

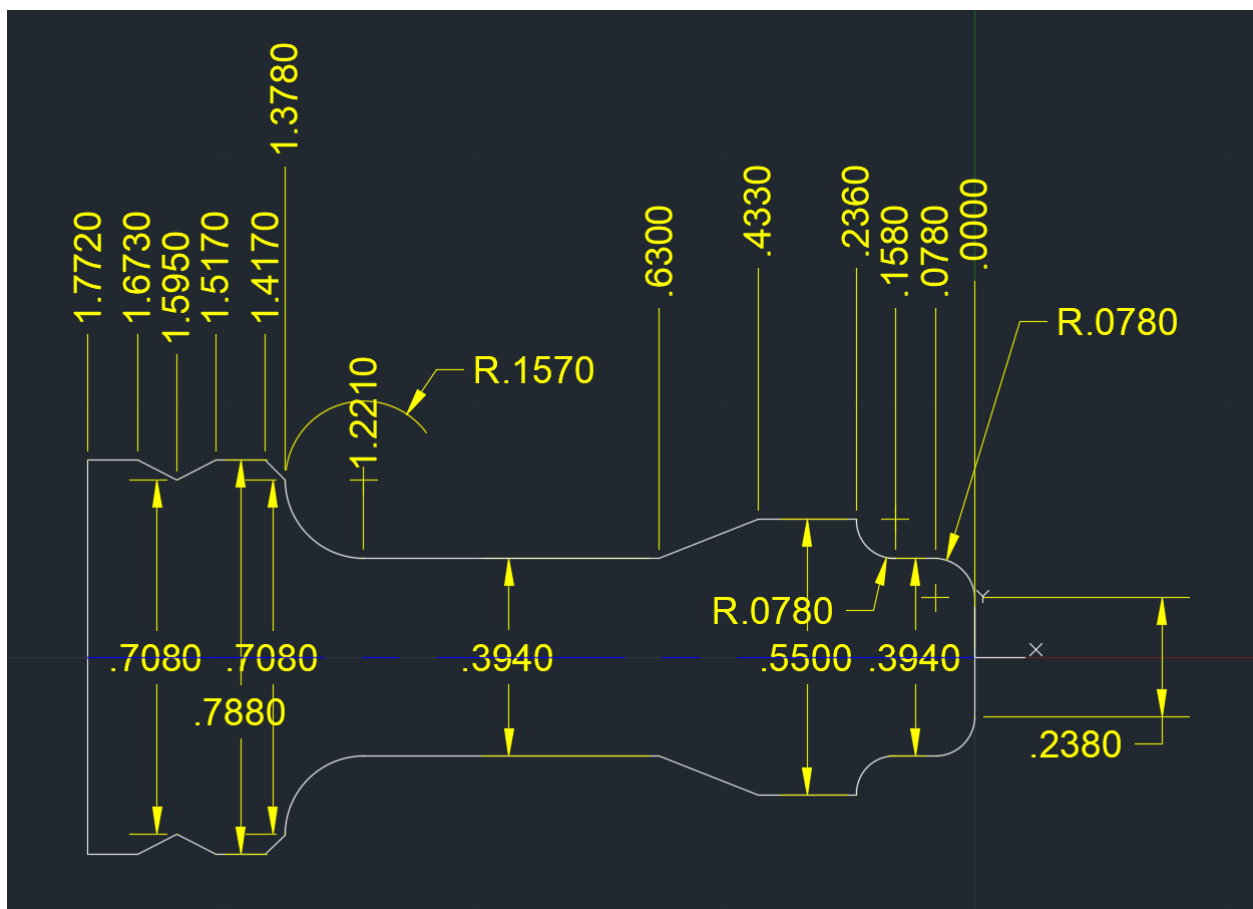
ENGT 3652 Project 5: CNC Lathe-Bishop

Leomar Durán

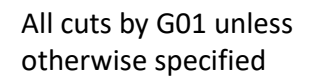
25th April 2023

Chapter 1

Original drawing



2



All cuts by G01 unless
otherwise specified

Chapter 3

Manual Gcode

```
%
O52224 (Duran-bishopManual)
T0303 (call & set up tool #3: X-Z- ,off
→ tool)
G54
M03 (turn spindle)
S1200 (RPM = [4 * CS cutting
→ speed]/[diameter] = [4 x 300]/[1 in] =
→ 1200)
G96
G50 S4000 (upper limit)
M08 (turn coolant on)
G00 Z.100 X1. (S) (program 0, !!!X is
→ diameter!!!)
G71 P10 (line number)
Q1 D.035 (depth of cut)
U.010 (finishing: roughing pass, extra on
→ X)
W.005 (finishing: for next tool to cut on
→ Z)
F.010 (feed [in/rev])
N10 (* Define the profile of the bishop *)
G00 Z.100 X.0 G42 (P: rapid move w/nose R
→ compensation, !!!X is diameter!!!)
G01 Z.0 F.010 (P1)
G01 X.238 (P2)
G03 Z-.078 X.394 R.078 (P3, X = .238 +
→ 2*.078)
G01 Z-.158 (P4)
G02 Z-.236 X.550 R.078 (P5, X = .394 +
→ 2*.078)
G01 Z-.433 (P6)
G01 Z-.630 X.394 (P7)
G01 Z-1.221 (P8)
G02 Z-1.378 X.708 R.157 (P9)
G01 Z-1.417 X.788 (P10)
G01 Z-1.517 (P11)
G01 Z-1.595 X.708 (P12)
G01 Z-1.673 X.788 (P13)
G01 Z-1.772 (P14)
```

```
N20 G00 Z-1.772 X.988 G40 (Q, X = .788 +
→ 2*.100 buffer, close G42)
G00 G53 X.0 (go home: milling machine, pull
→ X first)
G53 Z.0 (pull Z first next, use machine 0
→ as reference)
T0202 (finish turn, X+Z-, off tool)
G54
M03 (turn spindle)
S1200 (RPM = [4 * CS cutting
→ speed]/[diameter] = [4 x 300]/[1 in] =
→ 1200)
G96
G50 S4000 (upper limit)
M08 (turn coolant on)
G00 Z.100 X1. (S) (!!!X is diameter!!!)
G70 P10 Q2
G00 X1.
G00 G53 X.0 (go home: milling machine, pull
→ X first)
G53 Z.0 (pull Z first next, use machine 0
→ as reference)
T0707 (parting tool for drilling, Z-, tool
→ edge)
G54
M03 (turn spindle)
S1200 (RPM = [4 * CS cutting
→ speed]/[diameter] = [4 x 300]/[1 in] =
→ 1200)
G96
G50 S4000 (upper limit)
M08 (turn coolant on)
G00 Z-1.772 X1.3 (S) (!!!X is diameter!!!)
G01 X.200 F.002 (parts catcher: go slow -
→ small feed)
M36 (call parts catcher ON)
G04 P1.5 (devolved delay [s])
M37 (parts catcher OFF)
M09 (turn off coolant)
G00 G53 X.0 (go home: milling machine, pull
→ X first)
```

```
G53 Z.0 (pull Z first next, use machine 0
↳ as reference, which will shut off
↳ coolant)
M30 (end of program)
%
```

Chapter 4

Plot of manual Gcode in NCViewer

GCode File

```
1 %  
2 O52224 (Duran-bishopManual)  
3 T0303 (call & set up tool #3: X-Z- ,off tool)  
4 G54  
5 M03 (turn spindle)  
6 S1200 (RPM = [4 * CS cutting speed]/[diameter] = [4 x 300]/[1 in])  
7 G96  
8 G50 S4000 (upper limit)  
9 M08 (turn coolant on)  
10 G00 Z.100 X1. (S) (program 0, !!!X is diameter!!!)  
11 G71 P10 (line number)  
12 Q1 D.035 (depth of cut)  
13 U.010 (finishing: roughing pass, extra on X)  
14 W.005 (finishing: for next tool to cut on Z)  
15 F.010 (feed [in/rev])  
16 N10 (* Define the profile of the bishop *)  
17 G00 Z.100 X.0 G42 (P: rapid move w/nose R compensation, !!!X is  
18 G01 Z.0 F.010 (P1)  
19 G01 X.238 (P2)  
20 G03 Z-.078 X.394 R.078 (P3, X = .238 + 2*.078)  
21 G01 Z-.158 (P4)  
22 G02 Z-.236 X.550 R.078 (P5, X = .394 + 2*.078)  
23 G01 Z-.433 (P6)  
24 G01 Z-.630 X.394 (P7)  
25 G01 Z-1.221 (P8)  
26 G02 Z-1.378 X.708 R.157 (P9)  
27 G01 Z-1.417 X.788 (P10)  
28 G01 Z-1.517 (P11)  
29 G01 Z-1.595 X.708 (P12)  
30 G01 Z-1.673 X.788 (P13)  
31 G01 Z-1.772 (P14)  
32 N20 G00 Z-1.772 X.988 G40 (Q, X = .788 + 2*.100 buffer, close G  
33 G00 G53 X.0 (go home: milling machine, pull X first)  
34 G53 Z.0 (pull Z first next, use machine 0 as reference)  
35 T0202 (finish turn, X+Z-, off tool)  
36 G54  
37 M03 (turn spindle)  
38 S1200 (RPM = [4 * CS cutting speed]/[diameter] = [4 x 300]/[1 in])  
39 G00  
40
```

PLOT

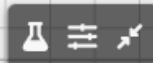


Digital Read Out

Machine Options

Plot Orientation: Vertical (Z-Up)

Diameter Mode (Lathe)



Chapter 5

Manual Gcode, edited for CNC Simulator

```
%
094688 (Duran-bishopManualForCncSim)
T0303 (call & set up tool #3: X-Z-, off
→ tool)
G54
M03 (turn spindle)
S1200 (RPM = [4 * CS cutting
→ speed]/[diameter] = [4 x 300]/[1 in] =
→ 1200)
G96
G50 S4000 (upper limit)
M08 (turn coolant on)
G00 Z.100 X1. (S) (program 0, !!!X is
→ diameter!!!)
G71 P10 (line number)
Q1 D.035 (depth of cut)
U.010 (finishing: roughing pass, extra on
→ X)
W.005 (finishing: for next tool to cut on
→ Z)
F.010 (feed [in/rev])
N10 (* Define the profile of the bishop *)
M03 S1200 (turn spindle at 1200 RPM
→ initially)
G00 Z.100 X.0 G42 (P: rapid move w/nose R
→ compensation, !!!X is diameter!!!)
G01 Z.0 F.010 (P1)
G01 X.238 (P2)
G03 Z-.078 X.394 R.078 (P3, X = .238 +
→ 2*.078)
G01 Z-.158 (P4)
G02 Z-.236 X.550 R.078 (P5, X = .394 +
→ 2*.078)
G01 Z-.433 (P6)
G01 Z-.630 X.394 (P7)
G01 Z-1.221 (P8)
G02 Z-1.378 X.708 R.157 (P9)
G01 Z-1.417 X.788 (P10)
G01 Z-1.517 (P11)

G01 Z-1.595 X.708 (P12)
G01 Z-1.673 X.788 (P13)
G01 Z-1.772 (P14)
N20 G00 Z-1.772 X.988 G40 (Q, X = .788 +
→ 2*.100 buffer, close G42)
G00 (G53) X.0 (go home: milling machine,
→ pull X first)
(G53) Z.0 (pull Z first next, use machine 0
→ as reference)
T0202 (finish turn, X+Z-, off tool)
G54
M03 (turn spindle)
S1200 (RPM = [4 * CS cutting
→ speed]/[diameter] = [4 x 300]/[1 in] =
→ 1200)
G96
G50 S4000 (upper limit)
M08 (turn coolant on)
G00 Z.100 X1. (S) (!!!X is diameter!!!)
G70 P10 Q2
G00 X1.
G00 (G53) X.0 (go home: milling machine,
→ pull X first)
(G53) Z.0 (pull Z first next, use machine 0
→ as reference)
T0707 (parting tool for drilling, Z-, tool
→ edge)
G54
M03 (turn spindle)
S1200 (RPM = [4 * CS cutting
→ speed]/[diameter] = [4 x 300]/[1 in] =
→ 1200)
G96
G50 S4000 (upper limit)
M08 (turn coolant on)
G00 Z-1.772 X1.3 (S) (!!!X is diameter!!!)
G01 X.200 F.002 (parts catcher: go slow -
→ small feed)
M36 (call parts catcher ON)
```



```
G04 P1.5 (devolved delay [s])
M37 (parts catcher OFF)
M09 (turn off coolant)
G00 (G53) X.0 (go home: milling machine,
↳ pull X first)
(G53) Z.0 (pull Z first next, use machine 0
↳ as reference, which will shut off
↳ coolant)
M30 (end of program)
%
```

Chapter 6

Result of manual Gcode for CNC Simulator

Bishop.csdata

SET No1 00:01:21

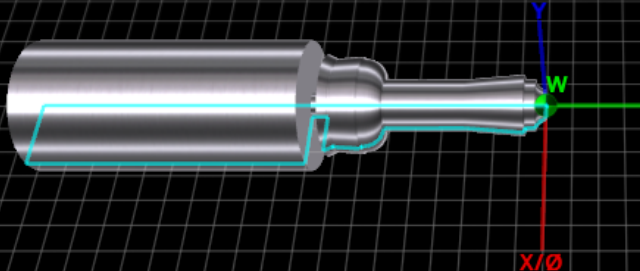
EN•RU X=10.44 in

in•mm Z=3.80 in

F=0.00 in/rev

LOW 3D V=0.00 ft/min

X/Z L3=2.07 in



Run

FP6: 89.8; USED VRAM (MB): 182.29; 3D POLYGONS: 4396; IMAGES: 866; SPRITES: 960; DRAWING TIME (S): 0.000336; PNTS: 68

O0001 O0002 O0003 O0004 O0005

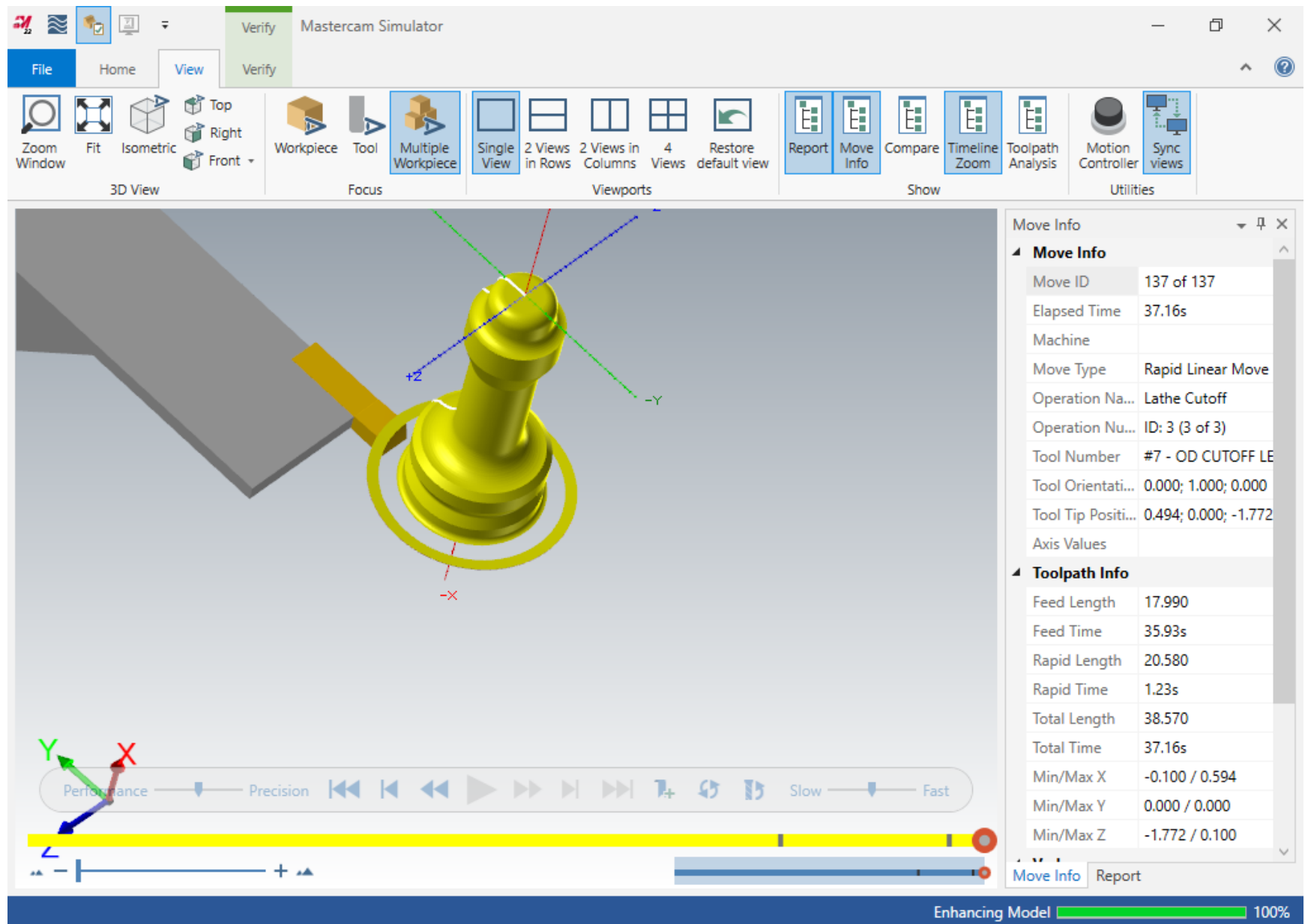
```

T0707 (PARTING TOOL FOR DRILLI
G54 ;
M03 (TURN SPINDLE)
S1200 (RPM00 4 * CS CUTTING S
G96 ;
G50 S4000 (UPPER LIMIT)
M08 (TURN COOLENT ON)
G00 Z-1.772 X1.3 (S) (X IS DIA
G01 X.200 F.002 (PARTS CATCHER
M36 (CALL PARTS CATCHER ON)
G04 P1.5 (DEVOLVED DELAY S)
M37 (PARTS CATCHER OFF)
M09 (TURN OFF COOLENT)
G00 (G53) X.0 (GO HOME MILLING
(G53) Z.0 (PULL Z FIRST NEXT U
M30 (END OF PROGRAM)

```

Chapter 7

Verification of operations in Mastercam



Chapter 8

The MasterCAM generated Gcode

```
%
049472 (Duran - Bishop)
(PROGRAM NAME - BISHOPFROMCAM)
(DATE=DD-MM-YY - 25-04-23 TIME=HH:MM -
  ↳ 21:55)
(MATERIAL - ALUMINUM INCH - 6061)
G20
(TOOL - 3 OFFSET - 3)
(OD 55 DEG RIGHT INSERT - DNMG-432)
G0 T0303 (roughing)
G18
G97 S3600 M03
G0 G54 X.988 Z.1 M8 (S, S.X >= Q.X)
G50 S4000
G96 S1000
G71 P100 Q110 D.035 U.02 W.005 F.01
N100 G0 X-.2 Z.1 S1000 G42 (P + tool radius
  ↳ compensation)
G1 Z0. F.005
X.1755
G3 X.394 Z-.1092 K-.1092
G1 Z-.1893
G2 X.4875 Z-.236 I.0467
G3 X.55 Z-.2672 K-.0313
G1 Z-.4642
G3 X.5456 Z-.4758 I-.0313
G1 X.394 Z-.6672
Z-1.2523
G2 X.6455 Z-1.378 I.1257
G1 X.6471
X.6475
G3 X.6917 Z-1.3872 K-.0313
G1 X.7697 Z-1.4262
G3 X.788 Z-1.4483 I-.0221 K-.0221
G1 Z-1.5482
G3 X.7811 Z-1.5625 I-.0313
G1 X.7157 Z-1.6262
X.7811 Z-1.69
G3 X.788 Z-1.7043 I-.0278 K-.0143
G1 Z-1.772

N110 X.988 G40 (Q + tool radius
  ↳ compensation OFF)
G0 Z.1
G18
G70 P100 Q110
G0 Z.1
G28 U0. W0. M05 (V0. is in y, which the
  ↳ lathe does not have)
T0300 (resets tool 03 to value saved in
  ↳ memory)
M01
(TOOL - 7 OFFSET - 7)
(OD CUTOFF LEFT INSERT - NONE)
G0 T0707
G18
G97 S3215 M03
G0 G54 X1.188 Z-1.772
G50 S4000
G96 S1000
G1 X.988 F.0025
X-.0818
X.1182
G0 X.988
G28 U0. W0. M05
T0700
M30
%
```

Chapter 9

Plot of MasterCAM-generated Gcode in NCViewer

GCode File

```
1 %  
2 O49472 (Duran - Bishop)  
3 (PROGRAM NAME - BISHOPFROMCAM)  
4 (DATE=DD-MM-YY - 25-04-23 TIME=HH:MM - 21:55)  
5 (MATERIAL - ALUMINUM INCH - 6061)  
6 G20  
7 (TOOL - 3 OFFSET - 3)  
8 (OD 55 DEG RIGHT INSERT - DNMG-432)  
9 G0 T0303 (roughing)  
10 G18  
11 G97 S3600 M03  
12 G0 G54 X.988 Z.1 M8 (S, S.X >= Q.X)  
13 G50 S4000  
14 G96 S1000  
15 G71 P100 Q110 D.035 U.02 W.005 F.01  
16 N100 G0 X-.2 Z.1 S1000 G42 (P + tool radius compensation)  
17 G1 Z0. F.005  
18 X.1755  
19 G3 X.394 Z-.1092 K-.1092  
20 G1 Z-.1893  
21 G2 X.4875 Z-.236 I.0467  
22 G3 X.55 Z-.2672 K-.0313  
23 G1 Z-.4642  
24 G3 X.5456 Z-.4758 I-.0313  
25 G1 X.394 Z-.6672  
26 Z-1.2523  
27 G2 X.6455 Z-1.378 I.1257  
28 G1 X.6471  
29 X.6475  
30 G3 X.6917 Z-1.3872 K-.0313  
31 G1 X.7697 Z-1.4262  
32 G3 X.788 Z-1.4483 I-.0221 K-.0221  
33 G1 Z-1.5482  
34 G3 X.7811 Z-1.5625 I-.0313  
35 G1 X.7157 Z-1.6262  
36 X.7811 Z-1.69  
37 G3 X.788 Z-1.7043 I-.0278 K-.0143  
38 G1 Z-1.772  
39 N110 X.988 G40 (Q + tool radius compensation OFF)  
40 G0 Z.1
```

PLOT



Digital Read Out

Machine Options

Plot Orientation: Vertical (Z-Up)

Diameter Mode (Lathe)

