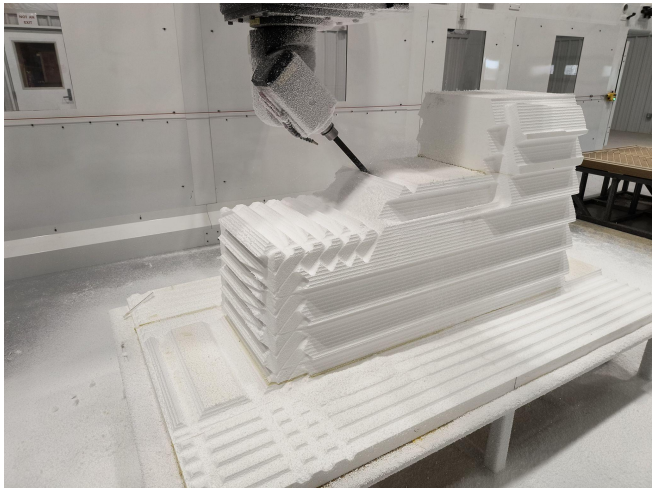
The Baptistery Basin at Piedmont Composites and Tooling

Piedmont Composites & Tooling, LLC (PCT), Located in Taylorsville, NC and founded in 1972 is a specialized manufacturer of high-quality fiberglass composite parts and tooling, serving diverse industries such as architectural, marine, signage, communications, and transportation out of their approximate 200,000 sqft facility. The company relies on its two CNC routers primarily for creating the tooling necessary for its composite molds.

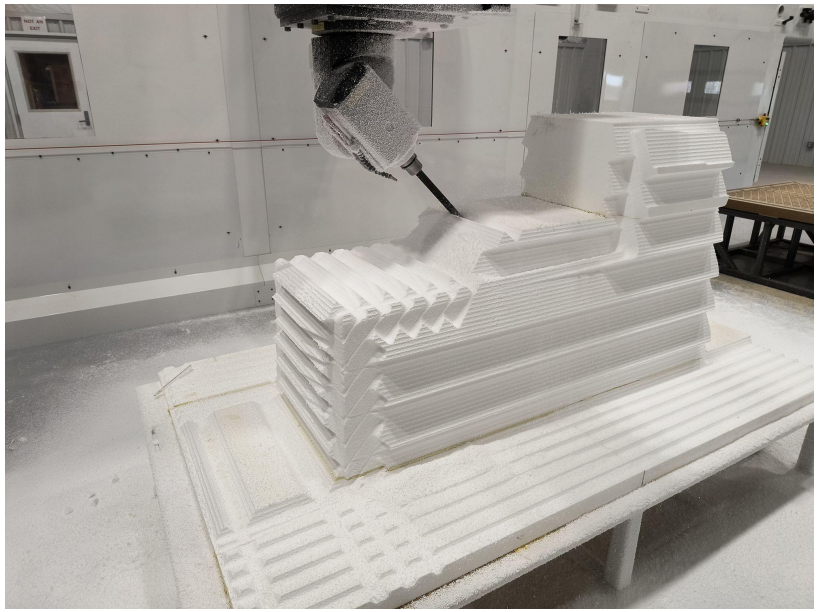


The company set up its first router around 2017 and quickly became adept at its operation with hard work and the use of RhinoCAM Computer-Aided Manufacturing (CAM) software from MecSoft Corporation a critical factor in the successful implementation of their new digital workflow.

The CR-ONSRUD 5 Axis Machining Center

Based on the success achieved and expanding on its reputation of being the best shop in the industry, Piedmont Composites & Tooling added on to its facility by installing a C.R. Onsrud “LR” (Light Rail) series 5-axis CNC router. The machining center has a cutting area of 28.5ft Long x 13.2ft Wide x 8ft in Z height!

PCT proudly describes their new C.R. Onsrud 5-axis CNC router as a massive head-to-head gantry machine, calling it a “a pretty big machine that dwarfs their other 5×10 ft CMS 5-axis CNC machine." The 91 in long × 54 in wide Baptistery project studied below was essentially the machine’s very first production job. PCT reports that the results were outstanding. The EPS foam cuts came out perfectly with no accuracy or finish issues. The C.R. Onsrud “LR” (Light Rail) series 5-axis CNC router at Piedmont Composites & Tooling is shown below.



Above we see the brand-new C.R. Onsrud “LR” (Light Rail) series 5-axis CNC router at Piedmont Composites & Tooling. It is a massive head-to-head gantry machine boasting an enormous work envelope of approximately 28 ft in X, 13.2 ft in Y, and a full 8 ft (96 in) of Z travel!

About this Case Study

In this case study we will be looking at how Piedmont Composites & Tooling has utilized both RhinoCAM and their newly acquired machine tool in manufacturing a specific part. The design part file that we will be looking at is a Baptistery Basin that was designed in Rhino and toolpaths programmed exclusively in RhinoCAM. The programmed toolpaths were output to the machine by a post processor specifically built for this machine - the result of a collaborative project between MecSoft's programmers, Piedmont Composites & Tooling machinists and C.R. Onsrud's post-processor team.

The RhinoCAM Difference

Below are just some of the positive experiences Piedmont Composites & Tooling has shared with us about their use of RhinoCAM!

RhinoCAM Benefits at Piedmont Composites & Tooling	
Benefit	**Details & Citation**
Seamless Integration (Workflow)	The single biggest advantage is the **seamless integration** of RhinoCAM into the Rhino CAD system. Since all their design work is done in Rhino, having the CAM system as a plugin eliminates the need for file export/import, saving significant time and reducing potential errors in a file transfer process.
Ease of Learning and Use	With no prior experience with the RhinoCAM interface, PCT found it **easy to learn and use**. The intuitive nature of the software allowed them to become proficient quickly.
Machining Capabilities	RhinoCAM successfully handles the complex geometry required for their composite work, including **3-axis surfacing** for intricate mold work and **5-axis indexing** on their CNC router.

Want to see how RhinoCAM can help you? Click Here to download a demo!

Outstanding Support	PCT specifically noted the technical support from MecSoft was **"outstanding,"** providing fast and helpful responses.
Cost-Effectiveness	The software provided a high-value, **cost-effective** CAM solution when compared to other systems they evaluated.

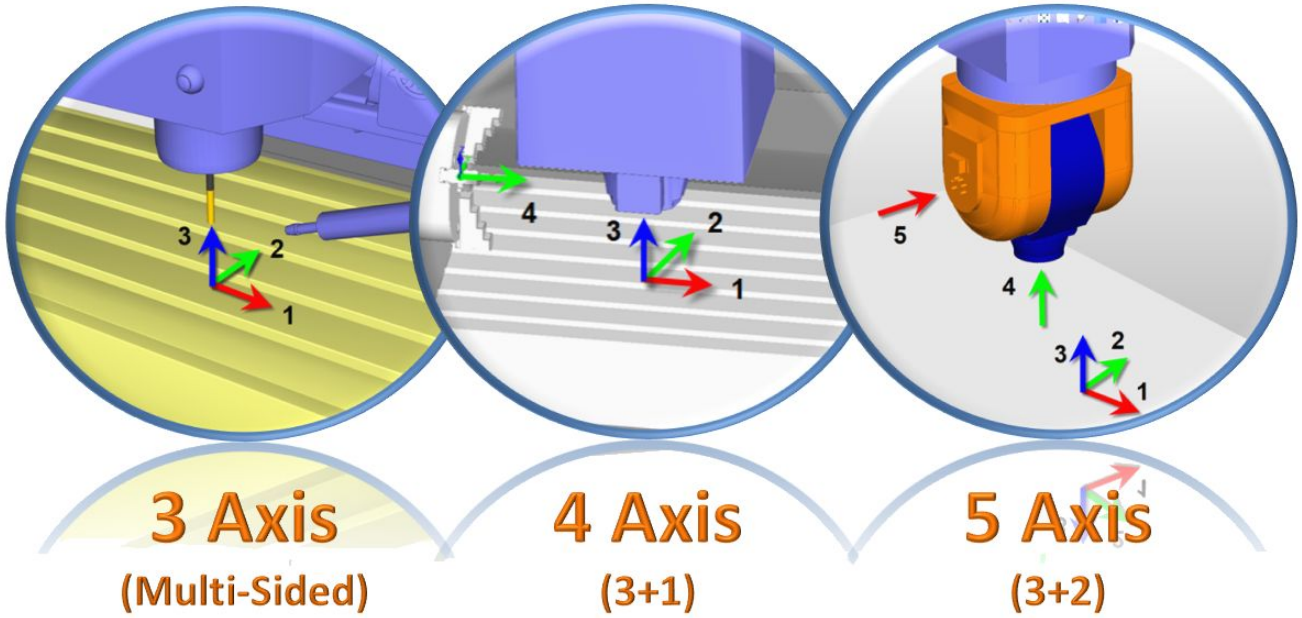
The table above lists some of the benefits reported by Piedmont Composites & Tooling that RhinoCAM has brought to their digital manufacturing wordflow.

"The single biggest thing we like is the seamless integration of having RhinoCAM inside the Rhino CAD system. Not having to export and import files saves us a tremendous amount of time. The support has also been outstanding. Any questions we've had, MecSoft has been there to answer them and quickly. RhinoCAM was an affordable software that had all of the capabilities that we needed. It was a great bang for our buck!"

Piedmont Composites & Tooling, Taylorsville, NC

Understanding Indexed 5 Axis Machining

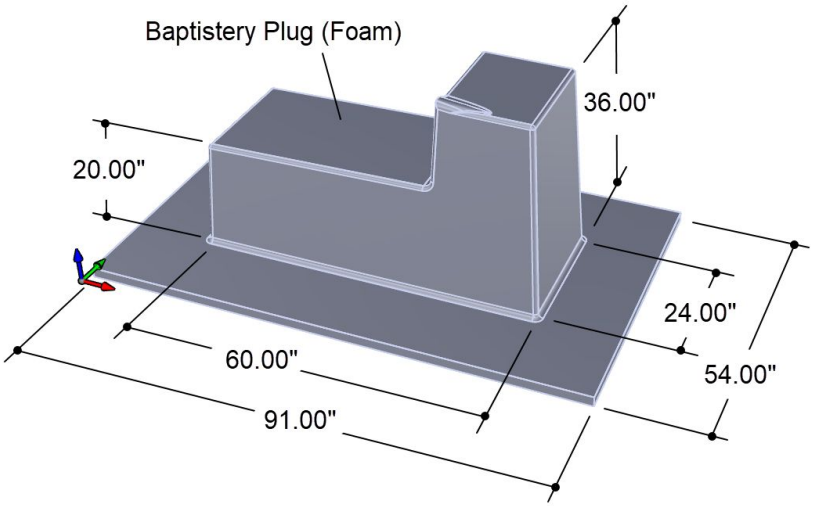
Indexed 5 Axis machining (sometimes referred to as (3+2) machining)," indicates that the 5-axis spindle is locked in a preset orientation while 2 and 3-axis operations are performed. The CR-ONSRUD 5 Axis CNC machine at Piedmont Composites & Tooling has a 5 Axis Head-Head configuration. This means that the 4th primary Axis and the 5th secondary Axis are both located in the head of the machine where the spindle is located. For reference, the illustration below shows a 3, 4 and 5 axis spindle with each axis identified. The 5 Axis spindle on the far right shows a Head-Head configuration. For more understanding of how Indexed 5 Axis machining works we recommend our video on **Indexed 5 Axis 3 plus 2 Machining here**.



This illustration shows a 3, 4 and 5 axis spindle with each axis identified. The 5 Axis spindle on the far right shows a typical Head-Head configuration.

The RhinoCAM Part

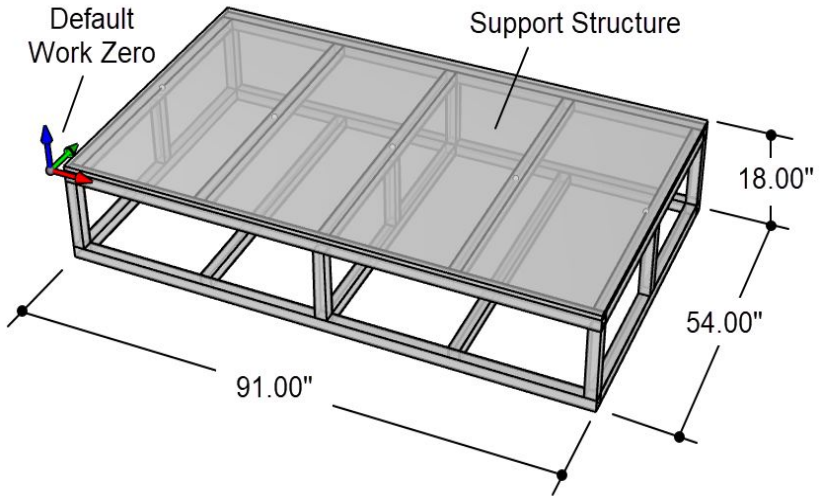
The RhinoCAM part in this study is a Baptistery plug form measuring approximately 91” long x 54” wide x 36” tall. It is cut from EPS 2 lb density foam. The part requires indexed 5 Axis machining (sometimes referred to as (3+2) machining) to form the resulting cut model shown below. The resulting machined part will be used as a form (sometimes referred to as a “plug”) upon which fiberglass composite materials are deposited to form the Baptistery Basin. You can refer to the illustration below for the basic part shape and dimensions.



The RhinoCAM part is a plug form cut from EPS 2 lb density foam upon which fiberglass composite materials are deposited to form the Baptistery Basin.

The Machining Fixture

The size of the Baptistery plug form requires its own machining structure to both fixture it in place and support it during the machining process. The Machining Fixture measures 91” long x 54” wide x 18” tall. It consists of a steel tubular frame topped with a ¾” thick plywood sheeting upon which the EPS 2 lb density foam stock is mounted. You can refer to the illustration below.

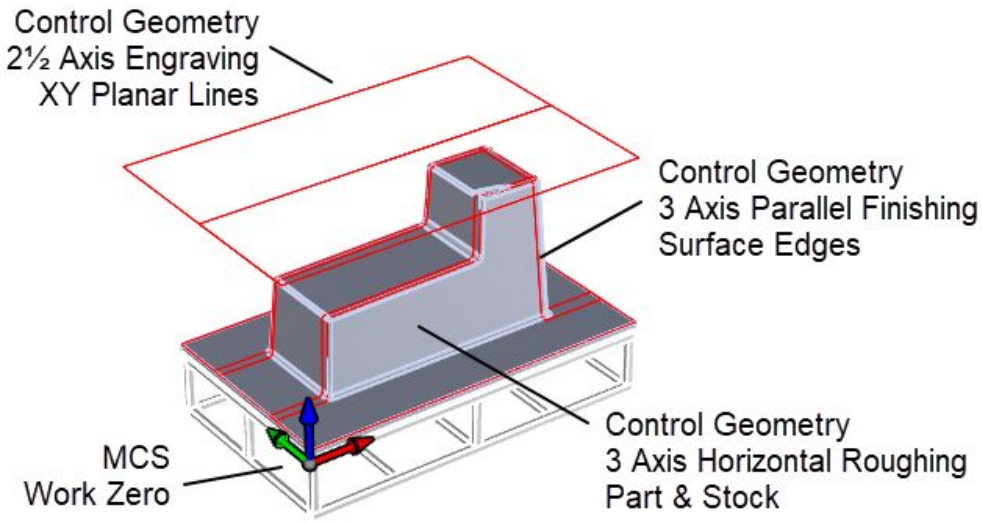


The Machining Fixture for the Baptistery Basin plug form consists of a steel tubular frame topped with ¾” plywood sheeting upon which the EPS 2 lb density foam stock is mounted.

Indexed 5 Axis Control Geometry

The control geometry for Indexed 5 Axis tool paths are identical to those of the 2½ Axis and 3 Axis operations being performed within each Setup. The control geometry for 2½ Axis operations can be curves and/or surface edges. The curves and surfaces can be planar or contoured and can be combined. Certain 2½ Axis operations require closed boundaries such as pockets while others such as profiling and Engraving allow for open curves and surface edges.

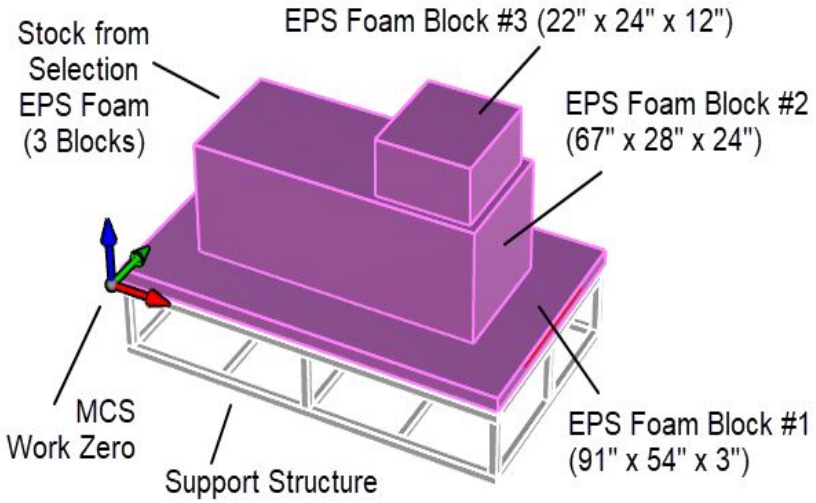
The control geometry for 3 Axis operations consists of the visible part geometry and define stock geometry (for roughing operations) as well as curves and/or surface edges. 3 Axis operations do not require control geometry to be selected. In 3 Axis finishing operations, if no control geometry is selected the entire visible part is used. In 3 Axis roughing operations, if no control geometry is selected the entire visible part and the entire stock definition geometry is used. Also in 3 Axis, if curves and/or surface edges are selected, they serve to contain the toolpath and they must form a closed boundary area. The illustration below shows the control geometry used in this part.



The Control Geometry for this part consists of XY planar curves for the 2½ Axis Engraving operations. For all 3 Axis Horizontal Roughing operations no control geometry is selected. For all 3 Axis Parallel Finishing operations closed surface edge perimeter curves are used.

The Foam Stock

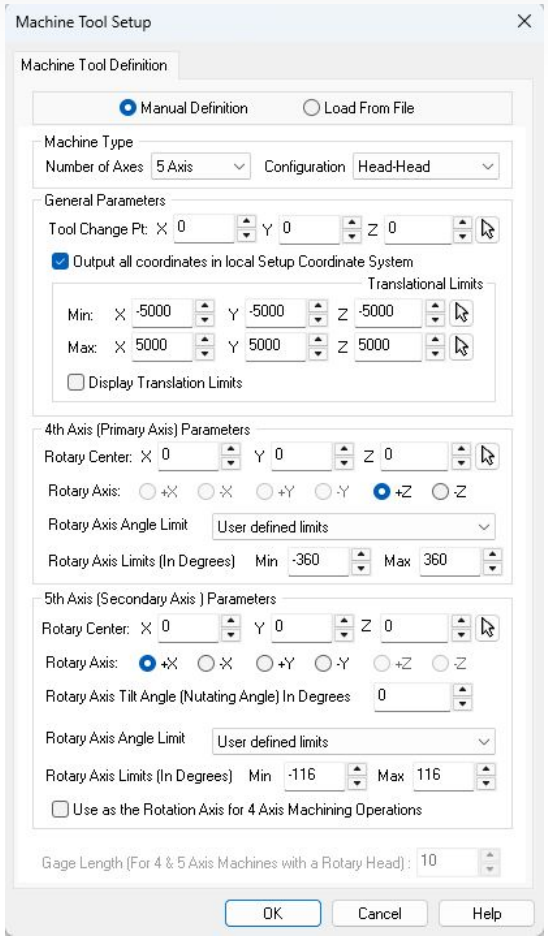
Due to the size of the Baptistery plug form, it requires the assembly of three foam blocks to serve as the in-process stock. You can refer to the illustration below. The base block measures 91” long x 54” wide x 3” high. The middle body block measures 67” long x 28” wide x 24” tall and the upper body block measures 22” wide x 24” long x 12” tall. These three blocks are modeled in Rhino and used to define a “Stock from Selection” in RhinoCAM. The stock blocks are cut from EPS 2 lb density foam. PCT also cuts several different densities of urethane board from 10 lb to 50+ lb in other projects.



The Baptistery plug form requires the assembly of three EPS 2 lb density foam blocks to serve as the in-process stock. These three blocks are modeled in Rhino and used to define a “Stock from Selection” in RhinoCAM.

Machine Tool Definition

In RhinoCAM, the Machine Tool Setup dialog, shown below, uses a Manual Definition with the Number of Axes set to 5-Axis and the Configuration set to Head-Head. In this setup, both the Primary and Secondary axes are located within the machine's Head (see illustrations above). The machine table remains stationary, while the Primary and Secondary axes in the Head move and rotate as required.

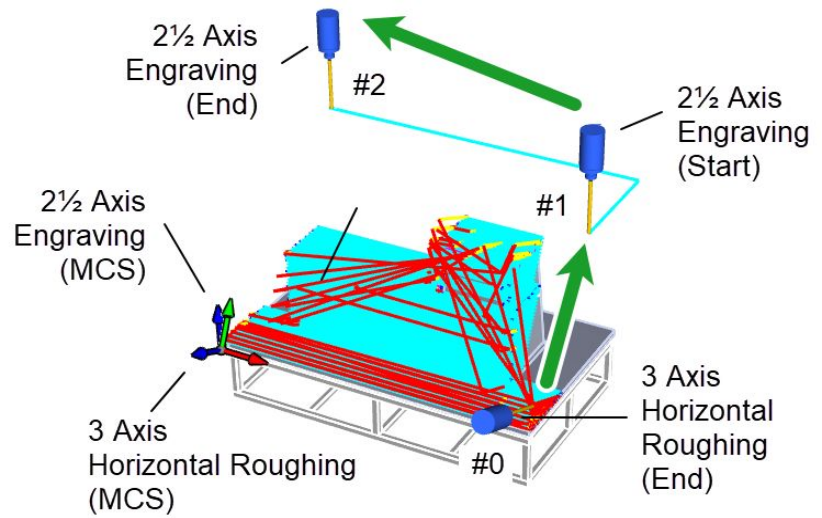


Above we see the Machine Tool Setup dialog with the parameters set for this Indexed 5 Axis part.

The dialog also defines the machine's 4th Primary Axis set to +Z and the 5th Secondary Axis set to +X. The Rotary Axis Limits are set to -360/360 and the Primary Axis Limits set to -116/116. All coordinate output is based on each setup's local coordinate system. Refer to the Machine Tool Setup dialog above for details.

Transfer Control in 5 Axis

The Machine Tool Setup dialog shown above allows you to define the Radial Axis Angle Limits of the 4th Primary Axis and the 5th Secondary Axis. Due to these machine specific limits the 5 axis spindle may have to unwind or rewind depending on the location on the last operation's retract point and clearance plane and the next operation's approach point and clearance plane. To assist in guiding the 5 axis spindle to the next area of the part to be machined, RhinoCAM provides the Engraving operation. During Engraving, the tip of the tool will follow exactly the control geometry selected. This allows you to physically map exactly where you want the 5 axis spindle to travel before it commences the next machining operation. The illustration below shows this.



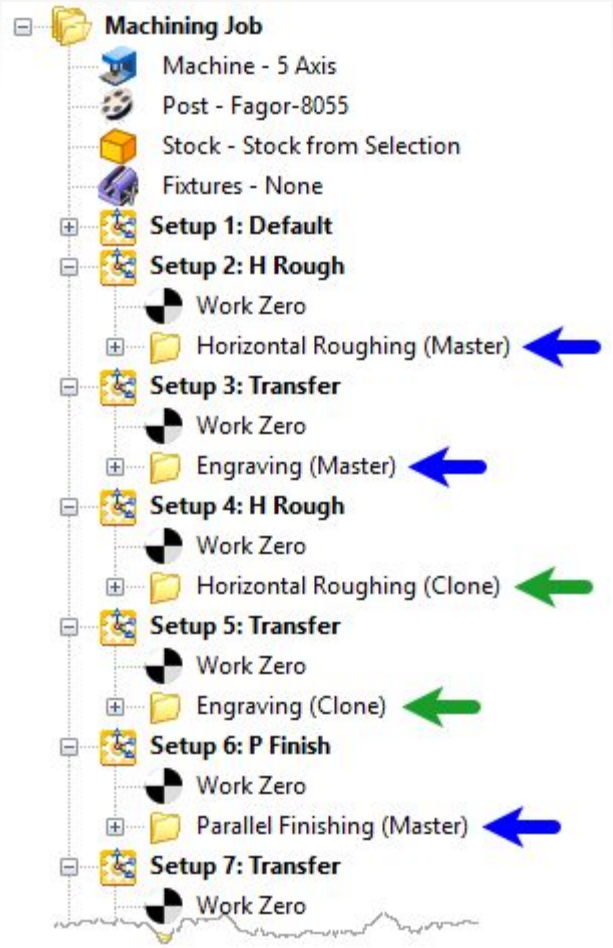
The 3 Axis Setup and Machining Job in VisualCAD/CAM

In the illustration above you see that when the 3 Axis Horizontal Operation is completed, the 5 axis spindle retracts and stops at the location marked #0. Because the very next operation is an Engraving operation, the tool immediately moves to location #1 and then traces the control geometry (in this case two connected XY planar lines) to location #2. You will notice that location #1 is near to #0 and that the tool will follow the Engraving control geometry to location #2 being on the opposite side of the part near where the next machining operation is to begin.

In the Machining Job trees shown below, you will notice that there is an Engraving operation under each Setup named “Transfer”. Each of the Transfer Setups precede the next Setup with the next machining operation. Having this control minimizes unwanted 5 axis rewinds and thus the possibility of wasted motions that can slow the machining process down.

Cloning Toolpath Knowledge in RhinoCAM

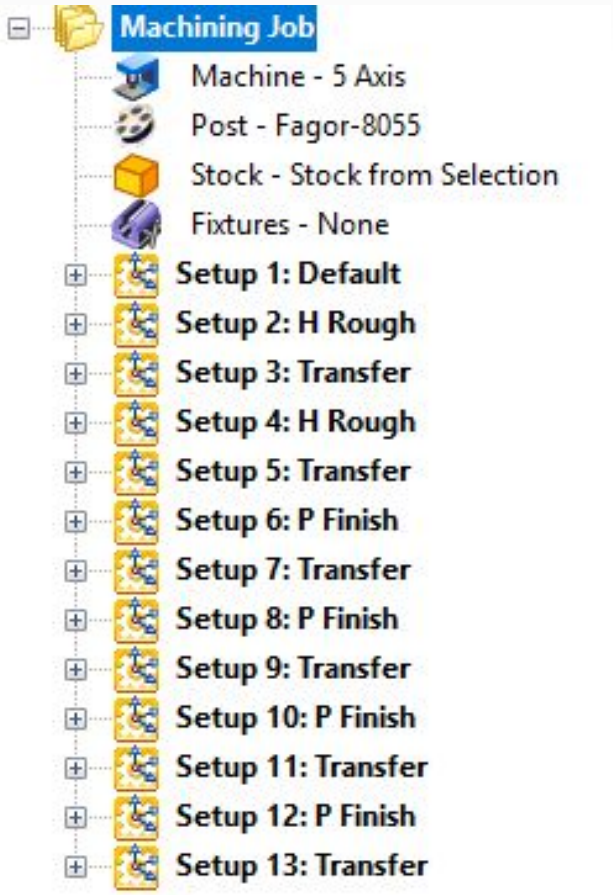
In RhinoCAM you can save time and maintain consistency by creating a toolpath operation with all of its parameters just once and then “Cloning” the operation for as many times as you need to use it within the Machining Job tree. As you review each of the Setups and toolpath methods in the Machining Job sections below, note that there are only three toolpath method required. These are 3 Axis Horizontal Roughing, 3 Axis Parallel Finishing and 2½ Axis Engraving. Each toolpath method is defined once and then cloned as needed throughout the machining Job. The only difference is the set of control geometry that each method is applied to. Additionally, the first instance of a toolpath can be loaded into the Machining Job from a knowledge base of operations tailored specifically to your requirements. This makes the CAM programming in RhinoCAM fast and consistent!



Toolpath operations are created once (the Master) and then Cloned as needed in the Machining Job tree. Master operations can also be loaded from a Knowledge Base tailored to specific applications.

The Machining Job

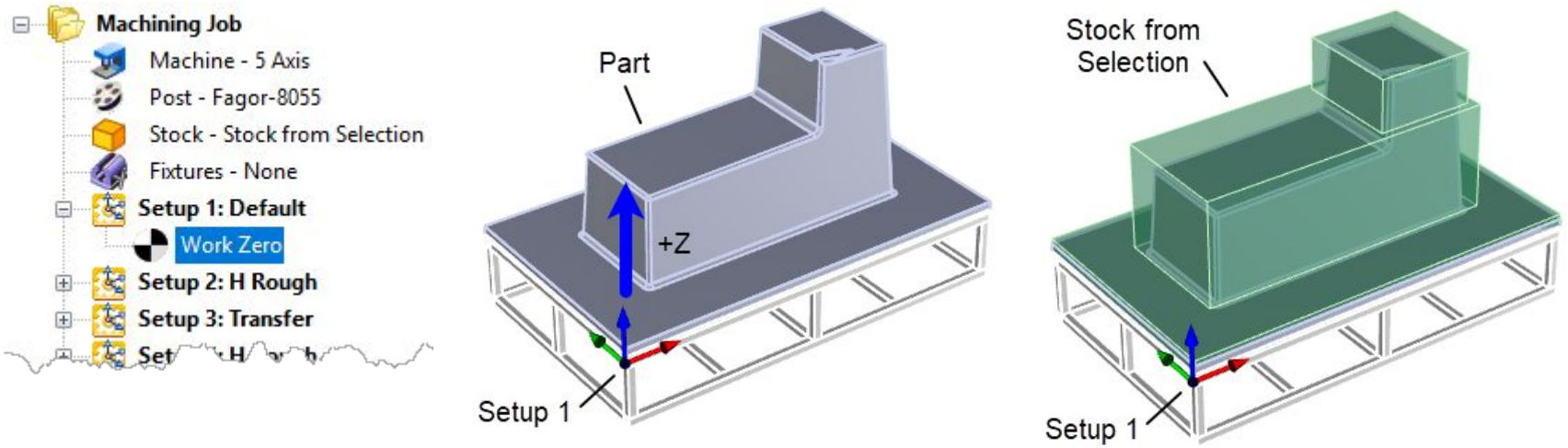
Below you see the entire Machining Job for this part. It consists of 13 individual Indexed 5 Axis Setups. The Setups named Transfer (Setups 3, 5, 7, 9, 11 and 13) are Engraving operations that guide the 5 Axis spindle to the next area to be machined, as we discussed above. Setup 1 is the default home position. Setups 2 and 4 are for Roughing while Setups 6, 8, 10 and 12 are for Finishing. You can refer to each section below for details about each Setup and toolpath method.



The final 5 Axis Machining Job Tree in RhinoCAM

Setup 1 Default

This is the default Setup 1 that is present in all Machining Jobs and defines the Machine home point and axes orientations. The Work Zero is a specific point and specifies that all coordinates in this setup are measured from this Work Zero point. This specific Work Zero (under Setup 1) is also where the default Machine Zero is located. The Work Zero is illustrated by the Red/Green and Blue triad in the illustrations below. The blue arrow added to the illustration indicates the direction of the +Z axis to the 5 axis spindle face.

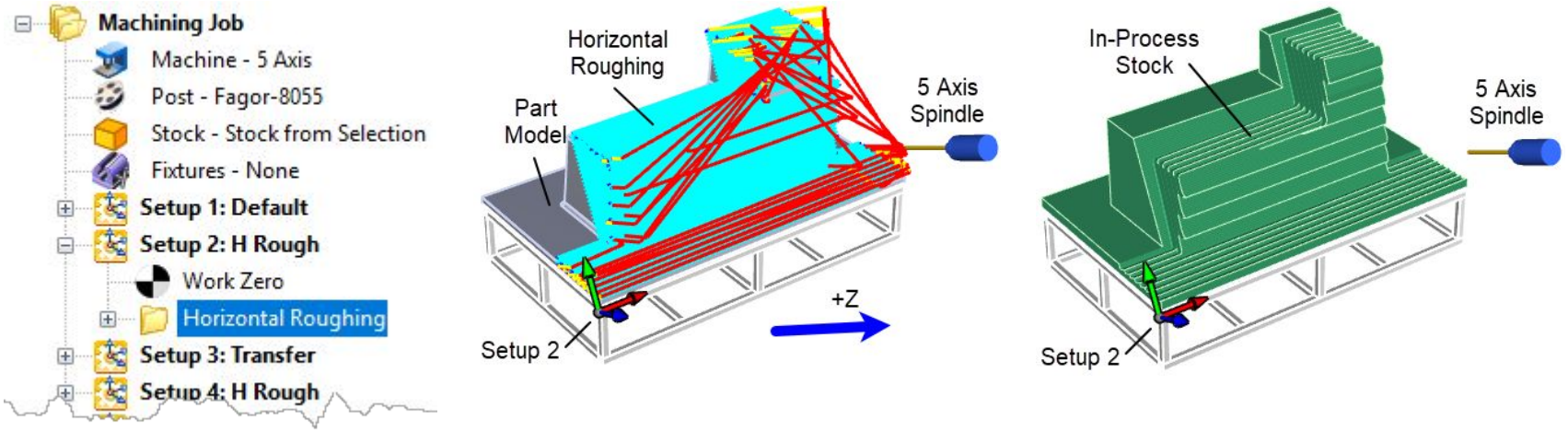


On the left we see the Machining Job with the Work Zero under Setup 1 selected. In the middle we see the part model with the Blue Work Zero triad pointing in the +Z direction. On the right we see the Stock from Selection model highlighted around the part model.

Setup 2: 3 Axis Horizontal Roughing (Master)

There are two Indexed 3 Axis Horizontal Roughing operations in this Machining Job and Setup 2 contains the first. It will rough out the front side of the part in levels. You can follow the illustrations below with the Machining Job tree on the left and the finished in-process stock on the right. In the middle you see the toolpath. The Setup indicates the +Z orientation of the 5 axis spindle and is indicated by the triad and the blue arrow. The location of the 5 Axis spindle is shown at the end of the cut.

Cut Parameters Include: Control geometry: Part & Stock, Tool: 25mm Ball Mill, Cut Tolerance: 0.01”, Stock Allowance: 0.05”, Cut Pattern: Linear, Cut Direction: Mixed, Stepover Distance: 50% (of Tool Diameter), Stepdown: 2”, Cut levels: Top: 1.63” and Bottom Containment: -16.25”, Transfer: Skim 1.5”, Cut Arc Fitting: Enabled, Engage/Retract: Helical.

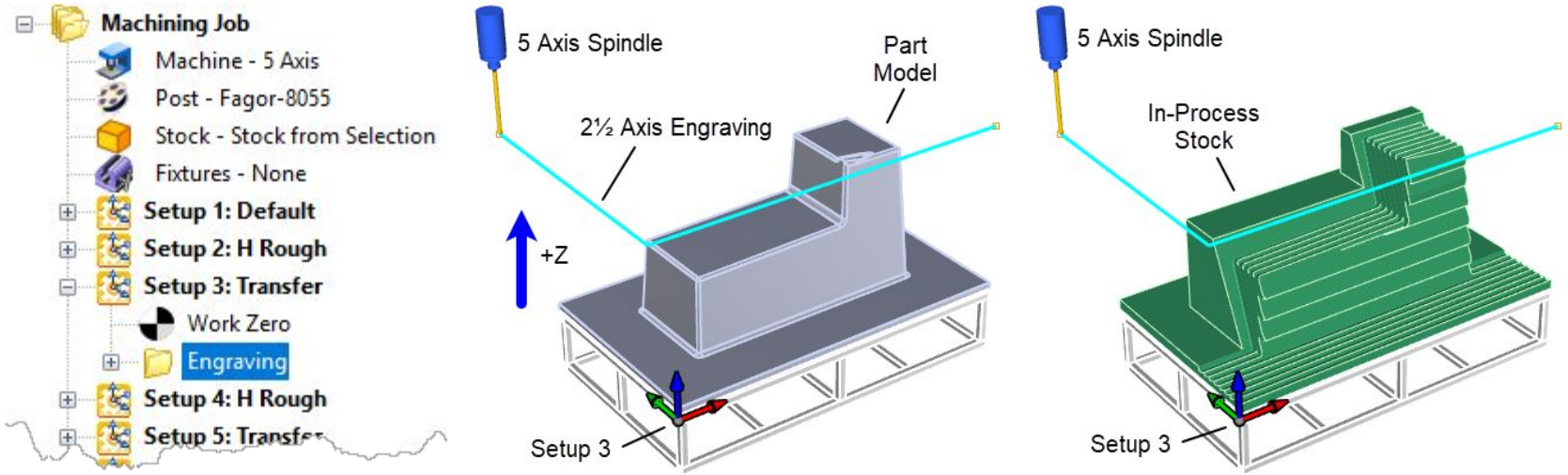


On the left we see the Machining Job with the first 3 Axis Horizontal Roughing operations selected. In the middle we see the +Z orientation of the spindle and the location of the 5 Axis spindle at the end of the cut. On the right we see the resulting simulation and in-process stock once the cut is complete.

Setup 3: Transfer: 2½ Axis Engraving (Master)

Setup 3 contains the first of six Engraving operations (see Transfer Control in 5 Axis above for more about the use of Engraving operations in this study). This operation will guide the tool to the opposite back side of the part near where the next operation will begin. The illustrations below show the Machining Job tree on the left. In the middle we see that the +Z axis of the Work Zero triad is pointing vertical. The light blue lines are the Control Geometry that the tool will follow, and the 5 Axis spindle is shown at the end of the Engraving operation near the back side of the part. On the right, the simulation of the in-process stock has not changed.

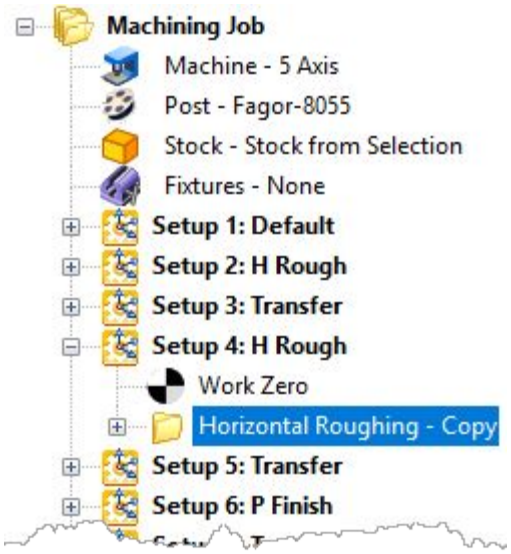
Cut Parameters Include: Control Geometry: XY Planer Lines, Tool: 25mm Ball Mill, Cut Tolerance: 0.001”, Cut depth: 0”, Sorting: Directional, Entry/Exit: None.

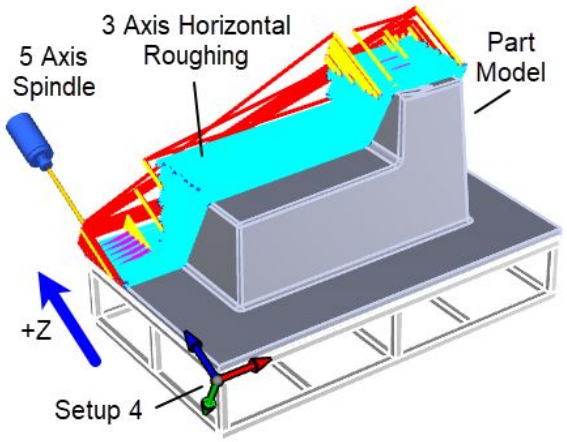


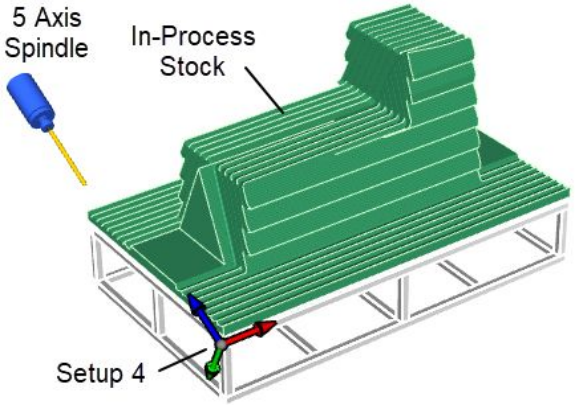
The Machining Job tree is shown on the left. In the middle we see that the +Z axis of the Work Zero triad is pointing vertical. The light blue lines are the Control Geometry that the tool is following, and the 5 Axis spindle is shown at the end of the Engraving operation near the back side of the part. On the right the simulation of the in-process stock has not changed.

Setup 4: 3 Axis Horizontal Roughing (Clone)

Setup 4 contains the second of the two 3 Axis Horizontal Roughing operations in this Machining Job. This operation is an exact clone of the operation and its parameters in Setup 2. It will rough out the back side of the part in levels. You can follow the illustrations below with the Machining Job tree on the left and the finished in-process stock on the right. In the middle you see the toolpath. Again, the Setup 4 triad indicates the +Z orientation of the spindle and is indicated by the blue arrow. The location of the 5 Axis spindle is at the end of the cut.



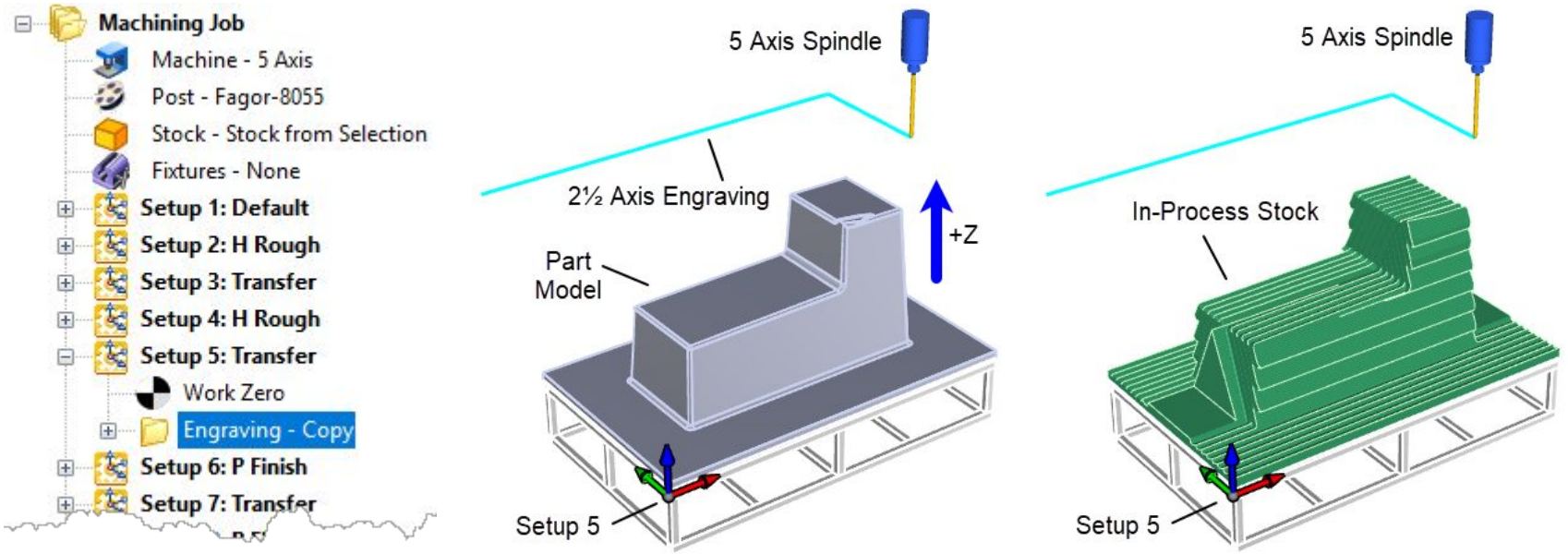




On the left we see the Machining Job tree with the 3 Axis Horizontal Roughing operation selected. The finished in-process stock is on the right, and the toolpath is shown in the middle. Again, the Setup 4 triad indicates the +Z orientation of the spindle and is indicated by the blue arrow and the location of the 5 Axis spindle is at the end of the cut.

Setup 5: Transfer: 2½ Axis Engraving (Clone)

Setup 5 contains the second Engraving operation (see Transfer Control in 5 Axis above for more about the use of Engraving operation in this case study). This operation is an exact clone of the operation and its parameters in Setup 3. This operation will guide the tool to the right side of the part near where the next operation will begin cutting. The illustrations below show the Machining Job tree on the left. In the middle we see that the +Z axis of the Setup 5 triad is again pointing vertical. The light blue lines are the Control Geometry that the tool will follow and that the 5 Axis spindle is shown at the end of the Engraving operation near the back right side of the part where the next cut will begin. On the right, the simulation of the in-process stock again has not changed.

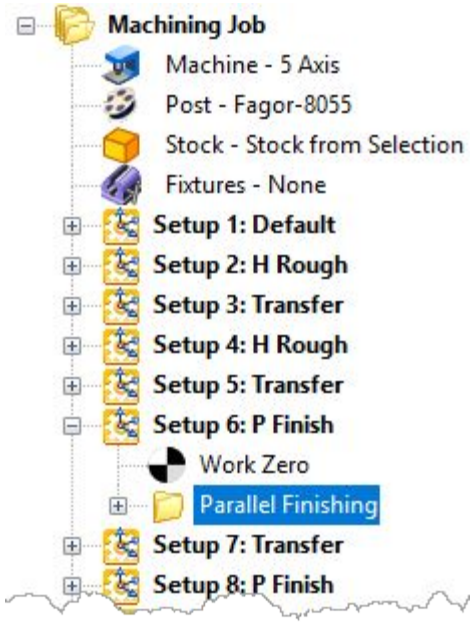


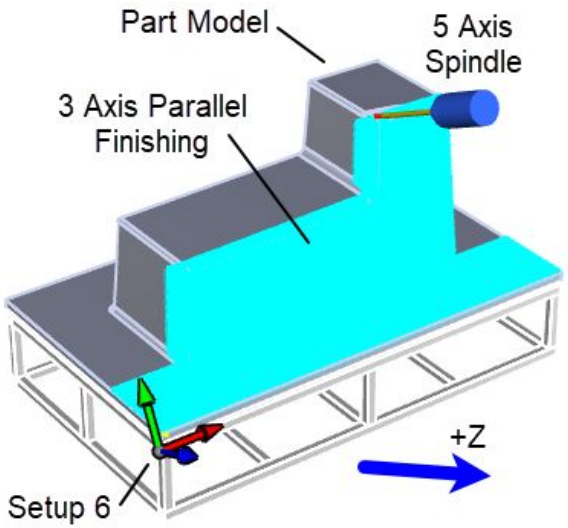
These illustrations show the Machining Job tree on the left with the Engraving operation selected. In the middle, the +Z axis of the Setup 5 triad is pointing vertically and the 5 Axis spindle is shown at the end of the Engraving operation near the right side of the part. On the right, the simulation of the in-process stock again has not changed.

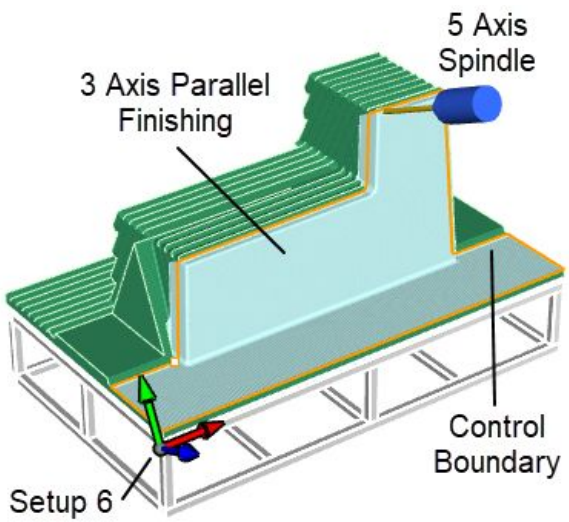
Setup 6: 3 Axis Parallel Finishing (Master)

Setup 6 contains the first of four 3 Axis Parallel Finishing operations, and it is selected in the machining Job on the left in the illustrations below. These four finishing operations will finish the part on each of the part's four sides. The Setup 6 triad indicates the +Z orientation of the spindle and is indicated by the blue arrow. The location of the 5 Axis spindle is at the end of the cut. The toolpath is shown in the middle image with a very fine stepover. On the right in-process stock image you see that the finishing operation is contained to the orange Control Boundary curves. These curves are actual surface edges of the part model.

Cut Parameters Include: Control Geometry: Closed Surface Edges, Tool: 25mm Ball Mill, Cut Tolerance: 0.001", Stock Allowance: -0.0625" (Overcut), Cut Direction: Mixed, Stepover Control: 0.05", Cut Pattern: Linear, Cut Direction: Mixed, Start Side: Bottom, Stepover Control: 0.05", Z Containment: None, Perform Cut Arc Fitting: Enabled, Entry/Exit: Linear, Cut Connections: Straight.



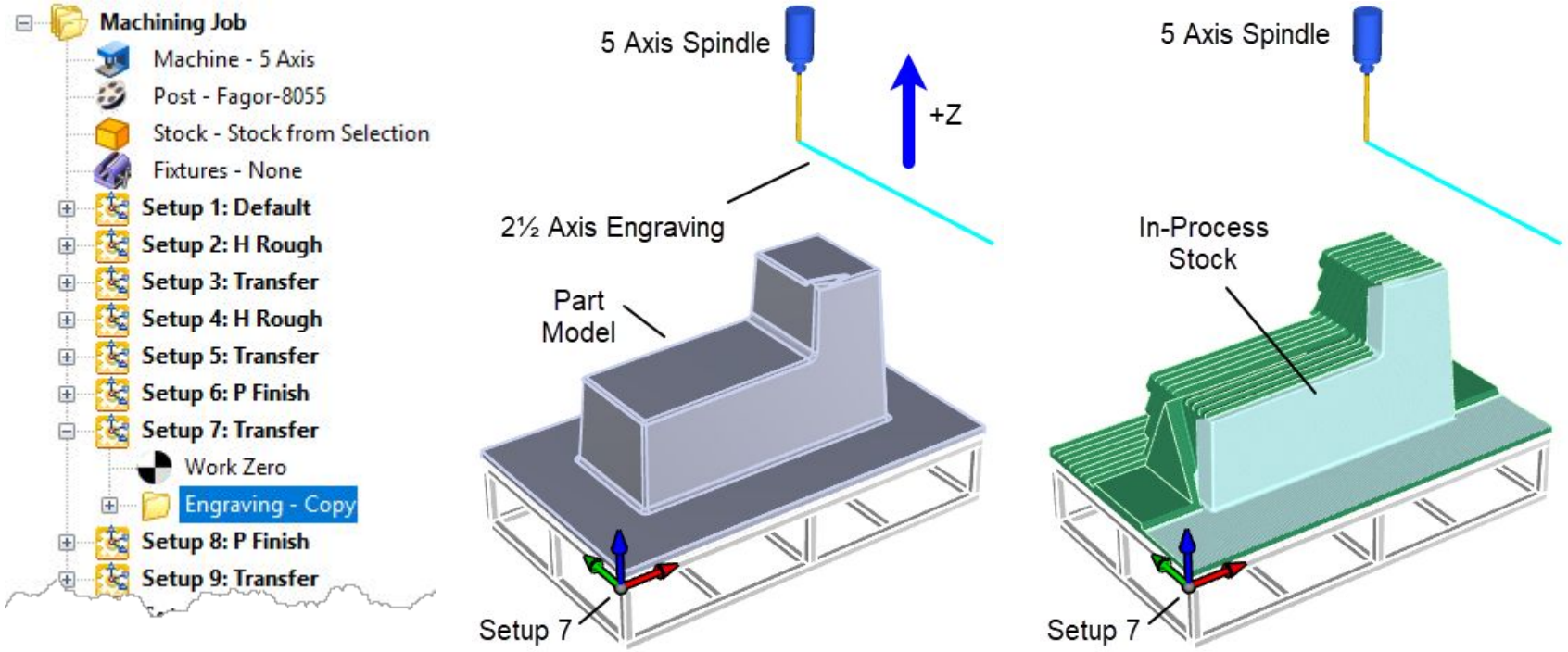




The above illustrations show the Machining Job tree on the left with the first 3 Axis Parallel Finishing operation selected. In the middle we see the +Z orientation of the spindle for Setup 6 and the location of the 5 Axis spindle at the end of the cut. On the right we see the resulting simulation and in-process stock once the cut is complete.

Setup 7: Transfer: 2½ Axis Engraving (Clone)

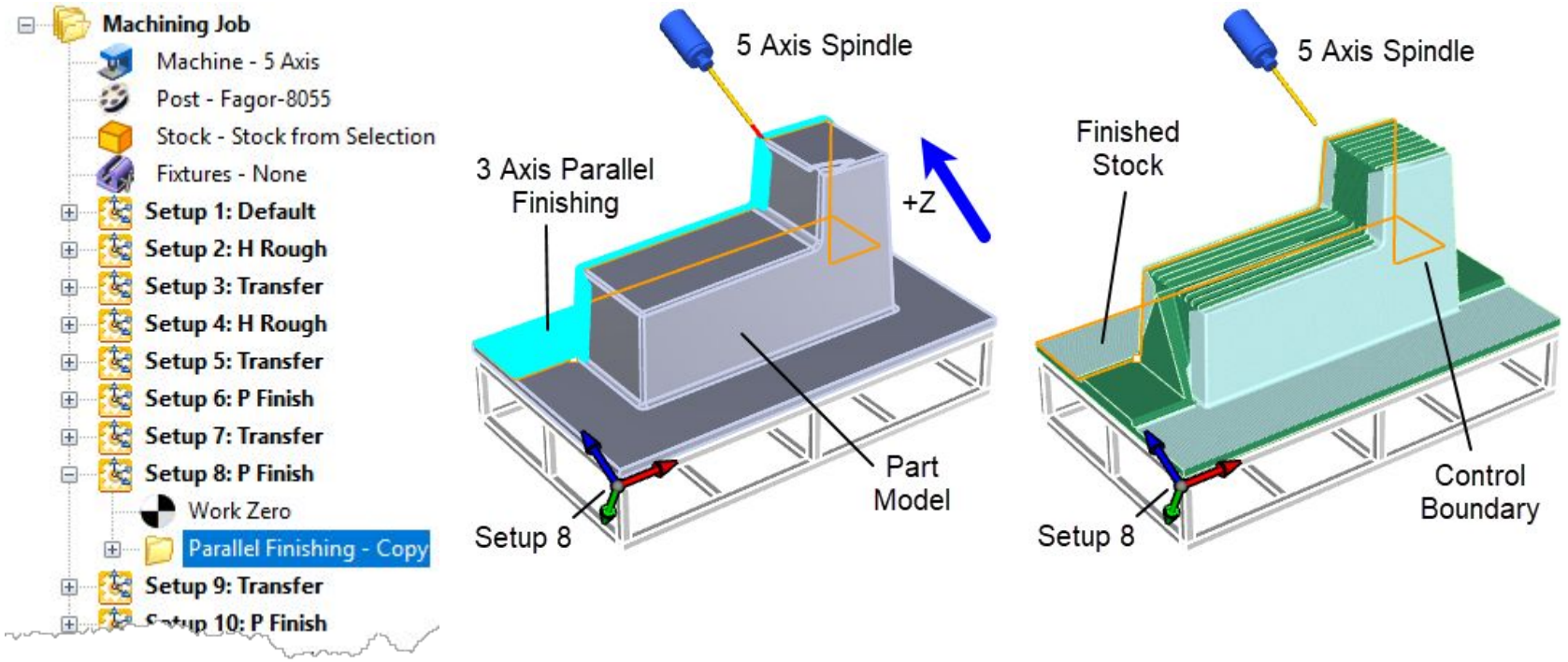
Setup 7 contains the third Engraving operation (see Transfer Control in 5 Axis above for more about the use of Engraving operations in this case study). This operation is an exact clone of the operation and its parameters in Setup 3. This operation will return the tool to the back of the part near where the next finishing operation will begin. The illustrations below show the Machining Job tree on the left. In the middle we see that the +Z axis of the Setup 7 triad is again pointing vertical. The light blue lines are the Control Geometry that the tool will follow and that the 5 Axis spindle is shown at the end of the Engraving operation near the back right side of the part. On the right, the simulation of the in-process stock again has not changed.



The above illustrations show the Machining Job tree of the left with the Engraving operation selected under Setup 7. In the middle, the +Z axis of the Setup 7 triad is pointing vertically and the 5 Axis spindle is shown at the end of the Engraving operation near the back side of the part. On the right, the simulation of the in-process stock has not changed.

Setup 8: 3 Axis Parallel Finishing (Clone)

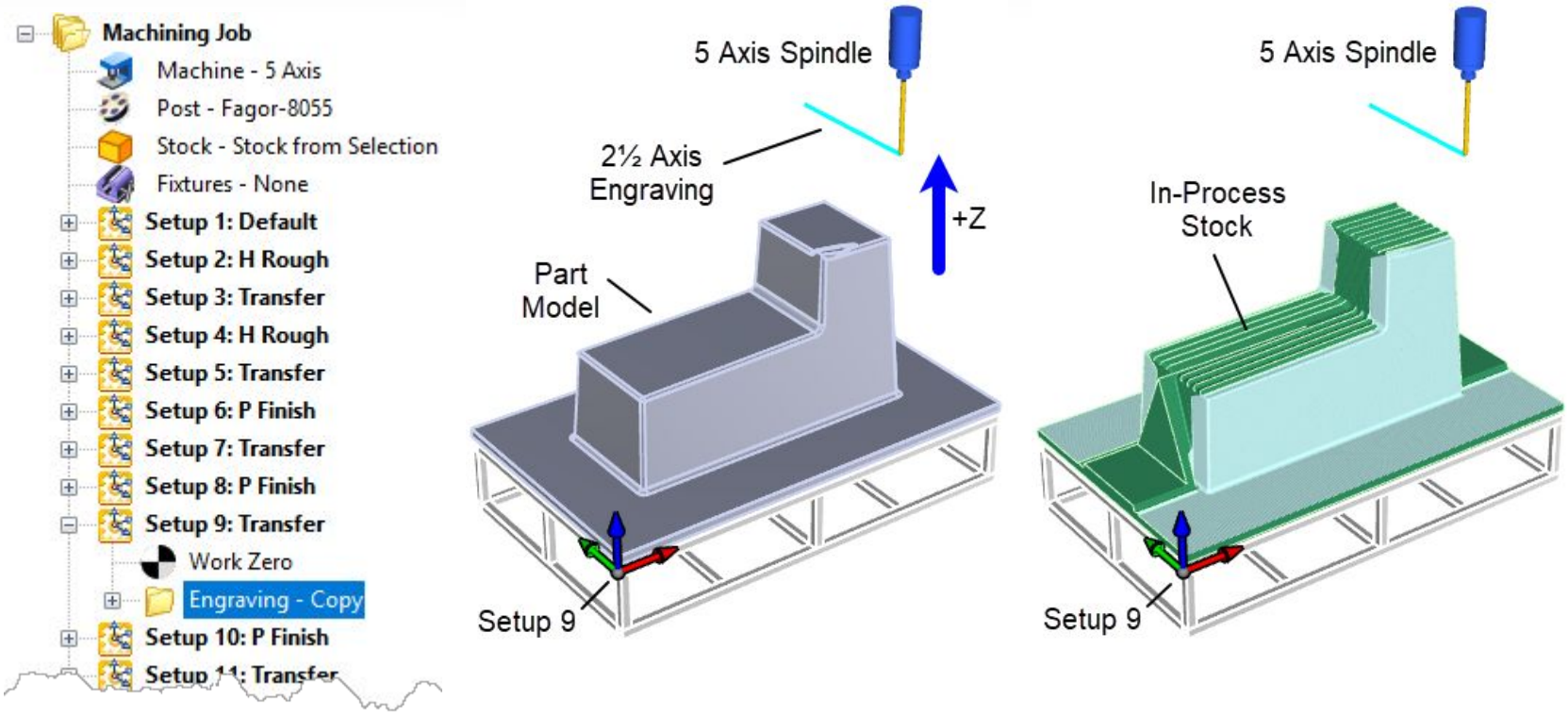
Setup 8 contains the second of four 3 Axis Parallel Finishing operations, and it is selected in the machining Job on the left in the illustrations below. This operation will finish the part on the back side. This operation is an exact clone of the operation and its parameters in Setup 6. The Setup 8 triad indicates the +Z orientation of the spindle and is indicated by the blue arrow. The location of the 5 Axis spindle is at the end of the cut. The toolpath is shown in the middle image with a very fine stepover. In the right in-process stock image you see that the finishing operation is contained to the orange Control Boundary curves. These curves are actual surface edges of the part model.



The above illustrations show the Machining Job tree on the left with the second 3 Axis Parallel Finishing operation selected under Setup 8. In the middle we see the +Z orientation of the spindle for Setup 8 and the location of the 5 Axis spindle at the end of the cut. On the right we see the resulting simulation and in-process stock once the cut is complete.

Setup 9: Transfer: 2½ Axis Engraving (Clone)

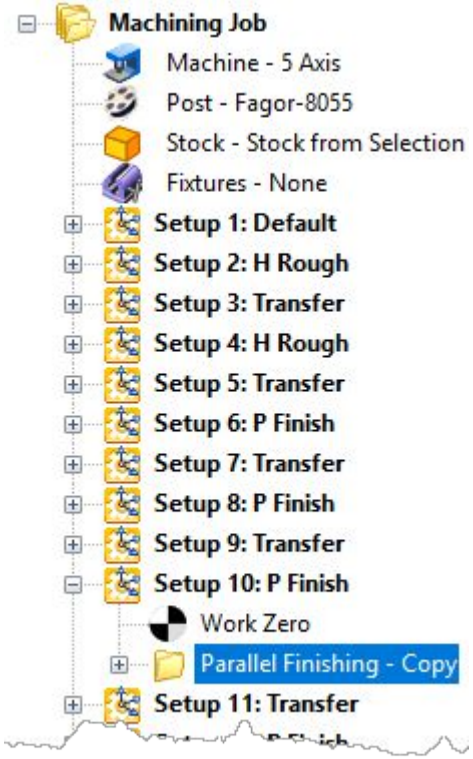
Setup 9 contains the fourth Engraving operation (see Transfer Control in 5 Axis above for more about the use of Engraving operations in this case study). This operation is an exact clone of the operation and its parameters in Setup 3. This operation will return the tool to the right side of the part near where the next finishing operation will begin. The illustrations below show the Machining Job tree on the left. In the middle we see that the +Z axis of the Setup 9 triad is again pointing vertical. The light blue lines are the Control Geometry that the tool will follow and that the 5 Axis spindle is shown at the end of the Engraving operation near the right side of the part. On the right, the simulation of the in-process stock again has not changed.

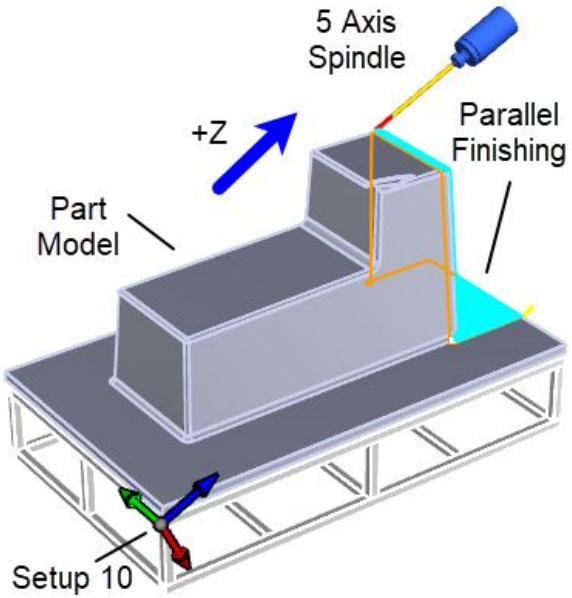


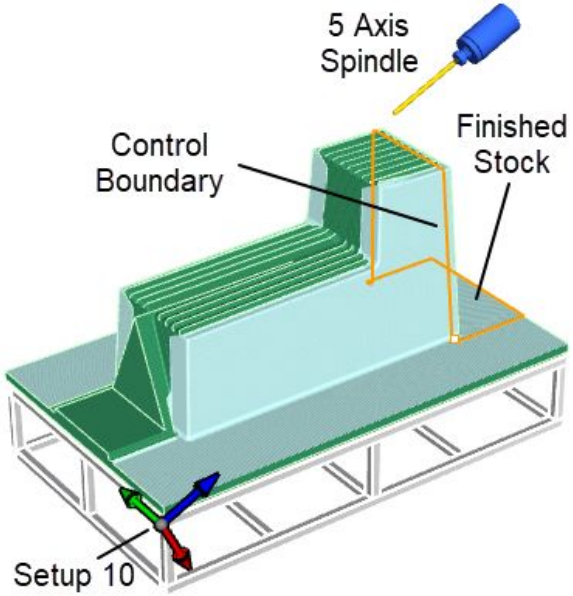
The above illustrations show the Machining Job tree of the left with the fourth 2½ Engraving operation selected under Setup 9. In the middle, the +Z axis of the Setup 7 triad is pointing vertically and the 5 Axis spindle is shown at the end of the Engraving operation near the right side of the part. On the right, the simulation of the in-process stock has not changed since Setup 8.

Setup 10: 3 Axis Parallel Finishing (Clone)

Setup 10 contains the third of four 3 Axis Parallel Finishing operations, and it is selected in the machining Job on the left in the illustrations below. This operation is an exact clone of the operation and its parameters in Setup 6. This operation will finish the part on the right side. The Setup 10 triad indicates the +Z orientation of the spindle and is indicated by the blue arrow. The location of the 5 Axis spindle is at the end of the cut. Again, the toolpath is shown in the middle image with a very fine stepover. In the right in-process stock image you see that the finishing operation is contained to the orange Control Boundary curves. Again, these curves are the actual surface edges of the part model.



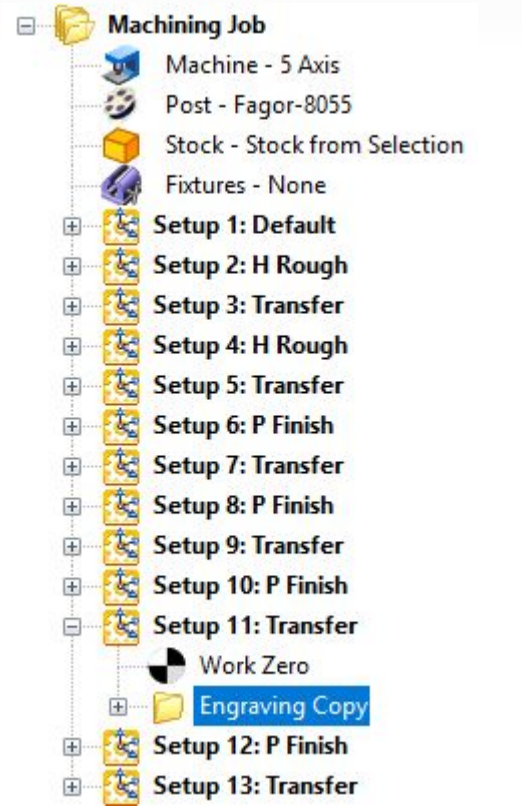


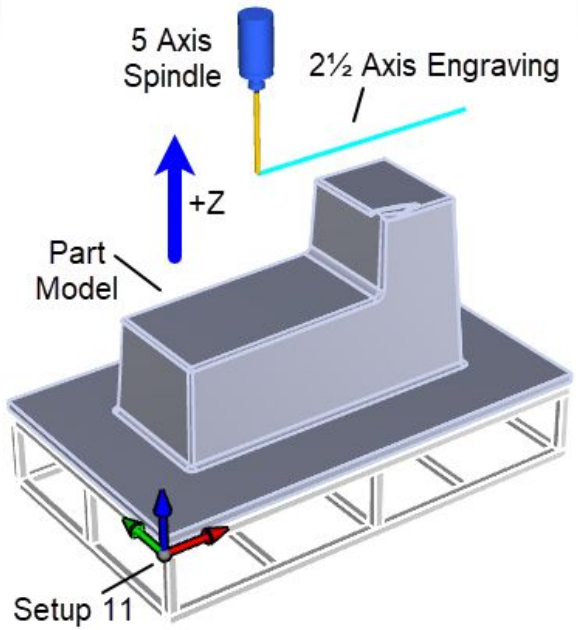


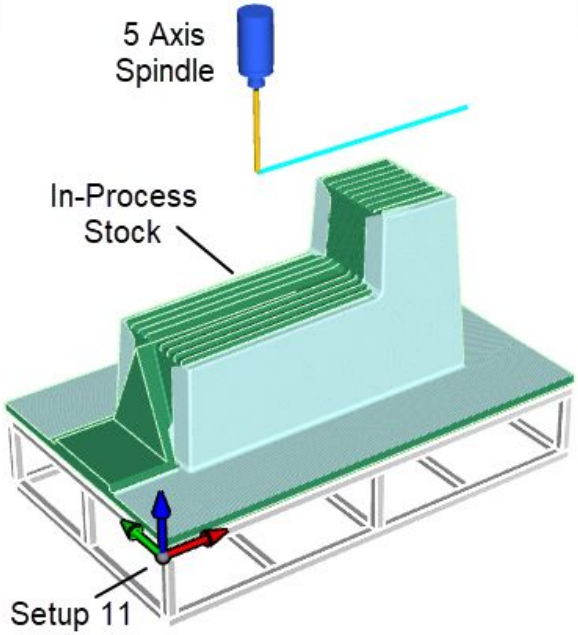
The above illustrations show the Machining Job tree on the left with the third 3 Axis Parallel Finishing operation selected under Setup 10. In the middle we see the +Z orientation of the spindle for Setup 10 and the location of the 5 Axis spindle at the end of the cut. On the right we see the resulting simulation and in-process stock once the cut is complete.

Setup 11: Transfer: 2½ Axis Engraving (Clone)

Setup 11 contains the fifth Engraving operation (see Transfer Control in 5 Axis above for more about the use of Engraving operations in this case study). This operation is an exact clone of the operation and its parameters in Setup 3. This operation will guide the tool to the left side of the part near where the next finishing operation will begin. The illustrations below show the Machining Job tree on the left. In the middle we see that the +Z axis of the Setup 11 triad is again pointing vertical. The blue lines are the Control Geometry that the tool will follow, and the 5 Axis spindle is shown at the end of the Engraving operation near the left side of the part. On the right, the simulation of the in-process stock again has not changed.





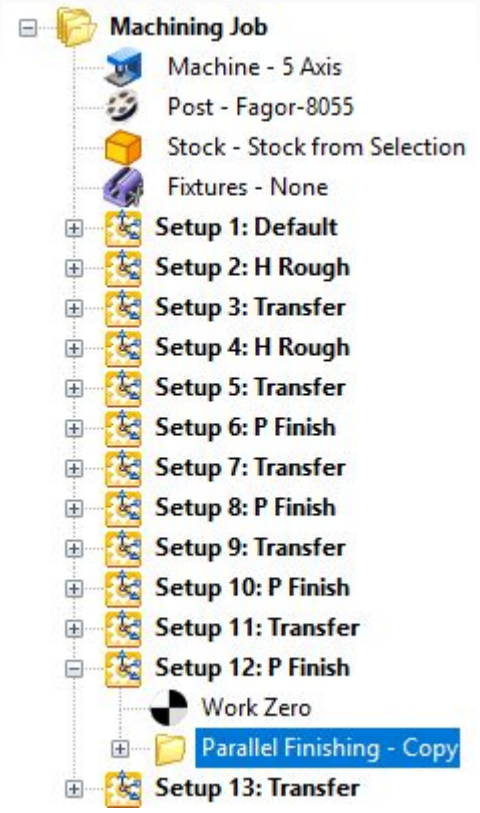


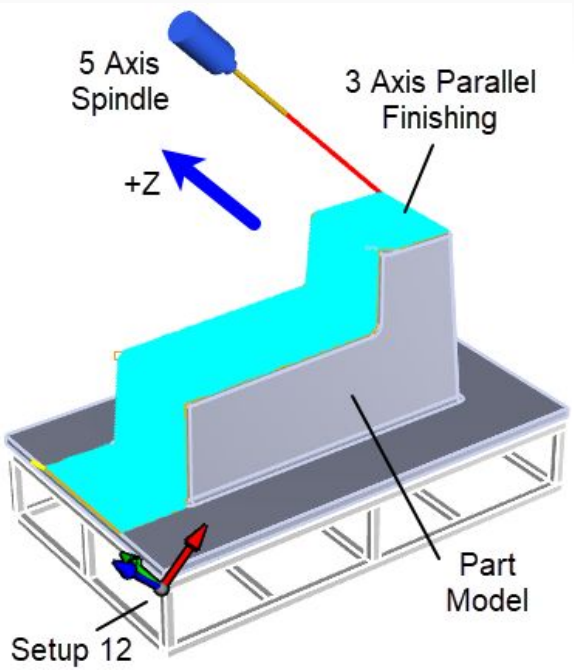
The above illustrations show the Machining Job tree on the left with the fifth 2½ Engraving operation selected under Setup 11. In the middle, the +Z axis of the Setup 11 triad is pointing vertically and the 5 Axis spindle is shown at the end of the Engraving operation near the left side of the part. On the right, the simulation of the in-process stock has not changed since Setup 10.

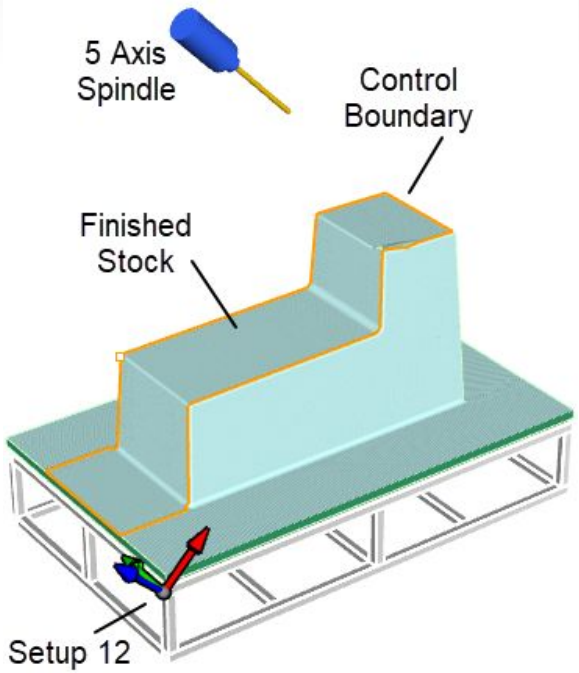
Setup 12: 3 Axis Parallel Finishing (Clone)

Setup 12 contains the fourth and final 3 Axis Parallel Finishing operation and it is selected in the machining Job on the left in the illustrations below. This operation is an exact clone of the operation and its parameters in Setup 6. This operation will finish the part on the left side. Again, the Setup 12 triad indicates the +Z orientation of the spindle and is indicated by the blue arrow. The location of the 5 Axis spindle is at the end of the cut. Below, the toolpath is shown in the middle image with a very fine stepover. In the right in-process stock image you see that the finishing operation is contained to the orange Control Boundary curves. Again, these curves are the actual surface edges of the part model.

The part is now finished!



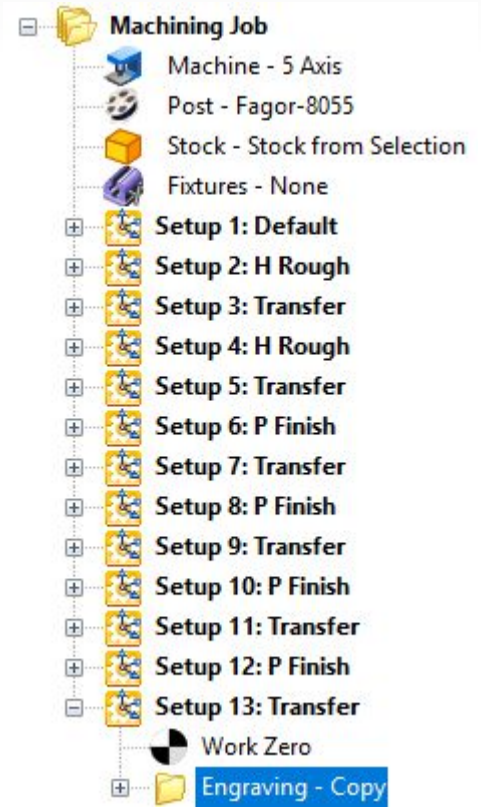


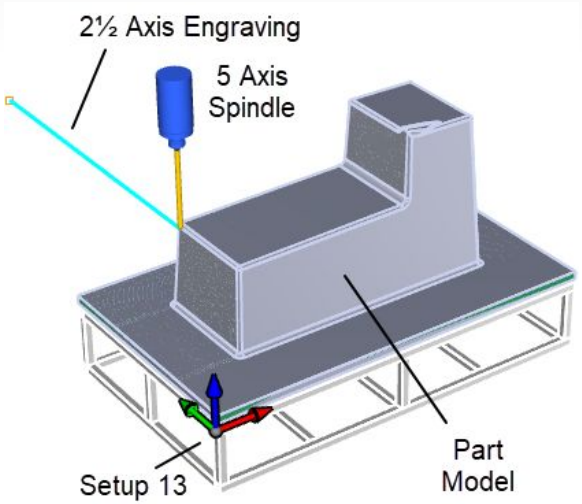


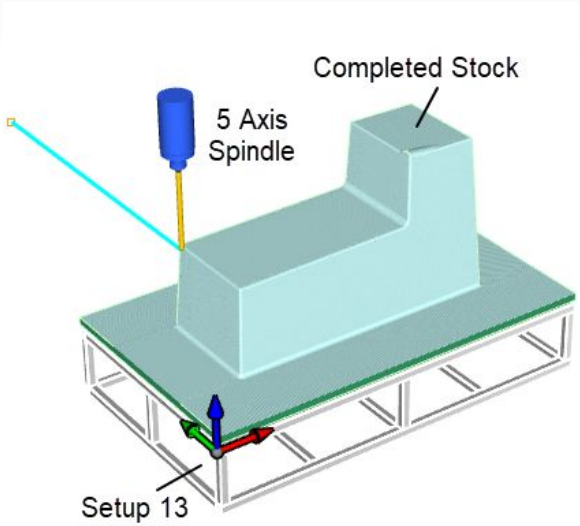
The above illustrations show the Machining Job tree on the left with the fourth and final 3 Axis Parallel Finishing operation selected under Setup 12. In the middle we see the +Z orientation of the spindle for Setup 12 and the location of the 5 Axis spindle at the end of the cut. On the right we see the resulting simulation and in-process stock once the cut is complete.

Setup 13: Transfer: 2½ Axis Engraving (Clone)

The final Setup 13 contains the sixth and final Engraving operation (see Transfer Control in 5 Axis above for more about the use of Engraving operations in this case study). This operation is an exact clone of the operation and its parameters in Setup 3. This operation will guide the tool back to the front side of the part above the original Setup 1 location. The illustrations below show the Machining Job tree on the left. In the middle we see that the +Z axis of the Setup 13 triad is again pointing vertical. The blue lines are the Control Geometry that the tool will follow, and the 5 Axis spindle is shown at the end of the Engraving operation near and above the original Setup 1 Work Zero on the front side of the part. On the right, the simulation of the in-process stock shows the finished part.



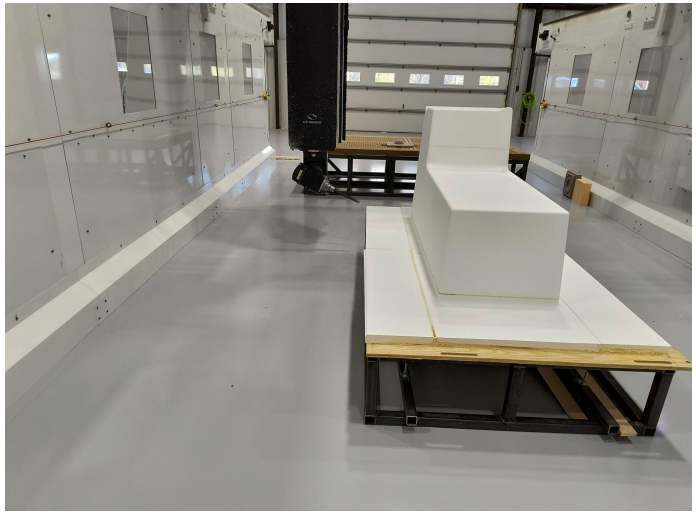




The above illustrations show the Machining Job tree on the left with the sixth and final 2½ Engraving operation selected under Setup 13. In the middle, the +Z axis of the Setup 13 triad is pointing vertically and the 5 Axis spindle is shown at the end of the Engraving operation near the front side of the part. On the right, the simulation of the in-process stock has not changed since Setup 12.

The Finished Plug Form and Composite Basin

The images below show the Baptistery plug form on the left after machining and still sitting on its support fixture in the C.R. Onsrud “LR” (Light Rail) series 5-axis CNC router chamber. The production 60” long x 24” wide x 36” deep composite baptistry basin is shown on the right.



Above we see the Baptistery plug form on the left after machining and still sitting on its support fixture in the C.R. Onsrud “LR” (Light Rail) series 5-axis CNC router chamber. The production 60” long x 24” wide x 36” deep composite baptistry basin is shown on the right.

Piedmont Composites & Tooling: Bringing Projects to Life

Piedmont Composites & Tooling is equipped to transform a project from initial concept to completion, handling everything from hand-built wooden plugs to precision-machined composite masters. The company's Tooling Department is staffed by highly experienced craftsmen, boasting an average of 20 years of experience. Their expertise spans a wide spectrum, from crafting single-use "one-off" molds to developing high-volume, high-temperature molds of all intermediate types, which many are used for parts production within PCT itself as many of its customers entrust them to produce the parts as well.

Piedmont Composites & Tooling maintains in-house wood and steel fabrication departments. This capability ensures that the final product's surface not only meets aesthetic requirements but that the support structure is built for durability. Notably, all tooling currently utilized within the factory was built by Piedmont Composites & Tooling itself. You can learn more about Piedmont Composites & Tooling at piedmontcomposites.com



More images form Piedmont Composites & Tooling Left: Tooling, (Middle) Wax Layup, (Right) facility in Taylorsville, NC

We want to extend a special thanks to Piedmont Composites & Tooling, LLC for allowing us to showcase his work!

Want to see how RhinoCAM can help you? Click Here to download a demo!

More about RhinoCAM MILL

RhinoCAM - MILL is available in 5 different configurations (Express, Standard, Expert, Professional and Premium). The part shown here was programmed using the Professional (3+2) configuration. Here are some additional details about each of the available configurations. For the complete features list, visit the RhinoCAM Product Page.

- **RhinoCAM MILL Express:** This is a general-purpose program tailored for hobbyists, makers and students. Ideal for getting started with CAM programming. Includes 2 & 3 axis machining methods. Includes ART & NEST modules as well!
- **RhinoCAM MILL Standard:** This configuration includes everything that is in the Express configuration plus additional 2-1/2 Axis, 3 Axis & Drill machining methods. Also now includes 2½ Axis Turning!
- **RhinoCAM MILL Expert:** Suitable for 4 Axis rotary machining. Includes the Standard configuration, plus 4 Axis machining strategies, advanced cut material simulation and tool holder collision detection.

- **RhinoCAM MILL Professional:** Ideal for complex 3D machining. Includes the Standard and Expert configuration, plus advanced 3 Axis machining strategies, 5 Axis indexed machining, machine tool simulation, graphical toolpath editing and a host of other features.
- **RhinoCAM MILL Premium:** Tailored for complex 3D machining with both 3 Axis and full 5 Axis methods. Includes the Standard, Expert and Professional configurations, plus 5 Axis simultaneous machining strategies.

Try RhinoCAM Today!

Powerful production CAM for Rhino users!

Follow MecSoft Corporation Online at: