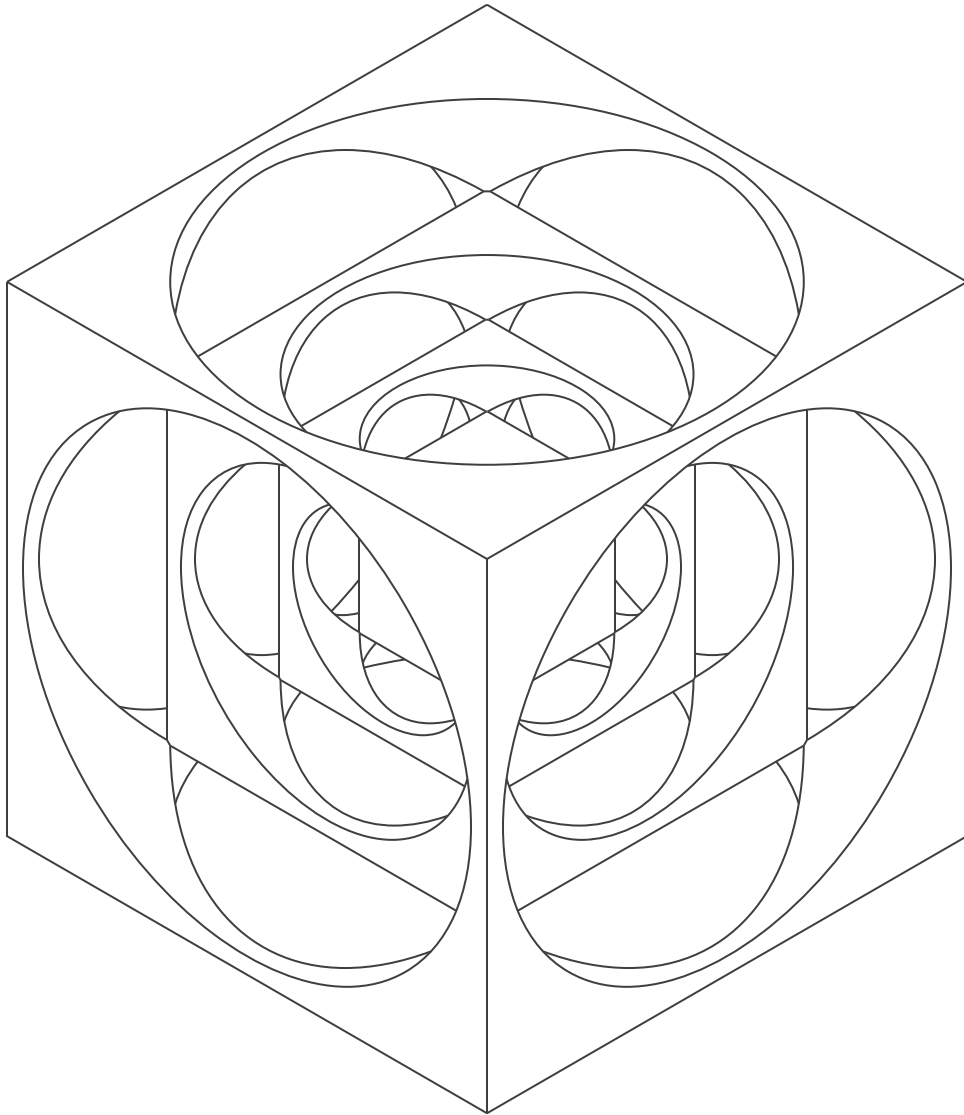


# QUICK REFERENCE

## MILLING A TURNERS CUBE



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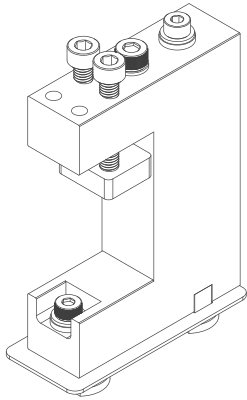
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# TOOL LIST

Everything you will need for both Manual and Guided Mode

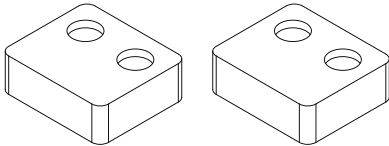


Purchase all in **Turner's Cube Starter Kit**  
Available at [coastrunner.net](http://coastrunner.net)



## Universal Clamp & Clamp Hardware

- 1x Clamp Body
- 1x Front M4 mounting bolt
- 1x Rear M4 mounting bolt
- 2x M4 t-slot nut
- 2x M5 clamp bolts
- 1x Insulating pad
- 2x Washers and insulators



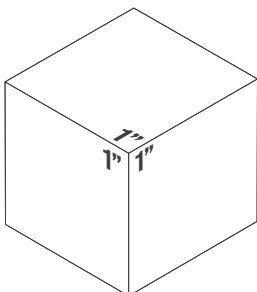
## Soft Jaws

- 2x Aluminum soft jaws



## Cutting Hardware

- 1x 3/16" Collet
- 1x 5/32" 4-flute endmill, 2" OAL, 3/16" Shank



## Stock

- 1" x 1" x 1" 17-4 Steel Cube

# MANUAL MODE

Doing It Yourself



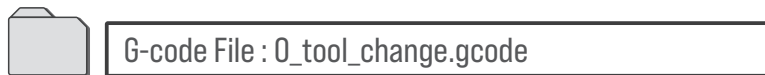
Download Turner's Cube G-code Collection  
for use in Manual Operations Mode

## Milling using the Manual Operations Mode

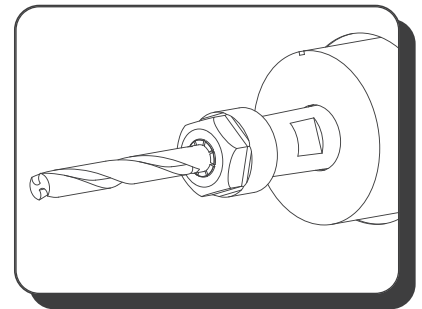
To get started, click the joystick  in the CRWrite footer to open Manual Operations Mode.  
Run G-code files by selecting them with "Run G-code File".

## G-code Operations

### Tool Installation



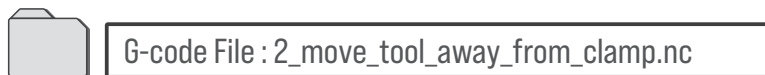
Move to tool change position and install 5/32" endmill.



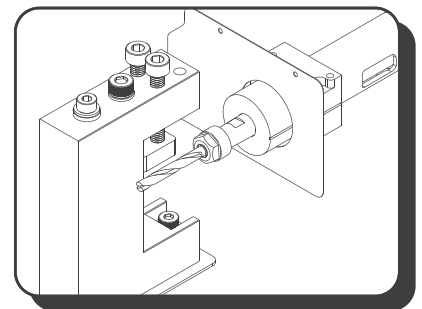
### Pinstop / Clamp Installation



Move tool to reference position. Install clamp on t-slot bed and slide to left until it touches tool. Tighten bolts to secure clamp.



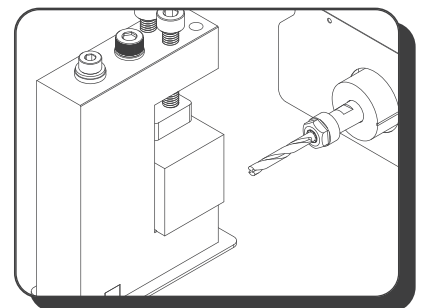
Run second gcode to retract tool from clamp.



### Install and Probe Stock



Install stock cube, spacing it from rear of clamp with 1/4" softjaw spacer.  
Run probe code to set probe location.  
Ensure probe wire is connected to clamp when probing.



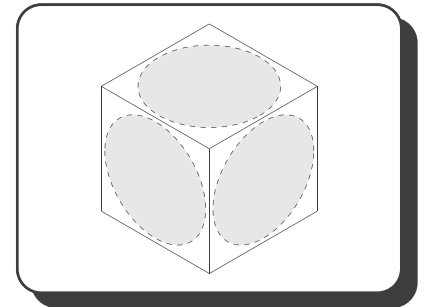
# MANUAL MODE

Doing It Yourself

## Face Three Sides



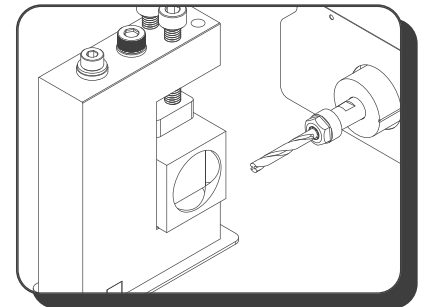
Run the gcode command three times. Between runs, reorient cube such that an unmachined side faces both tool and rear of clamp.



## Probe Stock Again



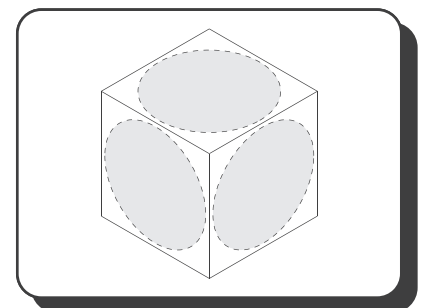
Turn cube such that unmachined side faces tool and machined side faces rear. Run probe code. Ensure probe wire is connected.



## Face Three Sides (Again)



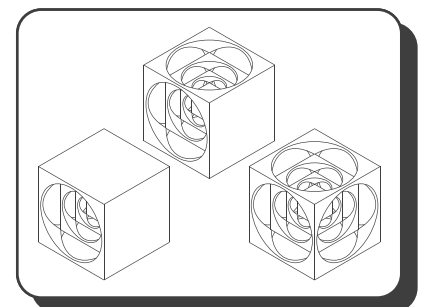
Face the final three sides, reorienting cube in between runs.



## Probe and Bore Holes



For each of the six cube faces, run the probe code, then run the bore code. Reorient to unbored face and repeat until all faces are bored.



# GUIDED MODE

Doing It With CRWrite



Download **Turner's Cube .croj File**  
for use in Guided Operations Mode

## Milling using the Guided Operations Mode

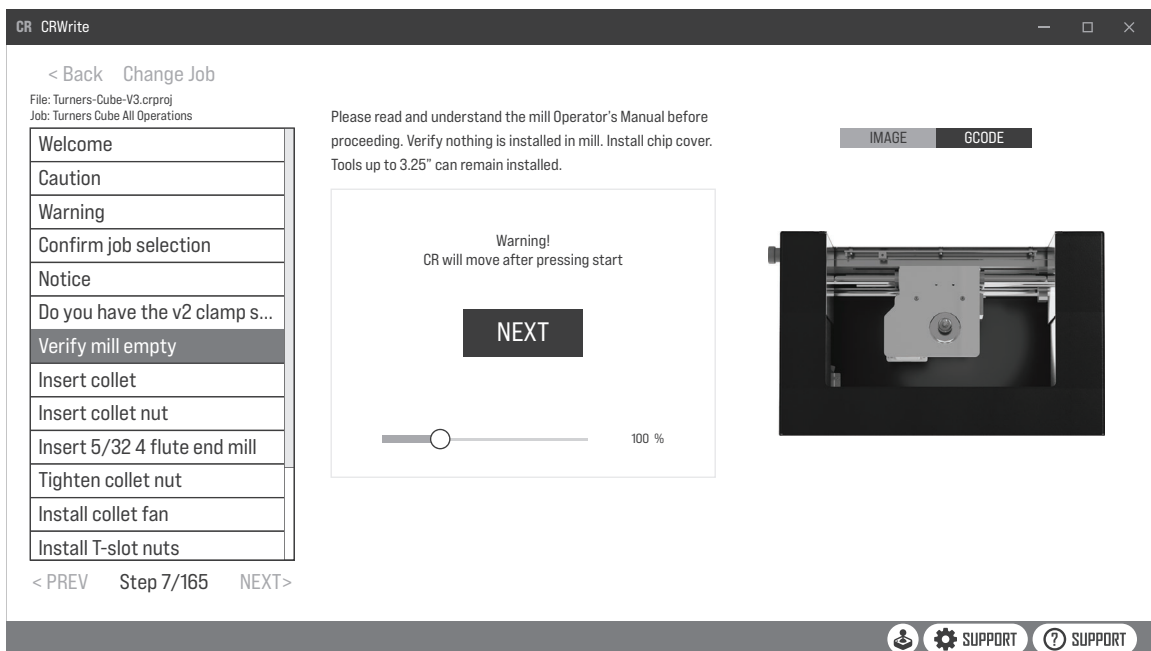
Running G-code files individually has several disadvantages:

- Requires you to know what file to run and when
- Requires significant context (which tool do I use? Which way do I turn the stock? etc.)

Guided Operations Mode in CRWrite was developed to eliminate this uncertainty and lack of context. In Guided Operations Mode, users are walked through each part of the milling operation step-by-step, with accompanying images and text. This includes:

- Installing the tool
- Assembling the fixture
- Securing the stock
- Probing
- Milling

Run the Turner's Cube in Guided Operations Mode by clicking **RUN** on the main menu and selecting the Turner's Cube .croj file. The step-by-step instructions will take you the rest of the way.



# CREATING G-CODE

Developing Past The Turners Cube

## G-code Generating

G-code can be generated for use on the Coast Runner through multiple methods:

### Writing by hand

### Generation using CAM Software

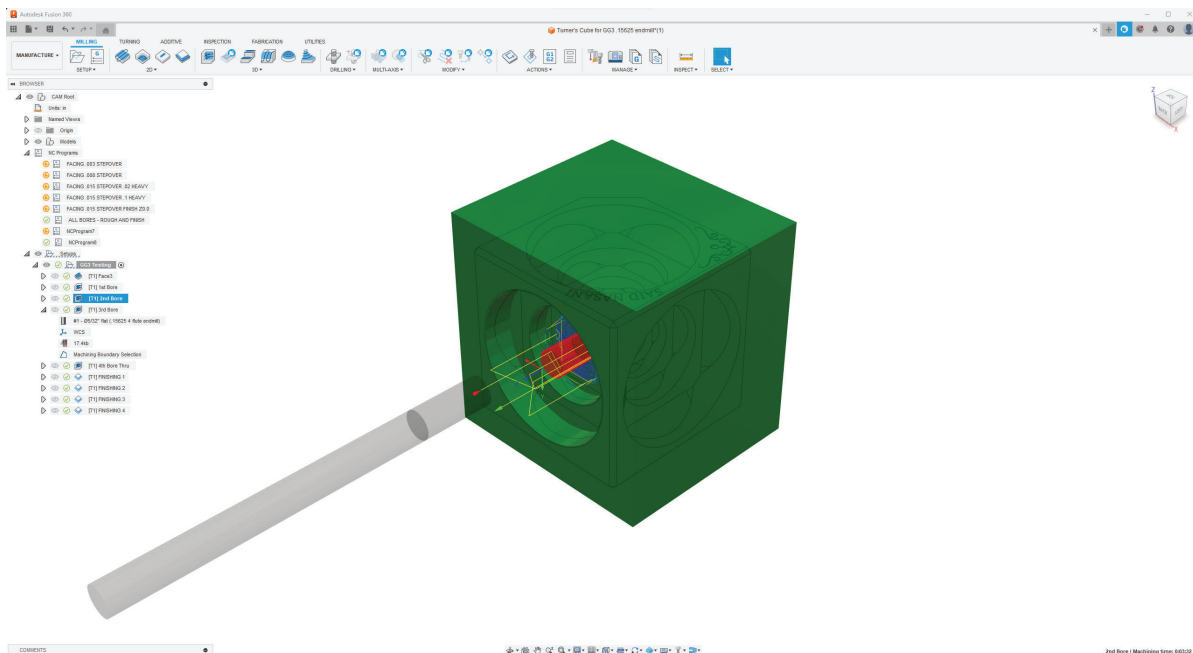
### Pros

### Cons

<ul style="list-style-type: none"><li>◦ Does not require software knowledge</li><li>◦ Better for small tasks (probing, pinstop)</li></ul>	<ul style="list-style-type: none"><li>◦ Impractical for large cuts</li><li>◦ Slow and methodical</li></ul>
<ul style="list-style-type: none"><li>◦ Quicker to generate</li><li>◦ More practical for large operations</li></ul>	<ul style="list-style-type: none"><li>◦ Requires CAM software knowledge</li></ul>

G-code can be created using CAM software like Fusion360 with the following high-level steps:

- Create CAD model of final product
- Configure CAM software for the specific machine, stock characteristics, tool, etc.
- Define toolpaths to achieve the cuts required
- Post-process toolpaths into G-code file

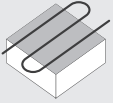

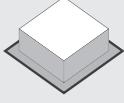
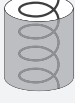
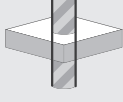


# CREATING G-CODE

Developing Past The Turners Cube

## Toolpaths

Toolpaths are the paths cutting tools take when carving or shaping an object. Software like CAD and CAM can mimic these paths, helping us spot issues like tool and object collision, figuring out speed, and catching errors when a cut goes outside the object. The most common toolpaths are as follows:

	Overview	Example
<b>Facing</b>	<b>Facing</b> reduces and squares a stock's face[s]	
<b>Contour</b>	<b>Contour</b> runs the tool along a specific path. Can be used to trim edges, cut slots, etc.	
<b>Adaptive</b>	<b>Adaptive</b> generates advanced techniques to clear material with low stress on machine tooling	
<b>Bore</b>	<b>Bore</b> uses an endmill to cut a hole through material. Moves in a "helical downcut"	
<b>Drill</b>	<b>Drill</b> uses a drill to cut a hole through material	

Understanding toolpaths is a crucial part of efficient and precise machining. This not only guarantees the accuracy of work but also significantly improves the safety and productivity of machining operations. Grasping the concept and application of toolpaths will undoubtedly elevate the quality and precision of any machining task.