

G-ZERO Mill

CAD Reader



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CAD Reader

G-ZERO CAD Import Interface

CAD Reader transfers coordinates from CAD drawing files directly into the G-ZERO source program. Just click on the elements of a CAD drawing to get their dimensions and coordinates instead of digging this information out of a blueprint and keying it in.

F9: Open/Close

Press the F9 function key to display the G-ZERO CAD import interface; press the F9 function key again to hide it.

If there is no CAD file defined in your source program, G-ZERO will guide you to open one. Make sure to select the correct file format in the "Files of type" box.

Source link

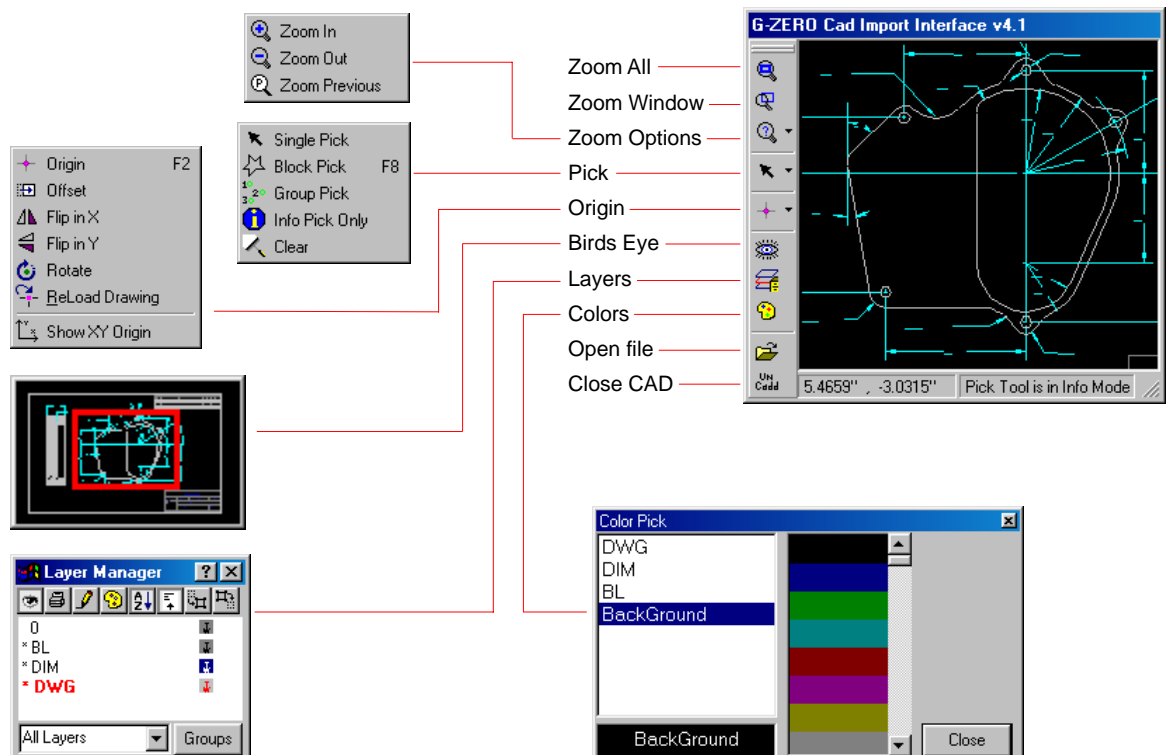
When you first activate CAD Reader, a comment line is added into your source program to establish a link with the CAD file. Example: CAD C:\MILL\Gasket.dxf

File format

CAD Reader can directly import data from these file formats: AutoCAD DXF (.dxf), Visual CADD (.vcd), Generic CADD (.gcd), and AutoCAD DWG (.dwg).

Toolbar

By default, CAD Reader's toolbar is attached to the left border of the CAD Import Interface window. You can detach it (click and drag the double-lines at the top of the toolbar) and place it anywhere you want, or attach it to another side of the CAD Import Interface window.



Zoom All

Displays the complete CAD drawing in the current window.



Zoom Window

Displays the rectangular area selected (zoom in the selected area). After selecting this option, click the left button of your mouse over first corner of rectangle, drag the yellow box to the opposite corner, and release the mouse button.



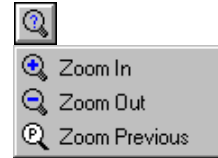
Zoom Options

Displays a list with three options:

ZOOM IN. Displays larger graphic (less area) in the same size viewport.

ZOOM OUT. Displays smaller graphic (more area) in the same size viewport.

ZOOM PREVIOUS. Displays the previous zoom setting.



Pick

Displays a list with four options:

SINGLE PICK. Position mouse cursor near an element (line, arc or circle) in the CAD graphic, and click the left button of your mouse. G-ZERO finds the CAD element closest to the cursor, changes its color, and inserts its information into the source program.

Pick each element in the order in which it is to be machined. Make sure to click on the outside of an arc to mill around the outside (+), or on the inside of the arc for an inside (-) cut.

BLOCK PICK - F8. Selects a series of elements connected to each other. After you selected this option (or pressed the F8 function key):

1. Position the cursor near the starting element (line, circle, or arc) and click the left button of your mouse. G-ZERO finds the element closest to the cursor and selects it by changing its color.
2. Now G-ZERO waits for you to pick the next entity, so click on an element that is adjacent to the first one you just selected in the direction you wish to machine.
3. At this point, G-ZERO waits for you to pick the ending entity, so use your mouse to click on the last element in the path. (You can repick the first element for a closed loop.) G-ZERO will continue highlighting every connected element until the path is complete and the entire contour will be added to the source program starting with a COMP command, and ending with an UNCOMP command.

Press the Esc key to terminate Block Pick.

GROUP PICK. It is designed to work with the DRILL command only (DRILL command needs to be programmed in the source code before Group Pick takes effect).

- ♦ Select "Group Pick" and click on a *circle*. CAD Reader will highlight ALL circles with the same dimension as the one you just picked, and allow you to select them one at a time to control the order in which they are imported into the source program (last circle's value is automatically imported). CAD Reader creates POINT commands in the source program with X, Y values that correspond to the center of the circles picked.
- ♦ Select "Prompt for Circle Blockpick" from *Tools / Options / CAD* to display pop-up window "Continue with blockpick?" Answer *Yes* to start picking circles for import, or *No* to select another set of circles to be highlighted.

Press the Esc key to terminate Group Pick.

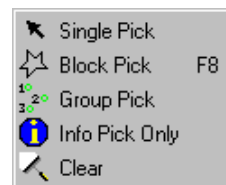
INFO PICK ONLY. When this option is active, the status bar displays "Pick Tool is in Info Mode." Use your mouse to click on any element in your CAD file and see its information displayed on the status bar.

Example 1:

```
Arc 2.4709,7.8220 r=0.5000 sa45.0000 ma120.9638
```

The element selected is an arc with center located at x=2.4709 and y=7.8220. Radius of arc is 0.5000, arc starts at angle 45.0000, and the move angle of arc (degrees of arc sweep) is 120.9638.

If you single picked this element, your source code would be: RADIUS .5 type1 x2.4709 y7.822



Example 2:

Line p1=1.5973,6.3891 pt2=1.9858,7.9433 Len=1.6020 np=p1

The element selected is a line. First point of line is located at x=1.5973 and y=6.3891. Second point of line is located at x=1.9858 and y=7.9433. Length of line is 1.6020. Nearest endpoint to mouse click is Point 1.

If you single picked this element, your source code would be: POINT x1.5973 y6.3891 f99.99

CLEAR. Clears any element selected.

Origin Options

Displays a list with seven choices:

ORIGIN - F2. Select this option (or press the F2 function key) to set the origin of coordinates of the CAD file to match it with the one the machinist is using. You will be asked to “Pick a line for X-axis origin” (a line that contains the X axis origin), and then, “pick a line for the Y-axis” (a line that contains the Y axis origin). The intersection of these two lines will be the new origin of coordinates from which all data are based on.

OFFSET. Offsets the origin of coordinates. You will be asked to “Enter the amount to offset the X-axis” and then “Enter the amount to offset the Y-axis.”

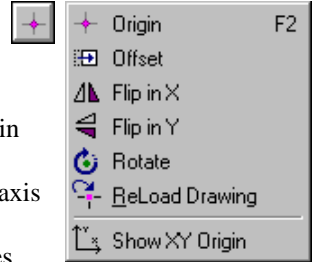
FLIP IN X. Flips the entire CAD drawing horizontally in the X axis.

FLIP IN Y. Flips the entire CAD drawing vertically in the Y axis.

ROTATE. Enter the angle of rotation (center of rotation is origin of coordinates) to rotate the entire CAD drawing.

RELOAD DRAWING. Reads and displays all information from the original CAD file.

SHOW XY ORIGIN / HIDE XY ORIGIN. Displays or hides the XY coordinates.



Toggle Birds Eye View

Displays (or hides) a small window that shows the entire CAD drawing with the currently displayed section marked with a red rectangle. Click the right button of your mouse (with cursor located on Birds Eye View), to move, resize or close Birds Eye View, display or hide a title bar, update view, and change the zoom of the area to be displayed in the CAD Import Interface window (size of red rectangle).



Toggle display of Layers

Displays (or hides) the Layer Manager window. From the Layer Manager, you can choose the layer(s) you want to view or hide in order to facilitate your importing information from the CAD file into your Source program. Toolbar Options:



Hide/Show selected layer. Names of hidden layers are shown in italics



(Not available in Mill v4.0)



Designate selected layer as Current layer (shown in red)



(Not available in Mill v4.0)



Sort layers in alphabetic order



Display Short/Long list of layers



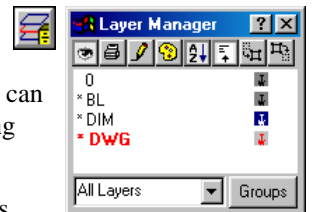
(Not available in Mill v4.0)





(Not available in Mill v4.0)



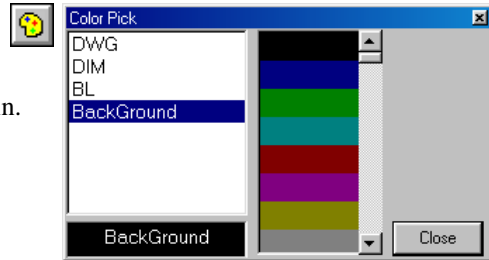
Groups (Not available in Mill v4.0)



To close the Layer Manager window, click the  button in the upper right corner of the Layer Manager window, or click the  option again from the CAD Import Interface window.

Toggle display of Colors

Select a layer and pick the color you want it to be displayed in. If you want to change the color of the background, select "BackGround" before picking its new color. All changes take effect immediately. Click the Close button to close the Color Pick window.



Open a different CAD file



Displays the *CAD file to Open* window from where you can select a different CAD file to open.

Close CAD window



Closes the *CAD Import Interface* window. You can also close this window by pressing the F9 function key.

Setting Origin of Coordinates

CAD drawings usually have the origins of coordinates different from the one used by machinists. Setting the origin is the first thing that has to be done to make sure that all information taken from the CAD drawing are referred to the same point of origin. *Note:* since G-ZERO does not alter the content of the CAD file it opens, the new origin is not saved; therefore, a new origin needs to be set every time the CAD drawing is loaded.

1. Select the Origin icon from the Toolbar menu (or press the F2 function key when the CAD Reader window is active)

2.

Select a horizontal line that contains the origin.

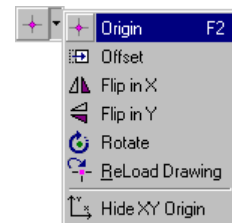
Note: If you select a circle or arc, G-ZERO will take the center of the circle (or radius) as the new origin (and will skip step 3)

3.

Select a vertical line that contains the origin.

4. The intersection of the two lines will be the new origin. Your CAD drawing will be redrawn with new coordinates shown in yellow.

If you would like to change the origin, just repeat steps 1 to 4.



Getting Information from an Element

Answering G-ZERO questions

When CAD Reader is active, you can answer some G-ZERO questions by clicking on the elements from your CAD drawing. Once you picked an element, CAD Reader will read all its information (location relative to the origin, radius of a circle or an arc, etc.) and pick the appropriate data you can use for your answer. *Note:* You can always use the picked value as part of your input math calculation. (See *Reference Basics, Input Math*)

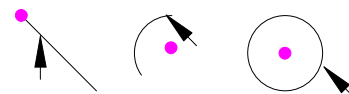
Programming a POINT

When you are NOT in the middle of programming a G-ZERO command (CAD Reader in Single Pick mode), clicking on ANY element of your CAD drawing will automatically program a 1)POINT command and add it to the end of your source program.

The X and Y values of the new POINT command will be:

Picking a LINE: X and Y values of the closest end point of that line

Picking a CIRCLE: X and Y values of the center of the circle



Picking an ARC: X and Y values of the center of the arc

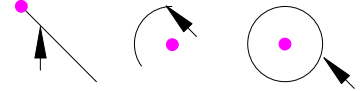
Using CAD Reader with G-ZERO Commands

1) POINT x_ y_ f_

x_

WHERE IN X WOULD YOU LIKE TO POSITION THE TOOL?

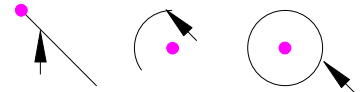
<u>Click on...</u>	<u>You'll get...</u>
line	X value of closest end
arc	X value of center
circle	X value of center



y_

WHERE, IN Y?

<u>Click on...</u>	<u>You'll get...</u>
line	Y value of closest end
arc	Y value of center
circle	Y value of center



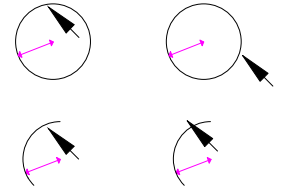
2) RADIUS _ type_ x_ y_

(Note: only available within COMP/UNCOMP commands)

-

WHAT IS THE RADIUS OF THE CIRCLE? (- for inside rad)

<u>Click on...</u>	<u>You'll get...</u>
circle (inside)	radius of circle (inside cut: -)
circle (outside)	radius of circle (outside cut: +)
arc (inside)	radius of arc (inside cut: -)
arc (outside)	radius of arc (outside cut: +)



x_

WHAT IS THE X DIMENSION OF THE RADIUS?

<u>Click on...</u>	<u>You'll get...</u>
circle	X value of the center of the circle
arc	X value of the center of the arc



y_

WHAT IS THE Y DIMENSION?

<u>Click on...</u>	<u>You'll get...</u>
circle	Y value of the center of the circle
arc	Y value of the center of the arc

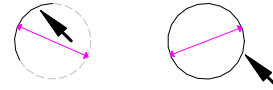


6) TOOL _dia_ flutes_ type_ rad_ ***

dia_

WHAT IS THE DIAMETER OF THIS TOOL?

<u>Click on...</u>	<u>You'll get...</u>
circle	diameter of circle
arc	diameter of arc



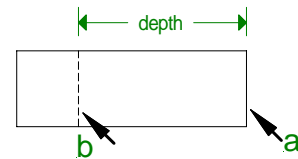
7) MILL zrapid_ zcut_ passes_ zret_ zf_ xyf_

zcut_

FEED TO WHAT Z DIMENSION? (usually minus)

Pick two parallel lines that represent the depth (i.e. from a side view)

1. Click mouse to activate feature
2. Pick Z0 line (a)
3. Pick Z depth line (b)



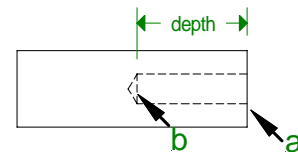
8) DRILL g_ zrap_ zcut_ pecks_ tip_ zret_ f_

zcut_

DRILL TO WHAT FINAL Z DIMENSION? (usually minus)

Pick two parallel lines that represent the depth (i.e. from a side view)

1. Click mouse to activate feature
2. Pick Z0 line (a)
3. Pick Z depth line (b)

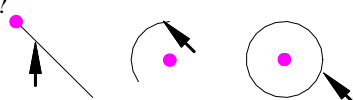


9) RECT xmin_ xmax_ ymin_ ymax_ thru_

xmin_

WHAT IS THE X OF THE LEFT-MOST EDGE OF THE RECTANGLE?

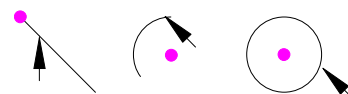
<u>Click on...</u>	<u>You'll get...</u>
line	X value of closest end
arc	X value of center
circle	X value of center



xmax_

WHAT IS THE X OF THE RIGHT-MOST EDGE?

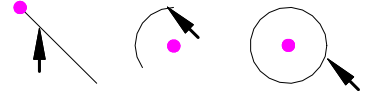
<u>Click on...</u>	<u>You'll get...</u>
line	X value of closest end
arc	X value of center
circle	X value of center



ymin_

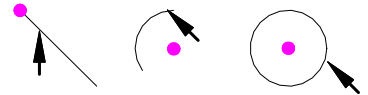
WHAT IS THE Y OF THE NEAR EDGE OF THE RECTANGLE?

Click on...	You'll get...
line	Y value of closest end
arc	Y value of center
circle	Y value of center



WHAT IS THE Y OF THE FAR EDGE?

Click on...	You'll get...
line	Y value of closest end
arc	Y value of center
circle	Y value of center

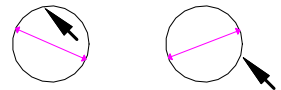


10) ROUND dia_ x_ y_ thru_

dia_

WHAT DIAMETER ROUND ARE YOU MILLING (- for inside)

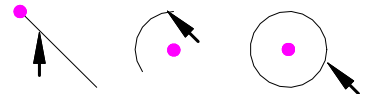
Click on...	You'll get...
circle (inside)	diameter of circle (inside cut: -)
circle (outside)	diameter of circle (outside cut: +)



x_

WHERE IS THE CENTER IN X?

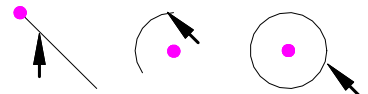
Click on...	You'll get...
line	X value of closest end
arc	X value of center
circle	X value of center



y_

WHERE IS THE Y CENTER?

Click on...	You'll get...
line	Y value of closest end
arc	Y value of center
circle	Y value of center

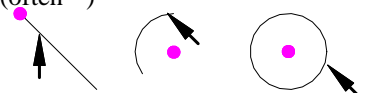


17) MAT'L xmin_ xmax_ ymin_ ymax_ thk_ type_

xmin_

WHAT IS THE LEFT-MOST X DIMENSION OF YOUR MATERIAL? (often -)

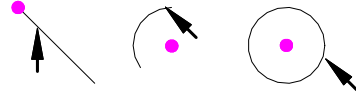
Click on...	You'll get...
line	X value of closest end
arc	X value of center
circle	X value of center



xmax_

WHAT IS THE RIGHT-MOST X DIMENSION?

<u>Click on...</u>	<u>You'll get...</u>
line	X value of closest end
arc	X value of center
circle	X value of center



ymin_

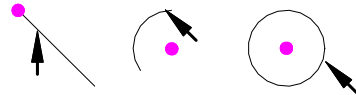
WHAT IS THE NEAREST Y DIMENSION OF YOUR MATERIAL? (often -)

<u>Click on...</u>	<u>You'll get...</u>
line	Y value of closest end
arc	Y value of center
circle	Y value of center

ymax_

WHAT IS THE FURTHEST Y DIMENSION?

<u>Click on...</u>	<u>You'll get...</u>
line	Y value of closest end
arc	Y value of center
circle	Y value of center

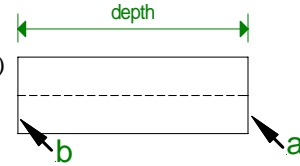


thk_

WHAT IS THE THICKNESS OF YOUR MATERIAL?

Pick two parallel lines that represent the thickness/depth (i.e. from a side view)

1. Click mouse to activate feature
2. Pick Z0 line (a)
3. Pick Z depth line (b)



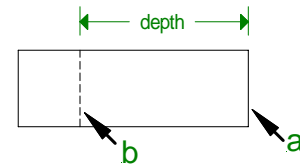
33) Z MOVE z_ ramp_ f_

z_

MOVE TOOL TO WHAT Z DIMENSION? (usually -)

Pick two parallel lines that represent the depth (i.e. from a side view)

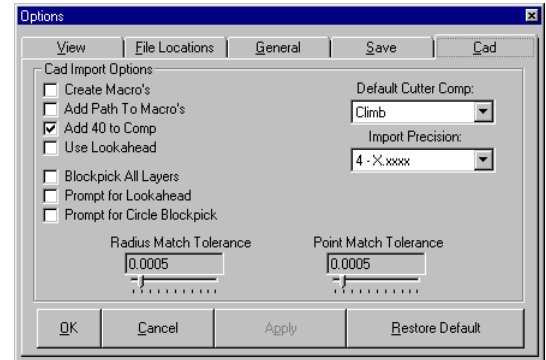
1. Click mouse to activate feature
2. Pick Z0 line (a)
3. Pick Z depth line (b)



Default Settings







To modify the default settings of the CAD Import Interface, make the appropriate selections in the CAD section of the *Options* window (*Tools* pull-down menu from the G-ZERO Mill v4.0b main screen).

For example, if you are doing a block-pick, the default cutter compensation is *Climb Cut*; if you want, you can change it to *Conventional*, *Auto Detect*, or *Prompting*.




Programming Sequence

The usual CAD programming sequence is as follows:

1. Start G-ZERO Mill
2. Start a new source program
3. Press the F9 function key to open the *CAD Import Interface* window
4. Select the CAD file you want to open
5. Set new origin:  or F2
6. Zoom to enlarge whenever needed
7. Select material:  17) Mat1 (click on line, arc or circle to get values for *xmin*, *xmax*, *ymin*, *ymax* and *thk*)
8. Select tool:  6) Tool (click on circle or arc to select tool diameter)
9. Select what you are going to do with the tool:  7) Mill or  8) Drill&Tap
10. Program the actual geometry elements
 - POINT: click on line for closest endpoint
click on arc for center of arc
click on circle for center of circle
 - RADIUS: click on circle for radius of circle
click on arc for radius of arc
 - CONTOUR: F8 Block Pick -- Pick 1st, 2nd, and last elements (defaults climb cut)
 - GROUP PICK: click on circle(s) for center of circle(s). (Use with DRILL command only)
11. Repeat steps 8 through 10 as needed
12. Close *CAD Import Interface* window ( or F9)
13. Proofread source program (Use F2 Part, F3 Tool, F4 Slinky, F5 Iso, or F6 Solid)
14. Edit source program if necessary (perhaps round a few sharp corners using Alt+click POINT)
15. Save source program, and press F12 to create G-code file
16. Exit G-ZERO Mill

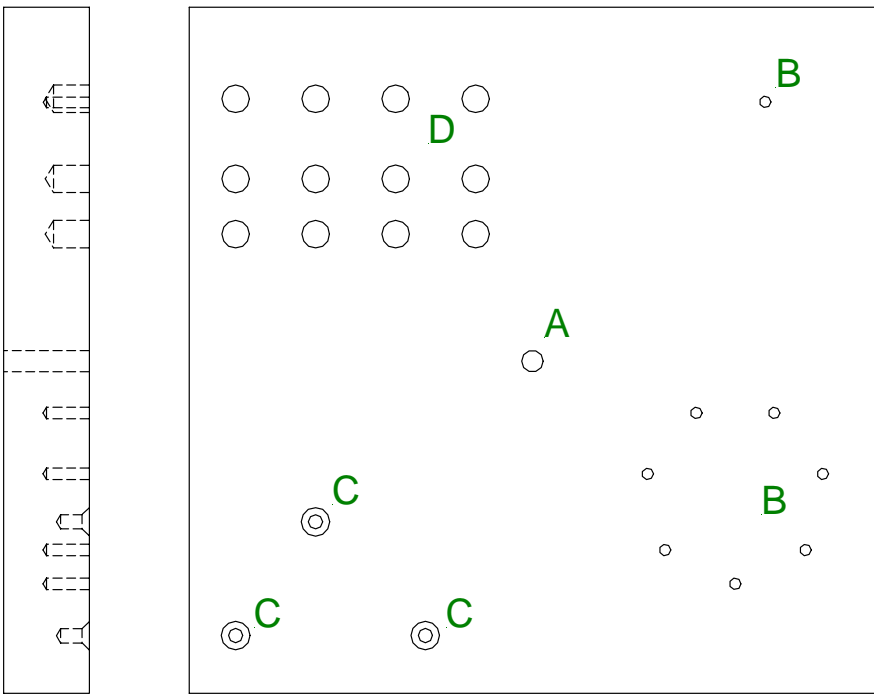
Sample Programming

This section covers a step-by-step example of programming source code files using G-ZERO Conversational Mill through CAD Reader. DXF files used in these examples are located in the ExampleM\Tutorial directory of your CD.

Note: Use Zoom Window  or other Zoom options to setup the best view for you to make selections.

Sample 1: Drill Mania

- ◆ Load CAD Reader and open DXF file
- ◆ Hide layers
- ◆ Set origin for DXF file
- ◆ Define material using values from DXF file
- ◆ Drill hole A
- ◆ Drill B holes
- ◆ Drill C holes
- ◆ Drill D holes
- ◆ Flatbottom drill D holes
- ◆ Tap B holes
- ◆ Countersink C holes
- ◆ Exit CAD Reader
- ◆ Proofread and edit source program



Rapid Output Co. www.g-zero.com 888-656-1945	TITLE: Drill Mania		REFERENCES:		RECOMMENDED OP & TOOL LIST: Drill A (0.375" dia. drill) Drill B (0.201" dia. drill) Drill C (0.25" dia. drill) Drill D (3/164" dia. drill) Flatbottom Drill D (31/64" dia. drill) Tap B (1/4"-20) Countersink C (0.5" dia. x 90°)
	MATERIAL: 1.5" 1018		- Holes: A: 0.375" dia. (thru) B: 1/4"-20 tap, 0.75" deep C: 0.25" x 0.5" deep with 90° x 0.41" dia. countersink D: 31/64" dia. flatbottom, 0.625" deep		
	DRAWING: M001	INITIALS: MC	- B holes: 7 holes equally spaced on 3.146" dia. botcircle - All measurements in inches (not to scale)		

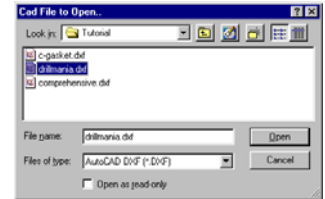
Load CAD Reader and open DXF file

1. Start G-ZERO Conversational Mill
2. Open a new file named Drill-Mania (File | Open)
3. Press F9 (Tools | CAD) to load CAD Reader
4. Locate and open file drillman.dxf (ExampleM\Tutorial directory on G-ZERO Mill CD)

Note: Select drive and directory where the file is located. Select files of type = AutoCAD.DXF to display only DXF files.

5. The drillmania.dxf file is opened in the G-ZERO CAD Import Interface window.
6. The first line of source code is added to your program to establish a link to the DXF file:

1 CAD D:\ExampleM\Tutorial\drillman.dxf



Hide layers

7. Click the “Toggle Display of Layers” button to open the “Layer Manager”
8. Select the DRAWING layer and set it as current layer
9. Select the BORDER layer and hide it (non-visible)
10. Click the “Toggle Display of Layers” button again to close the “Layer Manager”

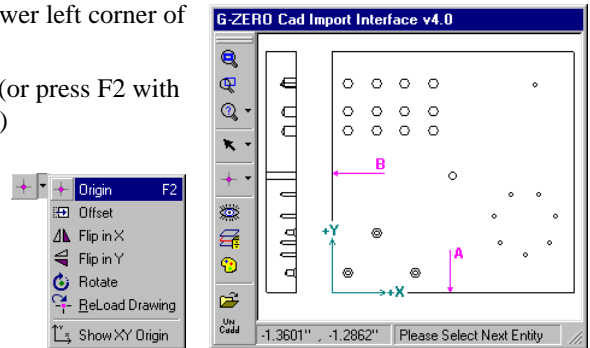


Set origin for DXF file

It's very important to make sure that the coordinates of the DXF file match the coordinates of the source program. In this example, we are going to use the lower left corner of the top view as the origin of coordinates.

11. Select Origin from the *Origin Options* button (or press F2 with G-ZERO Cad Import Interface window active)
12. *Pick a line for X-axis Origin (will contain origin)*
Click line A
13. *Now pick a line for the Y-axis*
Click line B

A yellow XY Origin of coordinates will appear in that corner.



Define material using values from DXF file

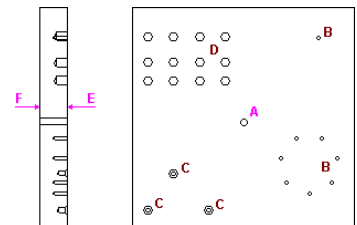
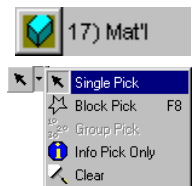
We can use values from the DXF file to define the material size and thickness. Call the MAT'L command the usual way, and instead of keying in the min and max values, select them from the DXF file.

14. Start the MAT'L command
15. Select *Single Pick* from the CAD Reader's toolbar
16. xmin: click line A and press Enter. “0” will be picked and entered as xmin
17. xmax: click line B and press Enter. “12” will be picked and entered as xmax
18. ymin: click line C and press Enter. “0” will be picked and entered as ymin
19. ymax: click line D and press Enter. “12” will be picked and entered as ymax
20. thk:

- Select Single Pick
- *Please Select 1st Line for Z Zero:* Click line E
- *Please Select 2nd Line to Use for Z-axis calculation:* Click line F. G-ZERO calculates the distance between the 2 parallel lines just selected.

21. Key in part material (4=1018) or select it from the pop-up box.

2 MAT'L xmin0 xmax12 ymin0 ymax12 thk1.5 type4=1018



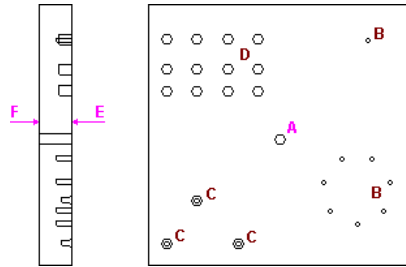
Drill hole A

22. Program the TOOL command the normal way, except for the diameter of the tool that can easily be picked from the DXF file.

What is the diameter of this tool?

- Select Single Pick
- Click circle A, and .5 will appear as the answer

```
3 TOOL 1 dia.5 flutes2 type20=HSS DRILL rad0 ***
```



23. For the DRILL command, we can get the zcut value from the DXF file. (Program the rest of the DRILL command as you normally would)

Drill to what final Z dimension? (usually minus)

- Select Single Pick
- Click line E for the first line for Z0 (See previous illustration)
- Click line F for the Z depth, and -1.5 will appear as the answer

```
4 DRILL g83=PECK zrap.1 zcut-1.5 pecks5 tip1 zret.1 f5.3
```

24. Location of hole A. Just click circle A to automatically program a POINT command with the X and Y values of the center of circle A.

- Select Single Pick
- Click circle A

```
5 POINT x6.01 y5.81
```

Drill B holes


25. Program the TOOL command the normal way, except for the diameter of the tool that can easily be picked from the DXF file.

What is the diameter of this tool?

- Select Single Pick
- Click circle B, and .2 will appear as the answer

```
6 TOOL 2 dia.2 flutes2 type20=HSS DRILL rad0 ***
```

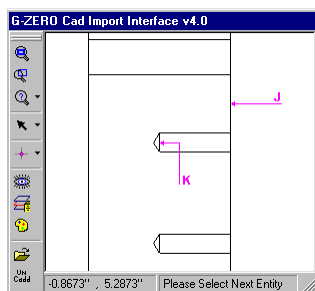
26. For the DRILL command, we can get the zcut value from the DXF file. (Program the rest of the DRILL command as you normally would)


Note: Use  to zoom to a closer section if needed.

Drill to what final Z dimension? (usually minus)

- Select Single Pick
- Click line J for the first line for Z0
- Click line K for the Z depth, and -.75 will appear as the answer

```
7 DRILL g83=PECK zrap.1 zcut-.75 pecks3 tip0 zret.1 f6.2
```

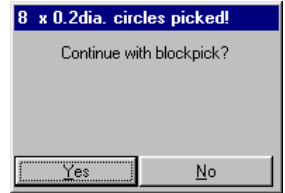


27. Location of 8 B holes. Since we have several holes to drill, we can use  Group Pick to highlight all the 8 holes, so we just need to select the order in which we want them to be drilled (the last one is automatically picked).

Note: you need to have “Prompt for Circle Blockpick” selected in the Tools | Options | CAD screen.

- Select Group Pick

- *Please Select First Circle of Group.* Click any B circle to determine the size of the hole. A window will appear with the number of circles found (8 circles with diameter 0.2)



- *Continue with blockpick?* Click Yes

- Now click on the highlighted circles to determine the order in which you want them to be drilled. (e.g.: start from the B circle in the upper right section, then click on the rest of the B circles counterclockwise)

As you click on the circles, a POINT command is added into the source code with the X and Y locations of the center of the circles.

Note that the last circle will be automatically selected for you.

```

8 POINT x10.08 y10.35
9 POINT x8.87 y4.91
10 POINT x8.02 y3.84
11 POINT x8.33 y 2.51
12 POINT x9.56 y1.92
13 POINT x10.79 y2.51
14 POINT x11.09 y3.84
15 POINT x10.24 y4.91

```

Drill C holes

28. Program the TOOL command the normal way, except for the diameter of the tool that can easily be picked from the DXF file.

What is the diameter of this tool?

- Select Single Pick

- Click any small C circle, and .26 will appear as the answer

```
16 TOOL 3 dia.26 flutes2 type20=HSS DRILL rad0 ***
```

29. For the DRILL command, we can get the zcut value from the DXF file. (Program the rest of the DRILL command as you normally would)

Drill to what final Z dimension? (usually minus)

- Select Single Pick

- Click line L for the first line for Z0

- Click line M for the Z depth, and -.5 will appear as the answer

```
17 DRILL g81=C'DRILL zrap.1 zcut-.5 pecks1 tip0 zret.1 f5.3
```

30. Location of small C holes. Just click the 3 small C circles to automatically program POINT commands with the X and Y values of the centers of the 3 small C circles.

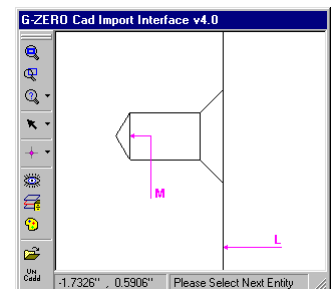
- Select Single Pick

- Click all three small C circles

```

18 POINT x.81 y1.01
19 POINT x2.21 y3
20 POINT x4.13 y1.01

```



Drill D holes

31. Program the TOOL command the normal way, except for the diameter of the tool that can be easily picked from any circle D of the DXF file.

```
21 TOOL 4 dia.48 flutes2 type20=HSS DRILL rad0 ***
```

32. For the DRILL command, get the zcut value using the side view of the DXF file.

```
22 DRILL g81=C'DRILL zrap.1 zcut-.62 pecks1 tip0 zret.1 f3.9
```

33. Locations of D holes. Use either the Single Pick or Group Pick method to select all the D circles and automatically program the 12 POINT commands.

```
23 POINT x.81 y10.4
24 POINT x2.21 y10.4
25 POINT x3.61 y10.4
26 POINT x5.01 y10.4
27 POINT x5.01 y9
28 POINT x3.61 y9
29 POINT x2.21 y9
30 POINT x.81 y9
31 POINT x.81 y8.03
32 POINT x2.21 y8.03
33 POINT x3.61 y8.03
34 POINT x5.01 y8.03
```

Flatbottom drill D holes

34. Program the TOOL and DRILL commands. Remember to pick the diameter of the tool from any of the D circles in the DXF file. Also, get the zcut for the DRILL command from the side view of the DXF file.

For the location of the 12 D holes, repeat lines 23 to 34.

```
35 TOOL 5 dia.48 flutes2 type0=HSS MILL rad0 ***
36 DRILL g82=C'SINK zrap.1 zcut-.62 pecks5 tip0 zret.1 f6.1
37 REPEAT from23 thru34 ***
```

Tap B holes

35. Program the TOOL and DRILL commands. Remember to pick the diameter of the tool from any of the B circles in the DXF file. Also, get the zcut for the DRILL command from the side view of the DXF file.

For the location of the 8 B holes, repeat lines 8 to 15.

```
38 TOOL 6 dia.2 flutes2 type31=TAPMATIC NC/R rad0 ***
39 DRILL g84=TAP zrap.2 zcut-.75 pecks20 tip0 zret.2
40 REPEAT from8 thru15 ***
```


Countersink C holes

36. Program the TOOL and DRILL commands. Remember to pick the diameter of the tool from any of the large C circles in the DXF file.

For the location of the 3 C holes, repeat lines 18 to 20.

```
41 TOOL 7 dia.5 flutes2 type30=C'SINK rad0 ***
42 DRILL g81=C'DRILL zrap.1 zcut0 pecks90 tip.41 zret.1 f1.6
43 REPEAT from18 thru20 ***
```


Exit CAD Reader

Exit CAD Reader by pressing F9 again, *or* selecting  in the toolbar, *or* selecting UnCad from the Tools drop-down menu.

Proofread and edit source program

Proofread source program using the different redraw function keys: F2 Part, F3 Tool, F4 Slinky, F5 Iso, or F6 Solid.

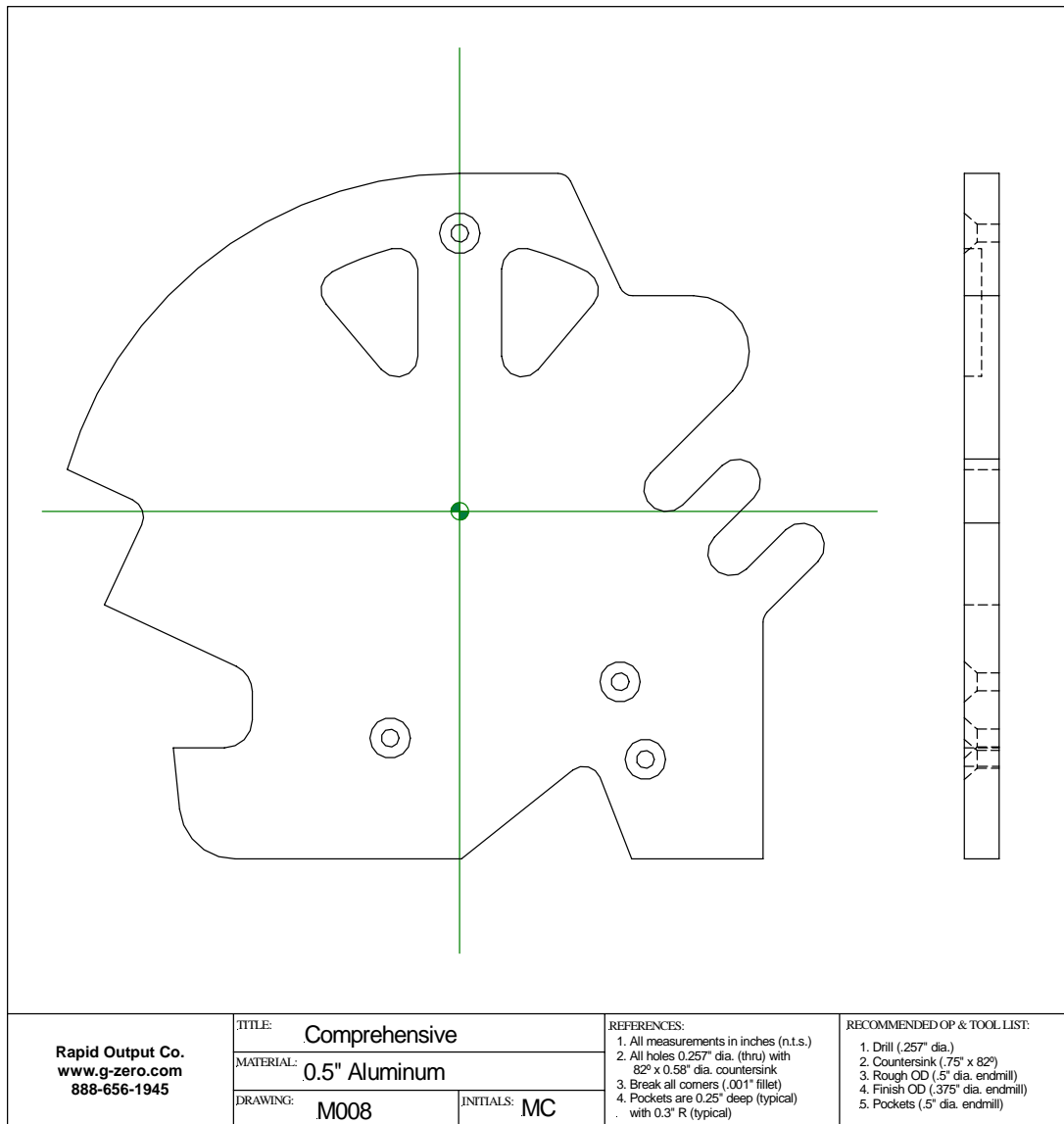
Make any changes if necessary using G-ZERO editing features.

Return to CAD Reader to get data if needed by pressing F9 again. Remember to set a new origin in your DXF file any time you reload it.



Save source file and exit G-ZERO when done.

Sample 2: Comprehensive

- ◆ Initial settings
- ◆ Set origin for DWG file
- ◆ Define material using values from DWG file
- ◆ Stub drill
- ◆ Countersink
- ◆ Rough profile
- ◆ Finish profile
- ◆ Rough and finish pockets



Initial settings

1. Start G-ZERO and open a new file named Comprehensive (File | Open)
2. Press F9 (Tools | CAD) to load CAD Reader and open file comprehen.dwg (ExampleM\Tutorial directory on G-ZERO Mill CD)
3. The first line of code is added to your source program to establish a link to the DWG file:
1 CAD D:\ExampleM\Tutorial\comprehen.dwg
4. Hide layer(s)  and use Zoom  any time to ease your job.

Set origin for DWG file

Select the central cross lines as coordinates.

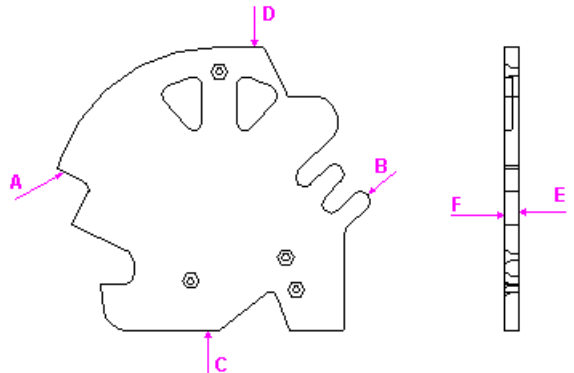
5. Select Origin from the Origin Options button (or press F2 with Cad Import Interface window active)
6. *Pick a line for X-axis Origin (will contain origin)*
Click the horizontal center line
7. *Now pick a line for the Y-axis*
Click the vertical center line

A yellow XY origin of coordinates will appear in your CAD window.

Define material using values from DWG file

Program the Material command getting its values from the dwg file:

8. Start the Mat'l command
9. Select Single Pick
10. *xmin*: click on upper section of line A to make sure the furthest left point is picked: -5.6349
11. *xmax*: click on arc B to get the x value of the center of the arc. For the material xmax, add the radius of the arc: $4.9156 + .325$, where
4.9156: picked by computer (center of arc)
+: you key in
.325: radius of arc (see CAD dialog bar)
After you press the Enter key, G-ZERO computes this value and enter 5.24064 as the answer for xmax.
12. *ymin*: click on line C: -5
13. *ymax*: click line D: 4.862
14. *thk*: Select Single Pick
Please Select 1st Line for Z Zero: click line E
Please Select 2nd Line to Use for Z-axis calculation: click line F
15. Select the type of material from the pop-up box
2 MAT'L xmin-5.6349 xmax5.2406 ymin-5 ymax4.862 thk.5 type0=ALUMALOY



Stub drill

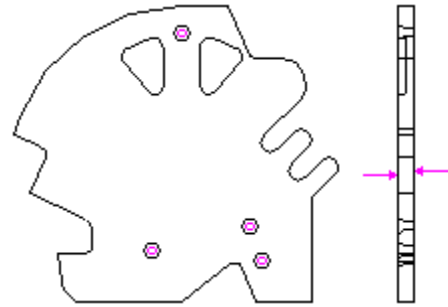
16. Program the TOOL and DRILL commands. Remember to pick the diameter of the tool from any of the small circles in the DXF file. Also, get the zcut for the DRILL command from the side view of the DXF file.
3 TOOL 1 dia.257 flutes2 type20=HSS DRILL rad0 ***
4 DRILL g81=C'DRILL zrap.1 zcut-.5 pecks1 tip1 zret.1 f27.1

17. For the location of the 4 holes, use either the Single Pick or Group Pick method to determine their drilling sequence.

```

5 POINT x-1 y-3.26
6 POINT x2.667 y-3.567
7 POINT x2.3045 y-2.4514
8 POINT x0 y4

```



Countersink

18. Program the TOOL and DRILL commands. Remember to pick the diameter of the tool from any of the large circles in the DXF file.

For the location of the 4 circles, repeat lines 5 to 8.

```

9 TOOL 2 dia.58 flutes1 type30=C'SINK rad0 ***
10 DRILL g82=C'SINK zrap.05 zcut0 pecks82 tip.58 zret.05 f10.3
11 REPEAT from5 thru8 ***

```

Rough profile

19. Program the following commands as you normally would:

TOOL command

STOCK command to leave extra material on the cutting surfaces for later cleanup

MILL command

```

12 TOOL 3 dia.5 flutes2 type0=HSS MILL rad0 ***
13 STOCK xystk.03 zstk0
14 MILL zrapid.05 zcut-.52 passes1 zret.1 zf26.7 xyf10.7

```

20. Program an “approach” POINT just off the part to drop the cutter in a safe location. We can use a point in the DXF file adding 0.5” to its X dimension:

Call the POINT command

```
15 POINT x
```

Where, in X would you like to position the tool?

- Select Single Pick
- Click the lower section of line A and CAD Reader will pick the its X value **4.4186**
- Add 0.5” by typing: **+ .5** and the Enter key

```
15 POINT x4.9186 y
```

Where, in Y?

- Click the lower section of line A again to pick the Y value of that point.

```
15 POINT x4.9186 y-1.4497
```

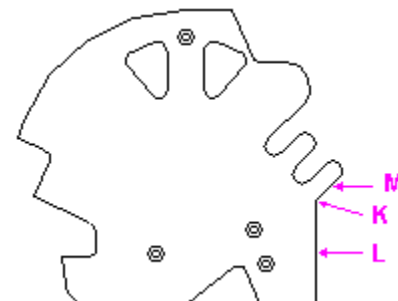
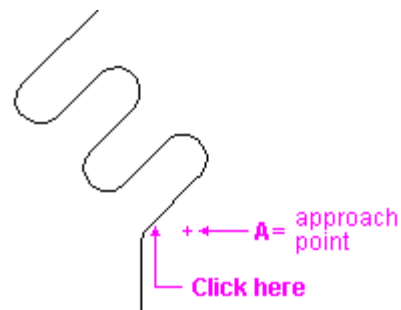
21. To define the profile, we are going to use **Block Pick**:

- Select Block Pick.
- *Please Select Starting Entity*: Click curve K
- *Please Select Next Entity*: Click line L (gives G-ZERO the cutting direction)
- *Please Select Ending Entity*: Click line M (G-ZERO will highlight every connected element and add their data to the source program)

```

16 COMP angle225 cl/con41 lookahead0
17 RADIUS -.2 type1 x4.56 y-1.5912
18 POINT x4.36 y-5
19 POINT x2.4697 y-5
20 RADIUS -.25 type1 x1.782 y-3.917
21 POINT x.0246 y-5
22 POINT x-3.2295 y-5
23 RADIUS .8 type1 x3.2295 y-4.2
24 POINT x-4.118 y-3.4

```



```

25 POINT      x-3.38 y-3.4
26 RADIUS    -.4 type1 x-3.38 y-3
27 RADIUS    -.4 type1 x-3.38 y-2.5915
28 POINT      x-5.1056 y-1.3455
29 POINT      x-4.5688 y-.1945
30 RADIUS    -.27 type1 x-4.8136 y-.0804
31 POINT      x-4.6994 y.1643
32 POINT      x-5.6349 y.6005
33 RADIUS    .005 type1 x-5.6328 y.605
34 RADIUS    5.862 type1 x0 y-1
35 RADIUS    .2 type1 x1.411 y4.662
36 POINT      x1.5922 y4.7465
37 POINT      x2.3062 y3.2155
38 RADIUS    -.2 type1 x2.4874 y3.3
39 RADIUS    .8 type1 x3.36 y2.3
40 RADIUS    -.325 type1 x2.9711 y.3201
41 RADIUS    .325 type1 x3.9964 y.4262
42 RADIUS    -.325 type1 x3.8903 y-.5991
43 RADIUS    .325 type1 x4.9156 y-.4931
44 POINT      x5.1454 y-.7229
45 POINT      x4.4186 y-1.4497
46 UNCOMP    angle225

```

22. Program a “retract” POINT (to point A) the same as the approach point.

```

47 POINT      x4.9186 y-1.4497 f20

```

Finish profile

23. Program a new TOOL and MILL command to finish profile.

```

48 TOOL 4     dia.375 flutes4 type1=CARBIDE MILL rad0 ***
49 MILL       zrapid.02 zcut-.52 passes1 zret.1 zf67.7 xyf29

```

24. Use the REPEAT command to repeat lines from COMP to retract point.

```

50 REPEAT     from16 thru47 ***

```

Rough and finish pockets

25. Program the TOOL, MILL and ROUGH commands the way you normally would. Remember to get the zcut for the MILL command from the side view of the DXF file using Single Pick.

```

51 TOOL 5     dia.5 flutes2 type0=HSS MILL rad0 ***
52 MILL       zrapid.05 zcut-.25 passes2 zret.1 zf26.7 xyf10.7
53 ROUGH      stk.005 stp75 angle180 cleanup1

```

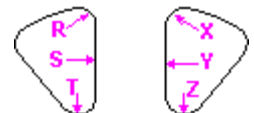
26. Use Block Pick to define profile for first pocket:

- Select Block Pick
- *Please Select Starting Entity:* Click line S
- *Please Select Next Entity:* Click curve R (gives G-ZERO the cutting direction)
- *Please Select Ending Entity:* Click curve T (G-ZERO will highlight every connected element and add their data to the source program)

```

54 COMP      angle90 cl/con41 lookahead0
55 POINT      x-.6 y2.233
56 POINT      x-.6 y3.4857
57 RADIUS    -.3 type1 x-.9 y3.4857
58 RADIUS    -3.9 type1 x0 y0
59 RADIUS    -.3 type1 x-1.6924 y3.1774
60 POINT      x-1.9222 y2.9845
61 POINT      x-1.1298 y2.0402
62 RADIUS    -.3 type1 x-.9 y2.233
63 UNCOMP    angle90

```

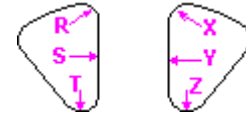


27. Program another ROUGH command to turn it off:

```
64 ROUGH   stk.005 stp75 angle180 cleanup1
```


28. Rough the othe pocket picking the values from the DXF file:

- Select Block Pick
- First element: line Y
- Second element: curve Z
- Ending element: curve X



```
65 MILL    zrapid.05 zcut-.25 passes2 zret.1 zf26.7 xyf10.7
66 ROUGH   stk.005 stp75 angle180 cleanup1
67 COMP    angle270 cl/con41 lookahead0
68 POINT   x.6 y3.4857
69 POINT   x.6 y2.233
70 RADIUS  -.3 type1 x.9 y2.233
71 RADIUS  -.3 type1 x1.6924 y3.1774
72 RADIUS  -3.9 type1 x0 y0
73 RADIUS  -.3 type1 x.9 y3.4857
74 UNCOMP  angle270
75 ROUGH   stk.005 stp75 angle180 cleanup1
```

Exit CAD Reader

Exit CAD Reader by pressing F9 again, *or* selecting  in the toolbar, *or* selecting UnCad from the Tools drop-down menu.