

inkjet_grid

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Introduction

Draft to calcul GCODE for inkjet printing.

- Create an array of position
- Fill array with 0 and 1, 1 to fires.
- Redim array; Divide one dimension by 12 because of 12 nozzles, with S values, S0 means no firing, S5 = 101 means fire first and third
- Produce XY coordonate for each cells of the array
- Begining GCODE
- Iterate through the array and produce gcode on the fly

```
inche = 25.4 # mm/inche
dpi = 96
reso = inche/dpi
nozzle_X = 12;nozzle_Y = 1
plate_X = 100;plate_Y=100
path = 2 ## here to get the array size
X=floor(plate_X/reso/nozzle_X)*nozzle_X;Y=floor(plate_Y/reso/nozzle_Y)*nozzle_Y
print(paste0("X_used: ",X*reso," - Y_used: ",Y*reso))
```

```
## [1] "X_used: 98.425 - Y_used: 99.74791666666667"
```

```
## With samples, just one dot line, several
a = array(0,dim = c(X,Y,path))
dist_bottom = ceiling(8/reso)
dist_gauche = ceiling(4/reso)
band_length = ceiling(6/reso)
gap = ceiling(2/reso)
dist_gauche_saved = dist_gauche
while(dist_gauche + band_length/2 < X - dist_gauche_saved){
  a[dist_gauche:(dist_gauche+band_length),dist_bottom,] = 1
  dist_gauche = dist_gauche+band_length+gap
}
print(paste0("Number of nozzles fired: ",sum(a)))
```

```
## [1] "Number of nozzles fired: 528"
```

```
dist_bottom = ceiling(20/reso)
dist_gauche = ceiling(4/reso)
band_length = ceiling(6/reso)
gap = ceiling(2/reso)
dist_gauche_saved = dist_gauche
while(dist_gauche + band_length/2 < X - dist_gauche_saved){
  a[dist_gauche:(dist_gauche+band_length),dist_bottom,] = 1
```

```

    dist_gauche = dist_gauche+band_length+gap
  }
print(paste0("Number of nozzles fired: ",sum(a)))

## [1] "Number of nozzles fired: 1056"

# raster(1-a[, ,1],xaxs="i",yaxs="i")

## We need test to check which is the first nozzle, may be we will need rev() here and there
## this assume that the nozzle one is on top, i.e. in the inside of the design
b = array(0,dim=c(X/nozzle_X,Y,dim(a)[3]))

BinToDec <- function(x) {sum(2^(which(x == 1)-1))}

DecToBin <- function(x){ rev(as.numeric(sapply(strsplit(paste(rev(intToBits(x))),""),`[[`,2))) [1:4])}
c(1,0,1,1) %>% BinToDec() %>% DecToBin()

## [1] 1 0 1 1

for(i in seq(path)){
  for(j in seq(X/nozzle_X)){
    for(k in seq(Y/nozzle_Y)){
      b[j,k,i] = BinToDec(a[((j-1)*nozzle_X+1):(j*nozzle_X),k,i])
    }
  }
}

b[,dist_bottom,1]

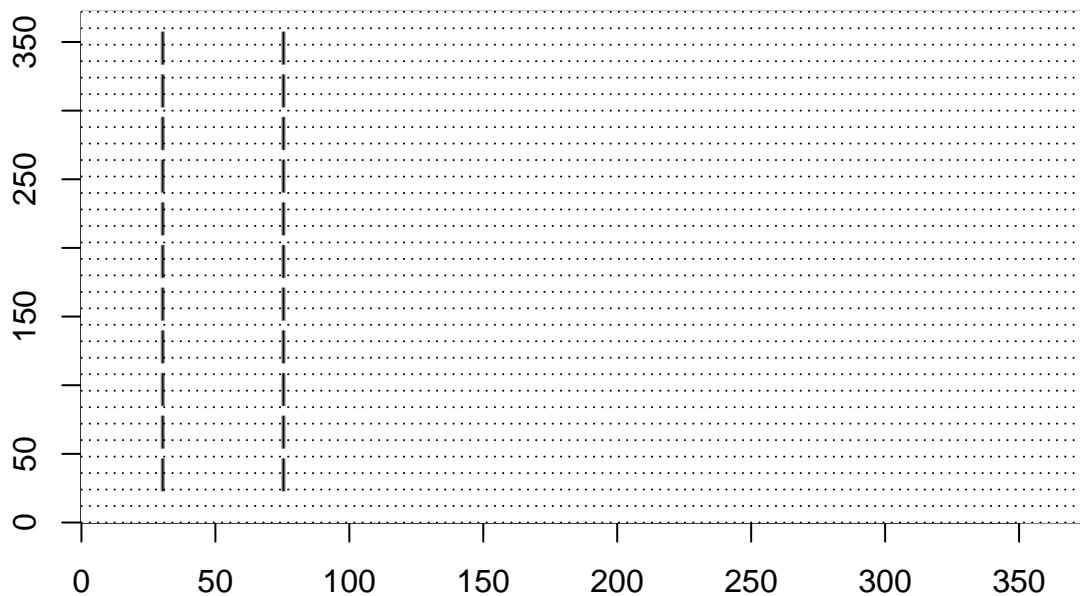
## [1] 0 4088 4095 3079 4095 1023 4064 4095 31 4095 4095 3968 4095 127
## [15] 4092 4095 3587 4095 511 4080 4095 2063 4095 2047 4032 4095 63 4094
## [29] 4095 1 0

print(paste0("Number of positions fired: ",sum(as.logical(b[, ,1]))))

## [1] "Number of positions fired: 58"

coordonate = list(
  X = seq(from=reso*nozzle_X/2+reso/2,by=reso*12,length.out = dim(b)[1]),
  Y=seq(from=reso/2,by = reso,length.out = dim(b)[2])
)
raster(1-a[, ,1],xaxs="i",yaxs="i")
abline(h=seq(0,dim(a)[1],by = 12),lty=3)

```



```
coordinate$Y
```

```
## [1] 0.1322917 0.3968750 0.6614583 0.9260417 1.1906250 1.4552083
## [7] 1.7197917 1.9843750 2.2489583 2.5135417 2.7781250 3.0427083
## [13] 3.3072917 3.5718750 3.8364583 4.1010417 4.3656250 4.6302083
## [19] 4.8947917 5.1593750 5.4239583 5.6885417 5.9531250 6.2177083
## [25] 6.4822917 6.7468750 7.0114583 7.2760417 7.5406250 7.8052083
## [31] 8.0697917 8.3343750 8.5989583 8.8635417 9.1281250 9.3927083
## [37] 9.6572917 9.9218750 10.1864583 10.4510417 10.7156250 10.9802083
## [43] 11.2447917 11.5093750 11.7739583 12.0385417 12.3031250 12.5677083
## [49] 12.8322917 13.0968750 13.3614583 13.6260417 13.8906250 14.1552083
## [55] 14.4197917 14.6843750 14.9489583 15.2135417 15.4781250 15.7427083
## [61] 16.0072917 16.2718750 16.5364583 16.8010417 17.0656250 17.3302083
## [67] 17.5947917 17.8593750 18.1239583 18.3885417 18.6531250 18.9177083
## [73] 19.1822917 19.4468750 19.7114583 19.9760417 20.2406250 20.5052083
## [79] 20.7697917 21.0343750 21.2989583 21.5635417 21.8281250 22.0927083
## [85] 22.3572917 22.6218750 22.8864583 23.1510417 23.4156250 23.6802083
## [91] 23.9447917 24.2093750 24.4739583 24.7385417 25.0031250 25.2677083
## [97] 25.5322917 25.7968750 26.0614583 26.3260417 26.5906250 26.8552083
## [103] 27.1197917 27.3843750 27.6489583 27.9135417 28.1781250 28.4427083
## [109] 28.7072917 28.9718750 29.2364583 29.5010417 29.7656250 30.0302083
## [115] 30.2947917 30.5593750 30.8239583 31.0885417 31.3531250 31.6177083
## [121] 31.8822917 32.1468750 32.4114583 32.6760417 32.9406250 33.2052083
## [127] 33.4697917 33.7343750 33.9989583 34.2635417 34.5281250 34.7927083
## [133] 35.0572917 35.3218750 35.5864583 35.8510417 36.1156250 36.3802083
## [139] 36.6447917 36.9093750 37.1739583 37.4385417 37.7031250 37.9677083
## [145] 38.2322917 38.4968750 38.7614583 39.0260417 39.2906250 39.5552083
## [151] 39.8197917 40.0843750 40.3489583 40.6135417 40.8781250 41.1427083
## [157] 41.4072917 41.6718750 41.9364583 42.2010417 42.4656250 42.7302083
## [163] 42.9947917 43.2593750 43.5239583 43.7885417 44.0531250 44.3177083
## [169] 44.5822917 44.8468750 45.1114583 45.3760417 45.6406250 45.9052083
## [175] 46.1697917 46.4343750 46.6989583 46.9635417 47.2281250 47.4927083
## [181] 47.7572917 48.0218750 48.2864583 48.5510417 48.8156250 49.0802083
## [187] 49.3447917 49.6093750 49.8739583 50.1385417 50.4031250 50.6677083
```

```
## [193] 50.9322917 51.1968750 51.4614583 51.7260417 51.9906250 52.2552083
## [199] 52.5197917 52.7843750 53.0489583 53.3135417 53.5781250 53.8427083
## [205] 54.1072917 54.3718750 54.6364583 54.9010417 55.1656250 55.4302083
## [211] 55.6947917 55.9593750 56.2239583 56.4885417 56.7531250 57.0177083
## [217] 57.2822917 57.5468750 57.8114583 58.0760417 58.3406250 58.6052083
## [223] 58.8697917 59.1343750 59.3989583 59.6635417 59.9281250 60.1927083
## [229] 60.4572917 60.7218750 60.9864583 61.2510417 61.5156250 61.7802083
## [235] 62.0447917 62.3093750 62.5739583 62.8385417 63.1031250 63.3677083
## [241] 63.6322917 63.8968750 64.1614583 64.4260417 64.6906250 64.9552083
## [247] 65.2197917 65.4843750 65.7489583 66.0135417 66.2781250 66.5427083
## [253] 66.8072917 67.0718750 67.3364583 67.6010417 67.8656250 68.1302083
## [259] 68.3947917 68.6593750 68.9239583 69.1885417 69.4531250 69.7177083
## [265] 69.9822917 70.2468750 70.5114583 70.7760417 71.0406250 71.3052083
## [271] 71.5697917 71.8343750 72.0989583 72.3635417 72.6281250 72.8927083
## [277] 73.1572917 73.4218750 73.6864583 73.9510417 74.2156250 74.4802083
## [283] 74.7447917 75.0093750 75.2739583 75.5385417 75.8031250 76.0677083
## [289] 76.3322917 76.5968750 76.8614583 77.1260417 77.3906250 77.6552083
## [295] 77.9197917 78.1843750 78.4489583 78.7135417 78.9781250 79.2427083
## [301] 79.5072917 79.7718750 80.0364583 80.3010417 80.5656250 80.8302083
## [307] 81.0947917 81.3593750 81.6239583 81.8885417 82.1531250 82.4177083
## [313] 82.6822917 82.9468750 83.2114583 83.4760417 83.7406250 84.0052083
## [319] 84.2697917 84.5343750 84.7989583 85.0635417 85.3281250 85.5927083
## [325] 85.8572917 86.1218750 86.3864583 86.6510417 86.9156250 87.1802083
## [331] 87.4447917 87.7093750 87.9739583 88.2385417 88.5031250 88.7677083
## [337] 89.0322917 89.2968750 89.5614583 89.8260417 90.0906250 90.3552083
## [343] 90.6197917 90.8843750 91.1489583 91.4135417 91.6781250 91.9427083
## [349] 92.2072917 92.4718750 92.7364583 93.0010417 93.2656250 93.5302083
## [355] 93.7947917 94.0593750 94.3239583 94.5885417 94.8531250 95.1177083
## [361] 95.3822917 95.6468750 95.9114583 96.1760417 96.4406250 96.7052083
## [367] 96.9697917 97.2343750 97.4989583 97.7635417 98.0281250 98.2927083
## [373] 98.5572917 98.8218750 99.0864583 99.3510417 99.6156250
```

```
coordinate$$X
```

```
## [1] 1.719792 4.894792 8.069792 11.244792 14.419792 17.594792 20.769792
## [8] 23.944792 27.119792 30.294792 33.469792 36.644792 39.819792 42.994792
## [15] 46.169792 49.344792 52.519792 55.694792 58.869792 62.044792 65.219792
## [22] 68.394792 71.569792 74.744792 77.919792 81.094792 84.269792 87.444792
## [29] 90.619792 93.794792 96.969792
```

```
gcode = c("G28 ; home all axis, will have a problem with the Z",
          "G21 ; set units to millimeters",
          "G90 ; use absolute coordinates",
          "M82 ; use absolute distances for extrusion",
          "G92 E0")
```

```
for(k in seq(dim(b)[3])){ # slice loop, need modulo for next loop
  if(k %% 2 == 1){
    s = seq(dim(b)[1])
  }else{
    s = seq(dim(b)[1]) %>% rev
  }
  for(i in s){ # X loop, need modulo
```

```

if(i %% 2 == 1){
  s = seq(dim(b)[2])
}else{
  s = seq(dim(b)[2]) %>% rev
}
for(j in s){
  if(b[i,j,k] != 0){
    gcode = c(gcode,paste0("G1 X",coordinate$X[i]," Y",coordinate$Y[j]," ; go in position"))
    gcode = c(gcode,"M400 ; Wait for current moves to finish ")
    gcode = c(gcode,paste0("M700 P0 S",b[i,j,k]," ; Fire inkjet bits"))
  }
}
}
}
print(gcode)

```

```

## [1] "G28 ; home all axis, will have a problem with the Z"
## [2] "G21 ; set units to millimeters"
## [3] "G90 ; use absolute coordinates"
## [4] "M82 ; use absolute distances for extrusion"
## [5] "G92 E0"
## [6] "G1 X4.89479166666667 Y19.9760416666667 ; go in position"
## [7] "M400 ; Wait for current moves to finish "
## [8] "M700 P0 S4088 ; Fire inkjet bits"
## [9] "G1 X4.89479166666667 Y8.06979166666667 ; go in position"
## [10] "M400 ; Wait for current moves to finish "
## [11] "M700 P0 S4088 ; Fire inkjet bits"
## [12] "G1 X8.06979166666667 Y8.06979166666667 ; go in position"
## [13] "M400 ; Wait for current moves to finish "
## [14] "M700 P0 S4095 ; Fire inkjet bits"
## [15] "G1 X8.06979166666667 Y19.9760416666667 ; go in position"
## [16] "M400 ; Wait for current moves to finish "
## [17] "M700 P0 S4095 ; Fire inkjet bits"
## [18] "G1 X11.24479166666667 Y19.9760416666667 ; go in position"
## [19] "M400 ; Wait for current moves to finish "
## [20] "M700 P0 S3079 ; Fire inkjet bits"
## [21] "G1 X11.24479166666667 Y8.06979166666667 ; go in position"
## [22] "M400 ; Wait for current moves to finish "
## [23] "M700 P0 S3079 ; Fire inkjet bits"
## [24] "G1 X14.41979166666667 Y8.06979166666667 ; go in position"
## [25] "M400 ; Wait for current moves to finish "
## [26] "M700 P0 S4095 ; Fire inkjet bits"
## [27] "G1 X14.41979166666667 Y19.9760416666667 ; go in position"
## [28] "M400 ; Wait for current moves to finish "
## [29] "M700 P0 S4095 ; Fire inkjet bits"
## [30] "G1 X17.59479166666667 Y19.9760416666667 ; go in position"
## [31] "M400 ; Wait for current moves to finish "
## [32] "M700 P0 S1023 ; Fire inkjet bits"
## [33] "G1 X17.59479166666667 Y8.06979166666667 ; go in position"
## [34] "M400 ; Wait for current moves to finish "
## [35] "M700 P0 S1023 ; Fire inkjet bits"
## [36] "G1 X20.76979166666667 Y8.06979166666667 ; go in position"
## [37] "M400 ; Wait for current moves to finish "

```

```

## [38] "M700 P0 S4064 ; Fire inkjet bits"
## [39] "G1 X20.7697916666667 Y19.9760416666667 ; go in position"
## [40] "M400 ; Wait for current moves to finish "
## [41] "M700 P0 S4064 ; Fire inkjet bits"
## [42] "G1 X23.9447916666667 Y19.9760416666667 ; go in position"
## [43] "M400 ; Wait for current moves to finish "
## [44] "M700 P0 S4095 ; Fire inkjet bits"
## [45] "G1 X23.9447916666667 Y8.0697916666667 ; go in position"
## [46] "M400 ; Wait for current moves to finish "
## [47] "M700 P0 S4095 ; Fire inkjet bits"
## [48] "G1 X27.1197916666667 Y8.0697916666667 ; go in position"
## [49] "M400 ; Wait for current moves to finish "
## [50] "M700 P0 S31 ; Fire inkjet bits"
## [51] "G1 X27.1197916666667 Y19.9760416666667 ; go in position"
## [52] "M400 ; Wait for current moves to finish "
## [53] "M700 P0 S31 ; Fire inkjet bits"
## [54] "G1 X30.2947916666667 Y19.9760416666667 ; go in position"
## [55] "M400 ; Wait for current moves to finish "
## [56] "M700 P0 S4095 ; Fire inkjet bits"
## [57] "G1 X30.2947916666667 Y8.0697916666667 ; go in position"
## [58] "M400 ; Wait for current moves to finish "
## [59] "M700 P0 S4095 ; Fire inkjet bits"
## [60] "G1 X33.4697916666667 Y8.0697916666667 ; go in position"
## [61] "M400 ; Wait for current moves to finish "
## [62] "M700 P0 S4095 ; Fire inkjet bits"
## [63] "G1 X33.4697916666667 Y19.9760416666667 ; go in position"
## [64] "M400 ; Wait for current moves to finish "
## [65] "M700 P0 S4095 ; Fire inkjet bits"
## [66] "G1 X36.6447916666667 Y19.9760416666667 ; go in position"
## [67] "M400 ; Wait for current moves to finish "
## [68] "M700 P0 S3968 ; Fire inkjet bits"
## [69] "G1 X36.6447916666667 Y8.0697916666667 ; go in position"
## [70] "M400 ; Wait for current moves to finish "
## [71] "M700 P0 S3968 ; Fire inkjet bits"
## [72] "G1 X39.8197916666667 Y8.0697916666667 ; go in position"
## [73] "M400 ; Wait for current moves to finish "
## [74] "M700 P0 S4095 ; Fire inkjet bits"
## [75] "G1 X39.8197916666667 Y19.9760416666667 ; go in position"
## [76] "M400 ; Wait for current moves to finish "
## [77] "M700 P0 S4095 ; Fire inkjet bits"
## [78] "G1 X42.9947916666667 Y19.9760416666667 ; go in position"
## [79] "M400 ; Wait for current moves to finish "
## [80] "M700 P0 S127 ; Fire inkjet bits"
## [81] "G1 X42.9947916666667 Y8.0697916666667 ; go in position"
## [82] "M400 ; Wait for current moves to finish "
## [83] "M700 P0 S127 ; Fire inkjet bits"
## [84] "G1 X46.1697916666667 Y8.0697916666667 ; go in position"
## [85] "M400 ; Wait for current moves to finish "
## [86] "M700 P0 S4092 ; Fire inkjet bits"
## [87] "G1 X46.1697916666667 Y19.9760416666667 ; go in position"
## [88] "M400 ; Wait for current moves to finish "
## [89] "M700 P0 S4092 ; Fire inkjet bits"
## [90] "G1 X49.3447916666667 Y19.9760416666667 ; go in position"
## [91] "M400 ; Wait for current moves to finish "

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## [92] "M700 P0 S4095 ; Fire inkjet bits"
## [93] "G1 X49.3447916666667 Y8.0697916666667 ; go in position"
## [94] "M400 ; Wait for current moves to finish "
## [95] "M700 P0 S4095 ; Fire inkjet bits"
## [96] "G1 X52.5197916666667 Y8.0697916666667 ; go in position"
## [97] "M400 ; Wait for current moves to finish "
## [98] "M700 P0 S3587 ; Fire inkjet bits"
## [99] "G1 X52.5197916666667 Y19.9760416666667 ; go in position"
## [100] "M400 ; Wait for current moves to finish "
## [101] "M700 P0 S3587 ; Fire inkjet bits"
## [102] "G1 X55.6947916666667 Y19.9760416666667 ; go in position"
## [103] "M400 ; Wait for current moves to finish "
## [104] "M700 P0 S4095 ; Fire inkjet bits"
## [105] "G1 X55.6947916666667 Y8.0697916666667 ; go in position"
## [106] "M400 ; Wait for current moves to finish "
## [107] "M700 P0 S4095 ; Fire inkjet bits"
## [108] "G1 X58.8697916666667 Y8.0697916666667 ; go in position"
## [109] "M400 ; Wait for current moves to finish "
## [110] "M700 P0 S511 ; Fire inkjet bits"
## [111] "G1 X58.8697916666667 Y19.9760416666667 ; go in position"
## [112] "M400 ; Wait for current moves to finish "
## [113] "M700 P0 S511 ; Fire inkjet bits"
## [114] "G1 X62.0447916666667 Y19.9760416666667 ; go in position"
## [115] "M400 ; Wait for current moves to finish "
## [116] "M700 P0 S4080 ; Fire inkjet bits"
## [117] "G1 X62.0447916666667 Y8.0697916666667 ; go in position"
## [118] "M400 ; Wait for current moves to finish "
## [119] "M700 P0 S4080 ; Fire inkjet bits"
## [120] "G1 X65.2197916666667 Y8.0697916666667 ; go in position"
## [121] "M400 ; Wait for current moves to finish "
## [122] "M700 P0 S4095 ; Fire inkjet bits"
## [123] "G1 X65.2197916666667 Y19.9760416666667 ; go in position"
## [124] "M400 ; Wait for current moves to finish "
## [125] "M700 P0 S4095 ; Fire inkjet bits"
## [126] "G1 X68.3947916666667 Y19.9760416666667 ; go in position"
## [127] "M400 ; Wait for current moves to finish "
## [128] "M700 P0 S2063 ; Fire inkjet bits"
## [129] "G1 X68.3947916666667 Y8.0697916666667 ; go in position"
## [130] "M400 ; Wait for current moves to finish "
## [131] "M700 P0 S2063 ; Fire inkjet bits"
## [132] "G1 X71.5697916666667 Y8.0697916666667 ; go in position"
## [133] "M400 ; Wait for current moves to finish "
## [134] "M700 P0 S4095 ; Fire inkjet bits"
## [135] "G1 X71.5697916666667 Y19.9760416666667 ; go in position"
## [136] "M400 ; Wait for current moves to finish "
## [137] "M700 P0 S4095 ; Fire inkjet bits"
## [138] "G1 X74.7447916666667 Y19.9760416666667 ; go in position"
## [139] "M400 ; Wait for current moves to finish "
## [140] "M700 P0 S2047 ; Fire inkjet bits"
## [141] "G1 X74.7447916666667 Y8.0697916666667 ; go in position"
## [142] "M400 ; Wait for current moves to finish "
## [143] "M700 P0 S2047 ; Fire inkjet bits"
## [144] "G1 X77.9197916666667 Y8.0697916666667 ; go in position"
## [145] "M400 ; Wait for current moves to finish "

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## [146] "M700 P0 S4032 ; Fire inkjet bits"
## [147] "G1 X77.9197916666667 Y19.9760416666667 ; go in position"
## [148] "M400 ; Wait for current moves to finish "
## [149] "M700 P0 S4032 ; Fire inkjet bits"
## [150] "G1 X81.0947916666667 Y19.9760416666667 ; go in position"
## [151] "M400 ; Wait for current moves to finish "
## [152] "M700 P0 S4095 ; Fire inkjet bits"
## [153] "G1 X81.0947916666667 Y8.0697916666667 ; go in position"
## [154] "M400 ; Wait for current moves to finish "
## [155] "M700 P0 S4095 ; Fire inkjet bits"
## [156] "G1 X84.2697916666667 Y8.0697916666667 ; go in position"
## [157] "M400 ; Wait for current moves to finish "
## [158] "M700 P0 S63 ; Fire inkjet bits"
## [159] "G1 X84.2697916666667 Y19.9760416666667 ; go in position"
## [160] "M400 ; Wait for current moves to finish "
## [161] "M700 P0 S63 ; Fire inkjet bits"
## [162] "G1 X87.4447916666667 Y19.9760416666667 ; go in position"
## [163] "M400 ; Wait for current moves to finish "
## [164] "M700 P0 S4094 ; Fire inkjet bits"
## [165] "G1 X87.4447916666667 Y8.0697916666667 ; go in position"
## [166] "M400 ; Wait for current moves to finish "
## [167] "M700 P0 S4094 ; Fire inkjet bits"
## [168] "G1 X90.6197916666667 Y8.0697916666667 ; go in position"
## [169] "M400 ; Wait for current moves to finish "
## [170] "M700 P0 S4095 ; Fire inkjet bits"
## [171] "G1 X90.6197916666667 Y19.9760416666667 ; go in position"
## [172] "M400 ; Wait for current moves to finish "
## [173] "M700 P0 S4095 ; Fire inkjet bits"
## [174] "G1 X93.7947916666667 Y19.9760416666667 ; go in position"
## [175] "M400 ; Wait for current moves to finish "
## [176] "M700 P0 S1 ; Fire inkjet bits"
## [177] "G1 X93.7947916666667 Y8.0697916666667 ; go in position"
## [178] "M400 ; Wait for current moves to finish "
## [179] "M700 P0 S1 ; Fire inkjet bits"
## [180] "G1 X93.7947916666667 Y19.9760416666667 ; go in position"
## [181] "M400 ; Wait for current moves to finish "
## [182] "M700 P0 S1 ; Fire inkjet bits"
## [183] "G1 X93.7947916666667 Y8.0697916666667 ; go in position"
## [184] "M400 ; Wait for current moves to finish "
## [185] "M700 P0 S1 ; Fire inkjet bits"
## [186] "G1 X90.6197916666667 Y8.0697916666667 ; go in position"
## [187] "M400 ; Wait for current moves to finish "
## [188] "M700 P0 S4095 ; Fire inkjet bits"
## [189] "G1 X90.6197916666667 Y19.9760416666667 ; go in position"
## [190] "M400 ; Wait for current moves to finish "
## [191] "M700 P0 S4095 ; Fire inkjet bits"
## [192] "G1 X87.4447916666667 Y19.9760416666667 ; go in position"
## [193] "M400 ; Wait for current moves to finish "
## [194] "M700 P0 S4094 ; Fire inkjet bits"
## [195] "G1 X87.4447916666667 Y8.0697916666667 ; go in position"
## [196] "M400 ; Wait for current moves to finish "
## [197] "M700 P0 S4094 ; Fire inkjet bits"
## [198] "G1 X84.2697916666667 Y8.0697916666667 ; go in position"
## [199] "M400 ; Wait for current moves to finish "

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## [200] "M700 P0 S63 ; Fire inkjet bits"
## [201] "G1 X84.2697916666667 Y19.9760416666667 ; go in position"
## [202] "M400 ; Wait for current moves to finish "
## [203] "M700 P0 S63 ; Fire inkjet bits"
## [204] "G1 X81.0947916666667 Y19.9760416666667 ; go in position"
## [205] "M400 ; Wait for current moves to finish "
## [206] "M700 P0 S4095 ; Fire inkjet bits"
## [207] "G1 X81.0947916666667 Y8.0697916666667 ; go in position"
## [208] "M400 ; Wait for current moves to finish "
## [209] "M700 P0 S4095 ; Fire inkjet bits"
## [210] "G1 X77.9197916666667 Y8.0697916666667 ; go in position"
## [211] "M400 ; Wait for current moves to finish "
## [212] "M700 P0 S4032 ; Fire inkjet bits"
## [213] "G1 X77.9197916666667 Y19.9760416666667 ; go in position"
## [214] "M400 ; Wait for current moves to finish "
## [215] "M700 P0 S4032 ; Fire inkjet bits"
## [216] "G1 X74.7447916666667 Y19.9760416666667 ; go in position"
## [217] "M400 ; Wait for current moves to finish "
## [218] "M700 P0 S2047 ; Fire inkjet bits"
## [219] "G1 X74.7447916666667 Y8.0697916666667 ; go in position"
## [220] "M400 ; Wait for current moves to finish "
## [221] "M700 P0 S2047 ; Fire inkjet bits"
## [222] "G1 X71.5697916666667 Y8.0697916666667 ; go in position"
## [223] "M400 ; Wait for current moves to finish "
## [224] "M700 P0 S4095 ; Fire inkjet bits"
## [225] "G1 X71.5697916666667 Y19.9760416666667 ; go in position"
## [226] "M400 ; Wait for current moves to finish "
## [227] "M700 P0 S4095 ; Fire inkjet bits"
## [228] "G1 X68.3947916666667 Y19.9760416666667 ; go in position"
## [229] "M400 ; Wait for current moves to finish "
## [230] "M700 P0 S2063 ; Fire inkjet bits"
## [231] "G1 X68.3947916666667 Y8.0697916666667 ; go in position"
## [232] "M400 ; Wait for current moves to finish "
## [233] "M700 P0 S2063 ; Fire inkjet bits"
## [234] "G1 X65.2197916666667 Y8.0697916666667 ; go in position"
## [235] "M400 ; Wait for current moves to finish "
## [236] "M700 P0 S4095 ; Fire inkjet bits"
## [237] "G1 X65.2197916666667 Y19.9760416666667 ; go in position"
## [238] "M400 ; Wait for current moves to finish "
## [239] "M700 P0 S4095 ; Fire inkjet bits"
## [240] "G1 X62.0447916666667 Y19.9760416666667 ; go in position"
## [241] "M400 ; Wait for current moves to finish "
## [242] "M700 P0 S4080 ; Fire inkjet bits"
## [243] "G1 X62.0447916666667 Y8.0697916666667 ; go in position"
## [244] "M400 ; Wait for current moves to finish "
## [245] "M700 P0 S4080 ; Fire inkjet bits"
## [246] "G1 X58.8697916666667 Y8.0697916666667 ; go in position"
## [247] "M400 ; Wait for current moves to finish "
## [248] "M700 P0 S511 ; Fire inkjet bits"
## [249] "G1 X58.8697916666667 Y19.9760416666667 ; go in position"
## [250] "M400 ; Wait for current moves to finish "
## [251] "M700 P0 S511 ; Fire inkjet bits"
## [252] "G1 X55.6947916666667 Y19.9760416666667 ; go in position"
## [253] "M400 ; Wait for current moves to finish "

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## [254] "M700 P0 S4095 ; Fire inkjet bits"
## [255] "G1 X55.6947916666667 Y8.0697916666667 ; go in position"
## [256] "M400 ; Wait for current moves to finish "
## [257] "M700 P0 S4095 ; Fire inkjet bits"
## [258] "G1 X52.5197916666667 Y8.0697916666667 ; go in position"
## [259] "M400 ; Wait for current moves to finish "
## [260] "M700 P0 S3587 ; Fire inkjet bits"
## [261] "G1 X52.5197916666667 Y19.9760416666667 ; go in position"
## [262] "M400 ; Wait for current moves to finish "
## [263] "M700 P0 S3587 ; Fire inkjet bits"
## [264] "G1 X49.3447916666667 Y19.9760416666667 ; go in position"
## [265] "M400 ; Wait for current moves to finish "
## [266] "M700 P0 S4095 ; Fire inkjet bits"
## [267] "G1 X49.3447916666667 Y8.0697916666667 ; go in position"
## [268] "M400 ; Wait for current moves to finish "
## [269] "M700 P0 S4095 ; Fire inkjet bits"
## [270] "G1 X46.1697916666667 Y8.0697916666667 ; go in position"
## [271] "M400 ; Wait for current moves to finish "
## [272] "M700 P0 S4092 ; Fire inkjet bits"
## [273] "G1 X46.1697916666667 Y19.9760416666667 ; go in position"
## [274] "M400 ; Wait for current moves to finish "
## [275] "M700 P0 S4092 ; Fire inkjet bits"
## [276] "G1 X42.9947916666667 Y19.9760416666667 ; go in position"
## [277] "M400 ; Wait for current moves to finish "
## [278] "M700 P0 S127 ; Fire inkjet bits"
## [279] "G1 X42.9947916666667 Y8.0697916666667 ; go in position"
## [280] "M400 ; Wait for current moves to finish "
## [281] "M700 P0 S127 ; Fire inkjet bits"
## [282] "G1 X39.8197916666667 Y8.0697916666667 ; go in position"
## [283] "M400 ; Wait for current moves to finish "
## [284] "M700 P0 S4095 ; Fire inkjet bits"
## [285] "G1 X39.8197916666667 Y19.9760416666667 ; go in position"
## [286] "M400 ; Wait for current moves to finish "
## [287] "M700 P0 S4095 ; Fire inkjet bits"
## [288] "G1 X36.6447916666667 Y19.9760416666667 ; go in position"
## [289] "M400 ; Wait for current moves to finish "
## [290] "M700 P0 S3968 ; Fire inkjet bits"
## [291] "G1 X36.6447916666667 Y8.0697916666667 ; go in position"
## [292] "M400 ; Wait for current moves to finish "
## [293] "M700 P0 S3968 ; Fire inkjet bits"
## [294] "G1 X33.4697916666667 Y8.0697916666667 ; go in position"
## [295] "M400 ; Wait for current moves to finish "
## [296] "M700 P0 S4095 ; Fire inkjet bits"
## [297] "G1 X33.4697916666667 Y19.9760416666667 ; go in position"
## [298] "M400 ; Wait for current moves to finish "
## [299] "M700 P0 S4095 ; Fire inkjet bits"
## [300] "G1 X30.2947916666667 Y19.9760416666667 ; go in position"
## [301] "M400 ; Wait for current moves to finish "
## [302] "M700 P0 S4095 ; Fire inkjet bits"
## [303] "G1 X30.2947916666667 Y8.0697916666667 ; go in position"
## [304] "M400 ; Wait for current moves to finish "
## [305] "M700 P0 S4095 ; Fire inkjet bits"
## [306] "G1 X27.1197916666667 Y8.0697916666667 ; go in position"
## [307] "M400 ; Wait for current moves to finish "

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## [308] "M700 P0 S31 ; Fire inkjet bits"
## [309] "G1 X27.1197916666667 Y19.9760416666667 ; go in position"
## [310] "M400 ; Wait for current moves to finish "
## [311] "M700 P0 S31 ; Fire inkjet bits"
## [312] "G1 X23.9447916666667 Y19.9760416666667 ; go in position"
## [313] "M400 ; Wait for current moves to finish "
## [314] "M700 P0 S4095 ; Fire inkjet bits"
## [315] "G1 X23.9447916666667 Y8.0697916666667 ; go in position"
## [316] "M400 ; Wait for current moves to finish "
## [317] "M700 P0 S4095 ; Fire inkjet bits"
## [318] "G1 X20.7697916666667 Y8.0697916666667 ; go in position"
## [319] "M400 ; Wait for current moves to finish "
## [320] "M700 P0 S4064 ; Fire inkjet bits"
## [321] "G1 X20.7697916666667 Y19.9760416666667 ; go in position"
## [322] "M400 ; Wait for current moves to finish "
## [323] "M700 P0 S4064 ; Fire inkjet bits"
## [324] "G1 X17.5947916666667 Y19.9760416666667 ; go in position"
## [325] "M400 ; Wait for current moves to finish "
## [326] "M700 P0 S1023 ; Fire inkjet bits"
## [327] "G1 X17.5947916666667 Y8.0697916666667 ; go in position"
## [328] "M400 ; Wait for current moves to finish "
## [329] "M700 P0 S1023 ; Fire inkjet bits"
## [330] "G1 X14.4197916666667 Y8.0697916666667 ; go in position"
## [331] "M400 ; Wait for current moves to finish "
## [332] "M700 P0 S4095 ; Fire inkjet bits"
## [333] "G1 X14.4197916666667 Y19.9760416666667 ; go in position"
## [334] "M400 ; Wait for current moves to finish "
## [335] "M700 P0 S4095 ; Fire inkjet bits"
## [336] "G1 X11.2447916666667 Y19.9760416666667 ; go in position"
## [337] "M400 ; Wait for current moves to finish "
## [338] "M700 P0 S3079 ; Fire inkjet bits"
## [339] "G1 X11.2447916666667 Y8.0697916666667 ; go in position"
## [340] "M400 ; Wait for current moves to finish "
## [341] "M700 P0 S3079 ; Fire inkjet bits"
## [342] "G1 X8.0697916666667 Y8.0697916666667 ; go in position"
## [343] "M400 ; Wait for current moves to finish "
## [344] "M700 P0 S4095 ; Fire inkjet bits"
## [345] "G1 X8.0697916666667 Y19.9760416666667 ; go in position"
## [346] "M400 ; Wait for current moves to finish "
## [347] "M700 P0 S4095 ; Fire inkjet bits"
## [348] "G1 X4.8947916666667 Y19.9760416666667 ; go in position"
## [349] "M400 ; Wait for current moves to finish "
## [350] "M700 P0 S4088 ; Fire inkjet bits"
## [351] "G1 X4.8947916666667 Y8.0697916666667 ; go in position"
## [352] "M400 ; Wait for current moves to finish "
## [353] "M700 P0 S4088 ; Fire inkjet bits"

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