

Comprehensive Subprogram 2


The drawing on the next page shows the details of all absolute coordinates for the center point of each circular pocket. These coordinates represent the XY positions - the actual tool locations - before the subprogram is called.

In order to find out how each coordinate has been calculated, two similar trigonometric formulas will be used - one is used to calculate the X coordinate, the other to calculate the Y coordinate of each pocket position.

For the trigonometric calculations of the X and Y absolute coordinates, use the hypotenuse of the triangle (its radius) and the sine and cosine functions:

$$X = R \times \cos A$$

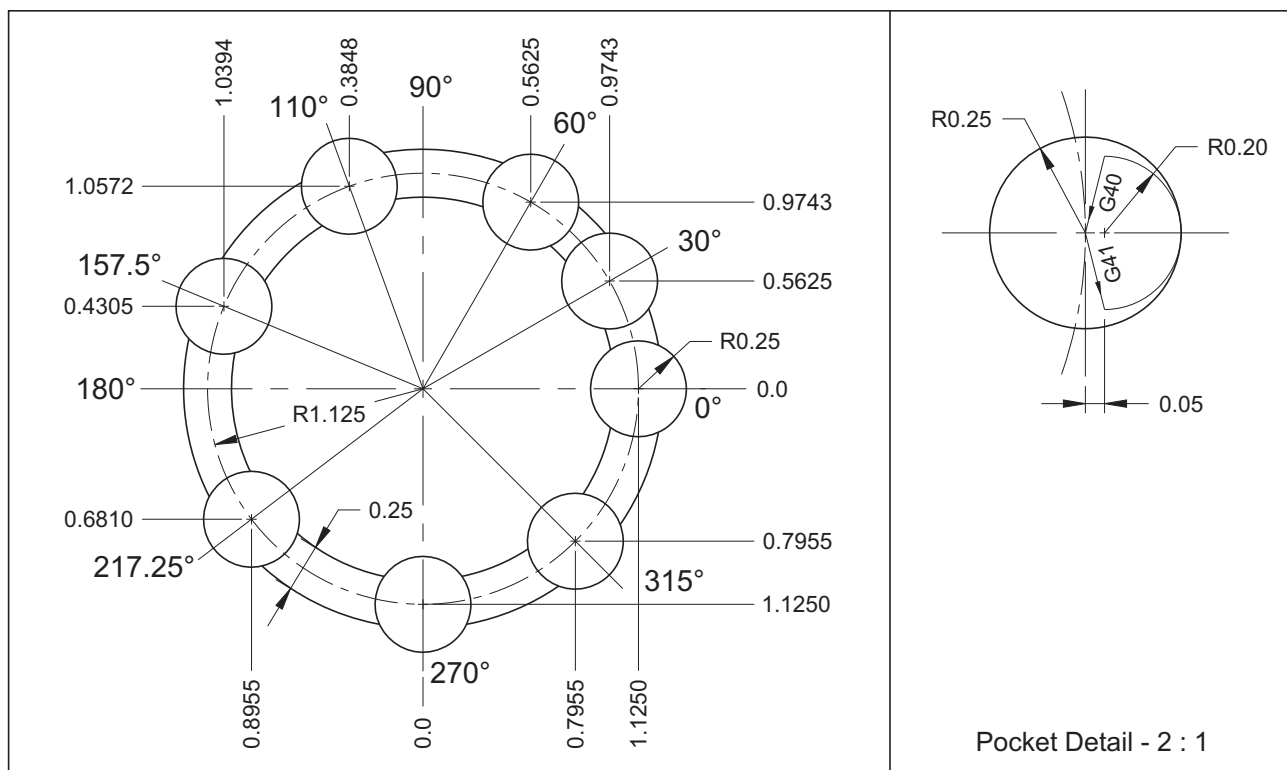
$$Y = R \times \sin A$$

 where ...

X or Y = Absolute coordinate to be calculated - X or Y
 R = Radius - R1.125 used in the example
 A = Absolute value of the current angle

The following table shows the results of trigonometric calculations for all pocket locations. Their order is listed from zero degrees (East), in the counterclockwise direction. This is also the direction in which the toolpath is programmed for this project. The complete program listing follows the table.

INCREMENTAL ANGLE	ANGULAR MOTION	X coordinate	Y coordinate
30.00°	From 0.00° to 30.00°	0.9743	0.5625
30.00°	From 30.00° to 60.00°	0.5625	0.9743
30.00°	From 60.00° to 90.00°	0.0000	1.1250
20.00°	From 90.00° to 110.00°	-0.3848	1.0572
47.50°	From 110.00° to 157.50°	-1.0394	0.4305
22.50°	From 157.50° to 180.00°	-1.1250	0.0000
37.25°	From 180.00° to 217.25°	-0.8955	-0.6810
52.75°	From 217.50° to 270.00°	0.0000	-1.1250
45.00°	From 270.00° to 315.00°	0.7955	-0.7955
45.00°	From 315.00° to 360.00°	1.1250	0.0000



(39-05.NC - SUBPROGRAM AND CIRCULAR INTERPOLATION PROJECT)

(X0Y0 = LL CORNER FOR SETUP SHIFTED TO CENTER BY G52 - Z0 = TOP OF PART)

(0.25 DIA CENTER CUTTING END MILL IN THE SPINDLE)

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N1 G20
N2 G17 G40 G49 G80
N3 G52 X2.0 Y2.0
N4 G90 G54 G00 X1.125 Y0 S1200 M03
N5 G43 Z0.1 H01 M08
N6 M98 P1111
N7 G03 X0.9743 Y0.5625 I-1.125 J0
N8 M98 P1111
N9 G03 X0.5625 Y0.9743 I-0.9743 J-0.5625
N10 M98 P1111
N11 G03 X0 Y1.125 I-0.5625 J-0.9743
N12 X-0.3848 Y1.0572 I0 J-1.125
N13 M98 P1111
N14 G03 X-1.0394 Y0.4305 I0.3848 J-1.0572
N15 M98 P1111
N16 G03 X-1.125 Y0 I1.0394 J-0.4305
N17 X-0.8955 Y-0.681 I1.125 J0
N18 M98 P1111
N19 G03 X0 Y-1.125 I0.8955 J0.681
N20 M98 P1111
N21 G03 X0.7955 Y-0.7955 I0 J1.125
N22 M98 P1111
N23 G03 X1.125 Y0 I-0.7955 J0.7955
N24 G00 Z1.0 M09
N25 G52 X0 Y0
N26 G28 X3.125 Y2.0 Z1.0 M05
N27 M30
%
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(ENGLISH UNITS MODE)
(STARTUP BLOCK)
(ORIGIN CHANGE TO PART CENTER)
(MOTION TO 0.00 DEGREES)
(CLEAR ABOVE THE PART)
(POCKET AT 0.00 DEGREES)
(MOTION TO 30.00 DEGREES)
(POCKET AT 30.00 DEGREES)
(MOTION TO 60.00 DEGREES)
(POCKET AT 60.00 DEGREES)
(MOTION TO 90.00 DEGREES)
(MOTION TO 110.00 DEGREES)
(POCKET AT 110.00 DEGREES)
(MOTION TO 157.50 DEGREES)
(POCKET AT 157.50 DEGREES)
(MOTION TO 180.00 DEGREES)
(MOTION TO 217.25 DEGREES)
(POCKET AT 217.25 DEGREES)
(MOTION TO 270.00 DEGREES)
(POCKET AT 270.00 DEGREES)
(MOTION TO 315.00 DEGREES)
(POCKET AT 315.00 DEGREES)
(MOTION TO 360.00 DEGREES)
(CLEAR ABOVE THE PART)
(RESET ORIGINAL PROGRAM ZERO)
(RETURN TO MACHINE ZERO)
(END OF MAIN PROGRAM)
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O1111	
N101 G01 Z-0.13 F3.0	(FEED-IN TO POCKET DEPTH)
N102 G91 G41 X0.05 Y-0.2 D51 F5.0	(CUTTER RADIUS OFFSET ON)
N103 G03 X0.2 Y0.2 I0 J0.2	(LEAD-IN ARC 0.2 RADIUS)
N104 X-0.25 Y0.25 I-0.25 J0	(QUADRANT I)
N105 X-0.25 Y-0.25 I0 J-0.25	(QUADRANT II)
N106 X0.25 Y-0.25 I0.25 J0	(QUADRANT III)
N107 X0.25 Y0.25 I0 J0.25	(QUADRANT IV)
N108 X-0.2 Y0.2 I-0.2 J0	(LEAD-OUT ARC 0.2 RADIUS)
N109 G01 G40 X-0.05 Y-0.2	(CUTTER RADIUS OFFSET OFF)
N110 G90 G00 Z-0.07	(RAPID OUT TO GROOVE DEPTH)
N111 M99	(END OF SUBPROGRAM)
%	