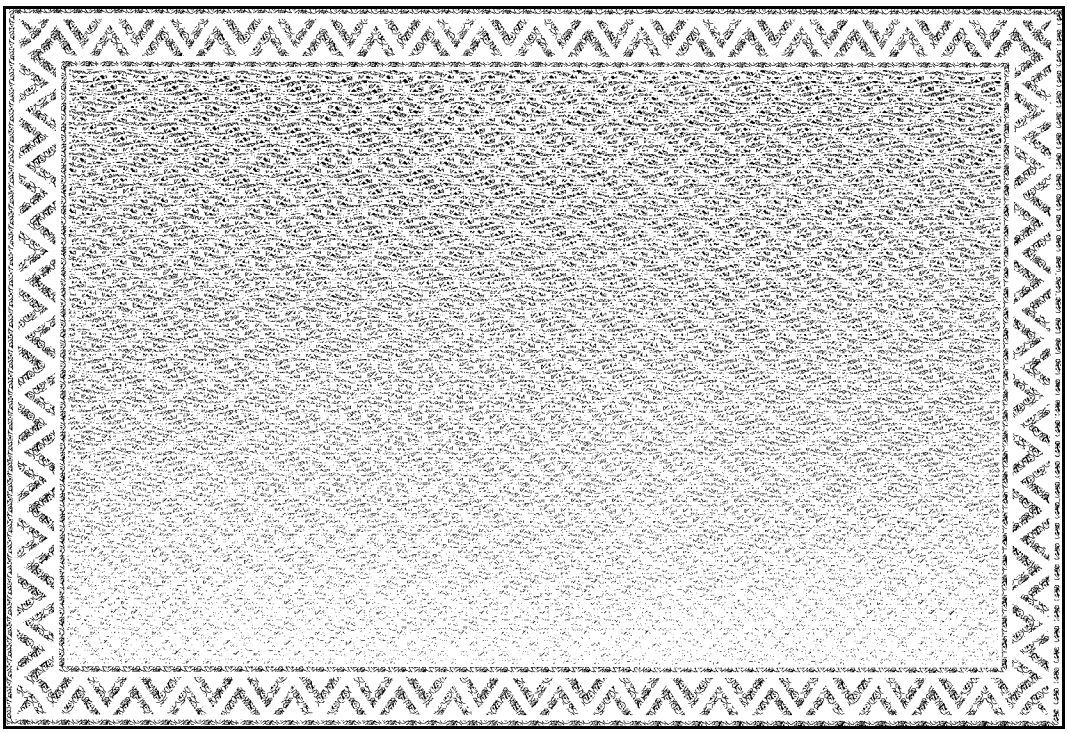


Circles and Ellipses

Figure 6c – Custom halftone dots (“logodots”) assigned to individual graphical elements that may be used within a composite image.

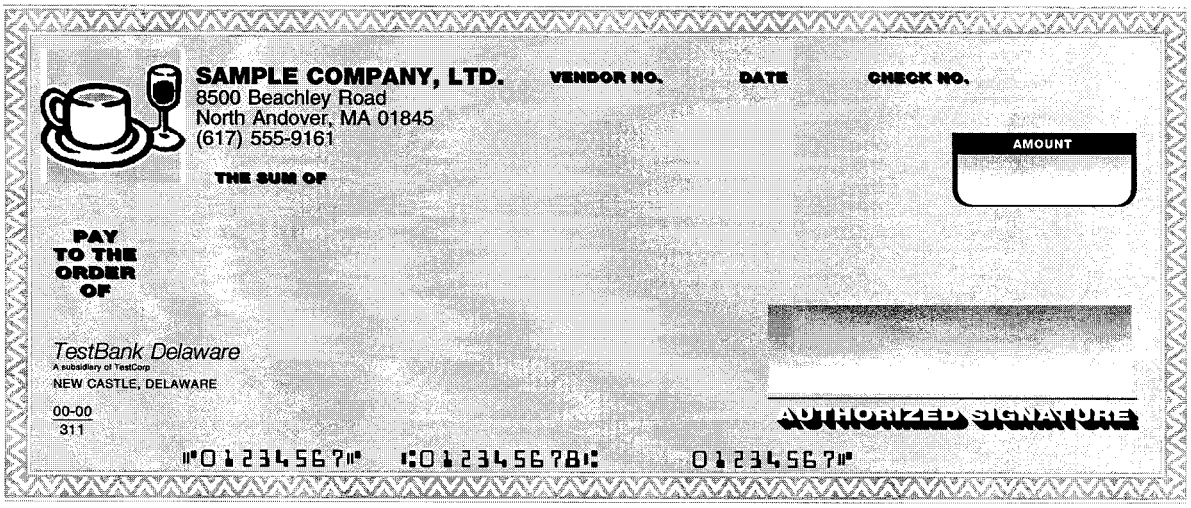


Filled Areas

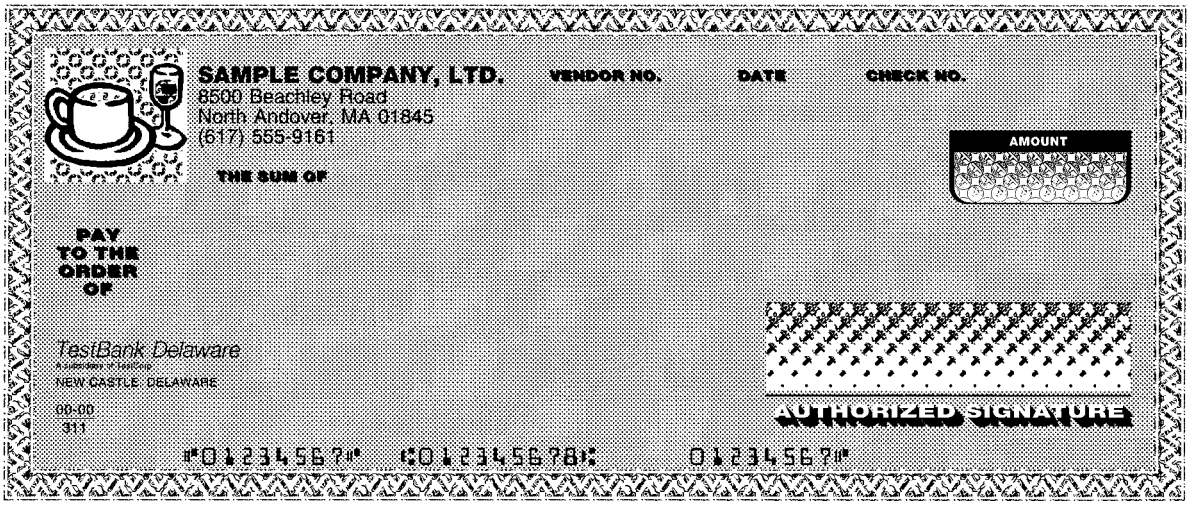


Borders, Pantographs, and Patterns

Figure 6d – Custom halftone dots (“logodots”) assigned to individual graphical elements that may be used within a composite image.



Security Document with All Graphical Elements Rendered in Conventional Halftone Dots



Security Document with Selected Graphical Elements Rendered in Custom Halftone Dots (“logodots”)

Figure 7 – Composite graphic image with a variety of conventional halftone dots and custom halftone dots (“logodots”).

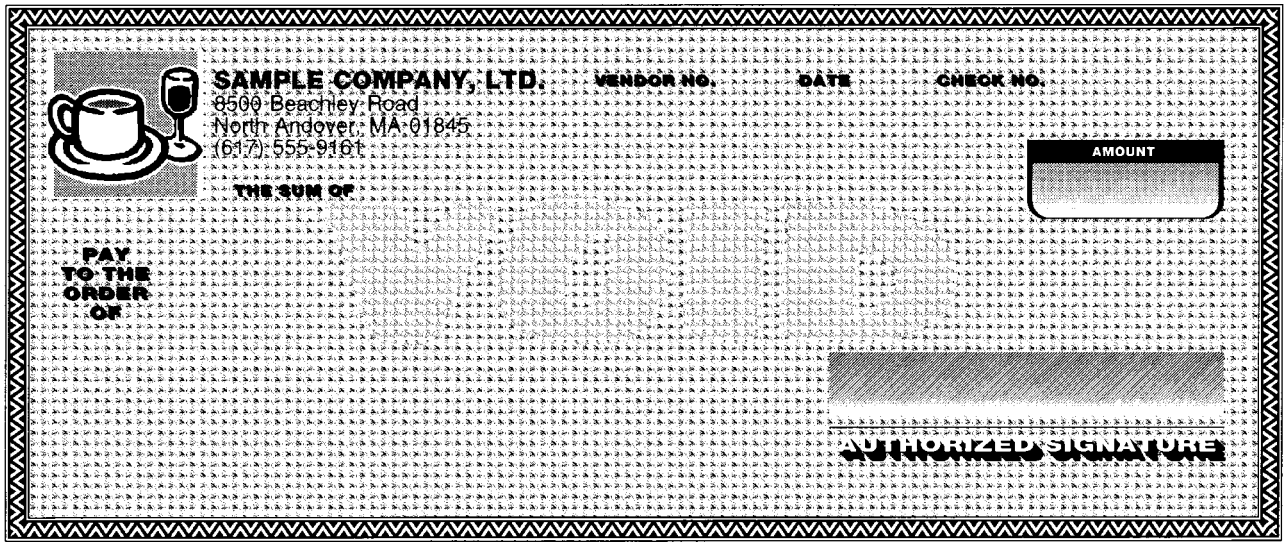


Figure 8a – Security document design with a combination of conventional halftone dots and custom halftone dots (“logodots”).

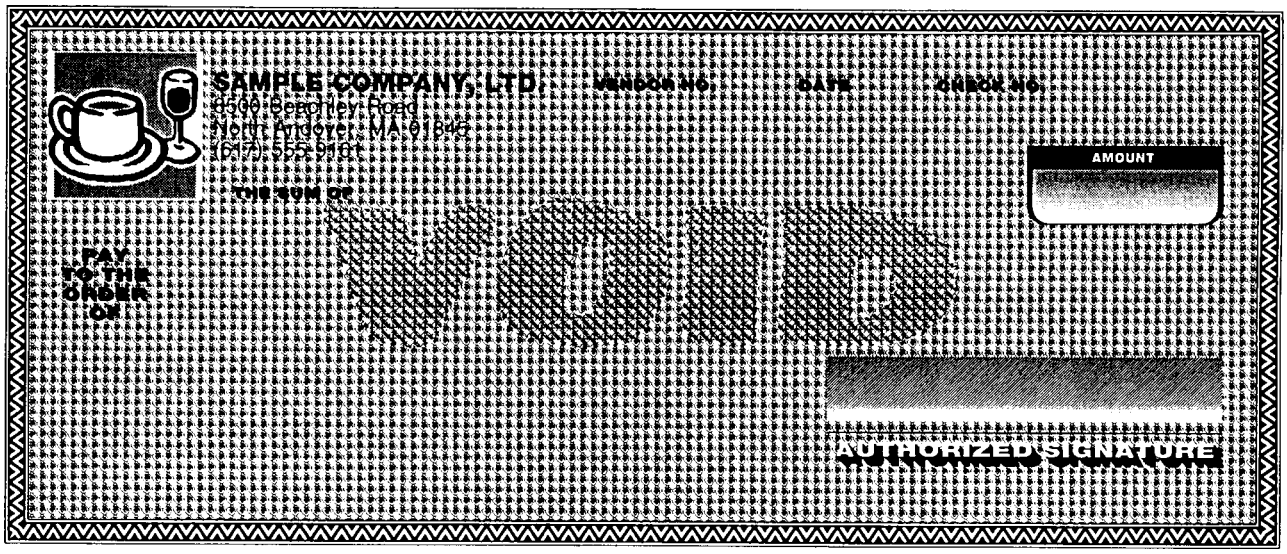


Figure 8b – Photocopy of Figure 8a specimen.

Figure 9 – DotMaker program user interface.

Pixel Illumination Ranking Order

254	208	189	205	210	214	221	225	229	232	238	243	248	251	254
229	186	189	206	211	216	221	226	229	233	238	244	249	252	254
213	183	191	209	214	217	223	228	230	234	239	245	251	253	254
211	181	197	211	216	220	225	230	233	236	241	247	252	253	254
188	210	209	213	219	222	226	232	238	240	242	248	252	254	254
192	213	213	214	221	225	228	235	244	249	247	244	241	238	234
197	214	216	217	223	226	226	223	218	211	208	203	199	193	187
205	219	223	226	228	242	234	202	176	125	101	79	53	31	12
209	222	226	228	241	250	229	163	102	69	32	0	0	0	0
211	223	229	232	241	251	227	160	99	63	28	0	0	0	0
216	226	231	235	243	253	223	152	77	32	0	0	0	0	0
220	231	233	240	246	251	219	147	61	27	0	0	0	0	0
227	235	237	243	250	248	211	119	39	0	0	0	0	0	0
231	240	242	249	254	250	207	101	14	0	0	0	0	0	0
238	242	246	250	254	249	201	97	10	0	0	0	0	0	0

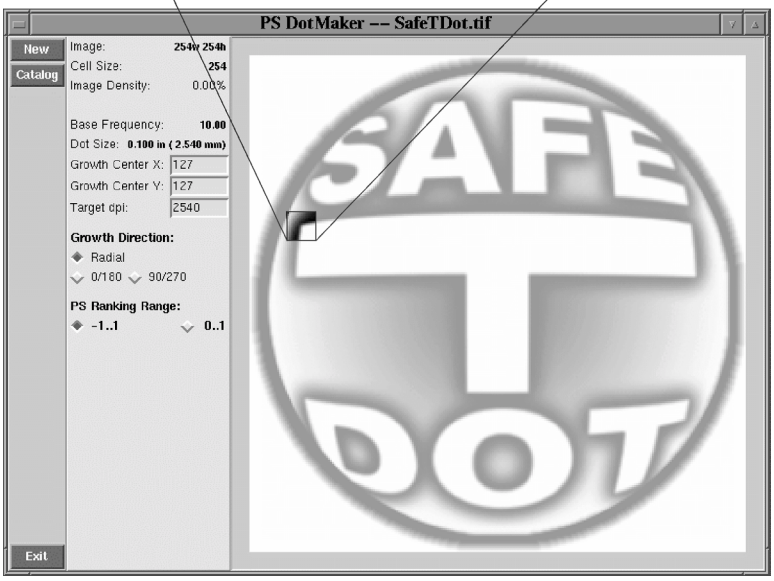
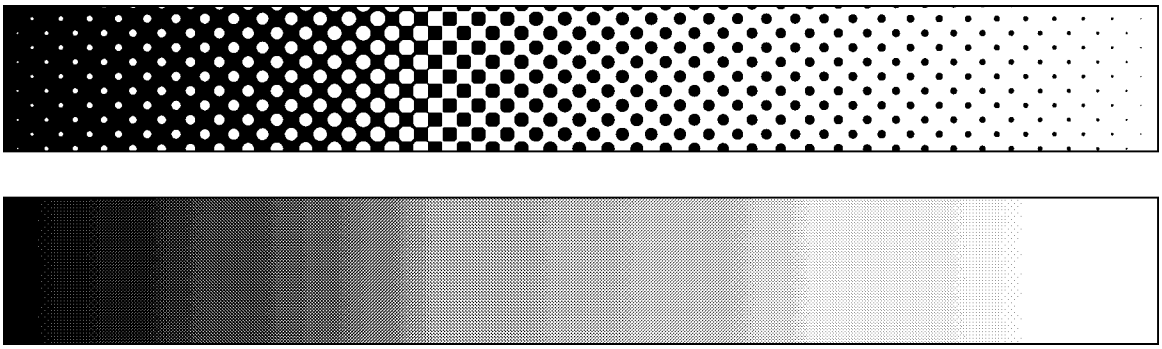


Figure 10 – Pixel illumination ranking order for a custom halftone dot (“logodot”).



```
{abs exch abs 2 copy add 1 gt
  {1 sub dup mul exch 1 sub dup mul add 1 sub}
  {dup mul exch dup mul add 1 exch sub}
ifelse}
```
(See Reference [3])

Figure 11 – Formula for the Euclidean composite dot spot function, 0% to 100% at 10 LPI and 80 LPI.

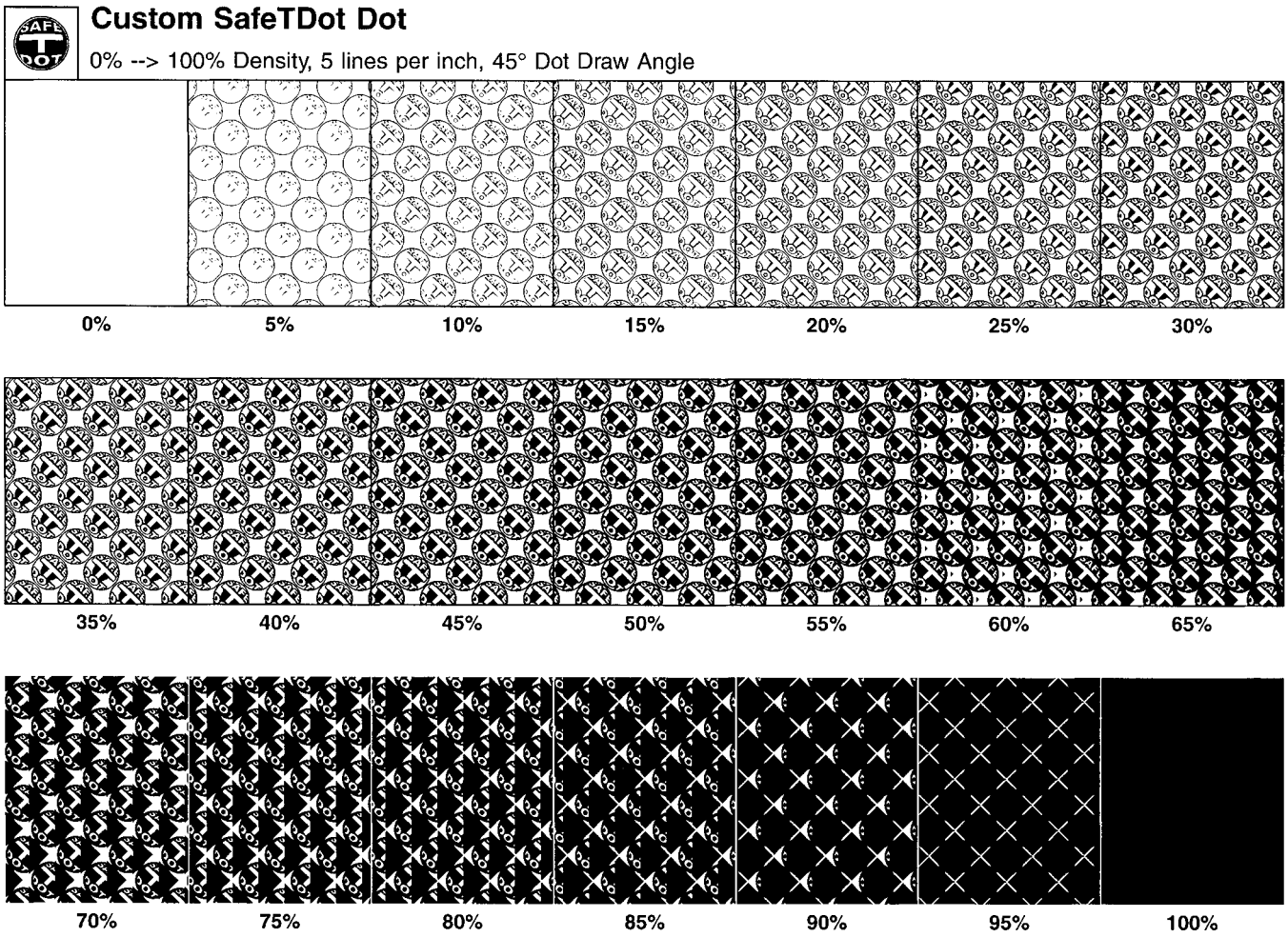


Figure 12 – Custom halftone dot (“logodot”) illumination through a range of 0% to 100%.

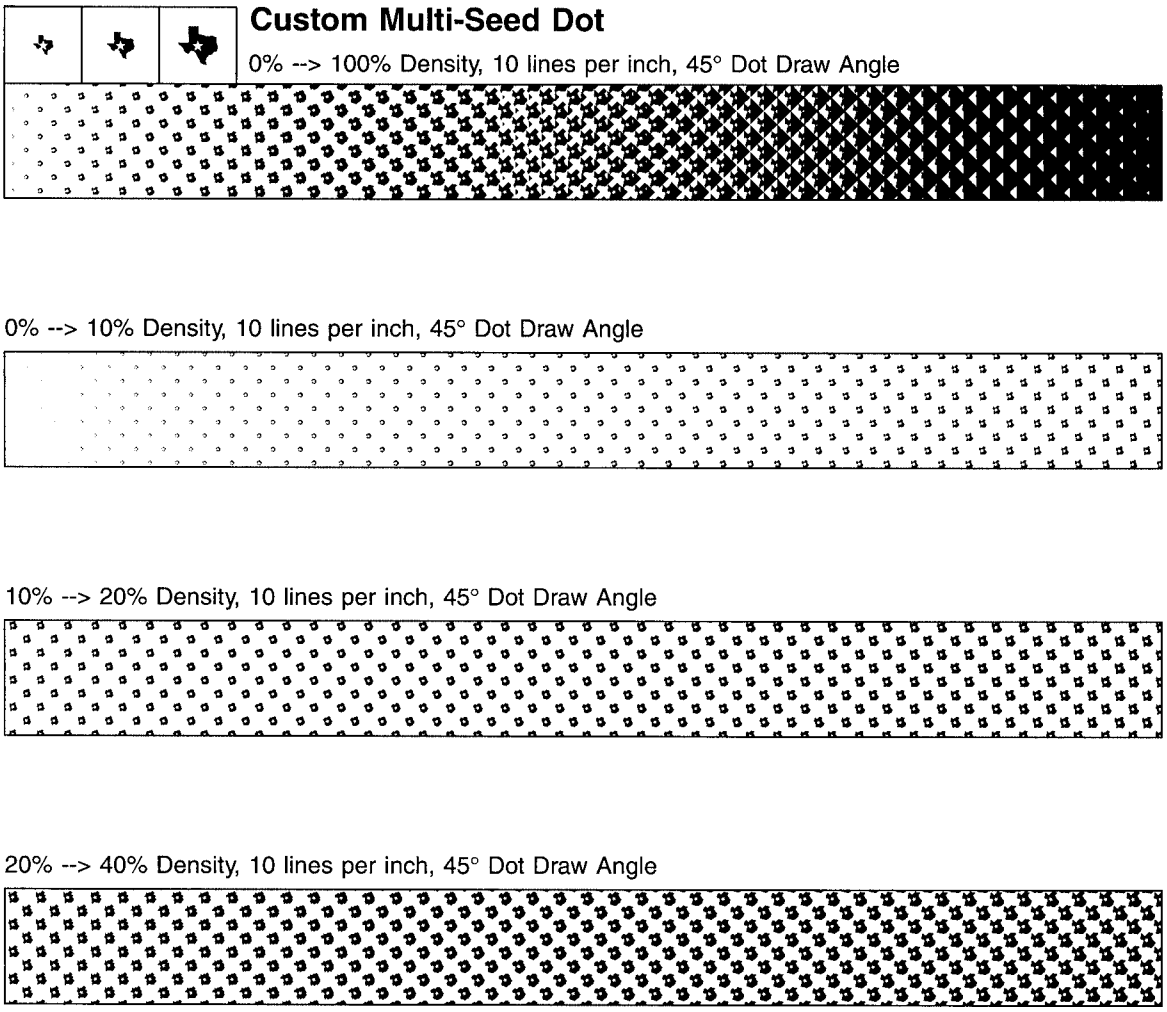


Figure 13 – Example of a multi-seed custom halftone dot ("logodot").

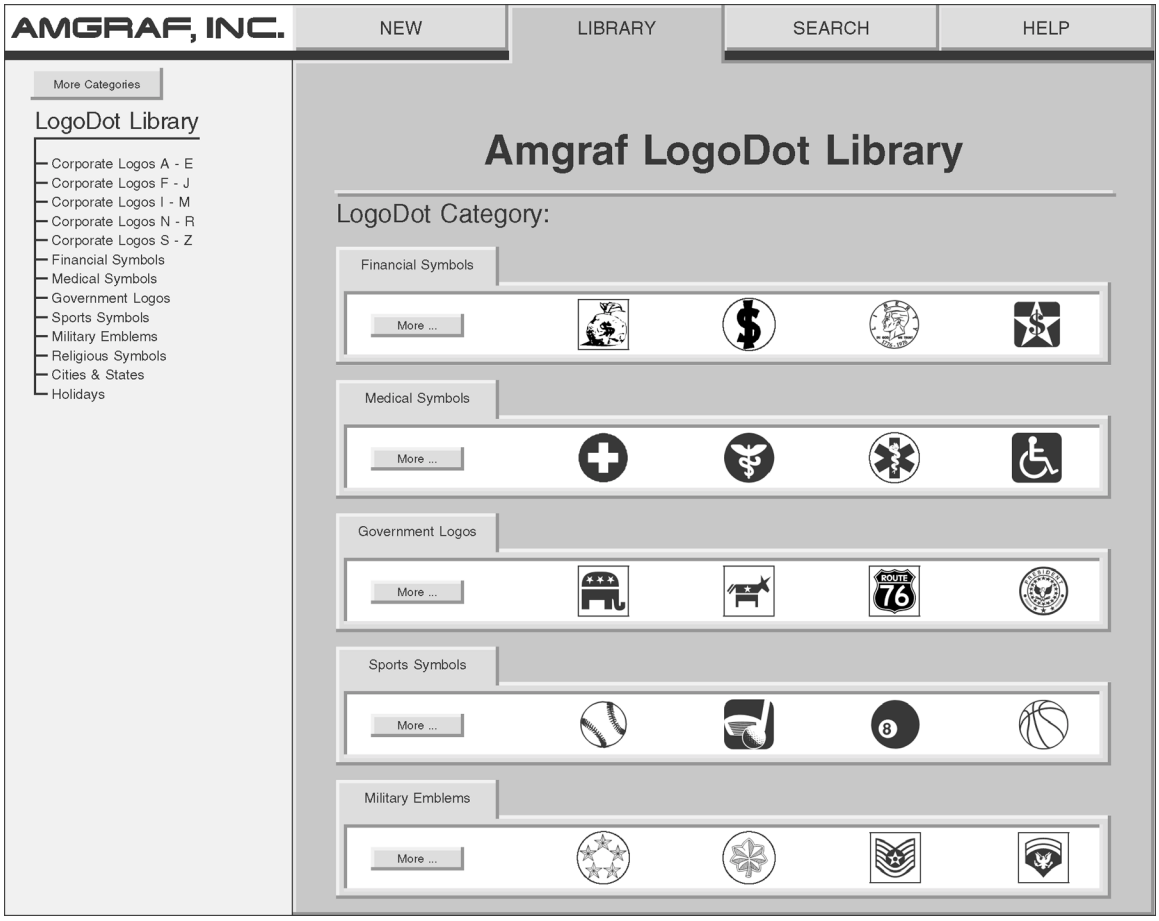


Figure 14 – Custom dot library user interface.