



LinuxCNC Help for the Sherline Machine CNC System

LinuxCNC Help for Programming and Running

1. Here is a link to G Codes for LinuxCNC: (<http://linuxcnc.org/docs/html/gcode/g-code.html#gcode:g20-g21>)
2. Here is a link to M Codes for LinuxCNC: (<http://linuxcnc.org/docs/html/gcode/m-code.html>)
3. Homing the Axis and Deleting the Messages that Occur When You Home the Axis

When you power on your control and you go to your machine control page, all of the axis position numbers are in yellow. At this time, the control does not know where axis zero is for any of the axes.

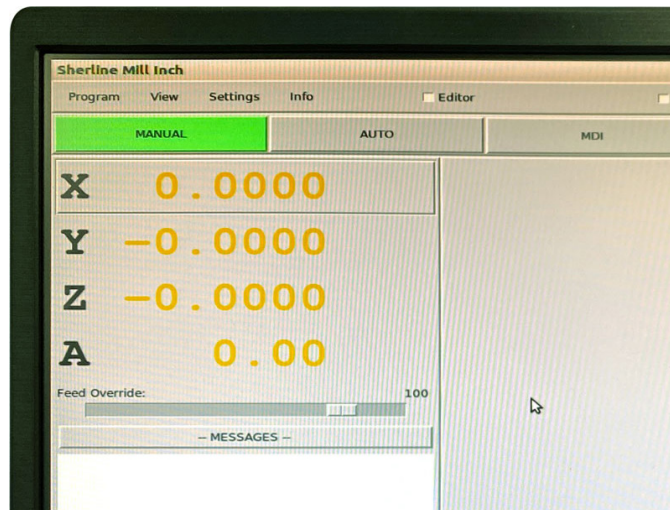


FIGURE 1

Because our LinuxCNC machine does not have limit switches, you can't home out the machine. What you do is jog the machine to where the Part Zero position is (indicate a hole or use an edge finder). Once an axis is at its Part Zero position, you click on the axis on the position screen (if you just jogged that axis, it will already be selected).

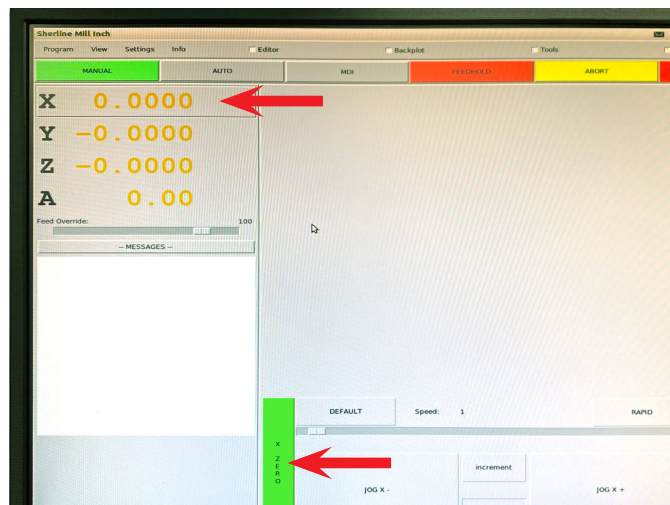


FIGURE 2—The top arrow shows the X-axis selected. The bottom arrow shows the “X Zero” button.

You then click on “X Zero” (Y, Z, or A depending on the axis). When you do this, the axis number on the position screen will change to 0.0000 and turn green.

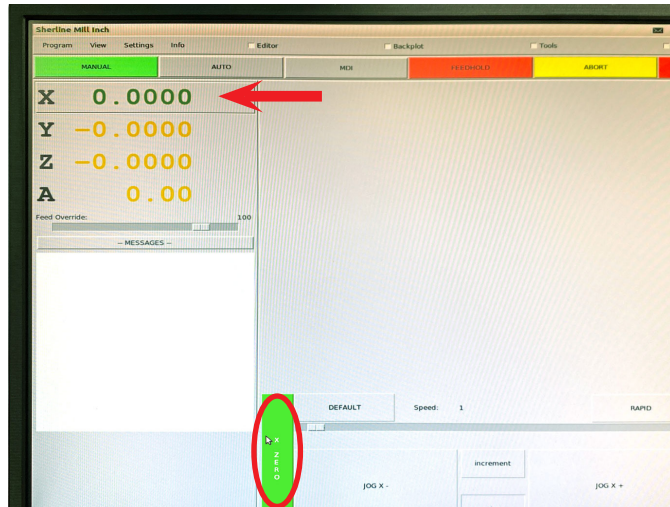


FIGURE 3—The red oval indicates the “XZero” button. The red arrow is pointing to the X-axis zeroed as indicated by the green digits. You can either choose an individual axis, or click on “All Zero” to zero all axes. Then they will all change to 0.0000 and turn green.

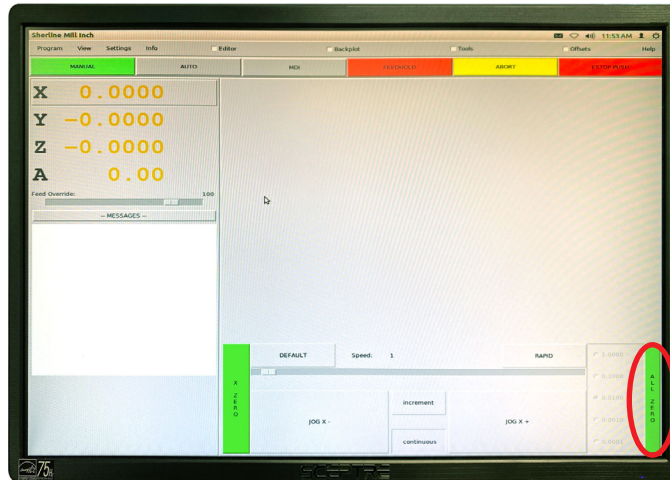


FIGURE 4—The red oval, in the lower-right corner, indicates the “All Zero” button.

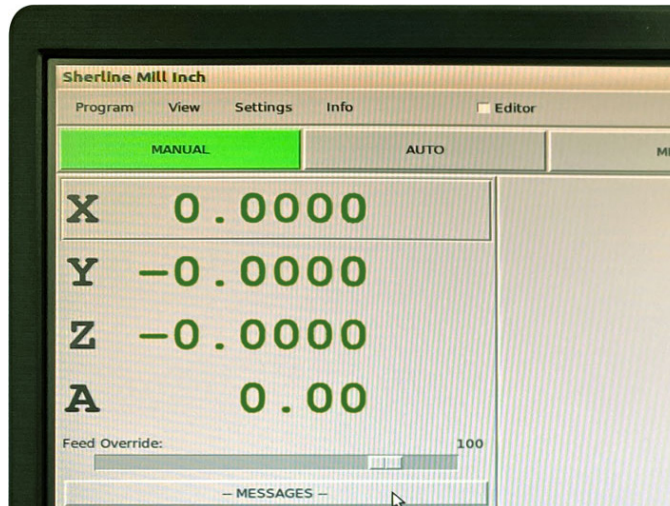


FIGURE 5—All axes zeroed as indicated by the green digits.

After you zero each axis, you will see the messages, “Can’t issue MDI command when not homed.” This doesn’t mean anything. Click on the “MESSAGES” button to clear these.

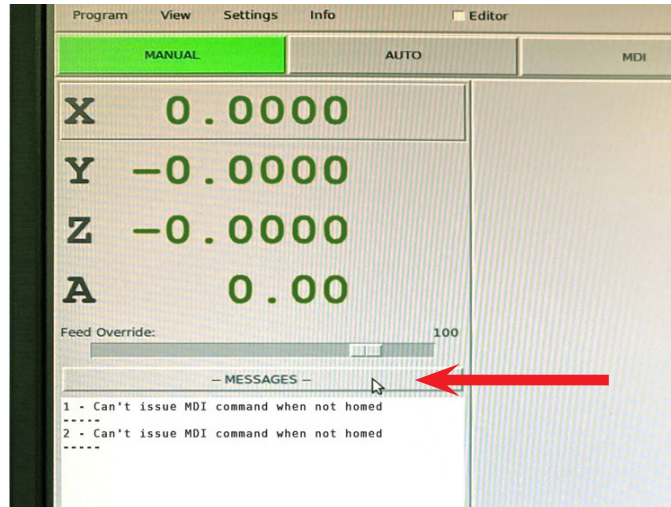


FIGURE 6—Click the “MESSAGES” button, as indicated by the red arrow, to clear the Messages dialog box.

At this point the controller knows where your Part Zero position is. You can jog the axes, use MDI, or use your program to move to any position with this position as your Part Zero point.

NOTE: Since the machine does not have limit switches, if you power off the machine, the Part Zero position will be gone. Therefore, you will need to write down the handwheel numbers for each axis when the machine is at Part Zero. If you always move your machine to Part Zero before you power off, you will then be in the correct position when you power on. Recheck your handwheel numbers on each axis and adjust if needed. Then click on “All Zero.” All position numbers will change to 0.0000 and green, and you will be set to go again.

- Next is a sample program for the mill so you can see how the basic layout of the program has to be. This is also a helpful example for setting up your post processor.

Mill Sample Program

NOTE TO START: At this time, the only “M” codes that can be used in a program are M00 and M01 (optional stop or full stop), and M02 or M30 at the end of the program. All other M codes will result in an error. M codes related to spindle rotation, coolant, or tool change will cause the computer to wait for a signal from a sensor that does not exist thereby causing an error.

% (ALL Programs must start with a %)

```
(First Machine Setup Machine Setup - 1)
(PROGRAM NAME – LINUXCNC SAMPLE PROGRAM.NC)
(POST – SHERLINE_EMC2)
(DATE - THU. 03/28/2013)
(TIME - 07:10AM)
(USE MAX RPM OF 2800 FOR ALL TOOLS FOR COPPER)
```

(If you are using sub programs the sub programs must be at the beginning of the program. No % at start or end)

```
O100 SUB (Y-axis SLOT SUB PROGRAM) (O100 THE FIRST DIGIT IN THIS SEQUENCE
IS THE “LETTER “O” NOT A ZERO)
G91 G00 Z-.1
G01 Y-.5 F6.0
G00 Z-.032
G01 Y.5
G00 Z-.032
G01 Y-.5
G00 Z-.032
```

```
G01 Y.5
G00 Z-.032
G01 Y-.5
G00 Z-.032
G01 Y.53
G00 Z-.032
G01 Y-.56
G00 Z-.032
G01 Y.56
G00 Z-.032
G01 Y-.56
G00 Z-.0253
G01 Y.56
G00 Z.3813 Y-.03
O100 ENDSUB
```

O200 SUB (X-axis SLOT SUB PROGRAM)

```
G91 G00 Z-.1
G01 X-.3125 F6.0
G00 Z-.032
G01 X.3125
G00 Z-.032
G01 Y-.3125
G00 Z-.032
G01 Y.3125
G00 Z-.032
G01 Y-.3125
G00 Z-.022
G01 Y.3125
G00 Z.250
O200 ENDSUB
```

```
G90 G00 G20 G94 G80 G40 G49 G17
```

(This is how we start all of our programs and this is what each G code does in order shown above) (G90 absolute position- G00 rapid move- G20 inch program- G94 feed in units per minute- G80 cancel drill can cycles- G40 cancel cutter comp- G49 cancel tool length compensation- G17 X/Y-axis used)

```
G90 G00 X2.0 Y2.0 (Tool change position. Change this to any absolute position that you want.)
```

```
G90 G00 X0 Y0 Z0 A0
(FEATURE DRILL HOLE)
```

```
M00
```

```
(**** Tool Change **** 1 CENTER DRILL)
```

```
G0 X-.6563 Y0.
```

G00 G43 H1 Z.1 (INCORPORATE LENGTH COMP FROM TOOL PAGE AND MOVE TO Z.100)

G81 G98 X-.6563 Y0. Z-.0701 L1 R.1 F5.6

X-.3438

G00 G80 (MUST HAVE GOO OR PROGRAM WILL ALARM)

G49 Z0 (REMOVES LENGTH COMP AND SENDS THE Z TO HOME)

G90 G00 X2.0 Y2.0 (TOOL CHANGE POSITION. CHANGE THIS TO ANY ABSOLUTE POSITION THAT YOU WANT.)

(FEATURE DRILL HOLE)

M00

(**** Tool Change **** 1/16 DRILL)

G90 G00 G80 G40 G49

G0 X-.3438 Y0.

G00 G43 H2 Z.1

(Begin FEATURE DRILL HOLE)

G83 G98 X-.3438 Y0. Z-.5688 L1 Q.0313 R.1 F5.60

X-.6563

G00 G80

G49 Z0

G90 G00 X2.0 Y2.0 (TOOL CHANGE POSITION. CHANGE THIS TO ANY ABSOLUTE POSITION THAT YOU WANT.)

(FEATURE PROFILE)

M00

(**** Tool Change **** 1/16 FLAT END MILL - STANDARD for Y-axis slots)

G90 G00 G80 G40 G49

G90 G00 X-.3125 Y.250 A90

G00 G43 H3 Z.1

O100 CALL (this calls up the sub program for the y-axis slot)

G90 G00 X-.6875 Y.250 A270

O100 CALL (This calls up the sub program for the Y-axis slot)

G90 G00 xX-.6875 Y.250 Z.1

G49 Z0

G90 G00 X2.0 Y2.0 (TOOL CHANGE POSITION. CHANGE THIS TO ANY ABSOLUTE POSITION THAT YOU WANT.)

(**** Tool Change **** 1/16 FLAT END MILL - STANDARD for X-axis slots)

G90 G00 G80 G40 G49

G90 G00 X-.3438 Y0.0 A0.0

G00 G43 H4 Z.1 (DIFFERENT OFFSET NUMBER FOR THE SAME TOOL IF USING TOOL #3 AGAIN)

O200 CALL (THIS CALLS UP THE SUB PROGRAM FOR THE X-axis SLOT)

G90 G00 X-.3438 Y0.0 A180

O200 CALL (this calls up the sub program for the X-axis slot)

G90 G00 X-.3438 Y0.0 Z.1 A0.0
G49 Z0

(FEATURE PROFILE)

M00

(**** Tool Change **** 1/2 FLAT ROUGH END MILL - STANDARD)

G90 G00 G80 G40 G49

G0 X-1.26 Y-.25

G00 G43 H5 Z.1

(Begin FEATURE PROFILE)

G0

G1 Z-.5 F8.22

G41 D5

Y-.51 F16.44

G3 X-1. Y-.25 I0. J.26

G1 Y.25

X0.

Y-.25

X-1.

G3 X-1.26 Y-.51 I0. J-.26

G1 X-1.

G40

G0 Z.1

G00 G49 Z0.0

G90 G40 G80 X0.0 Y0.0

M2 or M30

%

4. Special note on the Tooling Page and CNC Mill Set-up procedure:

If you are using the LinuxCNC and using the Sherline Base Page that comes with our disc, then the tooling page is different than the LinuxCNC tooling page.

On the Sherline Base Page, when you first install it and click on the Tooling page, you will see what is shown below. All of the tooling information that is shown on the original page is Sample Info and it doesn't work.

Very Important: If you just edit the Sample Info that is already on the tooling page and put in the tool info for the tools that you are using, it will not work! You need to get rid of all of the sample information and start fresh.

Default Tooling Page when first installed:

Tool #	Length	Dia.	Comment
T2	D0.06250	Z+0.100000	{;1/16} end mill
T3	D0.20100	Z+1.27300	{??????}
T99999	Z+0.100000	;BIG	

ADD EXTRA TOOL

REMOVE LAST TOOL

In order to input any information into the tooling page that will work, you need to remove all of the default tooling information.

To do this you click on “REMOVE LAST TOOL” three times. This will get rid of the tooling info for the three tools shown above.

Then you click on “ADD EXTRA TOOL”, and input your real tool information.

Your new tooling page information should look something like this:

Tool #	Length	Dia.	Comment
#1	-.2	.1875	3/16" Spot Drill
#2	-1.0	.125	1/8" Drill

It is unknown where they came up with the default information, but it is for show only. It is a poor example of what should be on the tooling page, and it doesn't work. *Again, you need to remove all of it and start fresh.*

Next is our suggestion for tool holders and setting up your tools. If you check out this video that is on our website (<https://youtu.be/m9J9kdvCkK0>) you will see the Drill Chuck Holder #3074 and other End Mill Holders in use.

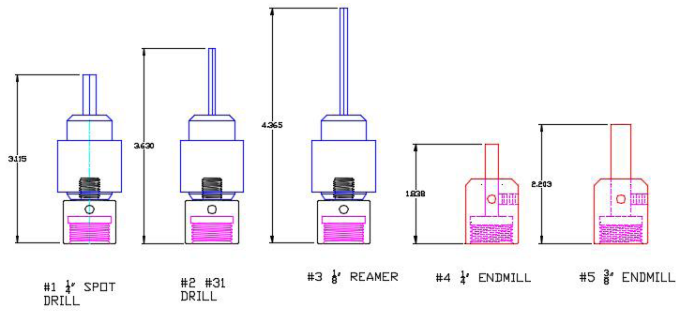


FIGURE 1



FIGURE 2

If you use the #3074 for all of your drills and the end mill holders for your other cutters, setting up your tools and your tool offsets is very easy. The end mill style holders all locate against the shoulder of the headstock spindle. If you use a separate holder for each of your tools, you can measure the overall length of the tool and the holder for each tool. You set up your Z Home position by putting the longest tool on the spindle (in the Figure 3 diagram below it is tool #3). Then you lower the tool until the tip of the tool touches the top of the part (use a piece of .001 shim stock as a feeler gage for tip contact with the top of the part). Then you raise the head 1.0" (or whatever amount of clearance you want between the tip of the tool and the top of the part). This Z level is now your Z home position that all of your tool offset lengths will be set from.



TOOL HEIGHT AND OFFSETS:
 1. SET THE LONGEST TOOL (TOOL#3) 1.0" ABOVE THE TOP OF YOUR PART.
 2. ON THE TOOLING PAGE THE "LENGTH" FOR TOOL #3 WILL BE -1.00.
 3. THE LENGTHS FOR ALL OF THE OTHER (SHORTER) TOOLS WILL BE 1.0 + THE DIFFERENCE IN THEIR LENGTH WHEN COMPARED TO TOOL #3.
 EX: TOOL #1 WILL = -2.25, TOOL #2 WILL = -1.735

FIGURE 3

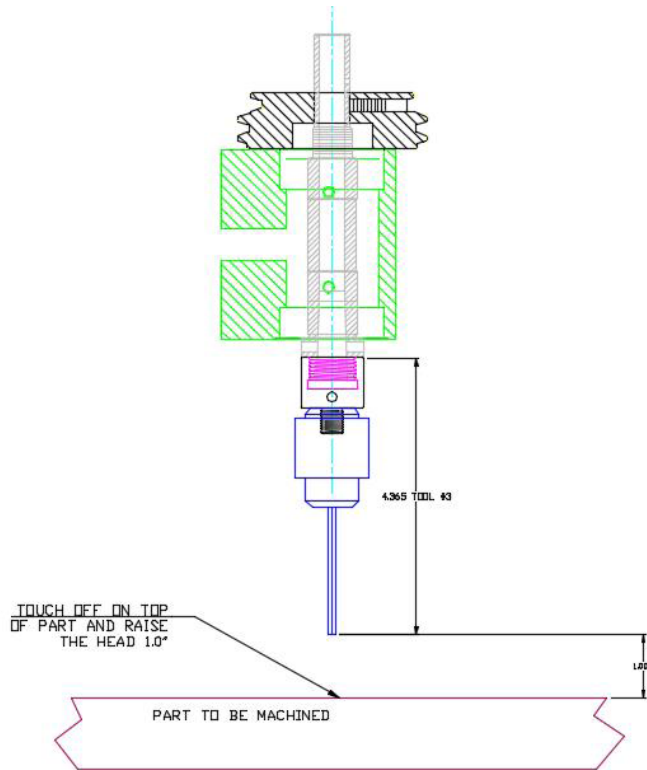


FIGURE 4—If you use this method, setting up your jobs will be easier.

Tooling Page
 Program Name:

Tool #	Tool Description	Tool Length	Tool Offset
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Sample Mill and Lathe Program

NOTE: All of these programs are in INCH and they have a G20 at the beginning. You can run these programs on either inch or metric machines. The G20 and G21 define what the units are in the program. The values in the INI files for the machine that you are using, will translate those units into inch or metric moves for your machine.

TIP: Here's a programming tip that will save you time and frustration. If you are setting up a job that has multiple tools, instead of running one very long program, turn the long program into shorter programs to run each tool separately. The reason for this is that you can't really start the program in the middle or at any one specific tool. If you want to run tool #4, you have to watch the machine cut air for the first three tools, and then run tool #4. Take the first part of the program for tool #1 and make that a short program, and then do the same for each tool after that. You can then call up program 4005-1 (as an example) and run tool #1. Then run program 4005-2 for tool #2 and so on. While you are running each of these individual tool programs, you can modify the feeds and speed or the direction of a cut or rapid move and save them. After you have run all of your tools, cut and paste each of your short edited programs into one complete program to run the rest of the parts.

Sample Mill Program

Following are copies of the print and program for a perpetual motion wheel and stand (Figure 5). The program was designed to be use at a trade show. It will go through and cut portions of most of the shapes, but it will not cut a complete part. This is just for education purposes.

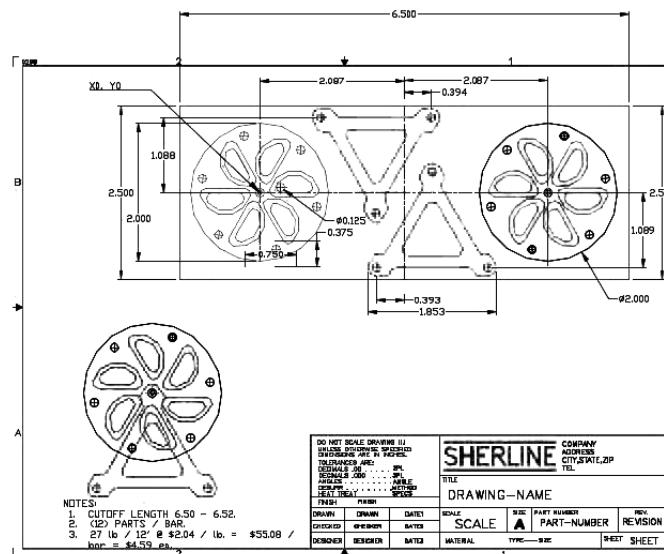


FIGURE 5—Print out of perpetual motion wheel and stand

PROGRAM:

%

(tool 6 END MILL ROUGH D.125 C0. L1.5)

(tool 7 END MILL ROUGH D.125 C.063 L5.)

(tool 7 END MILL FINISH D.125 C.0625 L5.)

(PERPETUAL FOR SHOW M W WITH NEW SLICE LOCATIONS SLICES 1ST TOOL.NC)

G17 G20 G94 G40 G49 G80 G90 G00 X0 Y0 Z0

(MSG, " Change to .125 END MILL ROUGH")

(MSG, " Spindle Speed 2500")

(M0)

G43 G90 H6

G0 Z.100

M0

(Begin FEATURE PROFILE)

G0 X0. Y0. Z.1

G0 X-.2208 Y-.4806

G1 Z-.125 F8.

G42 D6 X-.3357 Y-.577 F8.

G2 X-.3172 Y-.3657 I.1149 J.0964

G1 X-.1772 Y-.2482

G2 X-.0409 Y-.309 I.0534 J-.0636

X-.421 Y-.6279 I-.3148 J-.0107

X-.4571 Y-.4831 I.0172 J.0812

G1 X-.3172 Y-.3657

G2 X-.1059 Y-.3842 I.0964 J-.1149

G1 G40 X-.2208 Y-.4806

G0 Z.1

(SLICE 2)

G0 X.3058 Y-.4315

G0 Z.1

G1 Z-.125 F4.

G42 D6 X.3318 Y-.5792 F8.

G2 X.1581 Y-.4575 I-.026 J.1477

G1 X.1263 Y-.2776

G2 X.2471 Y-.19 I.0817 J.0144

X.3333 Y-.6785 I-.1481 J-.278

X.1898 Y-.6375 I-.0617 J.0555

G1 X.1581 Y-.4575

G2 X.2797 Y-.2838 I.1477 J.026

G1 G40 X.3058 Y-.4315

G0 Z.1

(SLICE 3)

G0 X.5266 Y.0491

G0 Z.1

G1 Z-.125 F4.

G42 D6 X.6675 Y-.0022 F8.

G2 X.4753 Y-.0919 I-.141 J.0513

G1 X.3036 Y-.0294

G2 X.2881 Y.119 I.0284 J.078

X.7542 Y-.0507 I.1667 J-.2673

X.6469 Y-.1544 I-.0789 J-.0257

G1 X.4753 Y-.0919

G2 X.3856 Y.1004 I.0513 J.141

G1 G40 X.5266 Y.0491

G0 Z.1

(SLICE 4)

G0 X.2208 Y.4805

G0 Z.1

G1 Z-.125 F4.

G42 D6 X.3357 Y.5769 F8.

G2 X.3172 Y.3656 I-.1149 J-.0964

G1 X.1772 Y.2482

G2 X.0409 Y.309 I-.0534 J.0636

X.421 Y.6278 I.3148 J.0107

X.4571 Y.483 I-.0172 J-.0812

G1 X.3172 Y.3656

G2 X.1059 Y.3841 I-.0964 J.1149

G1 G40 X.2208 Y.4805

G0 Z.1

(SLICE 5)

G0 X-.3058 Y.4314

G0 Z.1

G1 Z-.125 F4.

G42 D6 X-.3318 Y.5792 F8.

G2 X-.1581 Y.4575 I.026 J-.1477

G1 X-.1263 Y.2776

G2 X-.2471 Y.1899 I-.0817 J-.0144

X-.3333 Y.6785 I.1481 J.278

X-.1898 Y.6374 I.0617 J-.0555

G1 X-.1581 Y.4575

G2 X-.2797 Y.2837 I-.1477 J-.026

G1 G40 X-.3058 Y.4314

G0 Z.1

(SLICE 6)

G0 X-.5266 Y-.0491

G0 Z.10

G1 Z-.125 F4.

G42 D6 X-.6675 Y.0022 F8.

G2 X-.4752 Y.0918 I.141 J-.0513

G1 X-.3036 Y.0294
G2 X-.288 Y-.1191 I-.0284 J-.078
X-.7542 Y.0506 I-.1667 J.2673
X-.6469 Y.1543 I.0789 J.0257
G1 X-.4752 Y.0918
G2 X-.3856 Y-.1004 I-.0513 J-.141
G1 G40 X-.5266 Y-.0491
G0 Z1.1

(SLICE 1B)

G0 X3.6474 Y.0491
G0 Z.1
G1 Z-.125 F4.
G42 D6 X3.7884 Y.1004 F8.
G2 X3.6988 Y-.0919 I-.141 J-.0513
G1 X3.5271 Y-.1544
G2 X3.4198 Y-.0507 I-.0284 J.078
X3.886 Y.119 I.2995 J-.0976
X3.8704 Y-.0294 I-.0439 J-.0704
G1 X3.6988 Y-.0919
G2 X3.5065 Y-.0022 I-.0513 J.141
G1 G40 X3.6474 Y.0491
G0 Z.1

(SLICE 2B)

G0 X3.8682 Y-.4315
G0 Z.10
G1 Z-.125 F4.
G42 D6 X3.8943 Y-.2838 F8.
G2 X4.0159 Y-.4575 I-.026 J-.1477
G1 X3.9842 Y-.6375
G2 X3.8407 Y-.6785 I-.0817 J.0144
X3.9269 Y-.19 I.2343 J.2106
X4.0477 Y-.2776 I.039 J-.0732
G1 X4.0159 Y-.4575
G2 X3.8422 Y-.5792 I-.1477 J.026
G1 G40 X3.8682 Y-.4315
G0 Z1.1

(SLICE 3B)

G0 X4.3948 Y-.4806
G0 Z.10
G1 Z-.125 F4.
G42 D6 X4.2799 Y-.3842 F8.
G2 X4.4912 Y-.3657 I.1149 J-.0964
G1 X4.6311 Y-.4831
G2 X4.595 Y-.6279 I-.0534 J-.0636
X4.2149 Y-.309 I-.0652 J.3082
X4.3512 Y-.2482 I.083 J-.0028
G1 X4.4912 Y-.3657
G2 X4.5097 Y-.577 I-.0964 J-.1149
G1 G40 X4.3948 Y-.4806
G0 Z.1

(SLICE 4B)

G0 X4.7006 Y-.0491
G0 Z.1
G1 Z-.035 F4.
G42 D6 X4.5596 Y-.1004 F8.
G2 X4.6493 Y.0918 I.141 J.0513
G1 X4.8209 Y.1543
G2 X4.9282 Y.0506 I.0284 J-.078
X4.4621 Y-.1191 I-.2995 J.0976
X4.4776 Y.0294 I.0439 J.0704
G1 X4.6493 Y.0918
G2 X4.8415 Y.0022 I.0513 J-.141
G1 G40 X4.7006 Y-.0491
G0 Z.1

(SLICE 5B)

G0 X4.4798 Y.4314
G0 Z.1
G1 Z-.035 F4.
G42 D6 X4.4537 Y.2837 F8.
G2 X4.3321 Y.4575 I.026 J.1477
G1 X4.3638 Y.6374
G2 X4.5073 Y.6785 I.0817 J-.0144
X4.4211 Y.1899 I-.2343 J-.2106
X4.3003 Y.2776 I-.039 J.0732
G1 X4.3321 Y.4575
G2 X4.5058 Y.5792 I.1477 J-.026

G1 G40 X4.4798 Y.4314

G0 Z.1

(SLICE 6B)

G0 X3.9532 Y.4805

G0 Z.10

G1 Z-.035 F4.

G42 D6 X4.0681 Y.3841 F8.

G2 X3.8568 Y.3656 I-.1149 J.0964

G1 X3.7169 Y.483

G2 X3.753 Y.6278 I.0534 J.0636

X4.1331 Y.309 I.0652 J-.3082

X3.9968 Y.2482 I-.083 J.0028

G1 X3.8568 Y.3656

G2 X3.8383 Y.5769 I.0964 J.1149

G1 G40 X3.9532 Y.4805

G0 Z.1

(tool 1 END MILL ROUGH D.125 C0. L1.5)

(PERPETUAL M W WITH NEW SLICE LOCATIONS SLICES 4TH TOOL.NC)

G17 G20 G94 G40 G80 G90 G00 X0 Y0 Z.1

(MSG, " Change to .125 END MILL ROUGH")

(MSG, " Spindle Speed 2500")

(Begin FEATURE PROFILE)

G0 X0. Y0. Z.1

G0 X-.24 Y-.4576

G1 Z-.125 F8.

G42 D6 X-.355 Y-.554

G2 X-.3365 Y-.3427 I.1149 J.0964

G1 X-.1965 Y-.2253

G2 X-.0109 Y-.308 I.0726 J-.0866

X-.4272 Y-.6572 I-.3448 J-.0117

X-.4764 Y-.4601 I.0234 J.1106

G1 X-.3365 Y-.3427

G2 X-.1251 Y-.3612 I.0964 J-.1149

G1 G40 X-.24 Y-.4576

G0 Z.1

G0 X.2762 Y-.4367

G1 Z-.125 F8.

G42 D6 X.3023 Y-.5844
G2 X.1285 Y-.4627 I-.026 J.1477
G1 X.0968 Y-.2828
G2 X.2612 Y-.1635 I.1113 J.0196
X.3556 Y-.6986 I-.1622 J-.3045
X.1603 Y-.6427 I-.084 J.0755
G1 X.1285 Y-.4627
G2 X.2502 Y-.289 I.1477 J.026
G1 G40 X.2762 Y-.4367
G0 Z.1

G0 X.5163 Y.0209
G1 Z-.125 F8.
G42 D6 X.6572 Y-.0304
G2 X.465 Y-.1201 I-.141 J.0513
G1 X.2933 Y-.0576
G2 X.2722 Y.1445 I.0386 J.1062
X.7827 Y-.0414 I.1826 J-.2927
X.6367 Y-.1826 I-.1074 J-.035
G1 X.465 Y-.1201
G2 X.3753 Y.0722 I.0513 J.141
G1 G40 X.5163 Y.0209
G0 Z.1

G0 X.24 Y.4575
G1 Z-.125 F8.
G42 D6 X.355 Y.554
G2 X.3365 Y.3426 I-.1149 J-.0964
G1 X.1965 Y.2252
G2 X.011 Y.3079 I-.0726 J.0866
X.4272 Y.6572 I.3448 J.0117
X.4764 Y.4601 I-.0234 J-.1106
G1 X.3365 Y.3426
G2 X.1251 Y.3611 I-.0964 J.1149
G1 G40 X.24 Y.4575
G0 Z.1

G0 X-.2762 Y.4366
G1 Z-.125 F8.
G42 D6 X-.3023 Y.5844
G2 X-.1285 Y.4627 I.026 J-.1477
G1 X-.0968 Y.2828
G2 X-.2612 Y.1634 I-.1113 J-.0196

X-.3556 Y.6985 I.1622 J.3045
X-.1602 Y.6426 I.084 J-.0755
G1 X-.1285 Y.4627
G2 X-.2502 Y.2889 I-.1477 J-.026
G1 G40 X-.2762 Y.4366
G0 Z.1

G0 X-.5163 Y-.0209
G1 Z-.125 F8.
G42 D6 X-.6572 Y.0304
G2 X-.465 Y.12 I.141 J-.0513
G1 X-.2933 Y.0575
G2 X-.2722 Y-.1445 I-.0386 J-.1062
X-.7827 Y.0413 I-.1826 J.2927
X-.6367 Y.1825 I.1074 J.035
G1 X-.465 Y.12
G2 X-.3753 Y-.0722 I-.0513 J-.141
G1 G40 X-.5163 Y-.0209
G0 Z.1

(SIDE 2)

G0 X3.6577 Y.0209
G1 Z-.125 F8.
G42 D6 X3.7987 Y.0722
G2 X3.709 Y-.1201 I-.141 J-.0513
G1 X3.5373 Y-.1826
G2 X3.3913 Y-.0414 I-.0386 J.1062
X3.9018 Y.1445 I.328 J-.1069
X3.8807 Y-.0576 I-.0598 J-.0959
G1 X3.709 Y-.1201
G2 X3.5168 Y-.0304 I-.0513 J.141
G1 G40 X3.6577 Y.0209
G0 Z.1

G0 X3.934 Y.4575
G1 Z-.035 F8.
G42 D6 X4.0489 Y.3611
G2 X3.8375 Y.3426 I-.1149 J.0964
G1 X3.6976 Y.4601
G2 X3.7468 Y.6572 I.0726 J.0866
X4.1631 Y.3079 I.0714 J-.3375
X3.9775 Y.2252 I-.1129 J.0038

G1 X3.8375 Y.3426
G2 X3.819 Y.554 I.0964 J.1149
G1 G40 X3.934 Y.4575
G0 Z.1

G0 X4.4502 Y.4366
G1 Z-.035 F8.
G42 D6 X4.4242 Y.2889
G2 X4.3025 Y.4627 I.026 J.1477
G1 X4.3343 Y.6426
G2 X4.5296 Y.6985 I.1113 J-.0196
X4.4352 Y.1634 I-.2566 J-.2306
X4.2708 Y.2828 I-.0531 J.0997
G1 X4.3025 Y.4627
G2 X4.4763 Y.5844 I.1477 J-.026
G1 G40 X4.4502 Y.4366
G0 Z.11

(tool 1 END MILL ROUGH D.125 C.063 L5.)

(PERPETUAL MOTION WHEEL MILL STAND CENTER.NC)

G17 G20 G94 G40 G80 G90 G00 X1.6 Y.3 Z.11
(MSG, " Change to .125 END MILL ROUGH")
(MSG, " Spindle Speed 2500")
(M0)
(Top Stand)

G0 Z.11
(M0)
(Begin FEATURE PROFILE)
X1.6298 Y.323
g1 Z.06 F8.
G42 D6 X1.7198 Y.4788
G2 X1.7856 Y.233 I-.09 J-.1559
G0 X1.6298 Y.323 Z.11
G1 X1.7856 Y.233 Z.01
X1.7517 Y.1742 Z.0064
G2 X1.608 Y.1742 Z-.0027 I-.0719 J.0415
G1 X1.4307 Y.4813 Z-.0213
X1.2533 Y.7884
G2 X1.3252 Y.9129 I.0719 J.0415
G1 X2.0345
G2 X2.1063 Y.7884 I0. J-.083

G1 X1.7517 Y.1742
G2 X1.608 Y.1742 I-.0719 J.0415
G1 X1.4307 Y.4813
Z.06
G2 X1.4965 Y.7272 I.1559 J.09
G1 G40 X1.5865 Y.5713
G0 Z.21

(Bottom Stand)

G0 X2.5455 Y-.3235
G1 Z.06 F6.
G42 D6 X2.4555 Y-.4794
G2 X2.3896 Y-.2335 I.09 J.1559
G1 Z.01
X2.4235 Y-.1748 Z.0064
G2 X2.5672 Y-.1748 Z-.0027 I.0719 J-.0415
G1 X2.7446 Y-.4819 Z-.0213
X2.9219 Y-.789
G2 X2.85 Y-.9135 I-.0719 J-.0415
G1 X2.1407
G2 X2.0689 Y-.789 I0. J.083
G1 X2.4235 Y-.1748
G2 X2.5672 Y-.1748 I.0719 J-.0415
G1 X2.7446 Y-.4819
Z.06
G2 X2.6787 Y-.7278 I-.1559 J-.09
G1 G40 X2.5887 Y-.5719
G0 Z.11
G1 X2.5455 Y-.3235 Z.06 F6.
G42 D6 X2.4555 Y-.4794
G2 X2.3896 Y-.2335 I.09 J.1559
G1 Z-.0213
X2.4235 Y-.1748 Z-.0248
G2 X2.5672 Y-.1748 Z-.0339 I.0719 J-.0415
G1 X2.7446 Y-.4819 Z-.0525
X2.9219 Y-.789
G2 X2.85 Y-.9135 I-.0719 J-.0415
G1 X2.1407
G2 X2.0689 Y-.789 I0. J.083
G1 X2.4235 Y-.1748
G2 X2.5672 Y-.1748 I.0719 J-.0415
G1 X2.7446 Y-.4819

Z.06

G2 X2.6787 Y-.7278 I-.1559 J-.09

G1 G40 X2.5887 Y-.5719

G0 Z.11

G1 X2.5455 Y-.3235 Z.06 F6.

G42 D6 X2.4555 Y-.4794

G2 X2.3896 Y-.2335 I.09 J.1559

G1 Z-.0525

X2.4235 Y-.1748 Z-.0561

G2 X2.5672 Y-.1748 Z-.0652 I.0719 J-.0415

G1 X2.7446 Y-.4819 Z-.0838

X2.9219 Y-.789

G2 X2.85 Y-.9135 I-.0719 J-.0415

G1 X2.1407

G2 X2.0689 Y-.789 I0. J.083

G1 X2.4235 Y-.1748

G2 X2.5672 Y-.1748 I.0719 J-.0415

G1 X2.7446 Y-.4819

Z.06

G2 X2.6787 Y-.7278 I-.1559 J-.09

G1 G40 X2.5887 Y-.5719

G0 Z.11

G1 X2.5455 Y-.3235 Z.06 F6.

G42 D6 X2.4555 Y-.4794

G2 X2.3896 Y-.2335 I.09 J.1559

G1 Z-.0838

X2.4235 Y-.1748 Z-.0873

G2 X2.5672 Y-.1748 Z-.0964 I.0719 J-.0415

G1 X2.7446 Y-.4819 Z-.100

X2.9219 Y-.789

G2 X2.85 Y-.9135 I-.0719 J-.0415

G1 X2.1407

G2 X2.0689 Y-.789 I0. J.083

G1 X2.4235 Y-.1748

G2 X2.5672 Y-.1748 I.0719 J-.0415

G1 X2.7446 Y-.4819

Z.06

G2 X2.6787 Y-.7278 I-.1559 J-.09

G1 G40 X2.5887 Y-.5719

G0 Z.11

(PERPETUAL MOTION WHEEL MILL STAND PROFILE.NC)

G17 G20 G94 G40 G80 G90 G00 X2.5 Y-1.4

(MSG, " Change to .125 END MILL ROUGH")

(MSG, " Spindle Speed 2500")

(Begin FEATURE PROFILE)

X2.4954 Y-1.3485

G1 Z-.0262 F8.

G42 D6 X2.2454

G2 X2.4954 Y-1.0985 I.25 J0.

G1 X3.0139

G2 X3.0846 Y-1.1535 I0. J-.073

G3 X3.1747 Y-1.2235 I.0901 J.023

G1 X3.2969

G3 X3.4138 Y-1.021 I0. J.135

G1 X3.3527 Y-.9152

G3 X3.247 Y-.8722 I-.0805 J-.0465

G2 X3.164 Y-.8384 I-.0198 J.0703

G1 X2.6455 Y.0596

G2 X2.6578 Y.1484 I.0632 J.0365

G3 X2.6733 Y.2614 I-.065 J.0666

G1 X2.6123 Y.3672

G3 X2.3785 Y.3672 I-.1169 J-.0675

G1 X2.3174 Y.2614

G3 X2.333 Y.1484 I.0805 J-.0465

G2 X2.3452 Y.0596 I-.051 J-.0522

G1 X1.8267 Y-.8384

G2 X1.7437 Y-.8722 I-.0632 J.0365

G3 X1.638 Y-.9152 I-.0252 J-.0895

G1 X1.577 Y-1.021

G3 X1.6939 Y-1.2235 I.1169 J-.0675

G1 X1.816

G3 X1.9061 Y-1.1535 I0. J.093

G2 X1.9769 Y-1.0985 I.0707 J-.018

G1 X2.4954

G2 X2.7454 Y-1.3485 I0. J-.25

G1 G40 X2.4954

G0 Z.11

Z.0838

G1 Z-.0525 F8.

G42 D6 X2.2454

G2 X2.4954 Y-1.0985 I.25 J0.

G1 X3.0139

G2 X3.0846 Y-1.1535 I0. J-.073

G3 X3.1747 Y-1.2235 I.0901 J.023

G1 X3.2969
G3 X3.4138 Y-1.021 I0. J.135
G1 X3.3527 Y-.9152
G3 X3.247 Y-.8722 I-.0805 J-.0465
G2 X3.164 Y-.8384 I-.0198 J.0703
G1 X2.6455 Y.0596
G2 X2.6578 Y.1484 I.0632 J.0365
G3 X2.6733 Y.2614 I-.065 J.0666
G1 X2.6123 Y.3672
G3 X2.3785 Y.3672 I-.1169 J-.0675
G1 X2.3174 Y.2614
G3 X2.333 Y.1484 I.0805 J-.0465
G2 X2.3452 Y.0596 I-.051 J-.0522
G1 X1.8267 Y-.8384
G2 X1.7437 Y-.8722 I-.0632 J.0365
G3 X1.638 Y-.9152 I-.0252 J-.0895
G1 X1.577 Y-1.021
G3 X1.6939 Y-1.2235 I.1169 J-.0675
G1 X1.816
G3 X1.9061 Y-1.1535 I0. J.093
G2 X1.9769 Y-1.0985 I.0707 J-.018
G1 X2.4954
G2 X2.7454 Y-1.3485 I0. J-.25
G1 G40 X2.4954
G0 Z.11
Z.0575
G1 Z-.088 F8.
G42 D6 X2.2454
G2 X2.4954 Y-1.0985 I.25 J0.
G1 X3.0139
G2 X3.0846 Y-1.1535 I0. J-.073
G3 X3.1747 Y-1.2235 I.0901 J.023
G1 X3.2969
G3 X3.4138 Y-1.021 I0. J.135
G1 X3.3527 Y-.9152
G3 X3.247 Y-.8722 I-.0805 J-.0465
G2 X3.164 Y-.8384 I-.0198 J.0703
G1 X2.6455 Y.0596
G2 X2.6578 Y.1484 I.0632 J.0365
G3 X2.6733 Y.2614 I-.065 J.0666
G1 X2.6123 Y.3672
G3 X2.3785 Y.3672 I-.1169 J-.0675
G1 X2.3174 Y.2614

G3 X2.333 Y.1484 I.0805 J-.0465
G2 X2.3452 Y.0596 I-.051 J-.0522
G1 X1.8267 Y-.8384
G2 X1.7437 Y-.8722 I-.0632 J.0365
G3 X1.638 Y-.9152 I-.0252 J-.0895
G1 X1.577 Y-1.021
G3 X1.6939 Y-1.2235 I.1169 J-.0675
G1 X1.816
G3 X1.9061 Y-1.1535 I0. J.093
G2 X1.9769 Y-1.0985 I.0707 J-.018
G1 X2.4954
G2 X2.7454 Y-1.3485 I0. J-.25
G1 G40 X2.4954
G0 Z.11
Z.0313
G1 Z-.100 F8.
G42 D6 X2.2454
G2 X2.4954 Y-1.0985 I.25 J0.
G1 X3.0139
G2 X3.0846 Y-1.1535 I0. J-.073
G3 X3.1747 Y-1.2235 I.0901 J.023
G1 X3.2969
G3 X3.4138 Y-1.021 I0. J.135
G1 X3.3527 Y-.9152
G3 X3.247 Y-.8722 I-.0805 J-.0465
G2 X3.164 Y-.8384 I-.0198 J.0703
G1 X2.6455 Y.0596
G2 X2.6578 Y.1484 I.0632 J.0365
G3 X2.6733 Y.2614 I-.065 J.0666
G1 X2.6123 Y.3672
G3 X2.3785 Y.3672 I-.1169 J-.0675
G1 X2.3174 Y.2614
G3 X2.333 Y.1484 I.0805 J-.0465
G2 X2.3452 Y.0596 I-.051 J-.0522
G1 X1.8267 Y-.8384
G2 X1.7437 Y-.8722 I-.0632 J.0365
G3 X1.638 Y-.9152 I-.0252 J-.0895
G1 X1.577 Y-1.021
G3 X1.6939 Y-1.2235 I.1169 J-.0675
G1 X1.816
G3 X1.9061 Y-1.1535 I0. J.093
G2 X1.9769 Y-1.0985 I.0707 J-.018
G1 X2.4954

G2 X2.7454 Y-1.3485 I0. J-.25

G1 G40 X2.4954

G0 Z.11

G0 X1.6798 Y1.3479

g1 Z-.035 F8.

G42 D6 X1.9298

G2 X1.6798 Y1.0979 I-.25 J0.

G1 X1.1614

G2 X1.0906 Y1.1529 I0. J.073

G3 X1.0005 Y1.2229 I-.0901 J-.023

G1 X.8784

G3 X.7614 Y1.0204 I0. J-.135

G1 X.8225 Y.9146

G3 X.9282 Y.8716 I.0805 J.0465

G2 X1.0112 Y.8378 I.0198 J-.0703

G1 X1.5297 Y-.0602

G2 X1.5174 Y-.149 I-.0632 J-.0365

G3 X1.5019 Y-.262 I.065 J-.0666

G1 X1.5629 Y-.3678

G3 X1.7968 Y-.3678 I.1169 J.0675

G1 X1.8578 Y-.262

G3 X1.8422 Y-.149 I-.0805 J.0465

G2 X1.83 Y-.0602 I.051 J.0522

G1 X2.3485 Y.8378

G2 X2.4315 Y.8716 I.0632 J-.0365

G3 X2.5372 Y.9146 I.0252 J.0895

G1 X2.5982 Y1.0204

G3 X2.4813 Y1.2229 I-.1169 J.0675

G1 X2.3592

G3 X2.2691 Y1.1529 I0. J-.093

G2 X2.1983 Y1.0979 I-.0707 J.018

G1 X1.6798

G2 X1.4298 Y1.3479 I0. J.25

G1 G40 X1.6798

G0 Z.11

(Begin FEATURE PROFILE)

G0 X2.4954 Y-1.3385

G0 z.1

G1 Z-.100 F8.

G42 D6 X2.2454 F8.

G2 X2.4954 Y-1.0885 I.25 J0.

G1 X3.0139

G2 X3.0943 Y-1.151 I0. J-.083
G3 X3.1747 Y-1.2135 I.0804 J.0205
G1 X3.2969
G3 X3.4051 Y-1.026 I0. J.125
G1 X3.344 Y-.9202
G3 X3.2497 Y-.8818 I-.0719 J-.0415
G2 X3.1554 Y-.8434 I-.0225 J.0799
G1 X2.6369 Y.0546
G2 X2.6508 Y.1555 I.0719 J.0415
G3 X2.6647 Y.2564 I-.058 J.0594
G1 X2.6036 Y.3622
G3 X2.3871 Y.3622 I-.1083 J-.0625
G1 X2.326 Y.2564
G3 X2.34 Y.1555 I.0719 J-.0415
G2 X2.3539 Y.0546 I-.058 J-.0594
G1 X1.8354 Y-.8434
G2 X1.741 Y-.8818 I-.0719 J.0415
G3 X1.6467 Y-.9202 I-.0225 J-.0799
G1 X1.5856 Y-1.026
G3 X1.6939 Y-1.2135 I.1083 J-.0625
G1 X1.816
G3 X1.8964 Y-1.151 I0. J.083
G2 X1.9769 Y-1.0885 I.0804 J-.0205
G1 X2.4954
G2 X2.7454 Y-1.3385 I0. J-.25
G1 G40 X2.4954
G0 Z1.11
G0 X1.6798 Y1.3379
g0 z.1
g1 Z-.035 F8.
G42 D6 X1.9298 F8.
G2 X1.6798 Y1.0879 I-.25 J0.
G1 X1.1614
G2 X1.0809 Y1.1504 I0. J.083
G3 X1.0005 Y1.2129 I-.0804 J-.0205
G1 X.8784
G3 X.7701 Y1.0254 I0. J-.125
G1 X.8312 Y.9196
G3 X.9255 Y.8812 I.0719 J.0415
G2 X1.0199 Y.8428 I.0225 J-.0799
G1 X1.5383 Y-.0552
G2 X1.5244 Y-.1561 I-.0719 J-.0415
G3 X1.5105 Y-.257 I.058 J-.0594

G1 X1.5716 Y-.3628
G3 X1.7881 Y-.3628 I.1083 J.0625
G1 X1.8492 Y-.257
G3 X1.8353 Y-.1561 I-.0719 J.0415
G2 X1.8213 Y-.0552 I.058 J.0594
G1 X2.3398 Y.8428
G2 X2.4342 Y.8812 I.0719 J-.0415
G3 X2.5285 Y.9196 I.0225 J.0799
G1 X2.5896 Y1.0254
G3 X2.4813 Y1.2129 I-.1083 J.0625
G1 X2.3592
G3 X2.2788 Y1.1504 I0. J-.083
G2 X2.1983 Y1.0879 I-.0804 J.0205
G1 X1.6798
G2 X1.4298 Y1.3379 I0. J.25
G1 G40 X1.6798
G0 Z.11

(PERPETUAL MOTION WHEEL MILL WHEEL PROFILE.NC)

G17 G20 G94 G40 G80 G90 G00 X4.1 Y-1.3

(Second Wheel)

G0 X4.1739 y-1.35
g1 Z-.045 F8.
g1 y-1.2
G42 D6 X3.9739
G2 X4.1739 Y-1. I.2 J0.
G3 X4.1739 Y1. I0. J1.
X4.1739 Y-1. I0. J-1.
G2 X4.3739 Y-1.2 I0. J-.2
G1 G40 X4.1739
G0 Z.11

(First Wheel)

(Begin FEATURE PROFILE)

G0 X0. Y-1.35
G0 z.11
G1 Z-.063 F8.
g1 y-1.2
G42 D6 X-.2

G2 X0. Y-1. I.2 J0.
G3 X0. Y1. I0. J1.
X0. Y-1. I0. J-1.
G2 X.2 Y-1.2 I0. J-.2
G1 G40 X0.

G0 X0. Y-1.35
G0 z.11
G1 Z-.100 F8.
g1 y-1.2
G42 D6 X-.2
G2 X0. Y-1. I.2 J0.
G3 X0. Y1. I0. J1.
X0. Y-1. I0. J-1.
G2 X.2 Y-1.2 I0. J-.2
G1 G40 X0.

G0 X0. Y-1.35
G0 z.11
G1 Z-.100 F8.
g1 y-1.2
G42 D6 X-.2
G2 X0. Y-1. I.2 J0.
G3 X0. Y1. I0. J1.
X0. Y-1. I0. J-1.
G2 X.2 Y-1.2 I0. J-.2
G1 G40 X0.
G0 Z.11
G90 G00 G49 Z0

G90 G00 G40 G80 X0.0 Y0.0 Z0.0
M2

EMC2 Thread Milling Program

%
(MSG Thread Milling Program)
(TOOL #1 IS A 1/4" DIAMETER SINGLE TIP THREAD MILL)
(Z ZERO IS THE TOP OF THE HOLE AT X0, Y0. THE TOP OF THE STUD IS Z.5)
(WE ARE MILLING 1/2"-20 THREADS, ID AT X0, Y0 AND 1/2"-13 THREADS OD AT X0, Y-1.0)
(1.0" / 20 TPI = .050. THIS IS HOW MUCH THE Z AXIS WILL MOVE FOR EACH REVOLUTION)
(1.0" / 13 TPI = .0769. THIS IS HOW MUCH THE Z AXIS WILL MOVE FOR EACH REVOLUTION)

G17 G20 G40 G49 G80 G90 (FIRST LINE G17=X,Y AXIS, G20= INCH, G40 CANCELS ALL CUTTER COMP, G49 CANCELS ALL LENGTH COMP, G80 CANCELS ALL CAN CYCLES, G90 IS ABSOLUTE POSITIONING)
(THIS LINE OF CODE CANCELS EVERYTHING THAT MAY BE RETAINED SHOULD YOU STOP, AND RESTART THIS PROGRAM. THIS SETS EVERYTHING AT ZERO)

(Begin FEATURE THREAD MILL 1/2-20 HOLE .400 DEEP)

G90 G00 G80 G40 G49 X0.0 Y0.0 (CANCEL ALL AND MOVE TO CENTERLINE OF HOLE)

G43 H1 Z.1 (G43 INCORPORATES LENGTH COMPENSATION, H1 IS FOR TOOL #1, TOOL MOVES TO .100 ABOVE Z 0 SURFACE)

z0.0

(LINE EXPLANATION)

g91 g01 g42 d1 x-.250 f60

(FEED OUT FROM CL TO MAJOR DIA. OF THREAD USING G42 CUTTER COMP RIGHT AND CUTTER DIAMETER OFFSET D1)

g91g02 x0 y0 z-0.050 i0.25 j0.0 f6

(G91 = INCREMENTAL)

(G02 = CIRCULAR CUTTING IN THE CLOCKWISE DIRECTION)

(x0 AND y0 = ARC FINISH POINT)

(z = THE THREAD LEAD OR PITCH. A 20 TPI THREAD MOVES .050 FOR EACH FULL ROTATION)

(NOTE: IF YOU WANTED TO CUT A HALF CIRCLE, YOU WOULD CHANGE X0 TO X.5 AND Z-.050 TO Z-.025)

(i = THE INCREMENTAL DISTANCE AND DIRECTION FROM START POINT TO ARC CENTER IN THE X AXIS)

(J = THE INCREMENTAL DISTANCE AND DIRECTION FROM START POINT TO ARC CENTER IN THE y AXIS)

g91g02 x0 y0 z-0.050 i0.25 j0.0 f6 (EACH LINE WILL CUT ONE THREAD)

g91g02 x0 y0 z-0.050 i0.25 j0.0 f6

g91g02 x0 y0 z-0.050 i0.25 j0.0 f6

g91g02 x0 y0 z-0.050 i0.25 j0.0 f6

g91g02 x0 y0 z-0.050 i0.25 j0.0 f6

g91g02 x0 y0 z-0.050 i0.25 j0.0 f6

g91g02 x0 y0 z-0.050 i0.25 j0.0 f6

g91 g00 g40 x.250 (G40 CANCELS CUTTER COMP AS TOOL IS MOVING AWAY FROM THE MATERIAL)

g90 g00 z.600

(Begin FEATURE THREAD MILL O.D. 1/2-13 STUD .384 DEEP)

G90 G00 G80 G40 G49 X0.0 Y-1.0 (CENTER OF 1/2-13 STUD)

(MINOR DIAMETER OF A 1/2-13 THREAD IS 27/64" = .211 RADIUS)

(MOVE AWAY FROM CL OF STUD BY AN AMOUNT THAT IS GREATER THAN THE RADIUS OF THE STUD + CUTTER RADIUS + CLEARANCE)

G91 G00 X-.5

G90 G00 Z.500

(MOVE INTO THE MINOR DIAMETER OF THE THREAD. TAKE .500 -.211 = .289 USING G41 CUTTER COMP LEFT AND D1)

g91 g01 g41 d1 x.289f6

g91g02 x0 y0 z-0.0769 i0.211 j0.0 f6

g91g02 x0 y0 z-0.0769 i0.211 j0.0 f6

g91g02 x0 y0 z-0.0769 i0.211 j0.0 f6

g91g02 x0 y0 z-0.0769 i0.211 j0.0 f6

g91g02 x0 y0 z-0.0769 i0.211 j0.0 f6

g91 g00 g40 x-.289 (G40 CANCELS CUTTER COMP AS TOOL IS MOVING AWAY FROM THE MATERIAL)

g90 g00 z.6

G49 Z0 (G49 Z0 CANCELS LENGTH COMPENSATION)

G90 X1.0 Y1.0

M2

%

NOTES:

Depending on the desired finish and the material that you are cutting, you may want to do a rough and finish pass. You can accomplish this one of two ways.

1. Run the program twice. Add .002 or .003 to the diameter of the cutter on the “tool setup” page for the first run. This will offset the cutter leaving .001 to .0015 of material for a finish pass. Then change the tool diameter back to what it should be, and run the program again.
2. The second way is to program a rough and finish pass. For the ID thread you would change the (I) value from i.250 to i.248 for the roughing pass.

Rough: g91g02 x0 y0 z-0.050 i0.248 j0.0 f6

Finish: g91g02 x0 y0 z-0.050 i0.25 j0.0 f6

For the OD thread you will have to change the G41 line in addition to the threading lines. If you want to leave .001 for a finish pass, you will reduce the (x) value on the G41 line by .001 and increase the (i) value on the threading lines by .001. X.289 is changed to X.288 and i0.211 is changed to i0.212 for the roughing pass.

Rough: g91 g01 g41 d1 x.288 f6

g91g02 x0 y0 z-0.0769 i0.212 j0.0 f6

Finish: g91 g01 g41 d1 x.289 f6

g91g02 x0 y0 z-0.0769 i0.211 j0.0 f6

Lathe Control Page

The lathe uses an entirely different control page and tooling page.

1. Start-up procedure:
 - a. Click on the icon that represents your machine (Lathe Inch or Lathe Metric).
 - b. Home out your machine.
2. If you already have a home position, with the stepper motor power switch on the side of the PC in the “OFF” position. Turn your X and Z handwheels to the correct handwheel setting.
3. If you don’t already have a home position, then you are just going to zero your machine at its current location. Zero your axis.
4. Click on the “Toggle Emergency Stop” icon (See Figure 6).

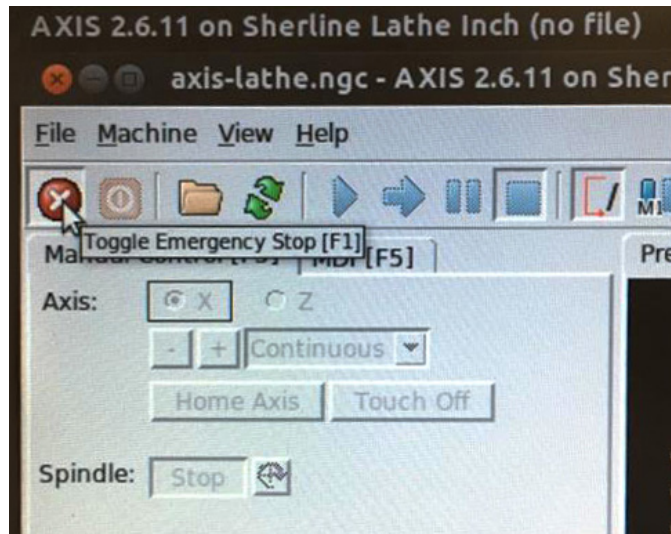


FIGURE 6

5. Click on the “Toggle Machine Power” icon.

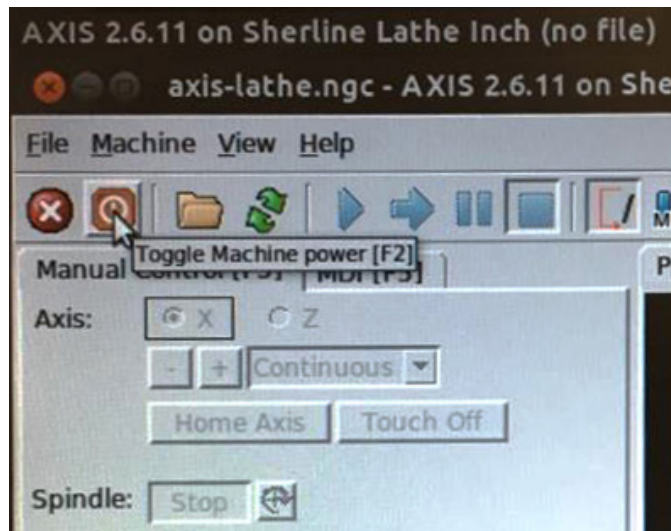


FIGURE 7

6. Click on the axis that you wish to Zero out. The dot will turn black when that axis is activated. Now click on the “Home Axis” icon.

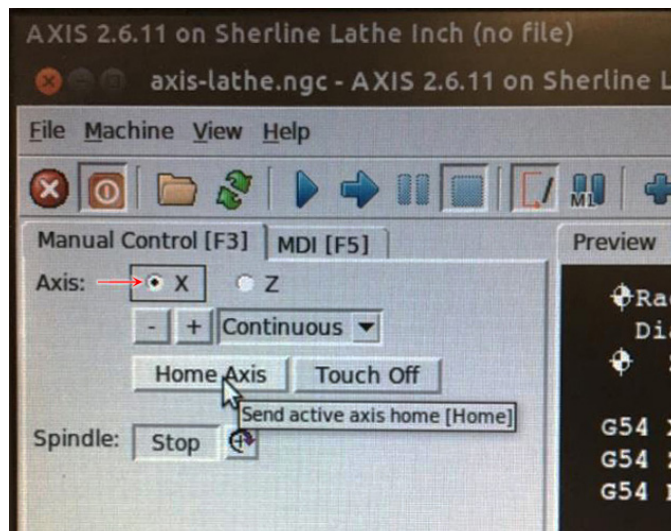


FIGURE 8—Red arrow is pointing to the X-axis radial button.

- Choose the next axis, and then home it too.

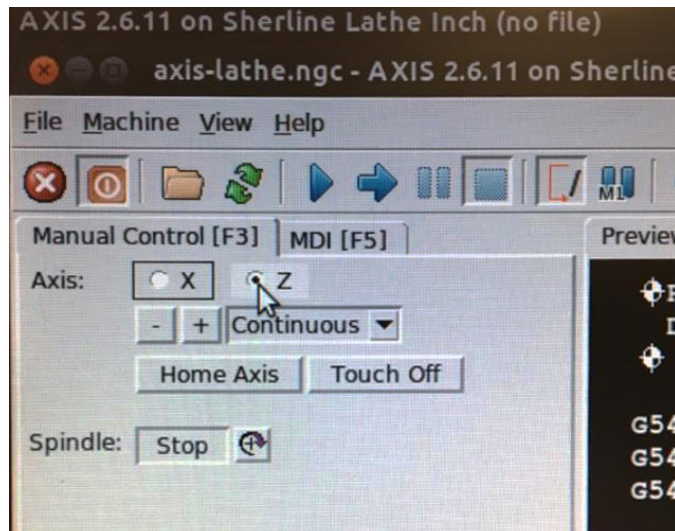


FIGURE 9—Click the Z-axis radial button

- Now your position page will show Zero for your radius, diameter, and Z-axis.

To Access the Tooling Page

- Click on “File” and then click on “Edit Tool Table”

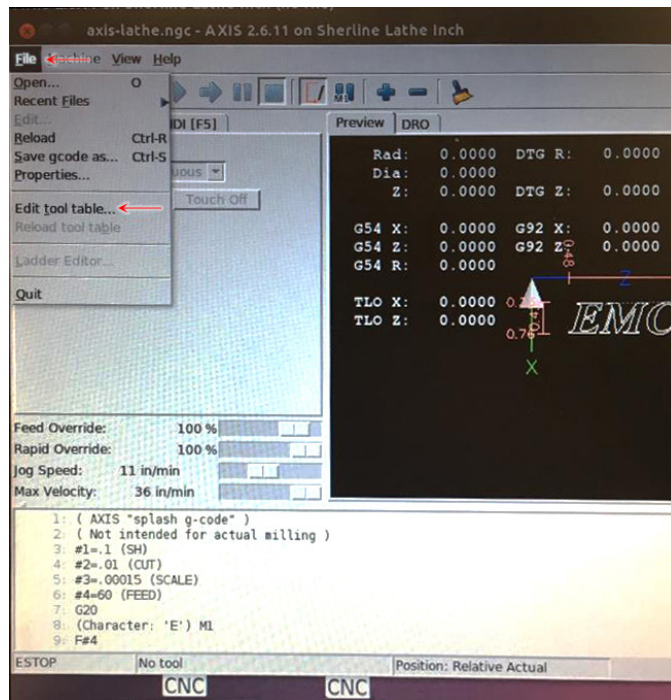


FIGURE 10—Please note the red arrows indicating the “File” and “Edit tool table...” menus.

- This is what your tooling page will look like:
 - The “Tool” and “Pocket” should be the same tool number.
 - Your “X” is the distance from your X Home Position, to the “Centerline” of the part. You will acquire this number by making a cut on the OD of the stock, Writing down the X position shown on the position screen, Measure the diameter of the turned surface, and then adding the radius of that diameter to the X value that is shown on the position page. The sum of those two values is what you enter for your X value on the tool table (see Figure 11).

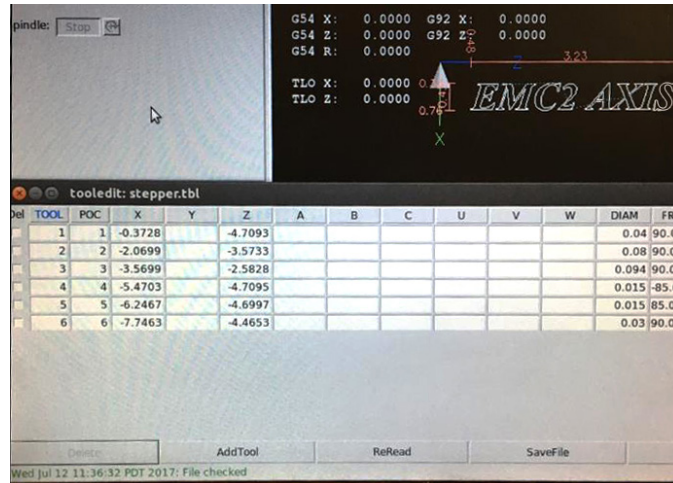


FIGURE 11—Here is a link to more information on LinuxCNC Tool Tables (<http://wiki.linuxcnc.org/cgi-bin/wiki.pl?ToolTable>)
 For this example, we are using a 1/4" dowel pin and just touching off on the side of it.

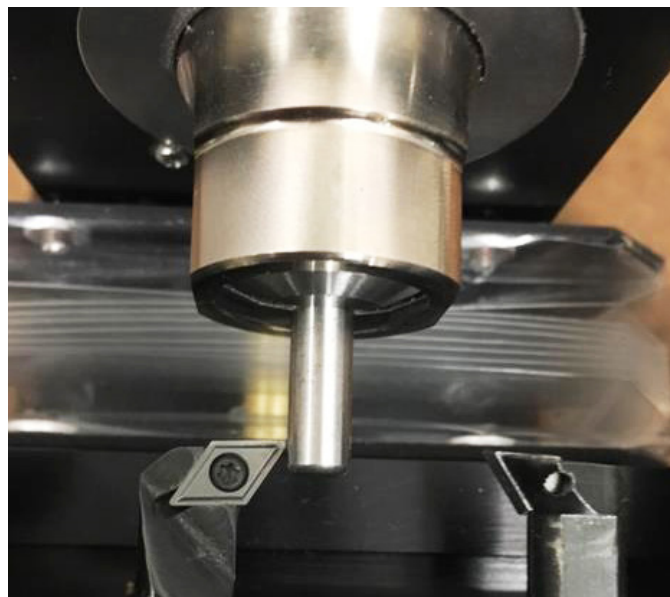


FIGURE 12—Notice the carbide tip on the left just touching the side of the dowel
 Write down the X Radius value from the position screen (X-5.6438)

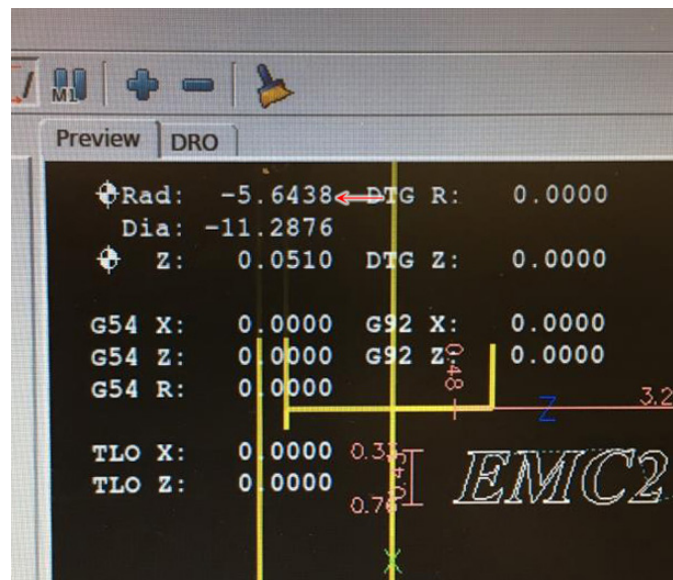


FIGURE 13

Measure the diameter of the part (.2502)



FIGURE 14

Add the radius of the part to the radius amount from the position page and enter that in the X value on the tool page ($-5.6438 + -.1251 = -5.7689$)

c. To get your Z-axis offset numbers:

Take the longest tool, touch it off on the front of the stock (See Figure 15), then move in the Z+ direction by the amount of clearance that you want (Ex 1.00"). Now Zero out the Z-axis (this position will now be your Z Home Position).

The Z offset for the longest tool would then be Z-1.00".

Now touch off the rest of the tools and write down their Z position from the position page.



FIGURE 15—Notice the carbide tip on the left just touching the front of the dowel

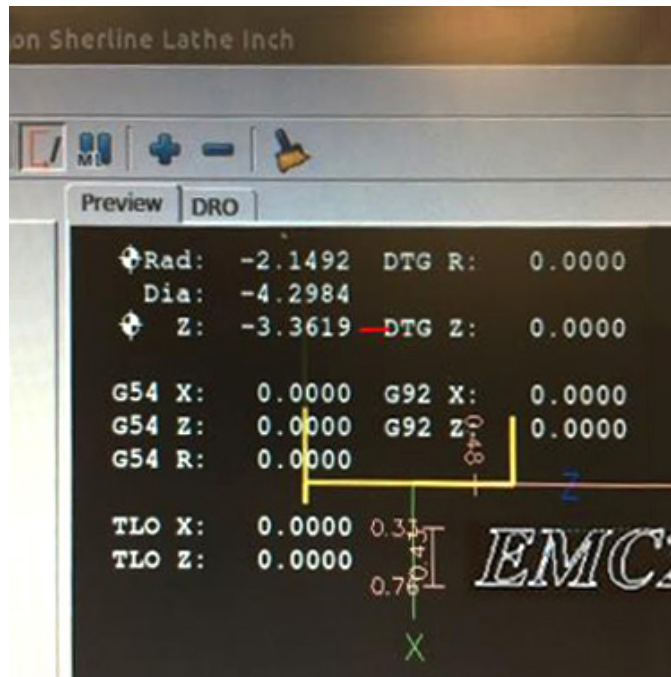


FIGURE 16

Front and Back Angle for Your Insert or other Cutting Tool

Below is a diagram showing how the front and back angles are defined. The insert shown is a 55-degree insert, which is 5 degree off square. The back angle is 30 degrees. The front angle is the sum of the back angle and the included angle of the insert ($30 + 55 = 85$).

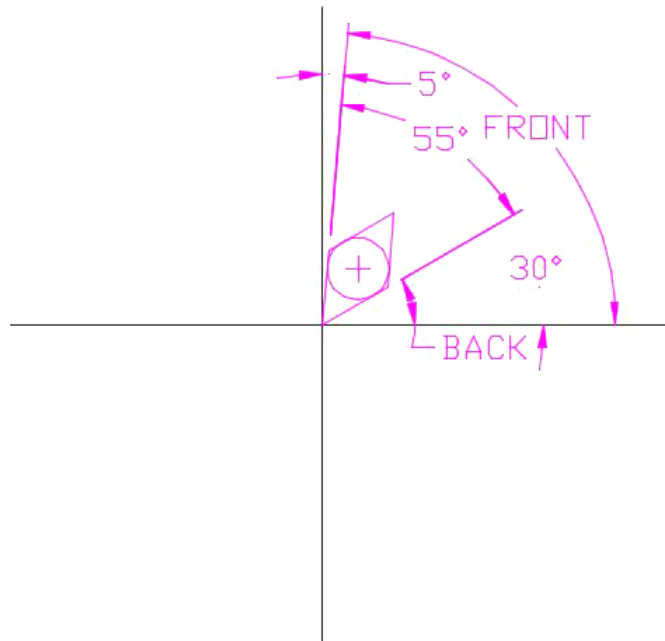
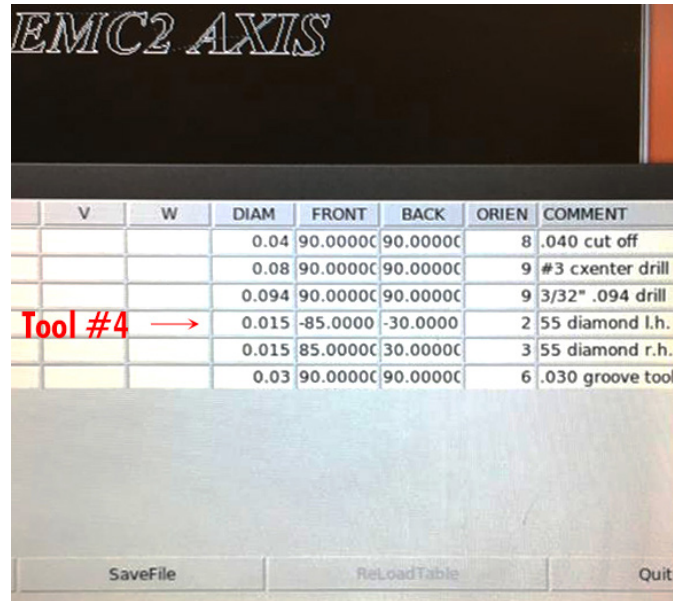


FIGURE 17—The tool above is defined below on the tool page as tool #4 (fourth down from the top of the list in Figure 18).

The tool #4 illustrated in Figure 17 above is a LH tool which is why the front and back numbers are negative in Figure 18 below.



V	W	DIAM	FRONT	BACK	ORIEN	COMMENT
		0.04	90.0000C	90.0000C	8	.040 cut off
		0.08	90.0000C	90.0000C	9	#3 ccenter drill
		0.094	90.0000C	90.0000C	9	3/32" .094 drill
		0.015	-85.0000	-30.0000	2	55 diamond l.h.
		0.015	85.0000C	30.0000C	3	55 diamond r.h.
		0.03	90.0000C	90.0000C	6	.030 groove tool

FIGURE 18

Any time that you make a change to the tool page, click on “Reload Table” and “Save File.”

Lathe Program

1. This program was set up for a part on our CNC Chucker Lathe, which has gang tooling (see Figure 19).

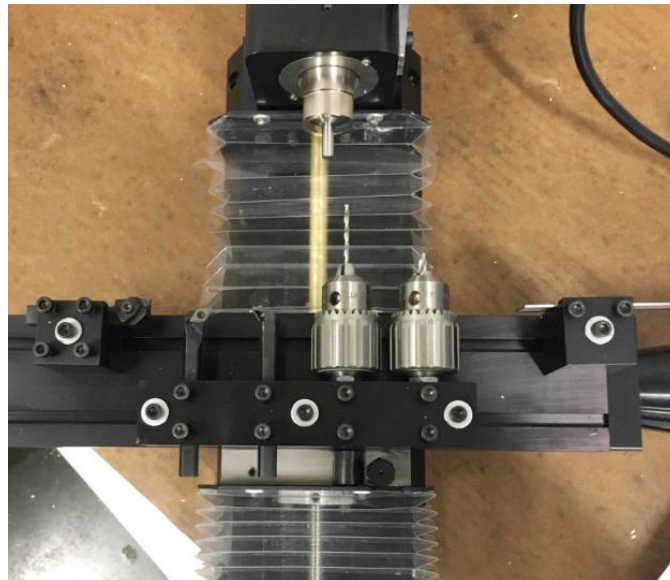


FIGURE 19

2. For this part we are using the following tools (see Figure 20):
 - a. .040 Cut-off tool (which is also used as a stop to set the stock distance from the front of the collet)
 - b. #3 Center drill
 - c. 3/32" .094" Jobber drill
 - d. L.H. 55° insert tool
 - e. R.H. 55° insert tool
 - f. .030 wide groove tool

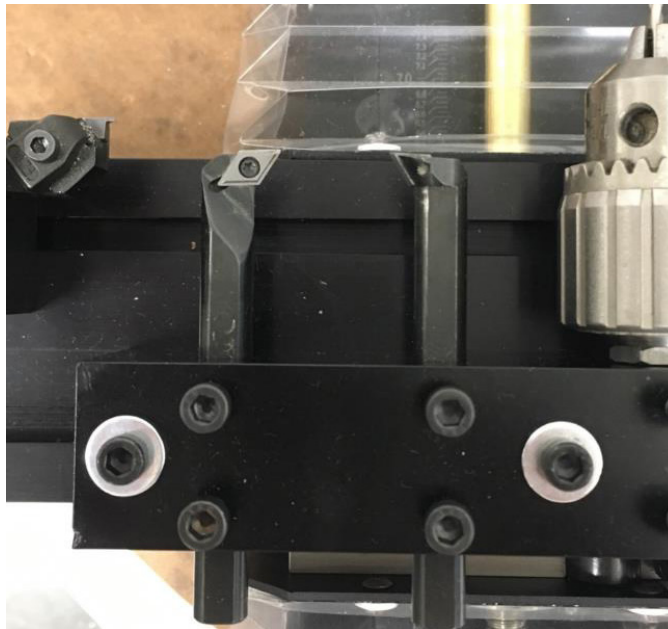


FIGURE 20—NOTE: the LH and RH 55 degree tools are set up to cut on opposite sides of the part.

3. Here is a print of the air fitting that we are making.

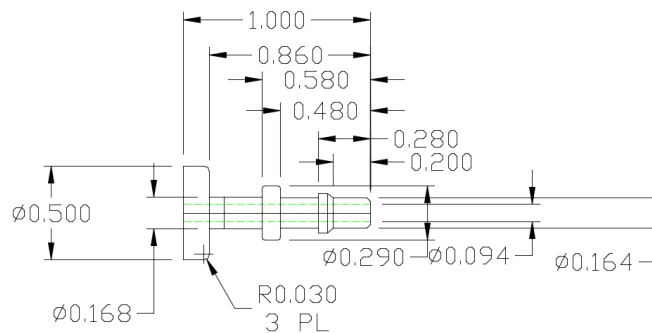


FIGURE 21

4. Here is a copy of the program.

```
%
(Machine Setup - 1 .040 wide Cutoff )
(TOOL #1 )
G80 G94 G7 G40 G20 G18 G90 G54
```

```
T1 M6 G43
G00 X-.6 Z.1
G00 Z-.820
G00 X-.208
G01 X-.118 F2.
G00 X-.208
G00 Z-.800
```

G01 X-.128 Z-.820 F1.0

G01 X.020 F3.0

G00 X0.0

G00 Z.100

G00 X0.0

M01

G01 Z0.0

M01

G00 Z1.

G49

G90G00G54 X0 Z0

(TOOL #2 2 CENTER DRILL)

N200 G00 G94 G7 G40 G20 G18 G90 G54

T2 M6 G43

G90 G00 Z.1

G00 X0

G01 Z-.100 F4.0

G90 G00 Z1.2

G49

(TOOL #3 0.0940 Dia.118.0000 Deg. 1.0000 CL)

N300 G00 G94 G7 G40 G20 G18 G90 G54

T3 M6 G43

G00 Z.1

G00 X0.0

G01 Z-.088 F2.0

G00 Z.1

G00 Z.060

G01 Z-.37

G00 Z.1

G00 Z-.350

G01 Z-.464

G00 Z.1

G00 Z-.440

G01 Z-.558

G00 Z.1

G00 Z-.530

G01 Z-.580

G00 Z.1

G00 Z-.560

G01 Z-.630

G00 Z.1

G00 Z-.610

G01 Z-.680

G00 Z.1

G00 Z-.660

G01 Z-.730

G00 Z.1

G00 Z-.710

G01 Z-.785

G00 Z.1

G00 Z-.76

G01 Z-.840

G00 Z.2

G49

(TOOL #4 55 DIAMNOD BACKSIDE)

N400 G80 G94 G7 G40 G20 G18 G90 G54

T4 M6 G43

G00 X-.7

G00 Z0

G01 X0.0 F3.0

G00 X-.7 Z.052

G00 X-.57

G01 X-.47 Z.002 F6.

G01 Z-.8639

G02 X-.5095 Z-.884 I.0232 K-.0426

G02 X-.5197 Z-.9024 I.0533 K-.0247

G01 X-.52 Z-1.

G01 X-.62 Z-.95

G00 Z.052

G00 X-.52

G01 X-.42 Z.002

G01 Z-.8579

G02 X-.47 Z-.8639 I-.0005 K-.0532

G01 X-.57 Z-.8139
G00 Z.052
G00 X-.47
G01 X-.37 Z.002
G01 Z-.8578
G01 X-.42
G01 X-.52 Z-.8079
G00 Z.052
G00 X-.42
G01 X-.32 Z.002
G01 Z-.8578
G01 X-.37
G01 X-.47 Z-.8078
G00 Z.052
G00 X-.37
G01 X-.27 Z.002
G01 Z-.4807
G02 X-.3044 Z-.498 I.0124 K-.0296
G02 X-.3098 Z-.5083 I.0351 K-.0146
G01 X-.31 Z-.5744
G01 Z-.8578
G01 X-.32
G01 X-.42 Z-.8078
G00 Z.052
G00 X-.32
G01 X-.22 Z.002
G01 Z-.2335
G02 X-.23 Z-.2474 I.0165 K-.0138
G01 Z-.4778
G02 X-.27 Z-.4807 I-.0033 K-.0475
G01 X-.37 Z-.4307
G00 Z.052
G00 X-.27
G01 X-.17 Z.002
G01 Z-.0214
G02 X-.1823 Z-.0313 I.0136 K-.0153
G02 X-.184 Z-.0494 I.0705 K-.0122
G01 Z-.2097
G01 X-.22 Z-.2335
G01 X-.32 Z-.1835
G00 Z.052
G00 X-.22
G01 X-.12 Z.002

G01 Z.0006
G01 X-.1298 Z-.0017
G01 X-.1687 Z-.0207
G01 X-.17 Z-.0214
G01 X-.27 Z.0286
G00 Z.052
G00 X-.1867
G01 X-.0867 Z.002
G01 X-.1122 Z.0017
G01 X-.12 Z.0006
G01 X-.22 Z.0506
G00 X-.53
G00 Z-.2356
G01 X-.33
G01 X-.23 Z-.2856
G01 X-.2282 Z-.3002
G01 X-.1984 Z-.3275
G01 X-.184 Z-.3404
G01 Z-.3571
G01 Z-.4777
G01 X-.23 Z-.4778
G01 X-.33 Z-.4278
G00 X-.61
G00 Z-.5244
G01 X-.41
G01 X-.31 Z-.5744
G02 X-.3019 Z-.5959 I.0383 K-.004
G01 X-.26 Z-.6326
G01 Z-.8578
G01 X-.31
G01 X-.41 Z-.8078
G00 Z-.5826
G00 X-.36
G01 X-.26 Z-.6326
G01 X-.21 Z-.6759
G01 Z-.8577
G01 X-.26
G01 X-.36 Z-.8078
G00 Z-.6259
G00 X-.31
G01 X-.21 Z-.6759
G01 X-.194 Z-.6899
G03 X-.188 Z-.7022 I-.0114 K-.0093

G01 Z-.8577
G01 X-.21
G01 X-.31 Z-.8077
G00 X-.6
G00 Z.2
G49

(TOOL #5 55 DIAMOND FRONTSIDE)

N500 G80 G94 G7 G40 G20 G18 G90 G54

T5 M6 G43

G00 X.7 Z.0497

G00 X.1038

G01 X.0038 Z-.0003 F4.

G01 X.0942

G03 X.1131 Z-.0041 I-.0006 K-.0153

G01 X.1503 Z-.0223

G03 X.164 Z-.0395 I-.0127 K-.015

G01 Z-.2103

G01 X.2071 Z-.2391

G01 X.21 Z-.2464

G01 X.2092 Z-.2977

G01 X.2023 Z-.3063

G01 X.1659 Z-.3378

G01 X.164 Z-.3419

G01 Z-.4797

G01 X.2308 Z-.4799

G01 X.2424 Z-.481

G03 X.2664 Z-.4869 I-.0074 K-.03

G03 X.2892 Z-.5077 I-.0177 K-.0232

G03 X.2884 Z-.5865 I-1.3457 K-.0332

G03 X.2761 Z-.6006 I-.0428 K.0102

G01 X.1744 Z-.6887

G02 X.168 Z-.6965 I.0063 K-.0071

G01 Z-.8597

G01 X.4104 Z-.8599

G03 X.4786 Z-.8766 I-.0016 K-.0463

G03 X.4973 Z-.8955 I-.0308 K-.027

G03 X.5 Z-.9172 I-.0777 K-.0157

G01 Z-1.

G01 X.6 Z-.95

G00 X.8

G00 Z.5

G00 G49

(TOOL #6 OD GROOVE .030 WIDE)

N600 G80 G94 G7 G40 G20 G18 G90 G54

T6 M6 G43

G00 X.5

G00 Z-.3149

G00 X.274

G01 X.214 F4.

G00 X.254

G00 X.224

G01 X.184

G00 X.274

G00 Z-.3349

G01 X.214

G00 X.254

G00 X.224

G01 X.184

G01 X.204 Z-.3299

G00 X.274

G00 Z-.3447

G01 X.214

G00 X.254

G00 X.224

G01 X.184

G01 X.204 Z-.3397

G00 X.274

G00 Z-.3453

G01 X.23

G01 X.25 Z-.3403

G00 X.254

G00 X.184

G00 X.2348

(Machine Setup - 1 Turn Groove Finish)

(TOOL #6 OD GROOVE .030 WIDE)

G00 X.5 Z-.3703

G00 X.25

G01 X.21 Z-.3503 F4.

G01 X.164 Z-.3497

G01 Z-.3103

G00 X.254

G00 Z-.2899

G01 X.214 Z-.3099

G01 X.164
G01 Z-.3103
G00 X.6
G00 Z-.3

(Machine Setup - 1 Turn Groove Rough)
(TOOL #6 OD GROOVE .030 WIDE)

G00 X.5 Z-.5982
G00 X.35
G01 X.3082 F3.
G01 X.3282 Z-.5882
G00 X.35
G00 Z-.6149
G01 X.29
G00 X.33
G00 X.3
G01 X.256
G00 X.296
G00 X.266
G01 X.222
G00 X.262
G00 X.232
G01 X.188
G01 X.35
G00 Z-.6349
G01 X.29
G00 X.33
G00 X.3
G01 X.256
G00 X.296
G00 X.266
G01 X.222
G00 X.262
G00 X.232
G01 X.188
G01 X.208 Z-.6249
G00 X.35
G00 Z-.6549
G01 X.29
G00 X.33
G00 X.3
G01 X.256
G00 X.296

G00 X.266
G01 X.222
G00 X.262
G00 X.232
G01 X.188
G01 X.208 Z-.6449
G00 X.35
G00 Z-.6749
G01 X.29
G00 X.33
G00 X.3
G01 X.256
G00 X.296
G00 X.266
G01 X.222
G00 X.262
G00 X.232
G01 X.188
G01 X.208 Z-.6649
G00 X.35
G00 Z-.6949
G01 X.29
G00 X.33
G00 X.3
G01 X.256
G00 X.296
G00 X.266
G01 X.222
G00 X.262
G00 X.232
G01 X.188
G01 X.208 Z-.6849
G00 X.35
G00 Z-.7149
G01 X.29
G00 X.33
G00 X.3
G01 X.256
G00 X.296

G00 X.266
G01 X.222
G00 X.262
G00 X.232
G01 X.188
G01 X.208 Z-.7049
G00 X.35
G00 Z-.7349
G01 X.29
G00 X.33
G00 X.3
G01 X.256
G00 X.296
G00 X.266
G01 X.222
G00 X.262
G00 X.232
G01 X.188
G00 X.6
G00 Z-.6

(Machine Setup - 1 Turn Groove Finish)

(TOOL #6 OD GROOVE .030 WIDE)

G00 X.5 Z-.790
G00 X.33
G01 X.29 Z-.770 F3.
G01 X.168
G01 Z-.6103
G00 X.33
G00 Z-.5724
G01 X.29 Z-.5924
G03 X.2579 Z-.6097 I-.0172 K-.0002
G01 X.168 Z-.6099
G01 Z-.6103
G00 X1.0
G00 Z1.0
G49
G90G00G54Z0
G00 X0

M30

%

(Machine Setup - 1 Turn Groove Finish)

(TOOL #6 OD GROOVE .030 WIDE)

T6 M6 G43

G00 X.6

G00 Z.1

G00 x.380 z.05

G01 Z-.6 F4.

G00 X1.0

G00 Z1.0

G49

G90G00G54Z0

M30

%

T1 M6 G43 (this implements the length offsets from the tool data page for tool #1 without a move)

G00 Z.1 (this moves the distance in Z that is on the tool data page for tool #1 -.100)

G00 X0 (this moves the distance in X that is on the tool data page for tool #1)

G00 Z-1.0

G00 Z0

G00 Z1.0 (move to clearance point in Z.)

G49 (This clears the length amounts for tool #1 without move)

M00

5. To run your program:

a. Click on “File” and “Open”

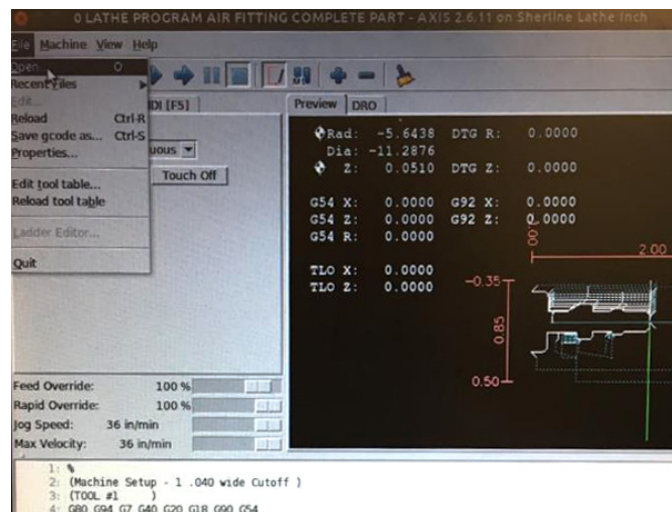


FIGURE 22

- b. Pick your program. If your program does not show, it may have been saved as a (.NC file) instead of a (.NGC File). If this is the case, choose “All Files.”

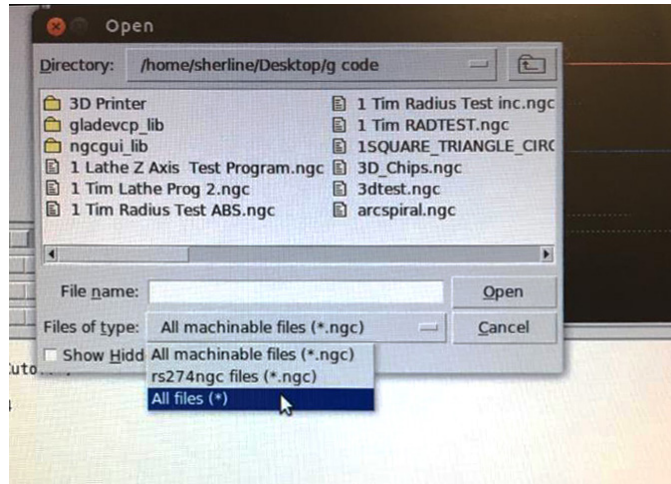


FIGURE 23

- c. Run your program.

Hit the desired icon at the top (Start, Single Step, Pause*, Stop).

Start Button: This button starts your program.

Single Step Button: This button will run your program one line at a time and stop after each move.

Pause Button: When you click the Pause button, it will stop the program right where it is (it will not finish the move dictated by the line of code that is running). In order to resume the program, click the Pause Button again. Your program will now resume from the point where it stopped.

Stop Button: When you click the Stop button, the program will stop. However, you cannot resume the program. The Stop button will reset the program to the beginning. Then you will need to click on the Start button, and the program will Restart from the beginning.

**NOTE: We “Highly Suggest” that you use the “Pause” button, instead of the “Stop” button.*

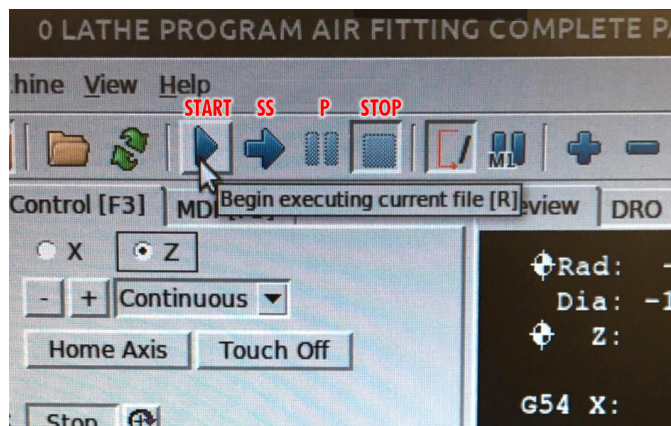


FIGURE 24—The red words/abbreviations indicate their respective icons.

Thank you,
Sherline Products Inc.