

Position Calibration Targets

26 December 2006

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¹\$Header: /EHamilton/General Information/Targets/Target.tex 2 12/26/06 9:39a EHamilton \$

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1 Calibration Grid[calibrationgrid]

To aid in determining the pointing accuracy of a Pan/Tilt/Dome a set of targets with calibrated 0.1° and 0.01° marks in pan and tilt have been developed for use at different distances from the unit being tested.

The method of calculating the angular distance required for 0.1° movement at various distances away from the camera is:

$$\begin{aligned}\pi &= 3.1415926 \\ c &= 2 \times \pi \times r \\ a &= (c \times 12)/(360 \times 10)\end{aligned}$$

Where:

- a = Arc of 0.1° width in inches.
- c = Circumference of a circle.
- r = Radius of a circle in feet.
- 2 = Factor between diameter and radius of a circle.
- 10 = Conversion factor from whole degrees to tenths of a degree.
- 12 = Conversion factor from feet to inches.
- 360 = Degrees in a circle.

For example at 48 feet from the camera, 0.1° of angular distance is 1.01 inch long. (Or 1.005300032 inch if more accuracy is needed.)

1.1 How to use the targets

The included targets in this note are designed for use at ranges of 2 to 11 feet in full foot increments and from 12 to 56 feet in even foot increments, between the camera and the target³. Each of the larger grids consists of a “large” and a “small” set of dots⁴. The large dots are 0.1° apart and the small dots are 0.01° apart. Each target has a central dot with the distance that the target is anticipated to be used at underneath. They also have four large sub-dots which are numbered from 1 to 4 for additional testing.

²\$Header: /EHamilton/General Information/Targets/Target.tex 2 12/26/06 9:39a EHamilton \$

³Targets may be generated for other distances if needed.

⁴The smaller grids do not have the 0.01° grids because the dots are too close together and tend to make a black box with no obvious dots in it.

1. More than one of these may be used at any one time. I.e. there may be two places that it is reasonable to point a camera at which may be on different walls, or other convenient surface, which may be at different, or the same, distances. Thus two targets would be used for the same series of tests.
2. When selecting a target to use it should be remembered that the distance to be used is the estimated distance from the camera's "pivot point". This may or may not be the front of the lens of the camera.
3. As a reasonably accurate indication of distance, it should be remembered that ceiling tiles are two feet on a side (some are two by four with a line down the middle). Over any reasonable distance any errors average out and the result is quite accurate. (Usually better than ± 1 inch.)
4. To easily calculate distance, count full tiles and double, or quadruple, their number. (Ceiling tiles being either 2 feet by 4 feet, or 2 feet by 2 feet in size.) The result is the distance between the camera and the target.
5. When using these targets, their accuracy improves somewhat when longer distances are used. The recommended distances to use with these targets are in the 40's of feet (40, 42, 44, 46 and 48).
6. If distances other than those provided in this set of foot distances are needed please let me know and I'll generate some more targets. I am only setup to generate targets on 8 $\frac{1}{2}$ by 11 inch paper in portrait format and in whole foot distances. I.e. no landscape formats, no metric distances and no "bigger" paper. (If it is important the distances (feet and inches, metric, etc.) for which the targets are generated at may be changed.)
7. When closer distances are needed than are provided by this set of targets, use the small grids and move the entire target 10 $\times$ closer. I.e. use the 40 foot target at 4 feet. When this is done the small target is correct for the closer distance.
8. Always remember that custom targets are made on request. So a target may be made for almost any reasonable distance. The only limitations are the size of the paper and the resolution of the printer⁵.
9. An accuracy of $\pm .1^\circ$ is interpreted to mean: "The unit will point to within $.1^\circ$ from where it is supposed to point. The pointing is to be within a square box that has equal length sides of $.2^\circ$ and the aiming point is to be in the center of the box. This is different than using a circle with a radius of $.1^\circ$."

A note on the accuracy of the targets

Accuracy in the generation of the grid is controlled by the quality of the printer used to print it out and the number of times that the individual target has been reproduced.

⁵And the attitude of the author!

The generated PDF file is correct, however the actual printing process sometimes introduces sizing errors. When paper is wrapped around a drum, as it is with most laser printers, one surface is longer (one side is on the outside of the circle so its radius is slightly longer than the other side's is).

While the paper direction that is longitudinal to the cylinder is almost always “correct”. This results in dimensions in one direction being somewhat better than those in the other direction.

To get an estimate of the amount of “printing error” that has been introduced to any given target, an inch rule has been provided on each edge of the target grid. If this inch rule is checked with an accurate machinist's ruler and indication of the dimensional errors that have been introduced to the copy at hand may be estimated. For almost all uses the introduced error may be ignored.

<i>d</i>	<i>a</i>	<i>d</i>	<i>a</i>	<i>d</i>	<i>a</i>	<i>d</i>	<i>a</i>
2	0.041887501	34	0.712087523	66	1.382287544	98	2.052487565
4	0.083775003	36	0.753975024	68	1.424175045	100	2.094375067
6	0.125662504	38	0.795862525	70	1.466062547	102	2.136262568
8	0.167550005	40	0.837750027	72	1.507950048	104	2.178150069
10	0.209437507	42	0.879637528	74	1.549837549	106	2.220037571
12	0.251325008	44	0.921525029	76	1.591725051	108	2.261925072
14	0.293212509	46	0.963412531	78	1.633612552	110	2.303812573
16	0.335100011	48	1.005300032	80	1.675500053	112	2.345700075
18	0.376987512	50	1.047187533	82	1.717387555	114	2.387587576
20	0.418875013	52	1.089075035	84	1.759275056	116	2.429475077
22	0.460762515	54	1.130962536	86	1.801162557	118	2.471362579
24	0.502650016	56	1.172850037	88	1.843050059	120	2.513250080
26	0.544537517	58	1.214737539	90	1.884937560	122	2.555137581
28	0.586425019	60	1.256625040	92	1.926825061	124	2.597025083
30	0.628312520	62	1.298512541	94	1.968712563	126	2.638912584
32	0.670200021	64	1.340400043	96	2.010600064	128	2.680800085

Table 1. Full Table of 0.1° widths[fulltable]

d	a	d	a	d	a	d	a
2	0.042	34	0.71	66	1.38	98	2.05
4	0.084	36	0.75	68	1.42	100	2.09
6	0.126	38	0.80	70	1.47	102	2.14
8	0.168	40	0.84	72	1.51	104	2.18
10	0.209	42	0.88	74	1.55	106	2.22
12	0.251	44	0.92	76	1.59	108	2.26
14	0.293	46	0.96	78	1.63	110	2.30
16	0.335	48	1.01	80	1.68	112	2.35
18	0.377	50	1.05	82	1.72	114	2.39
20	0.419	52	1.09	84	1.76	116	2.41
22	0.461	54	1.13	86	1.80	118	2.47
24	0.503	56	1.17	88	1.84	120	2.51
26	0.545	58	1.21	90	1.88	122	2.56
28	0.586	60	1.26	92	1.92	124	2.60
30	0.628	62	1.30	94	1.97	126	2.64
32	0.670	64	1.34	96	2.01	128	2.68

Table 2. Rounded Values of 0.1° widths[roundedvalues]

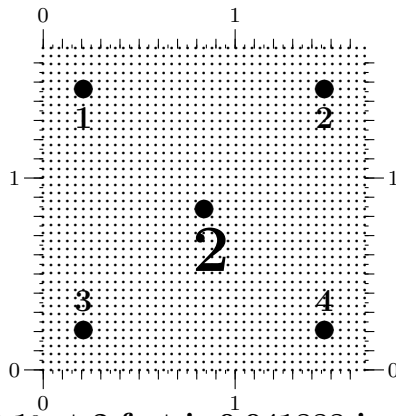


Figure 1. 0.1° at 2 feet is 0.041888 inch.[2feet]

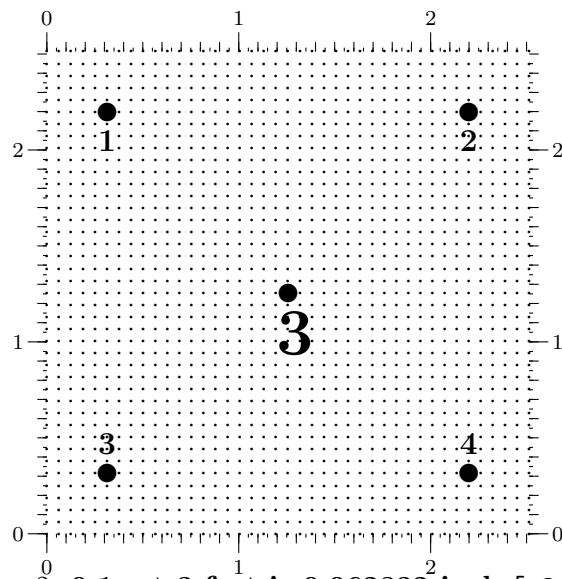


Figure 2. 0.1° at 3 feet is 0.062832 inch.[3feet]

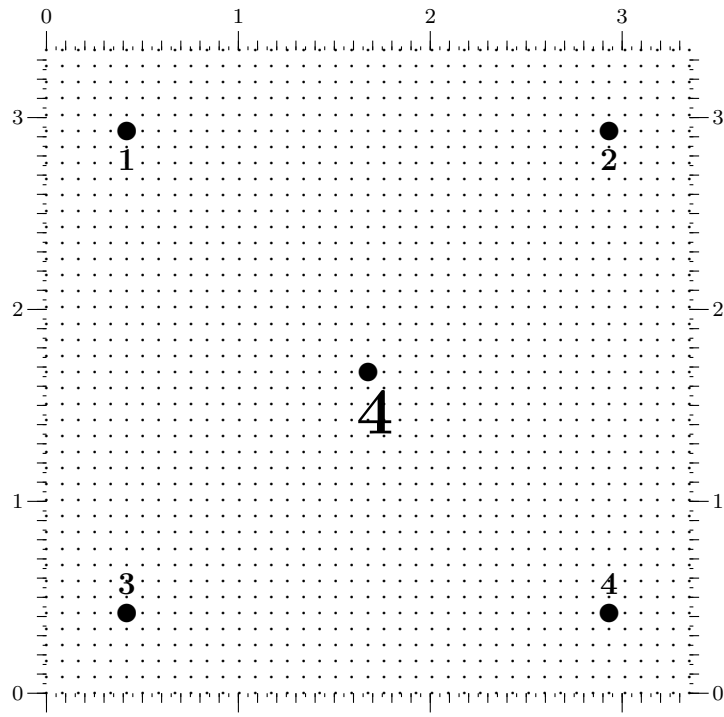


Figure 3. 0.1° at 4 feet is 0.083776 inch. [4feet]

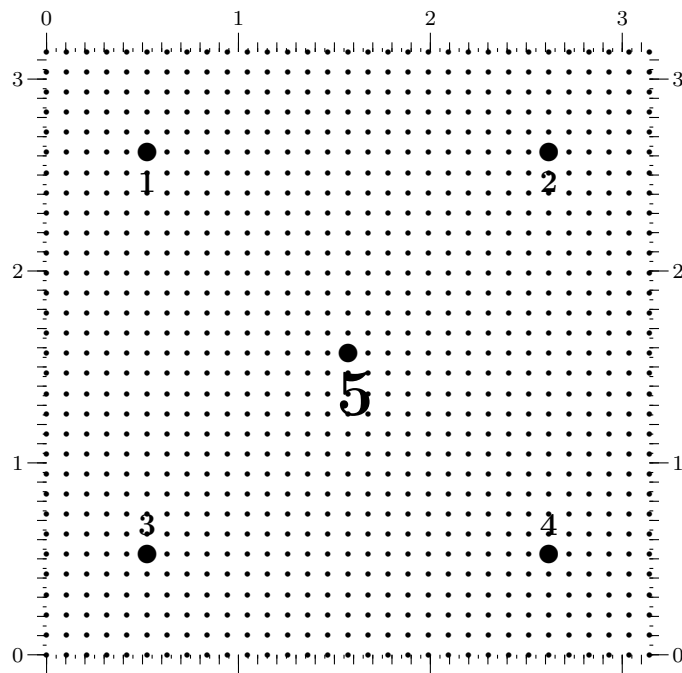


Figure 4. 0.1° at 5 feet is 0.104720 inch. [5feet]

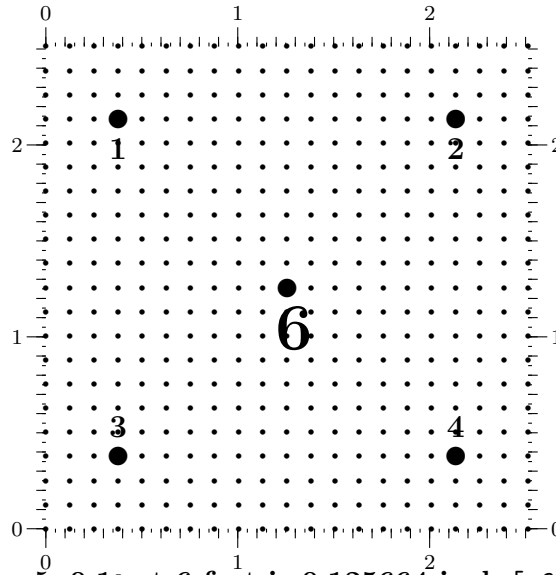


Figure 5. 0.1° at 6 feet is 0.125664 inch.[6feet]

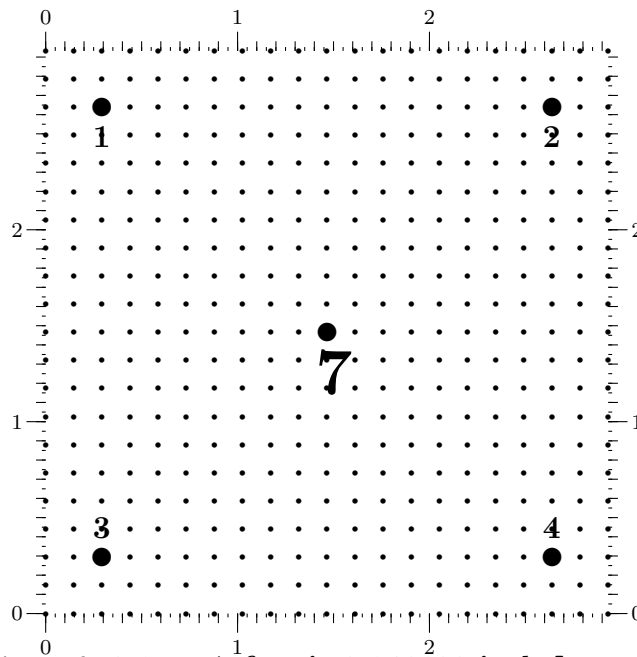
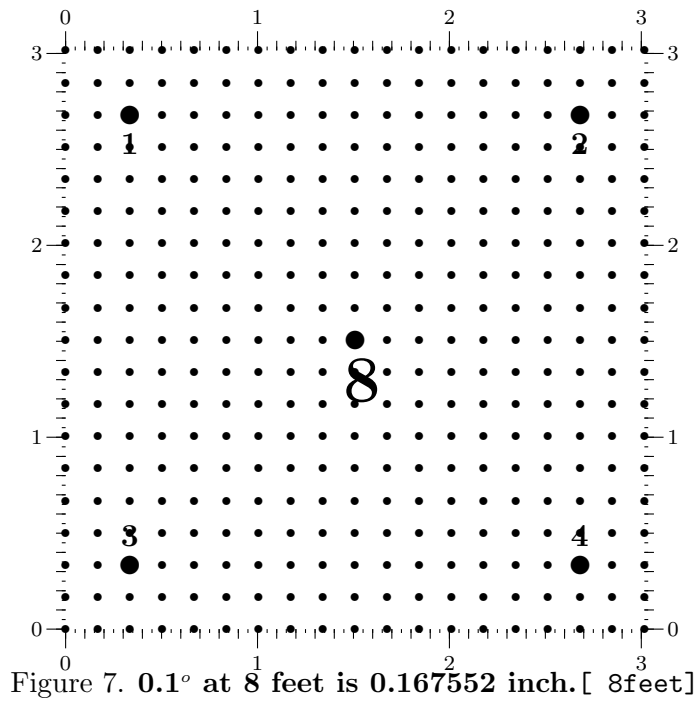
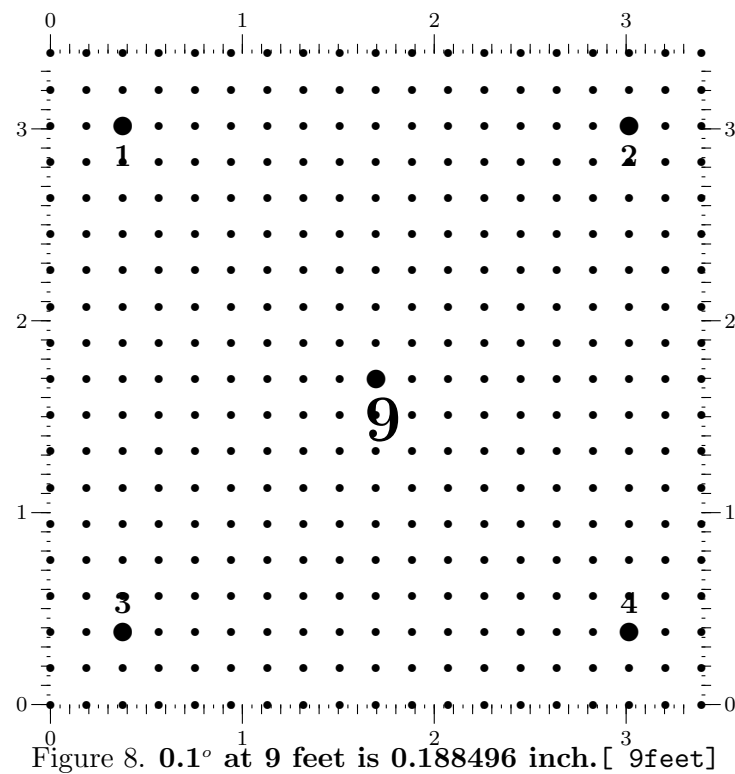
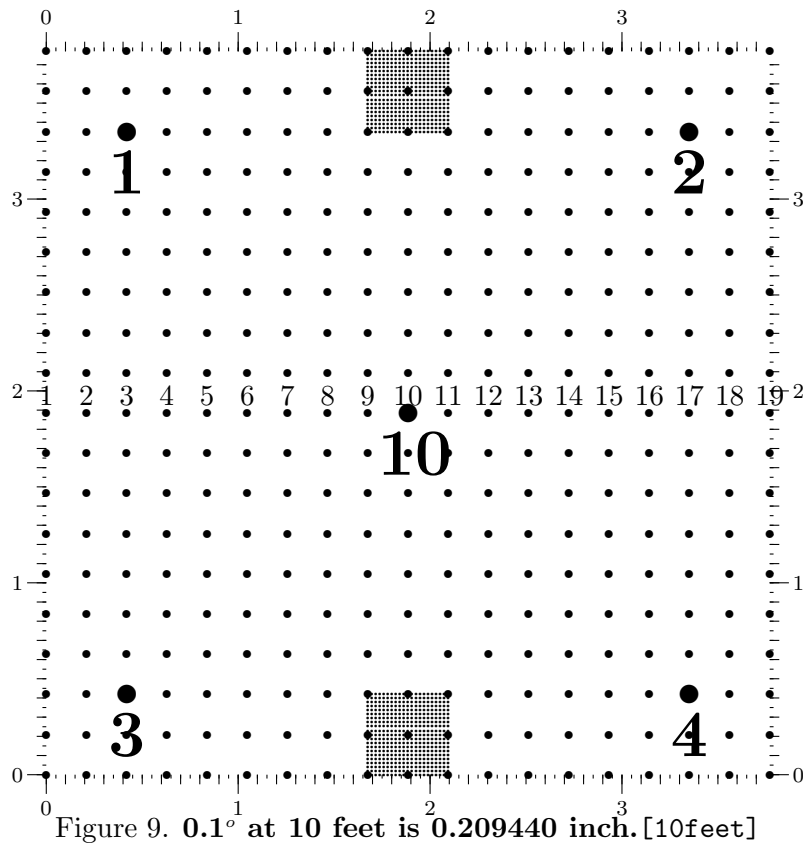
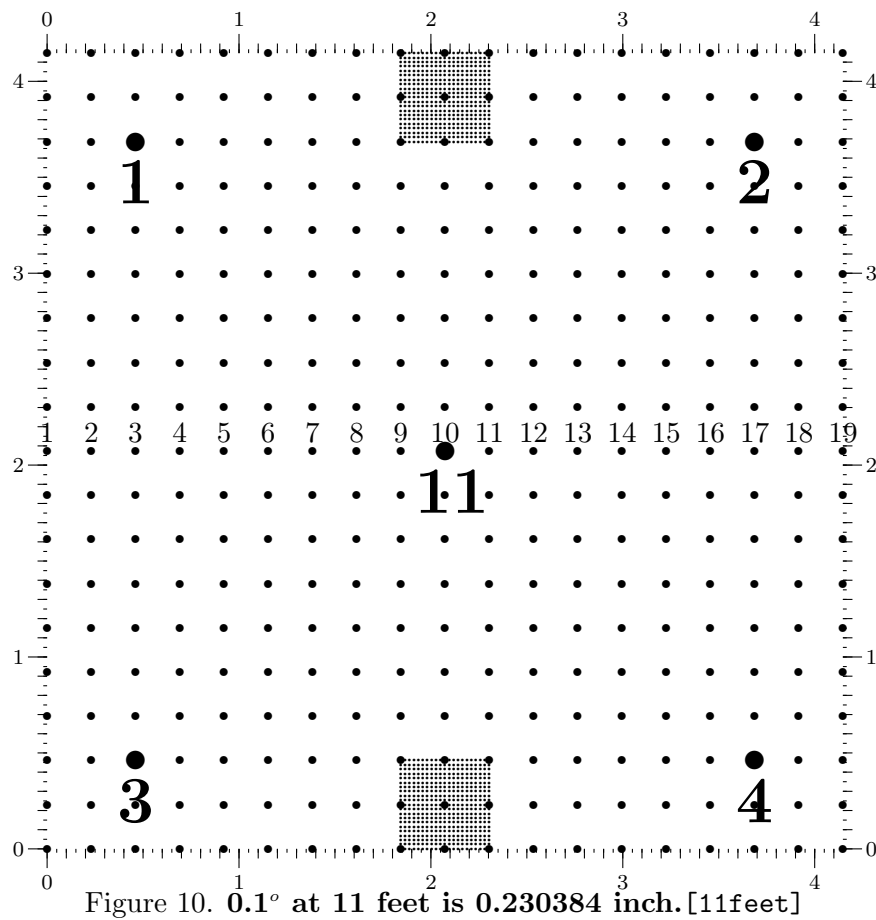


Figure 6. 0.1° at 7 feet is 0.146608 inch.[7feet]









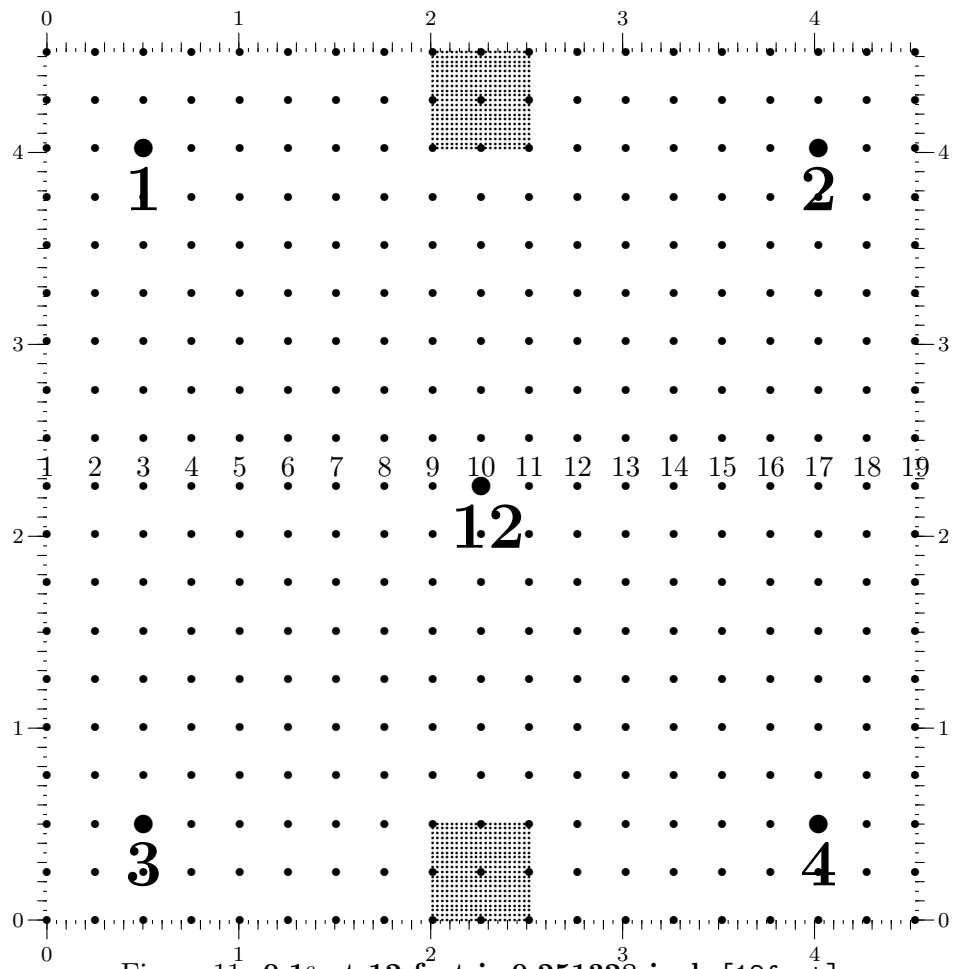
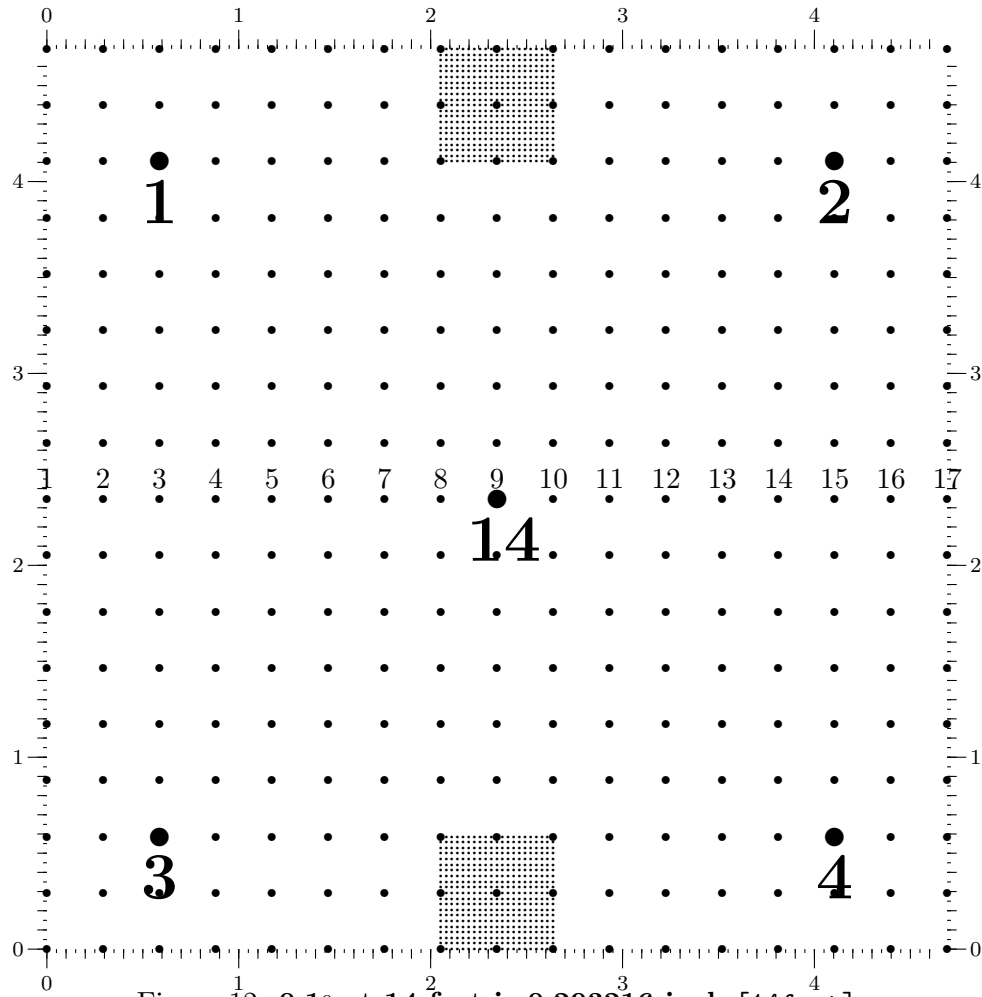
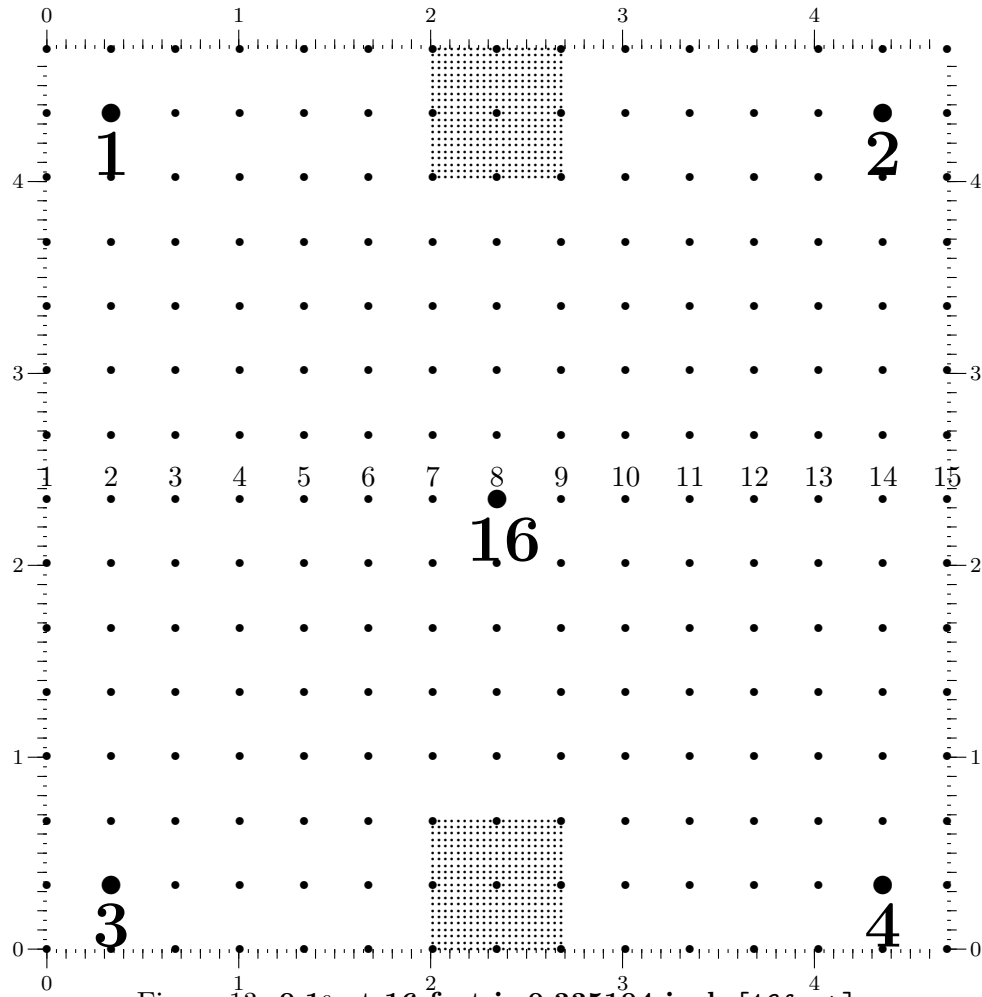


Figure 11. 0.1° at 12 feet is 0.251328 inch.[12feet]





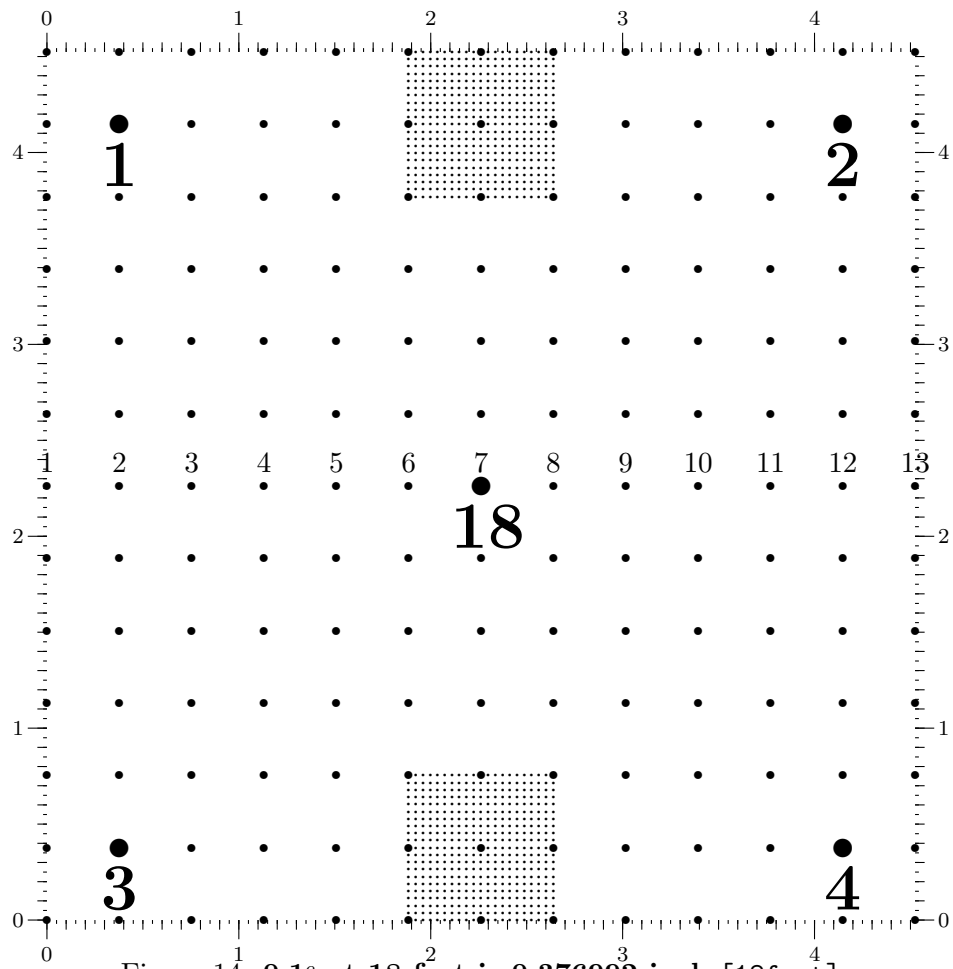
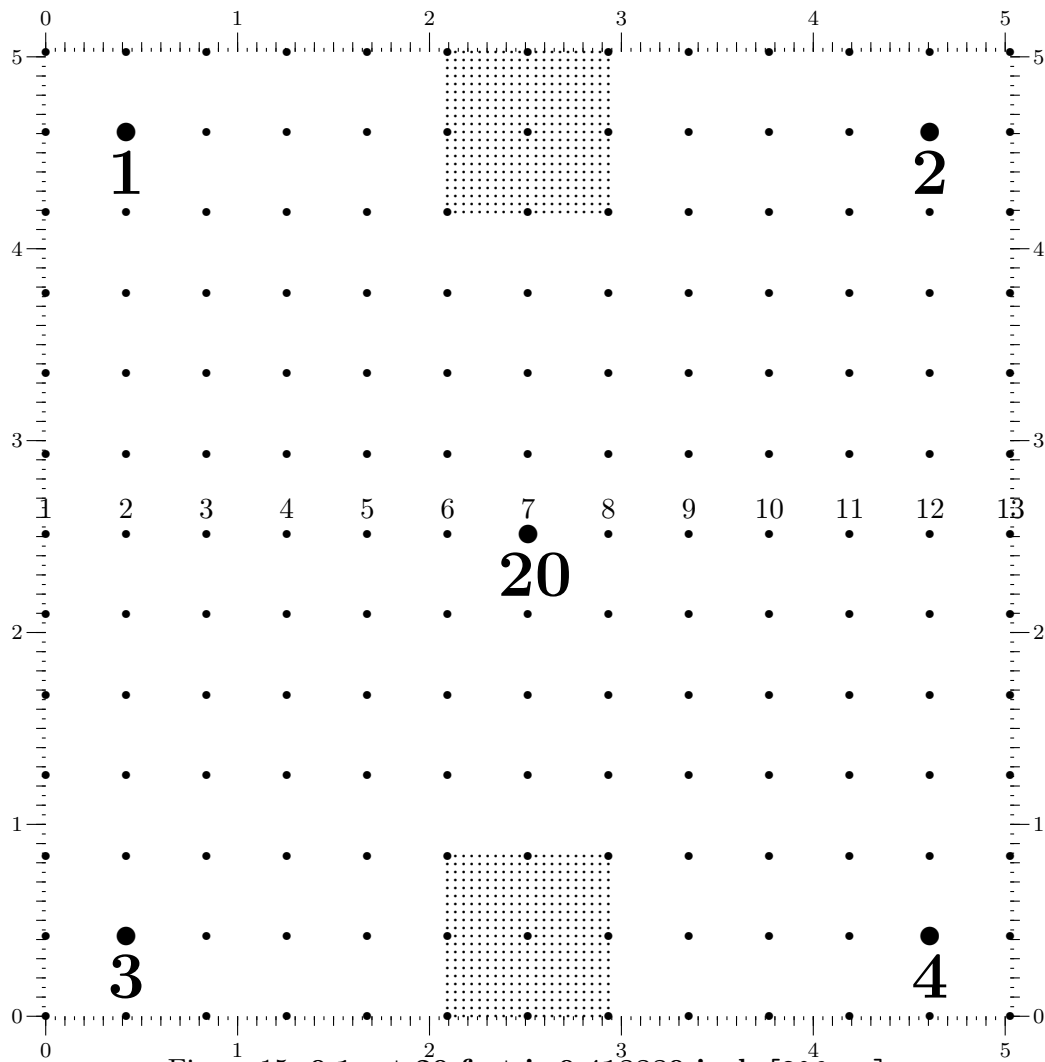
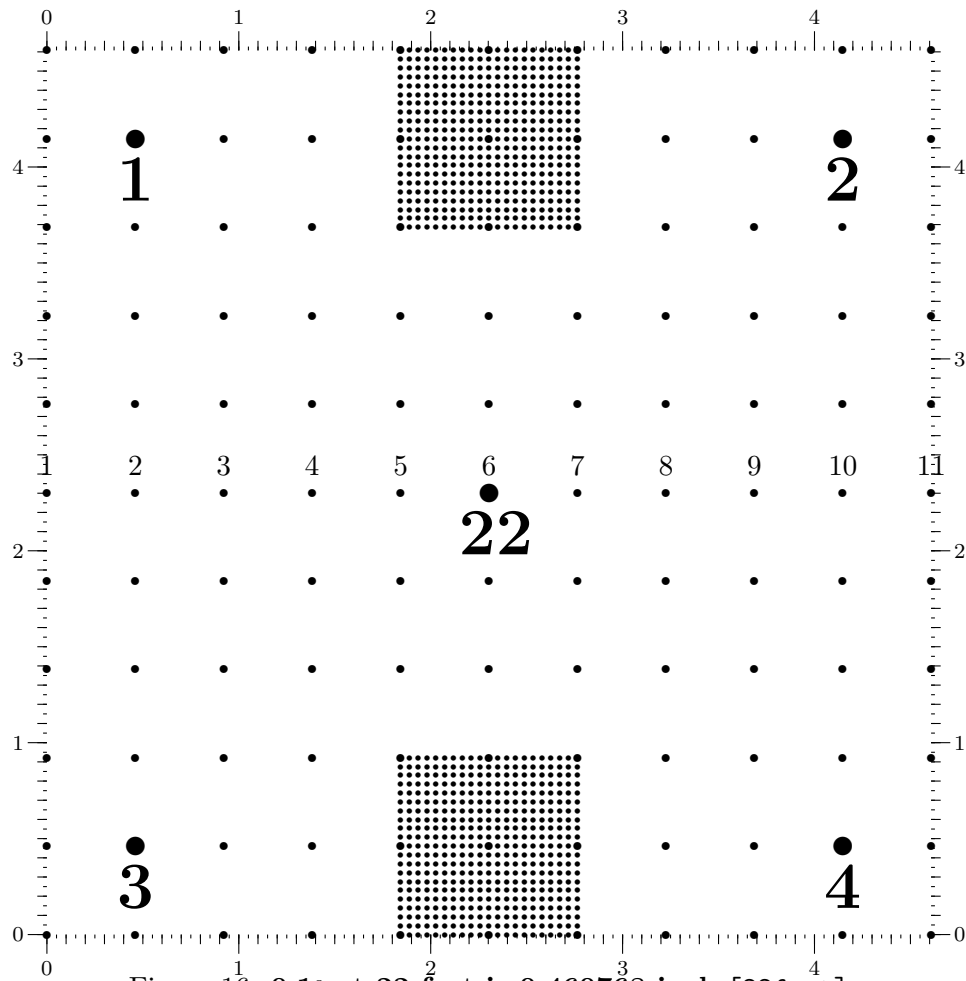
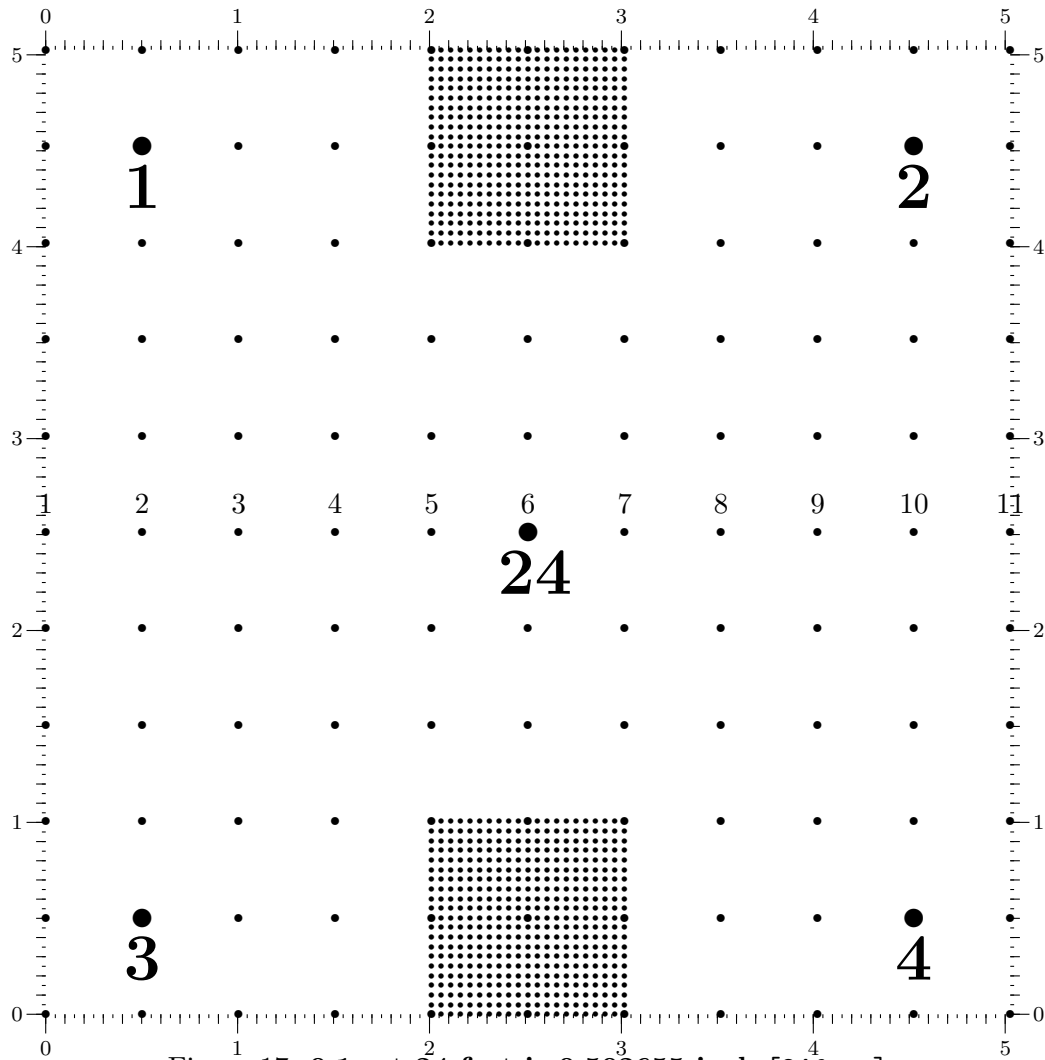
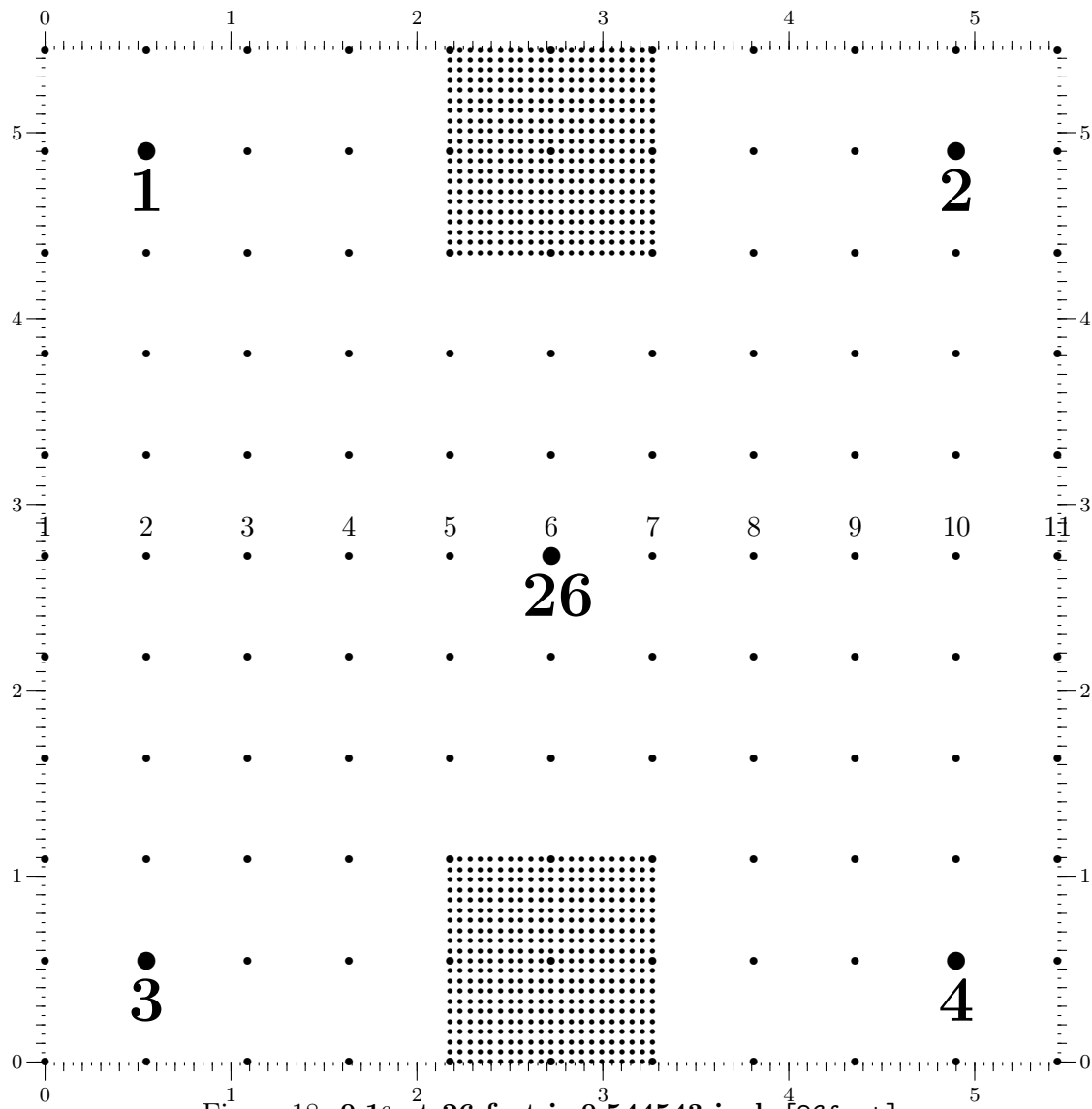


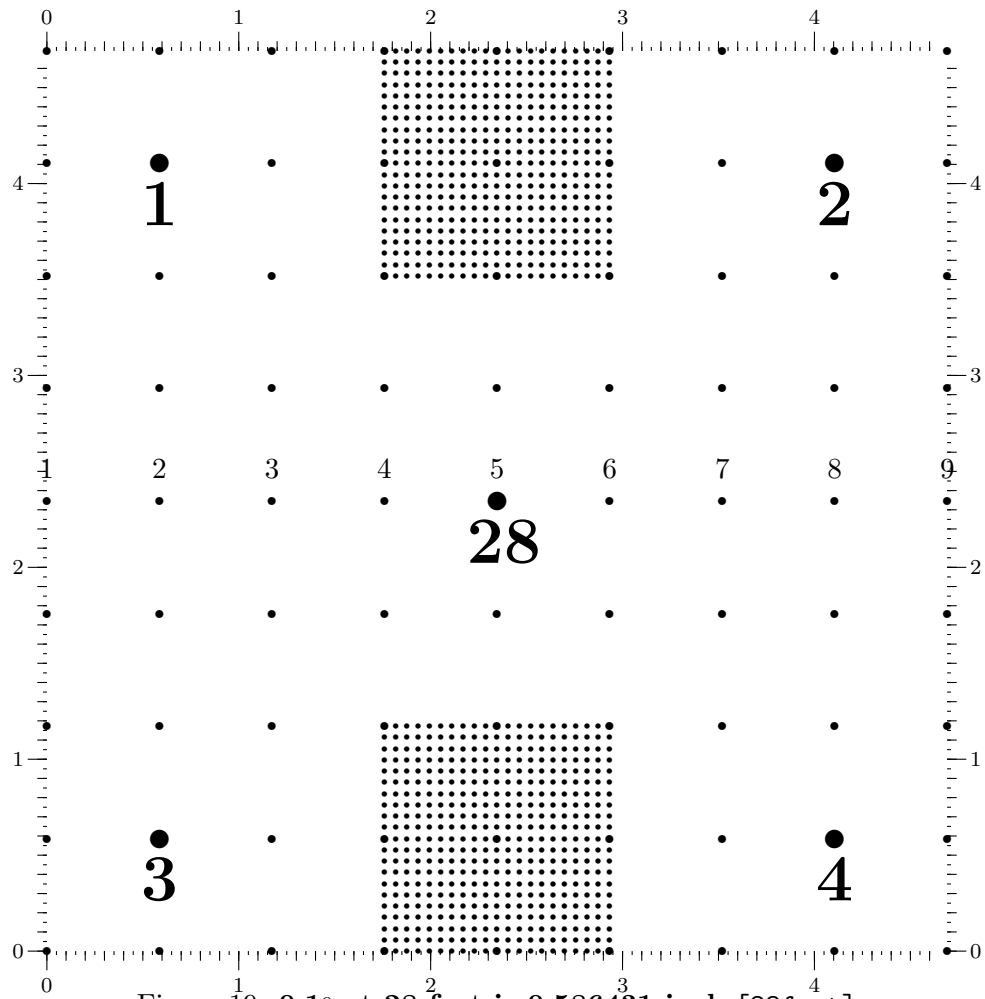
Figure 14. 0.1° at 18 feet is 0.376992 inch.[18feet]

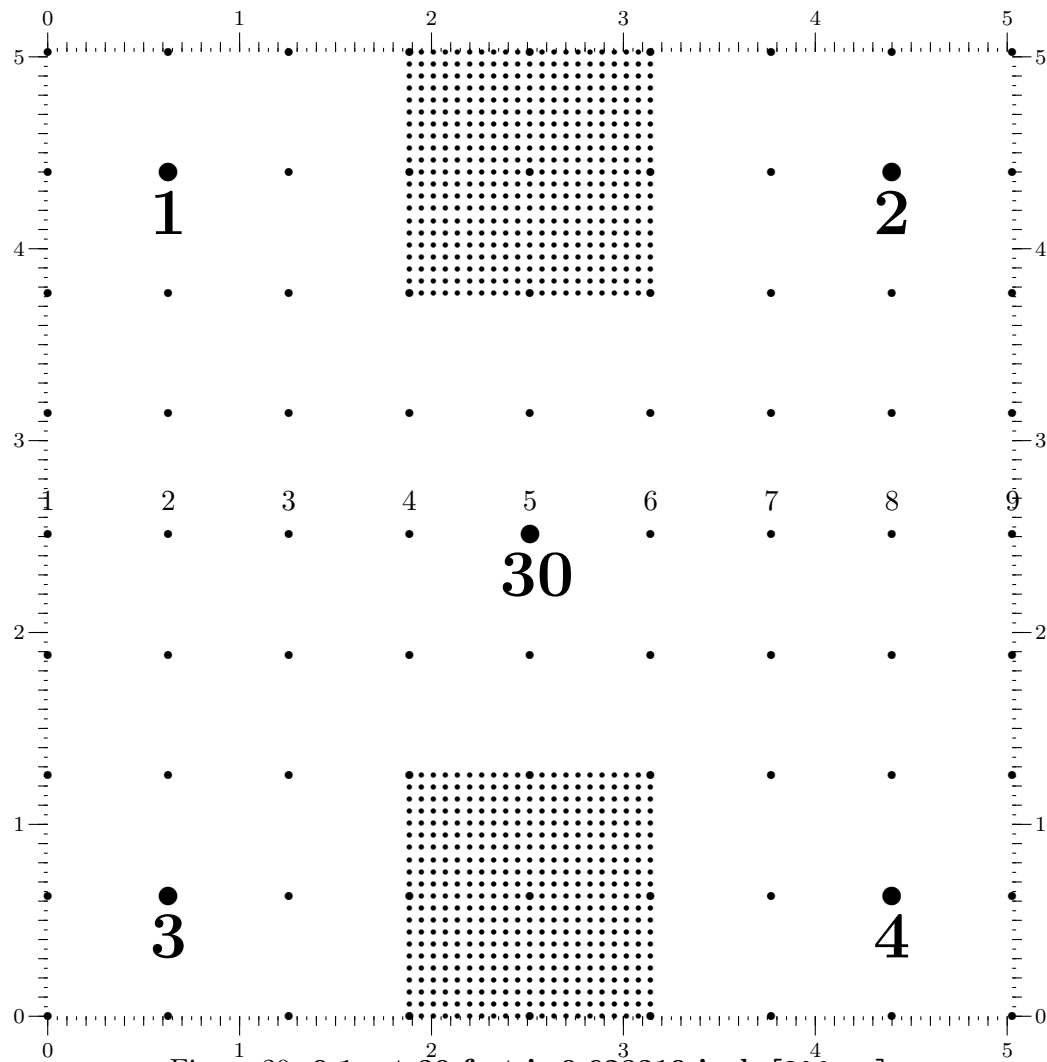












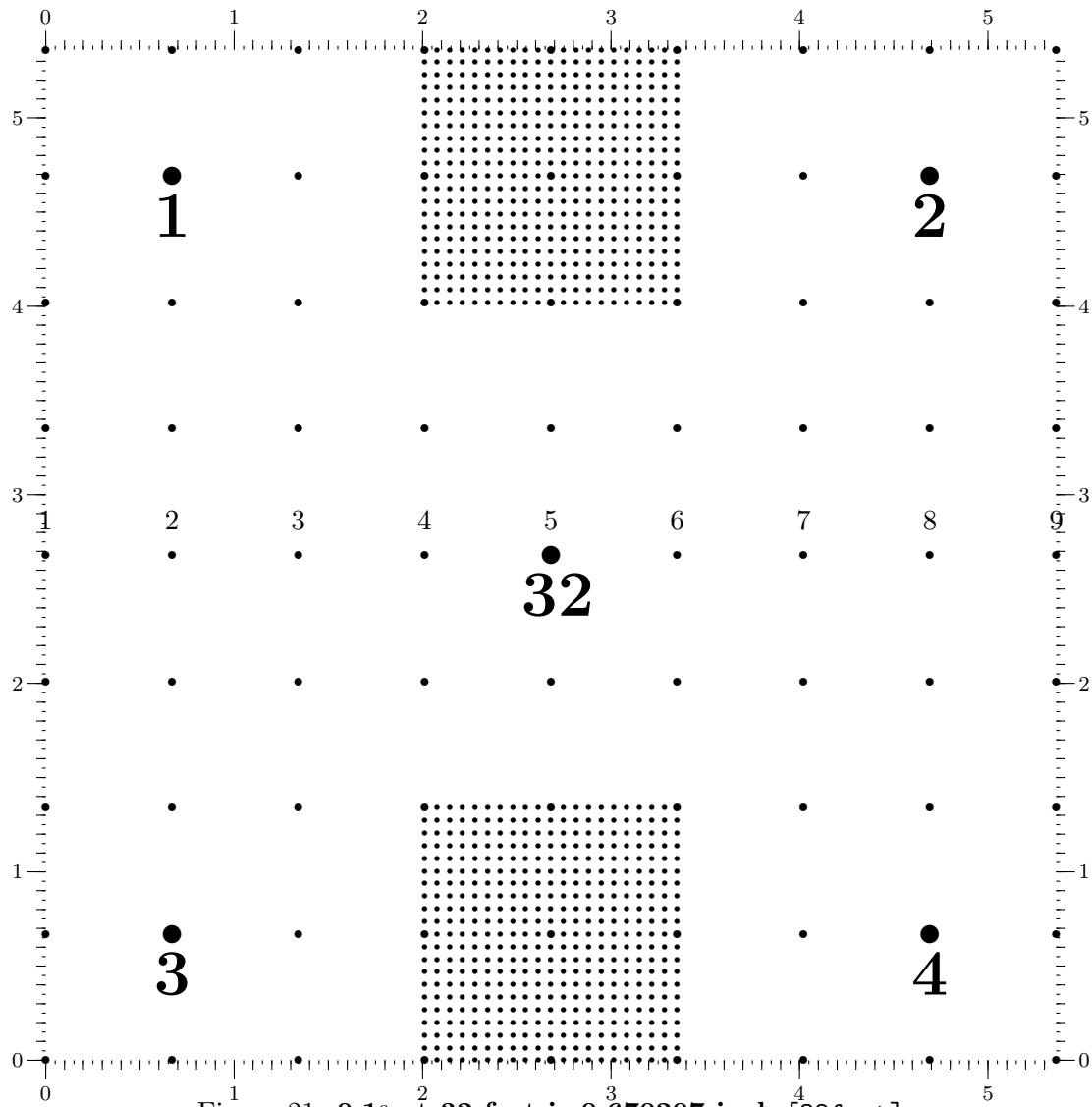
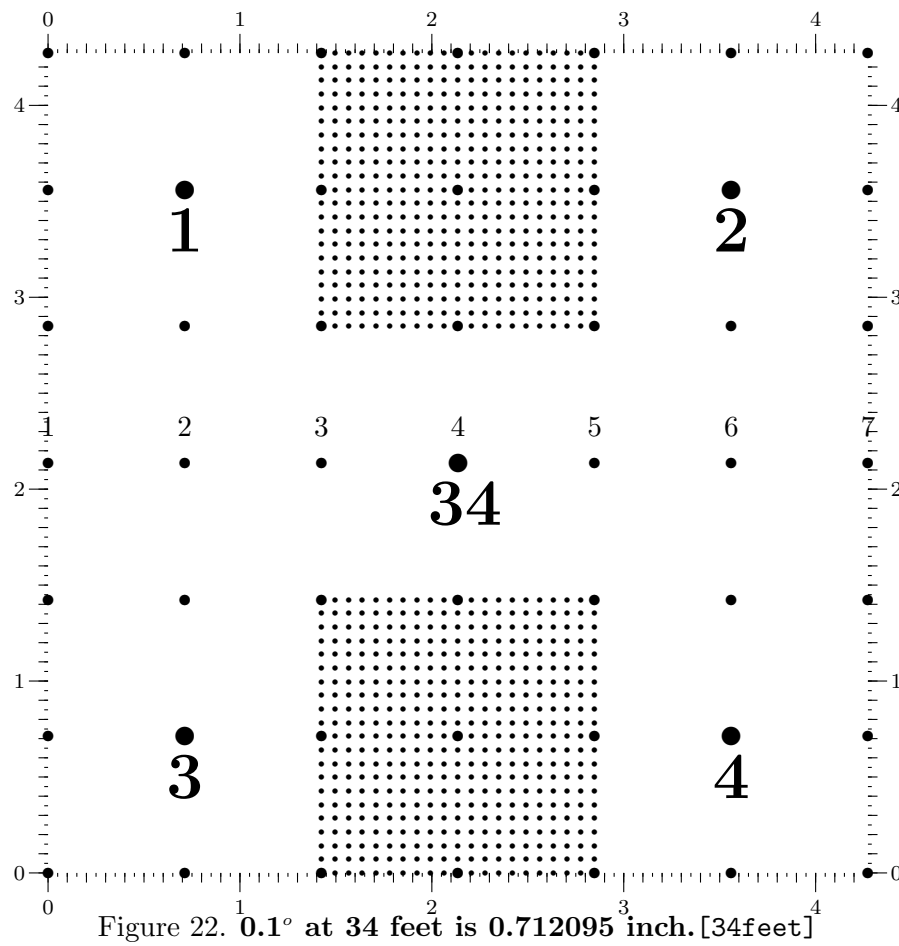
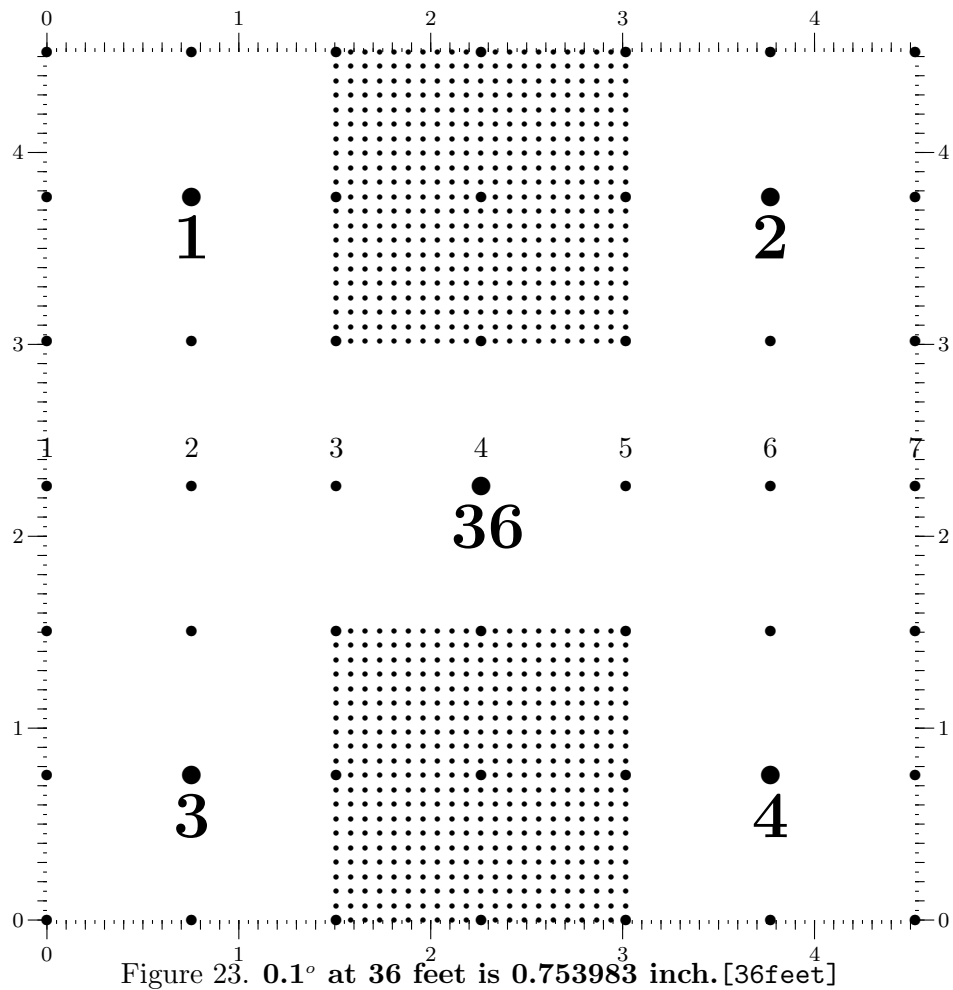
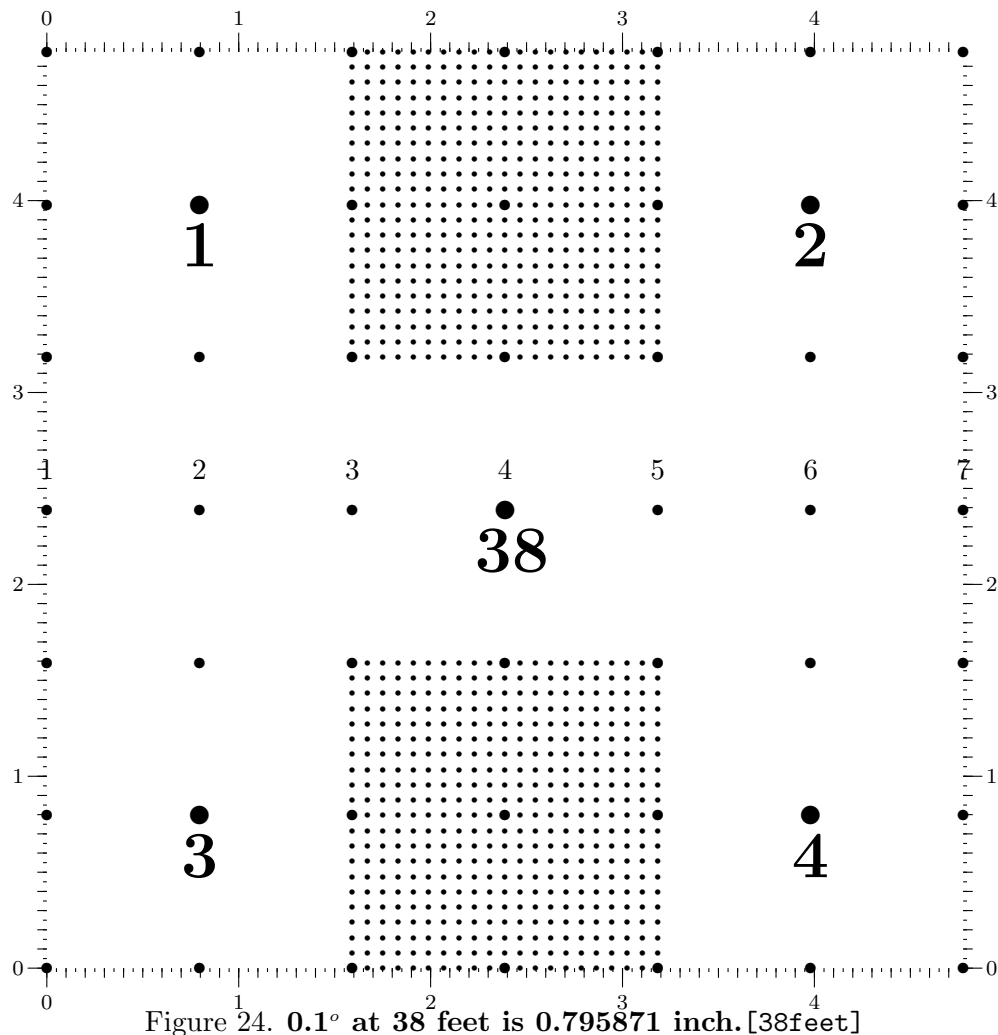
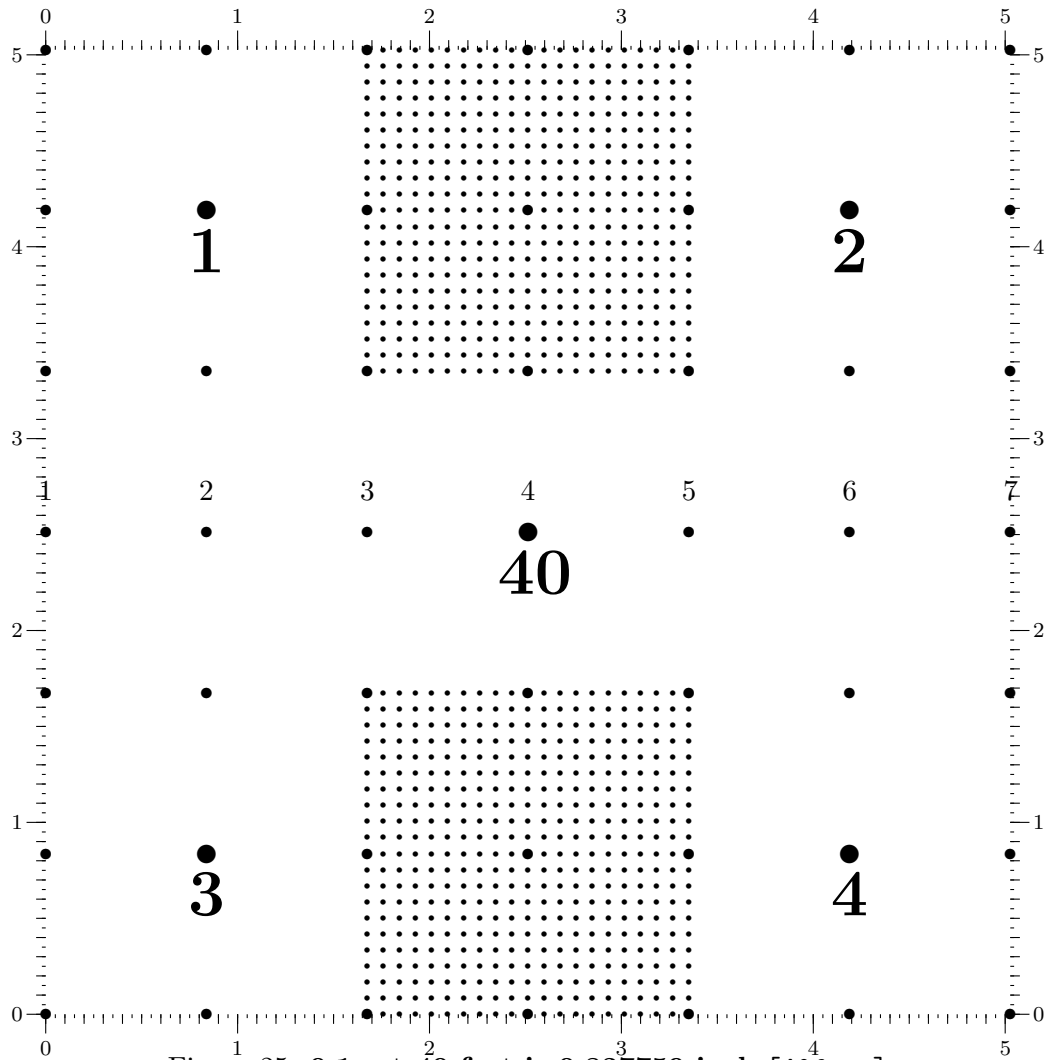


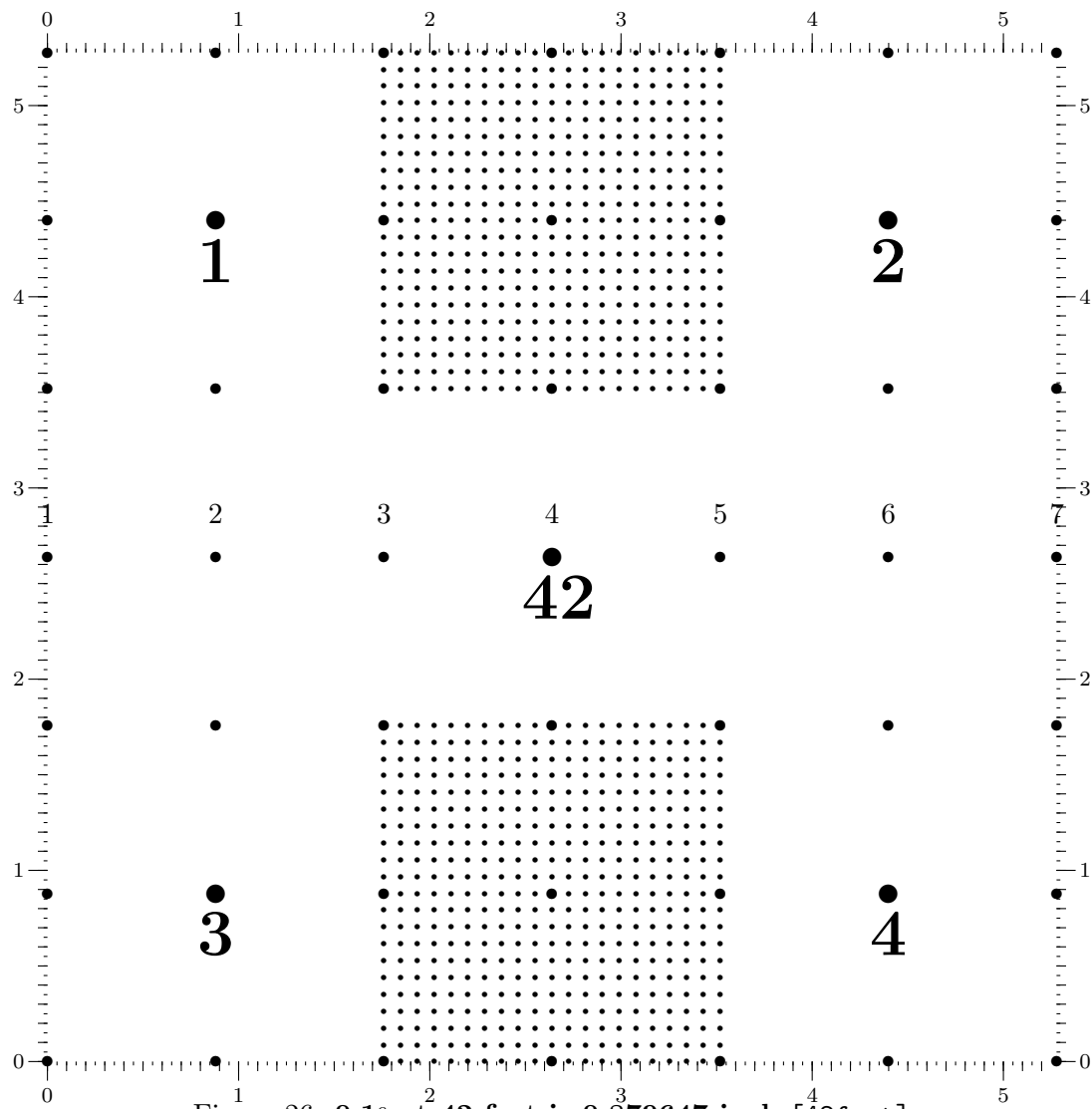
Figure 21. 0.1° at 32 feet is 0.670207 inch. [32feet]

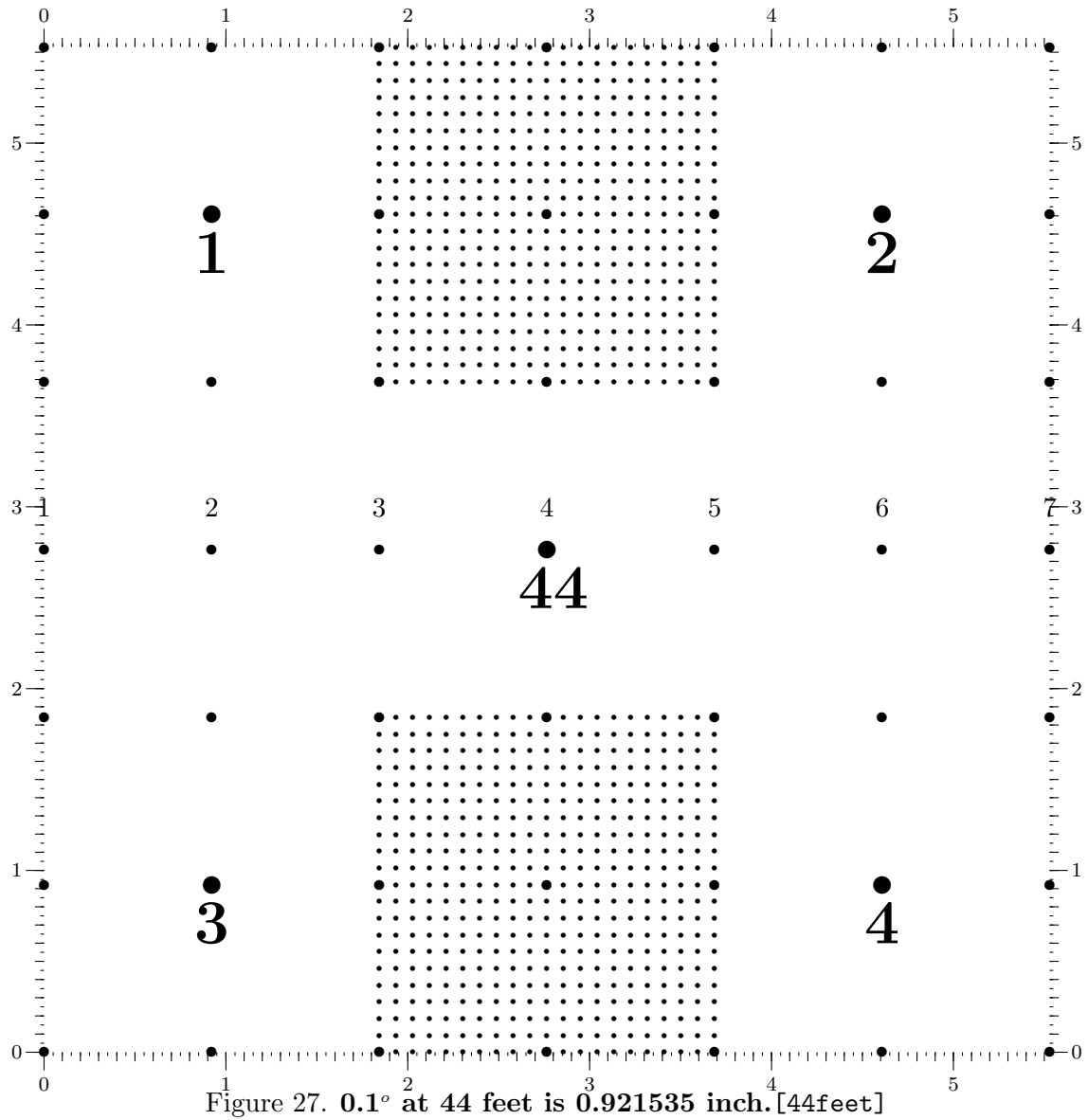


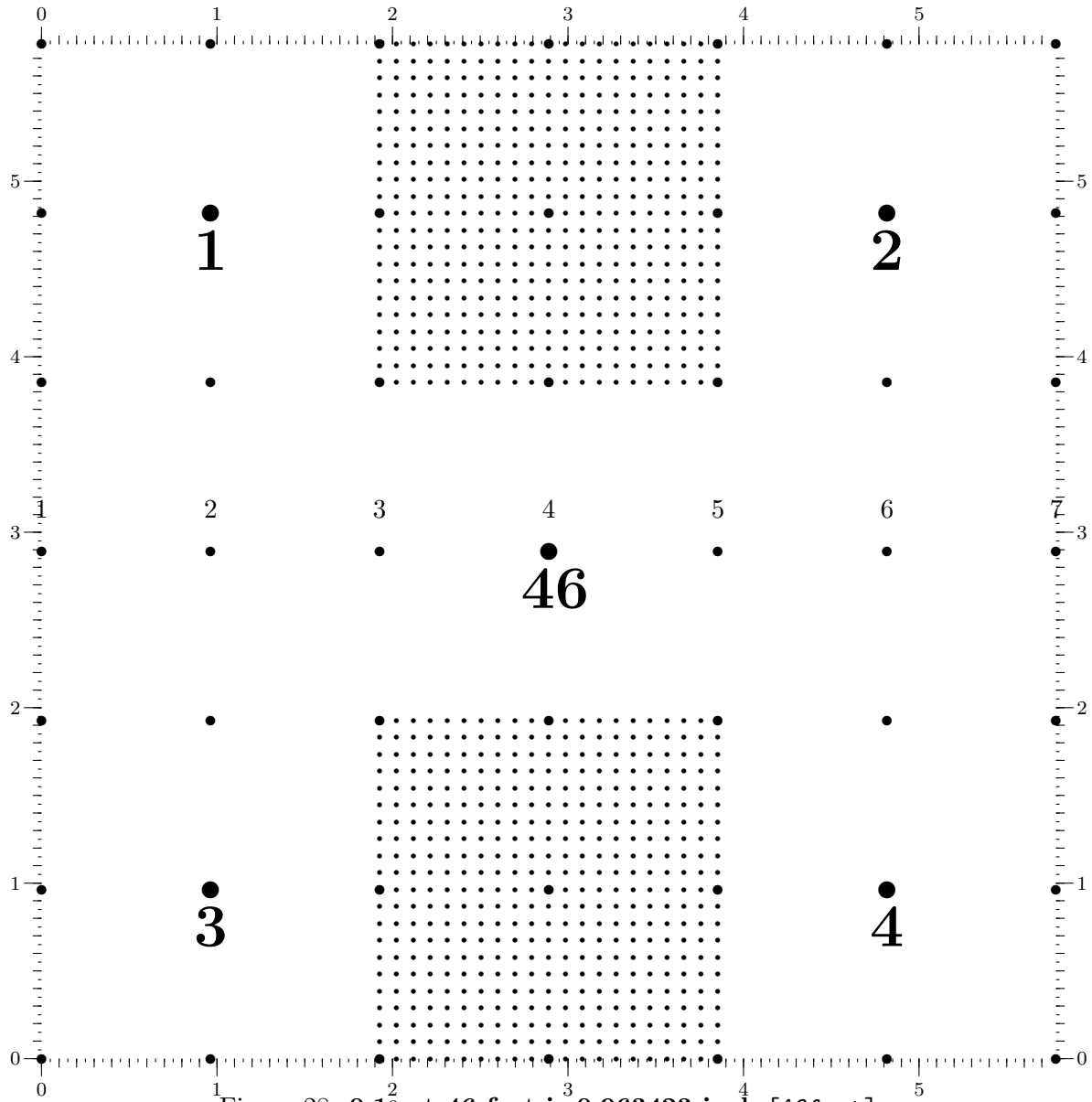


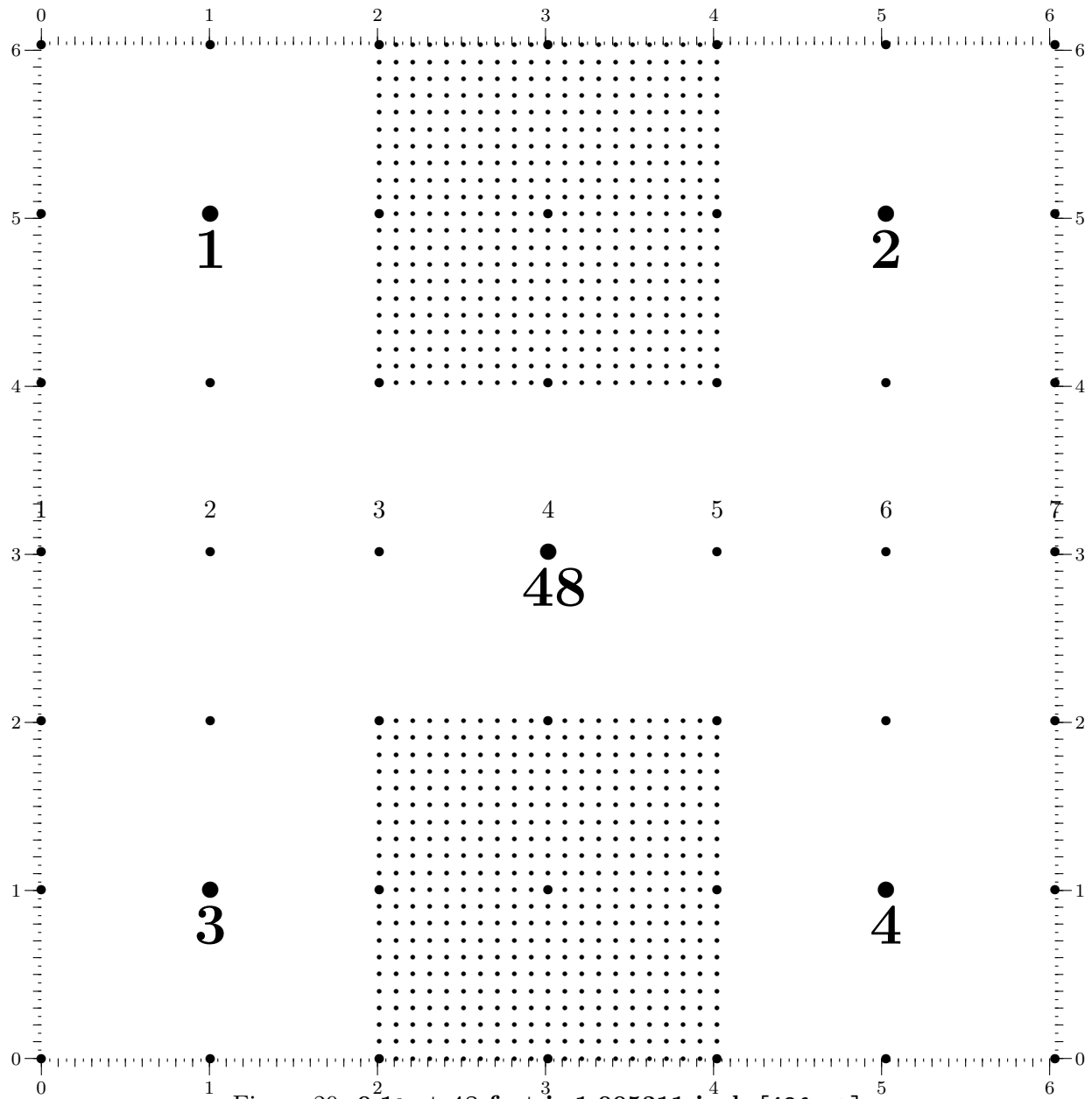


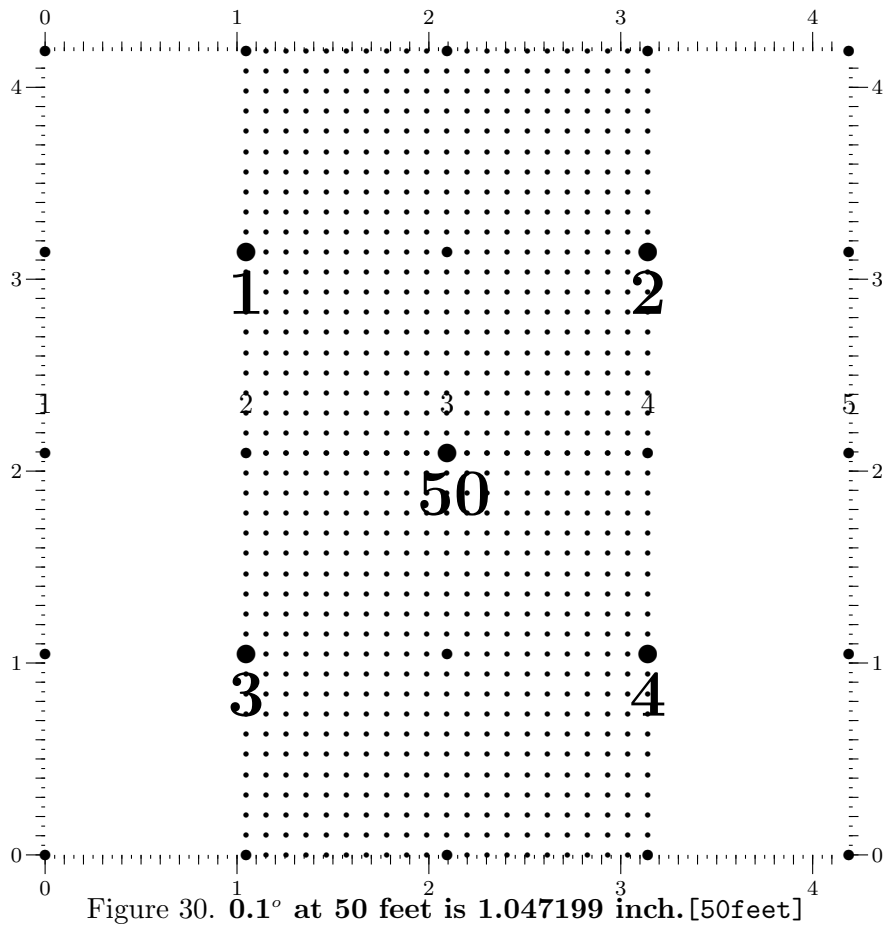


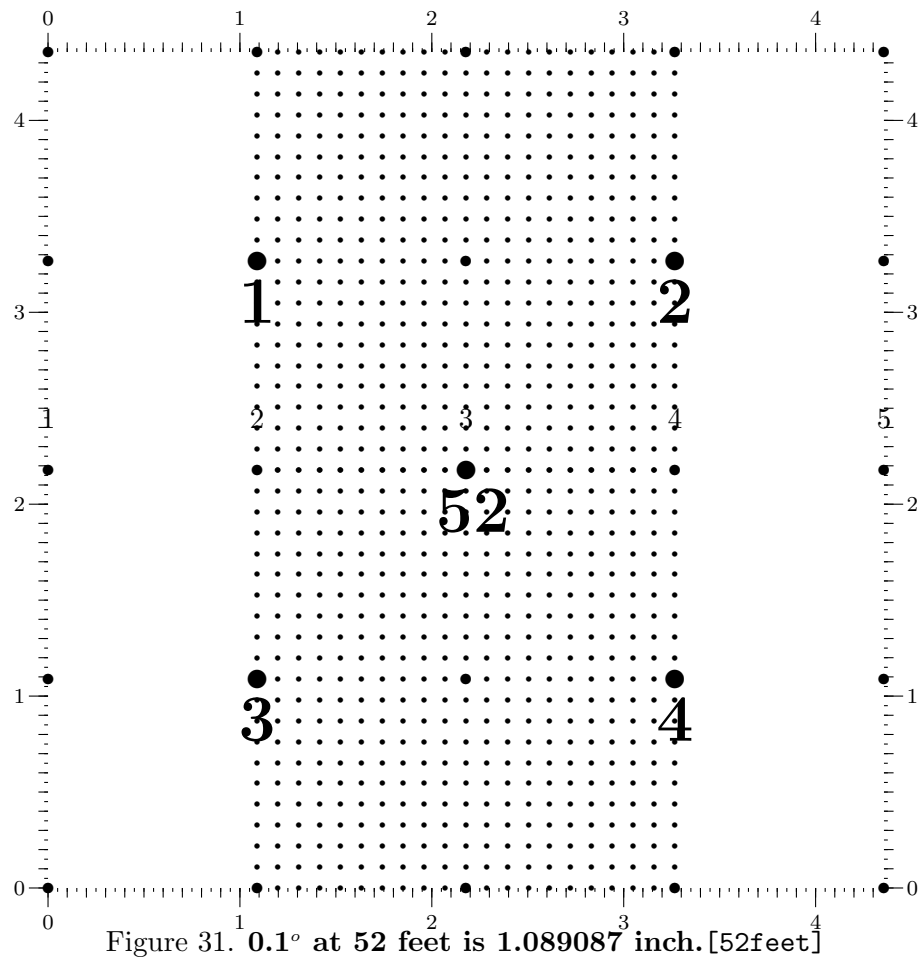


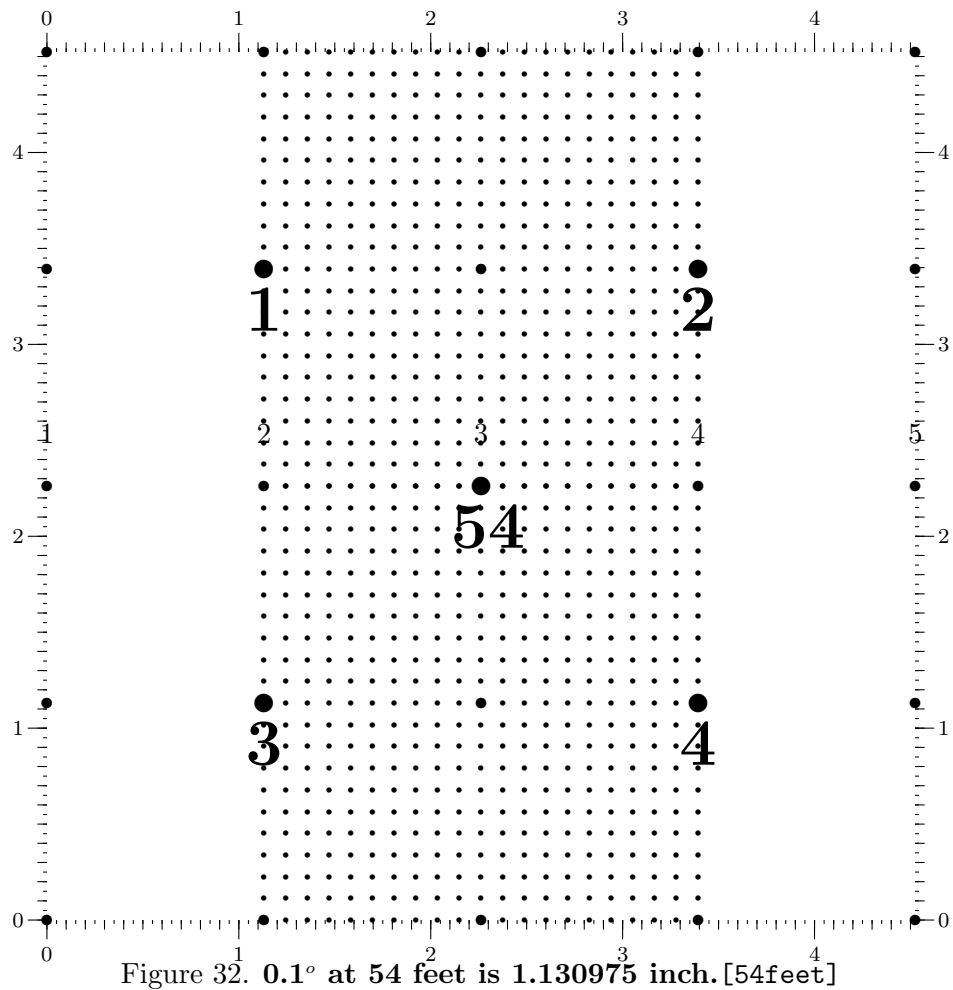


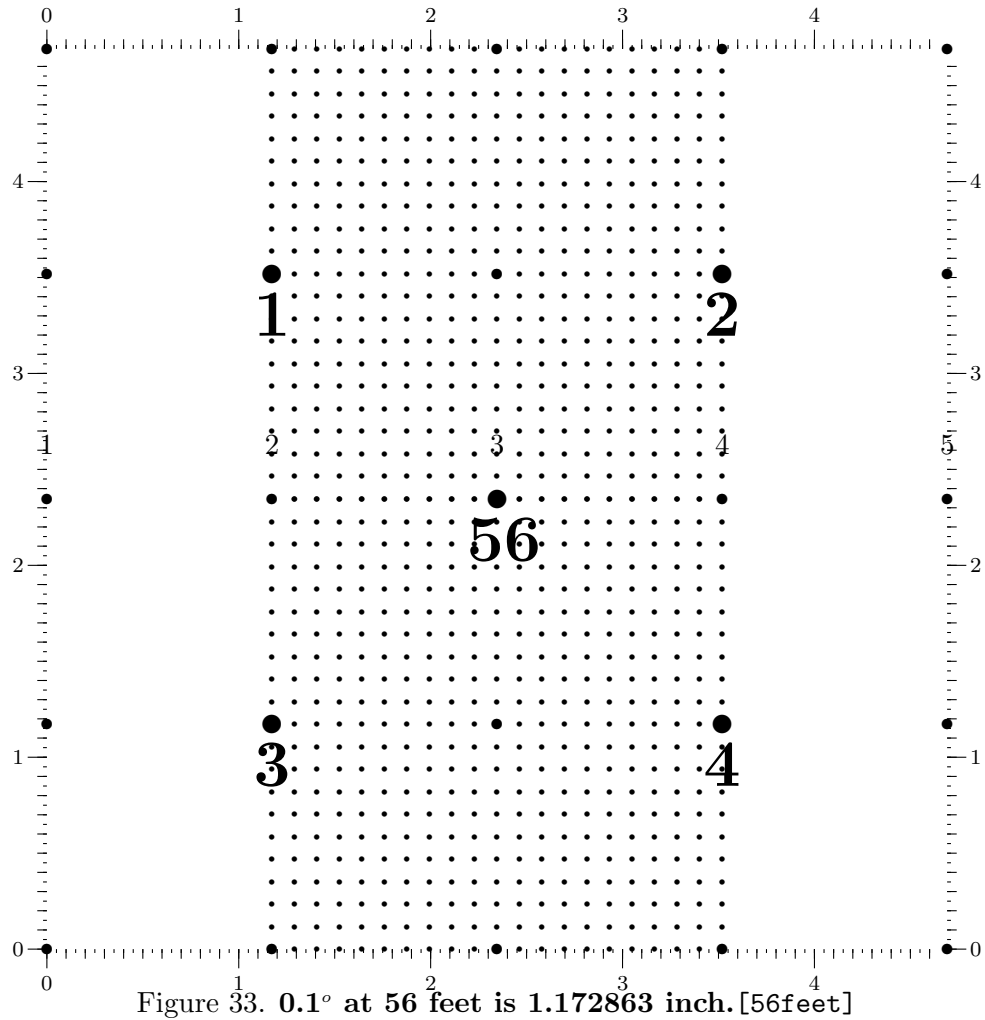












1.2 TgtGen.bas

A short program written in GW-BASIC was developed to generate the L^AT_EXplot files used in making the actual targets. Here it is.

```

1 10 CLS: REV$ = "$Id: TgtGen.bas,v 1.1 2005-08-22 12:45:02-07 Hamilton Exp Hamilton $"
2 20 REM $Header: /EHamilton/General Information/Targets/TgtGen.bas 2      12/26/06 9:39a Ehamilton $
3 30 PRINT REV$
4 40 PRINT "Make calibration targets in LaTeX"
5 50 '
6 60 S$ = "\"
7 70 PI = 3.1415962#
8 80 FOOTTOINCH = 12
9 90 DEGREESINCIRCLE = 360
10 100 TENTHS = 10
11 110 SMALL = 1: REM Used to suppress small grids on small grids
12 120 LARGE = 2: REM Used to enable small grids on large grids
13 130 '
14 140 INPUT "Write into which file (cr = test.inc);OUTFILE$
15 150 IF OUTFILE$ = "" THEN OUTFILE$ = "test.inc"
16 160 OPEN OUTFILE$ FOR OUTPUT AS #2
17 170 OPEN "status.log" FOR APPEND AS #3
18 180 PRINT #3,
19 190 PRINT #3,REV$
20 200 PRINT #3,DATE$,TIME$
21 210 PRINT #3,"Writing into ";OUTFILE$
22 220 '
23 230 REM STEPS      = Width in displayed dots, must be an even number
24 240 REM DOTSSIZESMALL = Pixel size of "standard dots"
25 250 REM DOTSIZELARGE = Pixel size of "calibration dots"
26 260 REM RADIUS      = Distance from camera to target in feet
27 270 REM GRIDSIZE    = SMALL or LARGE, small suppresses the small grids
28 280 REM DOTSSIN      = How far in from the corners to put the sub-marks
29 290 '
30 300 PRINT #2,"\clearpage"
31 310 PRINT #2,"\newcounter{spots}"
32 320 DOTSSIN = 5
33 330 GRIDSIZE = SMALL
34 340 STEPS = 40
35 350 DOTSSIZESMALL = 1
36 360 DOTSIZELARGE = 2
37 370 RADIUS = 2: GOSUB 1180
38 380 RADIUS = 3: GOSUB 1180
39 390 RADIUS = 4: GOSUB 1180
40 400 '
41 410 STEPS = 30
42 420 DOTSSIZESMALL = 1
43 430 DOTSIZELARGE = 3
44 440 RADIUS = 5: GOSUB 1180
45 450 '
46 460 STEPS = 20
47 470 DOTSSIN = 3
48 480 DOTSSIZESMALL = 2
49 490 DOTSIZELARGE = 3
50 500 RADIUS = 6: GOSUB 1180
51 510 DOTSSIN = 2
52 520 RADIUS = 7: GOSUB 1180
53 530 PRINT #2,"\clearpage"
54 540 '
55 550 STEPS = 18

```

```

56 560 DOTSSIZESMALL = 2
57 570 DOTSSIZELARGE = 4
58 580 RADIUS = 8: GOSUB 1180
59 590 RADIUS = 9: GOSUB 1180
60 600 GRIDSIZE = LARGE
61 610 RADIUS = 10: GOSUB 1180
62 620 RADIUS = 11: GOSUB 1180
63 630 RADIUS = 12: GOSUB 1180
64 640 '
65 650 STEPS = 16
66 660 RADIUS = 14: GOSUB 1180
67 670 '
68 680 DOTSSIN = 1
69 690 STEPS = 14
70 700 RADIUS = 16: GOSUB 1180
71 710 '
72 720 STEPS = 12
73 730 RADIUS = 18: GOSUB 1180
74 740 RADIUS = 20: GOSUB 1180
75 750 PRINT #2,"\clearpage"
76 760 '
77 770 STEPS = 10
78 780 DOTSSIZESMALL = 3
79 790 DOTSSIZELARGE = 4
80 800 RADIUS = 22: GOSUB 1180
81 810 RADIUS = 24: GOSUB 1180
82 820 RADIUS = 26: GOSUB 1180
83 830 '
84 840 STEPS = 8
85 850 DOTSSIZESMALL = 3
86 860 DOTSSIZELARGE = 4
87 870 RADIUS = 28: GOSUB 1180
88 880 RADIUS = 30: GOSUB 1180
89 890 RADIUS = 32: GOSUB 1180
90 900 '
91 910 STEPS = 6
92 920 DOTSSIZESMALL = 3
93 930 DOTSSIZELARGE = 5
94 940 RADIUS = 34: GOSUB 1180
95 950 RADIUS = 36: GOSUB 1180
96 960 RADIUS = 38: GOSUB 1180
97 970 RADIUS = 40: GOSUB 1180
98 980 RADIUS = 42: GOSUB 1180
99 990 RADIUS = 44: GOSUB 1180
100 1000 RADIUS = 46: GOSUB 1180
101 1010 RADIUS = 48: GOSUB 1180
102 1020 '
103 1030 STEPS = 4
104 1040 DOTSSIZESMALL = 3
105 1050 DOTSSIZELARGE = 5
106 1060 RADIUS = 50: GOSUB 1180
107 1070 RADIUS = 52: GOSUB 1180
108 1080 RADIUS = 54: GOSUB 1180
109 1090 RADIUS = 56: GOSUB 1180
110 1100 PRINT #2,"\clearpage"
111 1110 '
112 1120 REM All done
113 1130 PRINT #3,"All done"
114 1140 PRINT #3,DATE$,TIME$
115 1150 PRINT "All done, quitting"

```

```

116 1160 END
117 1170 '
118 1180 REM Build the target
119 1190 FULLSIZE = STEPS * 100
120 1200 HALFFULLSIZE = FULLSIZE / 2
121 1210 SMALLGRIDY = FULLSIZE - 200
122 1220 SMALLGRIDX = HALFFULLSIZE - 100
123 1230 DOTS = STEPS + 1
124 1240 ARC = (2 * PI * RADIUS * FOOTTOINCH) / (DEGREESINCIRCLE * TENTHS)
125 1250 RIGHTNUMBER = FULLSIZE - (DOTSIN * 100)
126 1260 LEFTNUMBER = 100 * DOTSIN
127 1270 TOPNUMBER = RIGHTNUMBER
128 1280 BOTTOMNUMBER = LEFTNUMBER
129 1290 '
130 1300 ACTUALSIZE = ARC * FULLSIZE
131 1310 HALFACTUALSIZE = ARC * HALFFULLSIZE
132 1320 '
133 1330 PRINT #2, ""
134 1340 PRINT #2, "\setcounter{spots}{0}"
135 1350 REM PRINT #2, "\clearpage"
136 1360 PRINT #2, "\begin{figure}"
137 1370 PRINT #2, "\begin{center}"
138 1380 PRINT #2, "\setlength{\unitlength}{.01in}"
139 1390 PRINT #2, "\begin{picture}("; ACTUALSIZE; ", "; ACTUALSIZE; ") {"
140 1400 PRINT #2, ""
141 1410 PRINT #2, "%\thicklines\put(0,0){\framebox("; ACTUALSIZE; ", "; ACTUALSIZE; "){}}\thinlines"
142 1420 PRINT #2, ""
143 1430 '
144 1440 GOSUB 2250: REM Put out a ruler around the grid
145 1450 '
146 1460 REM Stick the distance at the center of it all along with its dot
147 1470 PRINT #2, "\put("; HALFACTUALSIZE; ", "; HALFACTUALSIZE; "){\circle*{10}}"
148 1480 PRINT #2, "\put("; HALFACTUALSIZE+10; ", "; (HALFACTUALSIZE)-10; "){\makebox(0,0)[t]{\Huge\bf"; RADIUS; "}}"
149 1490 '
150 1500 REM Now stick out the four sub spots
151 1510 '
152 1520 PRINT #2, "\put("; ARC*LEFTNUMBER; ", "; ARC*TOPNUMBER;
153 1530 PRINT #2, "){\circle*{10}}": REM 1
154 1540 '
155 1550 PRINT #2, "\put("; ARC*RIGHTNUMBER; ", "; ARC*TOPNUMBER;
156 1560 PRINT #2, "){\circle*{10}}": REM 2
157 1570 '
158 1580 PRINT #2, "\put("; ARC*LEFTNUMBER; ", "; ARC*BOTTOMNUMBER;
159 1590 PRINT #2, "){\circle*{10}}": REM 3
160 1600 '
161 1610 PRINT #2, "\put("; ARC*RIGHTNUMBER; ", "; ARC*BOTTOMNUMBER;
162 1620 PRINT #2, "){\circle*{10}}": REM 4
163 1630 '
164 1640 REM Put out the sub marker numbers
165 1650 IF GRIDSIZE = LARGE THEN 1790
166 1660 PRINT #2, "\put("; ARC*LEFTNUMBER; ", "; (ARC*TOPNUMBER)-10;
167 1670 PRINT #2, "){\makebox(0,0)[t]{\large\bf 1}}"
168 1680 '
169 1690 PRINT #2, "\put("; ARC*RIGHTNUMBER; ", "; (ARC*TOPNUMBER)-10;
170 1700 PRINT #2, "){\makebox(0,0)[t]{\large\bf 2}}"
171 1710 '
172 1720 PRINT #2, "\put("; ARC*LEFTNUMBER; ", "; (ARC*BOTTOMNUMBER)+10;
173 1730 PRINT #2, "){\makebox(0,0)[b]{\large\bf 3}}"
174 1740 '
175 1750 PRINT #2, "\put("; ARC*RIGHTNUMBER; ", "; (ARC*BOTTOMNUMBER)+10;

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176 1760 PRINT #2,"){\makebox(0,0)[b]{\large\bf 4}}"
177 1770 GOTO 1920
178 1780 '
179 1790 REM Large size grids
180 1800 PRINT #2,"\put(";ARC*LEFTNUMBER;","; (ARC*TOPNUMBER)-10;
181 1810 PRINT #2,"){\makebox(0,0)[t]{\Huge\bf 1}}"
182 1820 '
183 1830 PRINT #2,"\put(";ARC*RIGHTNUMBER;","; (ARC*TOPNUMBER)-10;
184 1840 PRINT #2,"){\makebox(0,0)[t]{\Huge\bf 2}}"
185 1850 '
186 1860 PRINT #2,"\put(";ARC*LEFTNUMBER;","; (ARC*BOTTOMNUMBER)-10;
187 1870 PRINT #2,"){\makebox(0,0)[t]{\Huge\bf 3}}"
188 1880 '
189 1890 PRINT #2,"\put(";ARC*RIGHTNUMBER;","; (ARC*BOTTOMNUMBER)-10;
190 1900 PRINT #2,"){\makebox(0,0)[t]{\Huge\bf 4}}"
191 1910 '
192 1920 PRINT #2,""
193 1930 '
194 1940 REM Here put out the grids, small first
195 1950 IF GRIDSIZE = SMALL THEN 2080
196 1960 PRINT #2,"% Upper Small Grid"
197 1970 PRINT #2,"\put(";ARC*SMALLGRIDX;",";ARC*SMALLGRIDY;){\multiput(0,0)(0,";ARC*10;){21}{-
198 1980 PRINT #2,"\put(0,0){\multiput(0,0)(";ARC*10;,"0){21}{\circle*{";DOTSIZESMALL;"}}}"
199 1990 PRINT #2,"}"
200 2000 PRINT #2,""
201 2010 PRINT #2,"% Lower Small Grid"
202 2020 PRINT #2,"\put(";ARC*SMALLGRIDX;,"0){\multiput(0,0)(0,";ARC*10;){21}{-
203 2030 PRINT #2,"\put(0,0){\multiput(0,0)(";ARC*10;,"0){21}{\circle*{";DOTSIZESMALL;"}}}"
204 2040 PRINT #2,"}"
205 2050 PRINT #2,""
206 2060 '
207 2070 REM Now the main grid
208 2080 PRINT #2,"% Main Grid"
209 2090 PRINT #2,"\put(0,0){\multiput(0,0)(0,";ARC*100;){";DOTS;"}{-
210 2100 PRINT #2,"\put(0,0){\multiput(0,0)(";ARC*100;,"0){";DOTS;"}{\circle*{";DOTSIZELARGE;"}}}"
211 2110 PRINT #2,"}"
212 2120 PRINT #2,""
213 2130 '
214 2140 IF GRIDSIZE = SMALL THEN 2190
215 2150 PRINT #2,"\put(0,"; (HALFACTUALSIZE)+(20*ARC);
216 2160 PRINT #2,"){\multiput(0,0)(";ARC*100;,"0){";DOTS;
217 2170 PRINT #2,"){\addtocounter{spots}{1}\makebox(0,0)[b]{\arabic{spots}}}"
218 2180 '
219 2190 PRINT #2,"%\rcpicturerev{\$RCSfile: TgtGen.bas,v $}"
220 2200 PRINT #2,"\end{picture}"
221 2210 PRINT #2,USING "&caption{\&bf 0.1&degree& at ## feet is ##.#####
inch.&label{##feet}}";S$;S$;S$;S$;RADIUS;ARC;S$;RADIUS
222 2220 PRINT #2,"\end{center}"
223 2230 PRINT #2,"\end{figure}"
224 2240 RETURN
225 2250 '
226 2260 REM This routine puts an inch ruler around the grid
227 2270 '
228 2280 CNTLONGLINES = INT((ACTUALSIZE+.5)/100)+1
229 2290 IF CNTLONGLINES > ACTUALSIZE THEN CNTLONGLINES = INT((ACTUALSIZE+.5)/100)
230 2300 CNTSHORTLINES = INT((ACTUALSIZE+.5)/10)+2
231 2310 IF CNTSHORTLINES*10 > ACTUALSIZE THEN CNTSHORTLINES = CNTSHORTLINES - 1
232 2320 CNTSHORTERLINES = INT((ACTUALSIZE+.5)/5)+1
233 2330 IF CNTSHORTERLINES*20 > ACTUALSIZE THEN CNTSHORTERLINES = CNTSHORTERLINES - 1
234 2340 '

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235 2350 PRINT #2,
236 2360 PRINT #2,"% Horizontal line, bottom"
237 2370 PRINT #2,"\put(0,0){\multiput(0,0)(100,0){";CNTLONGLINES;"}{\line(0,-1){10}}}"
238 2380 PRINT #2,"\put(0,0){\multiput(0,0)(10,0){";CNTSHORTLINES;"}{\line(0,-1){5}}}"
239 2390 PRINT #2,"\put(0,0){\multiput(0,0)(5,0){";CNTSHORTERLINES;"}{\line(0,-1){2}}}"
240 2400 '
241 2410 PRINT #2,"\setcounter{numbers}{0}"
242 2420 PRINT #2,"\put(0,0){\multiput(0,-14)(100,0){";CNTLONGLINES;"}"
243 2430 PRINT #2," {\makebox(0,0)[t]{\scriptsize{\arabic{numbers}\addtocounter{numbers}{1}}}}}"
244 2440 '
245 2450 PRINT #2,"% Horizontal line, top"
246 2460 PRINT #2,"\put(0,0;ACTUALSIZE;"){\multiput(0,0)(100,0){";CNTLONGLINES;"}{\line(0,1){10}}}"
247 2470 PRINT #2,"\put(0,0;ACTUALSIZE;"){\multiput(0,0)(10,0){";CNTSHORTLINES;"}{\line(0,1){5}}}"
248 2480 PRINT #2,"\put(0,0;ACTUALSIZE;"){\multiput(0,0)(5,0){";CNTSHORTERLINES;"}{\line(0,1){2}}}"
249 2490 '
250 2500 PRINT #2,"\setcounter{numbers}{0}"
251 2510 PRINT #2,"\put(0,0;ACTUALSIZE;"){\multiput(0,14)(100,0){";CNTLONGLINES;"}"
252 2520 PRINT #2," {\makebox(0,0)[b]{\scriptsize{\arabic{numbers}\addtocounter{numbers}{1}}}}}"
253 2530 '
254 2540 PRINT #2,"% Vertical line, left side"
255 2550 PRINT #2,"\put(0,0){\multiput(0,0)(0,100){";CNTLONGLINES;"}{\line(-1,0){10}}}"
256 2560 PRINT #2,"\put(0,0){\multiput(0,0)(0,10){";CNTSHORTLINES;"}{\line(-1,0){5}}}"
257 2570 PRINT #2,"\put(0,0){\multiput(0,0)(0,5){";CNTSHORTERLINES;"}{\line(-1,0){2}}}"
258 2580 '
259 2590 PRINT #2,"\setcounter{numbers}{0}"
260 2600 PRINT #2,"\put(0,0){\multiput(-12,0)(0,100){";CNTLONGLINES;"}"
261 2610 PRINT #2," {\makebox(0,0)[r]{\scriptsize{\arabic{numbers}\addtocounter{numbers}{1}}}}}"
262 2620 '
263 2630 PRINT #2,"% Vertical line, right side"
264 2640 PRINT #2,"\put(0;ACTUALSIZE;0){\multiput(0,0)(0,100){";CNTLONGLINES;"}{\line(1,0){10}}}"
265 2650 PRINT #2,"\put(0;ACTUALSIZE;0){\multiput(0,0)(0,10){";CNTSHORTLINES;"}{\line(1,0){5}}}"
266 2660 PRINT #2,"\put(0;ACTUALSIZE;0){\multiput(0,0)(0,5){";CNTSHORTERLINES;"}{\line(1,0){2}}}"
267 2670 '
268 2680 PRINT #2,"\setcounter{numbers}{0}"
269 2690 PRINT #2,"\put(0;ACTUALSIZE;0){\multiput(12,0)(0,100){";CNTLONGLINES;"}"
270 2700 PRINT #2," {\makebox(0,0)[l]{\scriptsize{\arabic{numbers}\addtocounter{numbers}{1}}}}}"
271 2710 '
272 2720 PRINT #2,""
273 2730 RETURN

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