

CNC  
Router  
Reference  
Guide

Winter Quarter

2017

**GENERAL INFO / WORKFLOW****Physical limits**

Max depth of material stock:        1/4" tools = 6.75"    1/2" tools = 5.25"

Max depth of cut varies depending on geometry and operation.

Bed size = 97" x-axis, 49" y-axis

Available tools:

**T1** : 1/4" Square Endmill

**T2** : 1/4" Ball Endmill

**T3** : 1/2" Square Endmill

**T4** : 1/8" Drill Bit

**T5** : 1/2" Ball Endmill

**T6** : Open

**Digital Setup**

Units = Inches

Model geometry 1:1

Include only pertinent geometry

CNC origin location = x0,y0,z0

Place geometry in the positive XYZ quadrant

Include material stock

5 Typical Operations:

**Profiling** : Cutting 2D lines (T1 & T3)

**Pocketing** : Surfacing 2D regions (T1 & T3)

**Horizontal Roughing** : Roughing 3D geometry (T3)

**Parallel Finishing** : Finishing 3D geometry (T2 & T5)

**Drilling** : Drilling holes (T4)

**Workflow**

Setup Rhinocam operations in dFab using reference guide

Review Rhinocam settings with technician during designated time

Schedule mill time with technician

Supervise mill while job is running

**Bay Procedures**

Router to remain under supervision while job is in progress.

Appropriate eye, ear and lung protection to be worn at all times.

It is your responsibility to know how to stop the router in case of an emergency.

Doors are to remain closed while job is in progress.

All spoils must be discarded into appropriate dumpster.

Clean all dust from bay using compressed air, brooms and dust collection hose.

**PROFILING*****Machining Features / Regions***

select curves as regions (double-check they are closed curves)

***Tools***

**T1** 1/4" square endmill (**max cut depth = 1.5"**)

**T3** 1/2" square endmill (**max cut depth = 3.0"**)

***Feeds & Speeds***

spindle speed = 18,000rpm

all feed rates = 50 in/min

except cut (cf) = see cut rate chart (back of guide)

transfer rate (tf) = use Rapid

***Clearance***

absolute Z value = material thickness + 0.5" **Max.**

cut transfer method = clearance plane

***Cut Parameters***

select outside/inside for closed curves

**or** cut start side for open curves

***Cut Levels***

location of cut geometry = at top of material plane

total cut depth = material thickness + 0.03"

total rough depth = total cut depth - 0.125"

total finish depth = 0.125"

rough depth/cut = 0.25" max

finish depth/cut = 0.125" max

depth first ordering

***Entry/Exit***

None

***Sorting***

minimum distance sort

**POCKETING*****Machining Features / Regions***

select curves as regions

***Tools***

**T1** 1/4" square endmill (**max cut depth = 1.5"**)

**T3** 1/2" square endmill (**max cut depth = 3.0"**)

***Feeds & Speeds***

spindle speed = 18,000rpm

all feed rates = 50 in/min

except cut (cf) = see cut rate chart (back of guide)

transfer rate (tf) = use Rapid

***Clearance***

absolute Z value = material thickness + .5" **Max.**

cut transfer method = clearance plane

***Cut Parameters***

global parameters - stock = 0

stepover distance = see chart below

check corner cleanup

***Cut Levels***

location of cut geometry = at top of material plane

total cut depth = depth of pocket

total rough depth = depth of pocket

total finish depth = 0"

rough depth/cut = 0.25" max

finish depth/cut = 0"

depth first ordering

***Entry/Exit***

all values set to zero

***Sorting***

minimum distance sort

<b>Step Chart</b>				
Material	Blue Foam	ULMDF	Plywood	Hardwood
Stepover	75%	50%	35%	25%
Stepdown	200%	100%	50%	50%

**HORIZONTAL ROUGHING*****Machining Features / Regions***

select curves as regions - dup. border of bounding box

***Tools***

**T1** 1/4" square endmill (**max cut depth varies depending on geometry**)

**T3** 1/2" square endmill (**max cut depth varies depending on geometry**)

***Feeds & Speeds***

spindle speed = 18,000rpm

all feed rates = 50 in/min

except cut (cf) = see cut rate chart (back of guide)

transfer rate (tf) = use Rapid

***Clearance***

absolute Z value = material thickness + .5" **Max.**

cut transfer method = clearance plane

***Cut Parameters***

global parameters: stock = .0625"

stepover distance = see chart

***Cut Levels***

Stepdown distance = see chart

level first ordering

***Engage/Retract***

all values set to zero

<b>Step Chart</b>				
Material	Blue Foam	ULMDF	Plywood	Hardwood
Stepover	75%	50%	35%	25%
Stepdown	200%	100%	50%	50%

## **PARALLEL FINISHING**

### ***Machining Features / Regions***

select curves as regions (if necessary)

### ***Tools***

**T2** 1/4" ball endmill (max cut depth varies depending on geometry)

**T5** 1/2" ball endmill (max cut depth varies depending on geometry)

### ***Feeds & Speeds***

spindle speed = 18,000rpm

all feed rates = 50 in/min

except cut (cf) = see cut rate chart (back of guide)

transfer rate (tf) = use Rapid

### ***Clearance***

absolute Z value = material thickness + .5" **Max.**

cut transfer method = clearance plane

### ***Cut Parameters***

global parameters: stock = 0"

stepover = 25 - 50%

(smaller stepover equals higher surface resolution but adds to time and cost of job)

### ***Z Containment***

<none>

### ***Entry/Exit***

all values set to zero

## **DRILLING**

### ***Machining Features / Regions***

select pts (located at top or bottom of cut depth)

### ***Tools***

**T4** 1/8" Drill

(other tools can be made : ask technician for assistance)

### ***Feeds & Speeds***

spindle speed = 18,000rpm

all feed rates = 50 in/min

except cut (cf) = see cut rate chart (back of guide)

transfer rate (tf) = use Rapid

### ***Clearance***

absolute Z value = material thickness + .5" **Max.**

cut transfer method = clearance plane

### ***Cut Parameters***

standard drill for (<1" depth) or deep drill (>1" depth)

total cut depth : material thickness + .2"

set increment depths (.1"-.2") for deep drill steps (if necessary)

approach distance of .2" (if necessary)

### ***Z Containment***

<none>

### ***Sorting***

minimum distance sort

### ***Entry/Exit***

all values set to zero

<b>CUT RATES</b>					
Tool #	Onsrud Part #	Blue Foam (imp)	ULMDF (imp)	Plywood (imp)	Hardwood (imp)
1 (1/4" square)	48-179	180	150	150	150
2 (1/4" ball)	52-280B	215	200	200	150
3 (1/2" square)	48-183	250	200	200	200
5 (1/2" ball)	52-360B	250	250	250	250