



VisualCAD/CAM Rocks With Dingwall Guitars!

[Sheldon Dingwall](#) and [Dingwall Guitars](#)

(Saskatoon, SK, Canada) is one of the pioneers in the development of today's multi-scale [fan fret electric bass guitar](#). Sheldon was a player from a very young age, first learning the piano at age 5, drums and then guitar at age 12! But Sheldon didn't stop there. He decided to build his own guitar in his uncle's cabinet shop where he learned the critical woodworking skills from a master craftsman.





The VisualCAD/CAM Difference

[Dingwall Guitars](#) has been operating continuously for the past 32 years manufacturing thousands of their electric bass guitars from their 8,000 square foot facility. Sheldon learned early on the importance of digital manufacturing and has successfully implemented [VisualCAD/CAM](#) from MecSoft Corporation with their Fadal CNC milling center on thousands of components over the past twenty years. We recently sat down with Sheldon to learn more about the Dingwall brand and how VisualCAD/CAM fits into their manufacturing process.



“We started out using VectorCAM and then migrated to VisualCAM. The difference was night and day! VisualCAM is a much more robust and certainly a much better overall experience.”

*Sheldon Dingwall
Owner/Operator, [Dingwall Guitars Inc.](#)
Saskatoon, SK, Canada*

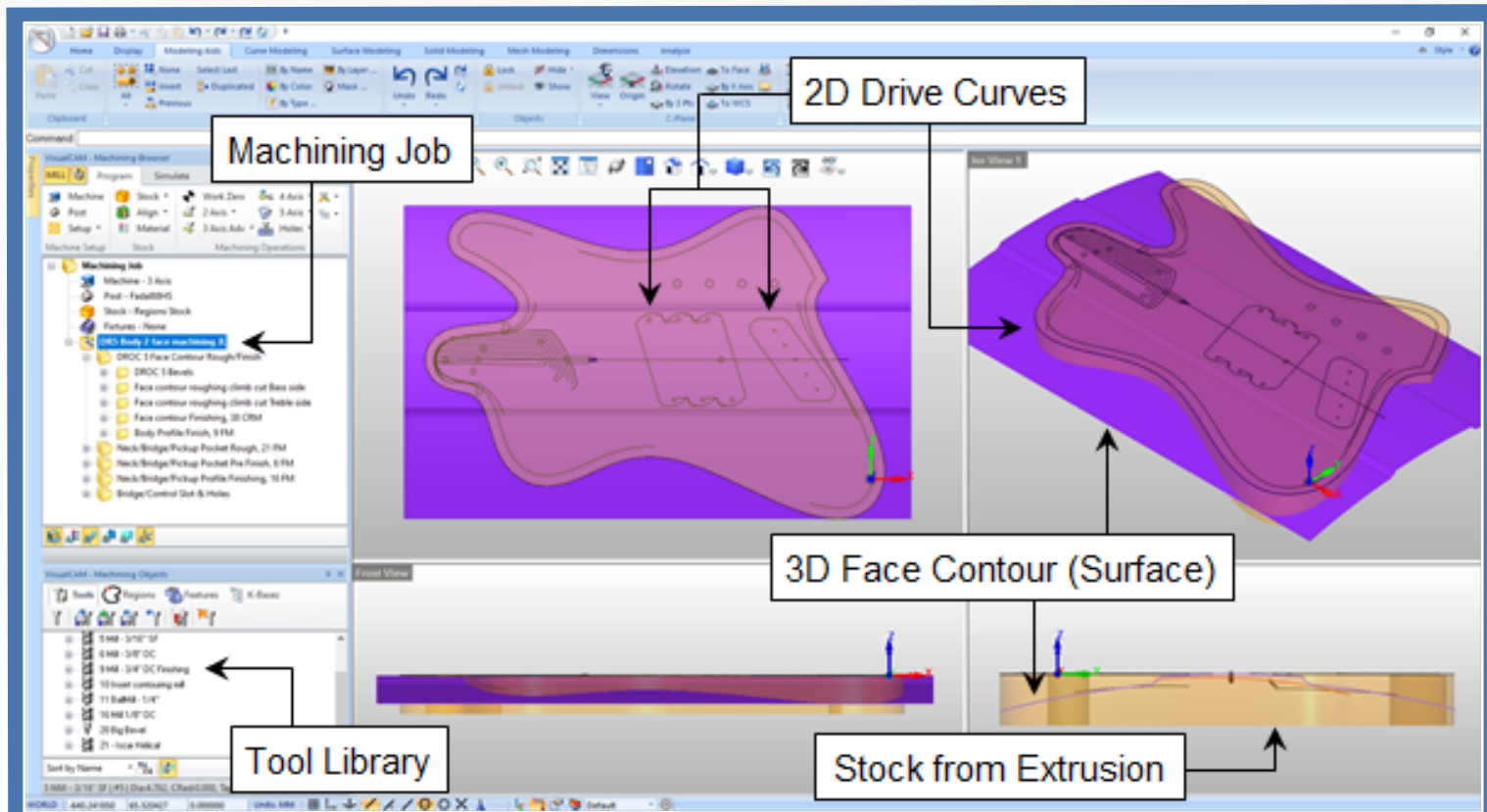


The VisualCAM Project

The [VisualCAD/CAM](#) project chosen for this case study is the CNC machined body of the [Dingwall D-ROC](#) electric bass guitar in its standard configuration. This is one of three *ready-to-play* guitar models from the Dingwall line. See more electric bass guitars in the Dingwall line further on in this article.

What sets this VisualCAD/CAM part file apart from other 3 Axis machining jobs is that only one 3D surface is required. Both the top and back are 3D contoured. It is used to define the sculpted top face of the D-ROC body. The remaining geometry are 2D and 3D curves. These curves are used to drive each of the 2½ Axis and 3 Axis toolpaths used to complete the machining job. The VisualCAD/CAM part file is shown below. The 3D contour surface is colored in deep violet. The remaining geometry curves are black and the stock definition is shown transparent.

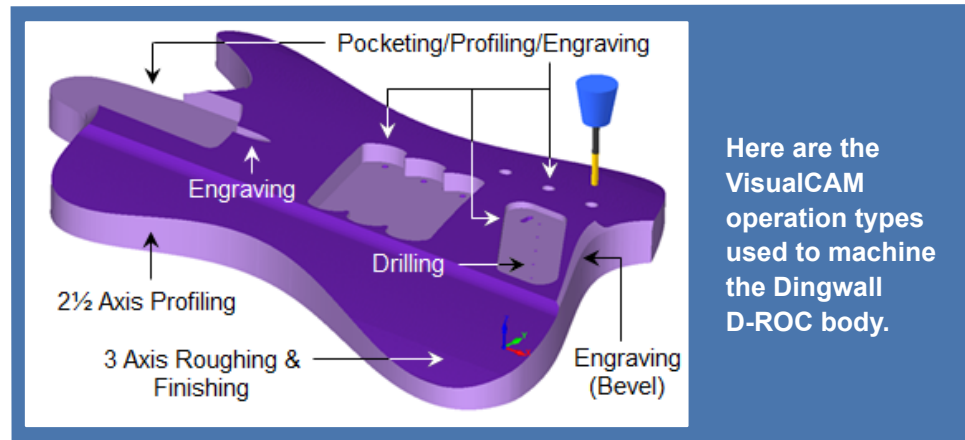




The VisualCAD/CAM part file for the [Dingwall D-ROC](#) electric bass guitar body. The Machining Job tree and Tool Library are shown on the left of the display. The quad viewport shows the Top, Front, Side and Isometric view of the D-ROC body geometry.

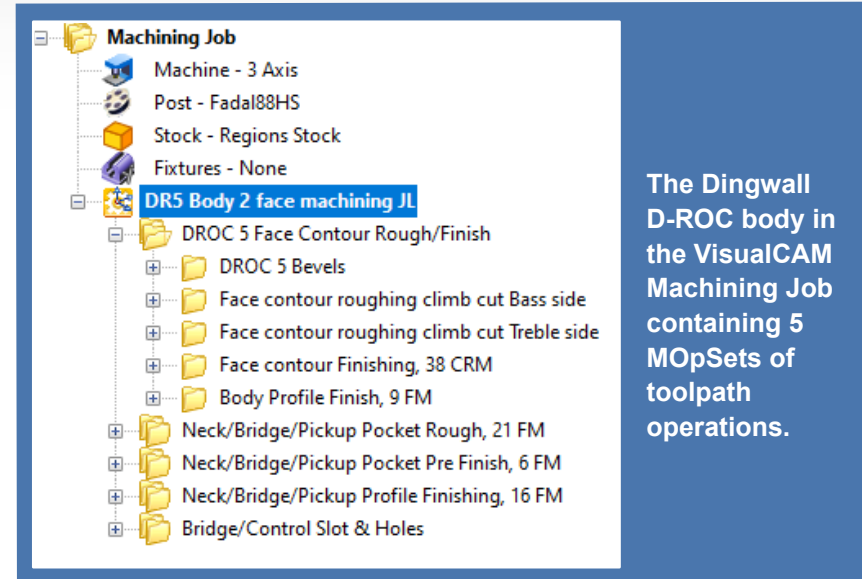
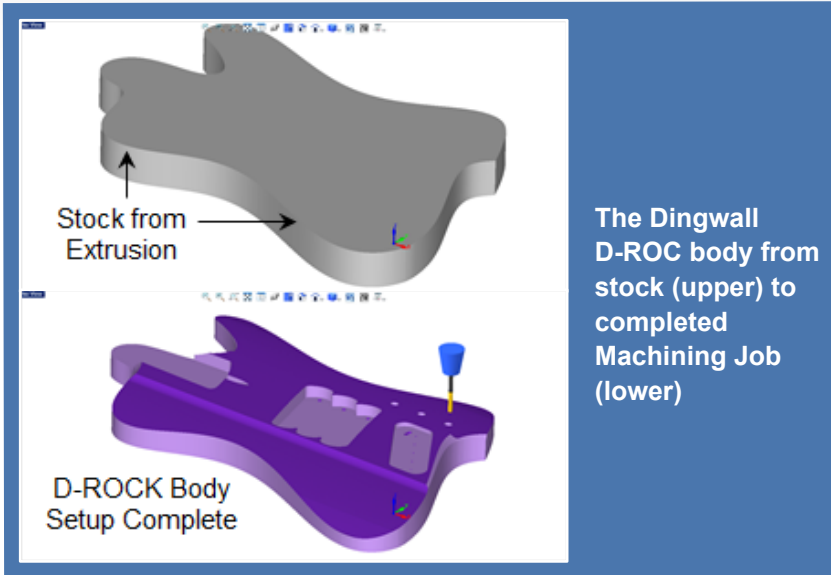


The Machining Job & Setup



The VisualCAM Machining Job for the [Dingwall D-ROC](#) body consists of one 3 Axis setup output to the Fadal 88Hs post processor. The Stock is defined as an extrusion of the outer perimeter curve, defined as “Regions Stock” in the Machining Job tree. The actual stock material for this project is Khaya, also known as African Mahogany. The setup consists of 5 MOpSets (Machining Operation Sets). Each set contains multiple machining operations grouped by tool definition and other factors.

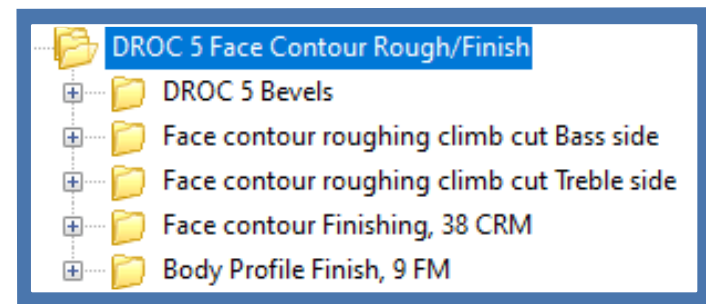
The first MOpSet contains 3 Axis rough and finish MOps (Machining Operations) for the upper contoured face of the [Dingwall D-ROC](#) body. The remaining MOpSets contain operations for the 2½ Axis roughing, pre-finishing and finishing toolpaths used to complete the machining job. The Machining Job tree, stock and completed cut material simulations are shown below.



The Dingwall D-ROC body in the VisualCAM Machining Job containing 5 MOpSets of toolpath operations.

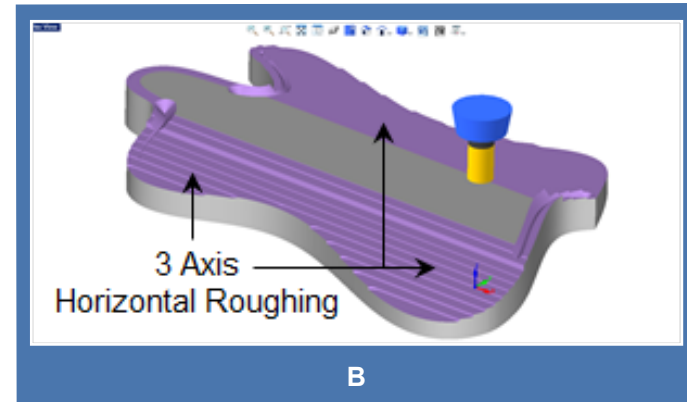
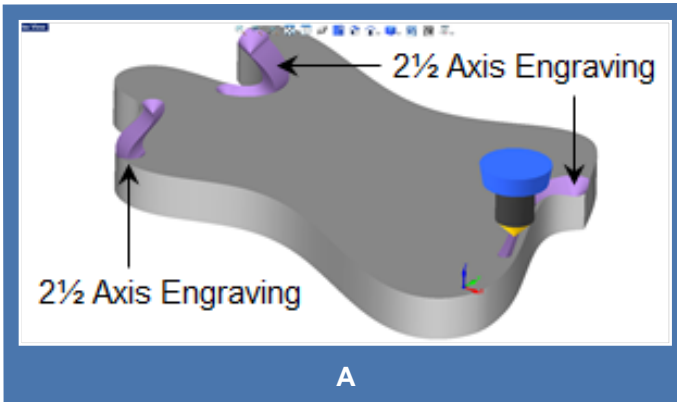
Body Rough & Finish

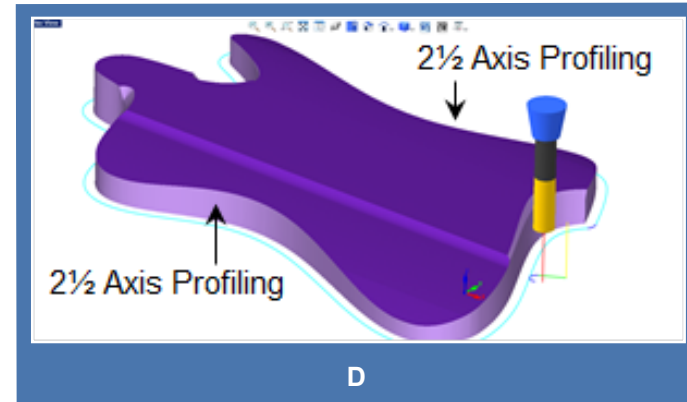
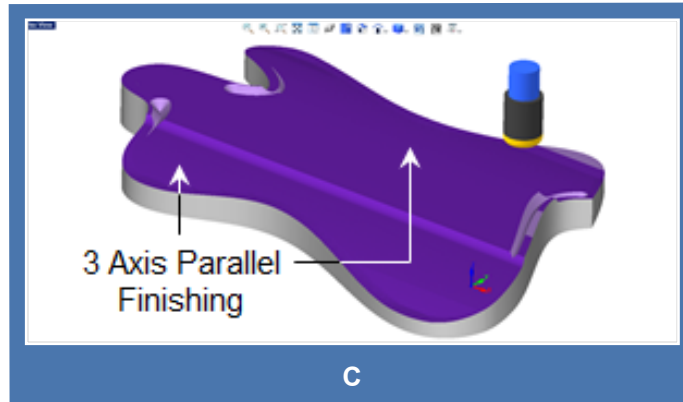
The first MOpSet in the Machining Job contains tool path strategies to rough and finish the top sculpted face of the D-ROC body. It starts off with 2½ Axis Engraving, followed with 3 Axis Roughing and Finishing and then 2½ Axis Profiling. You can refer to the descriptions and illustrations below:





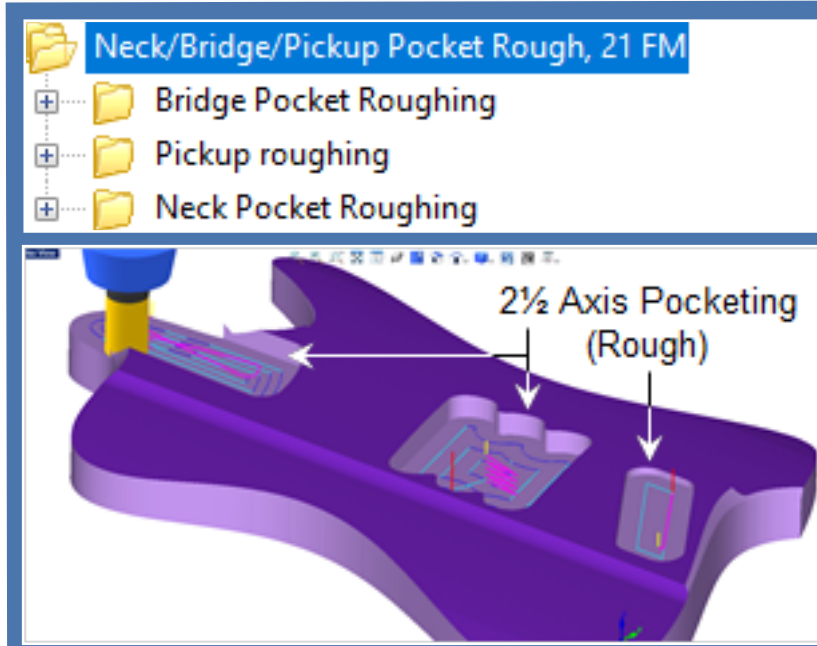
- A. 2½ Axis Engraving is used to machine a bevel in three areas of the body using a 38mm diameter 45-degree Vee mill. In engraving the tip of the cutter follows the selected geometry. In this case 3D curves.
- B. 3 Axis Horizontal Roughing is used to remove excess material from the stock of African Mahogany using a 25.4mm diameter flat end mill, climb cut direction, a stock allowance of 1mm and stepover of 50% of the tool diameter. In 3 Axis the visible 3D sculpted surface of the D-ROC body is used to calculate the toolpath.
- C. 3 Axis Parallel Finishing operation is used to remove the remaining 1mm of stock using a 38mm diameter x 6mm corner radius mill, a mixed cut direction and stepover of 1mm for an excellent surface finish.
- D. The final operation in this MOpSet is a 2½ Axis Profiling operation to cut the outer perimeter of the body that follows the 2D planar perimeter curve using a 19mm diameter flat end mill and a climb cut direction. One cut level at 44mm deep cuts the perimeter in one pass.





Pocket Rough

The second MOpSet in the Machining Job contains three 2½ Axis Pocketing operations to rough out the Neck, Bridge, and Pickup pockets using a 25.4mm diameter flat end mill, an offset cut pattern, climb cut direction, and 50% stepover, leaving 2mm of stock allowance on the part. One cut level at a depth of 6mm is used with a ramp entry and linear retract motions. Cut Arc Fitting is enabled for this operation with a Fitting Tolerance (t) of 0.1mm.



(Top) The Machining Job MOpSet for the 2½ Axis Pocket roughing for the Neck, Bridge, and Pickup pockets.

(Bottom) Cut material simulation showing the toolpaths for all three operations.



Pocket Pre-Finish

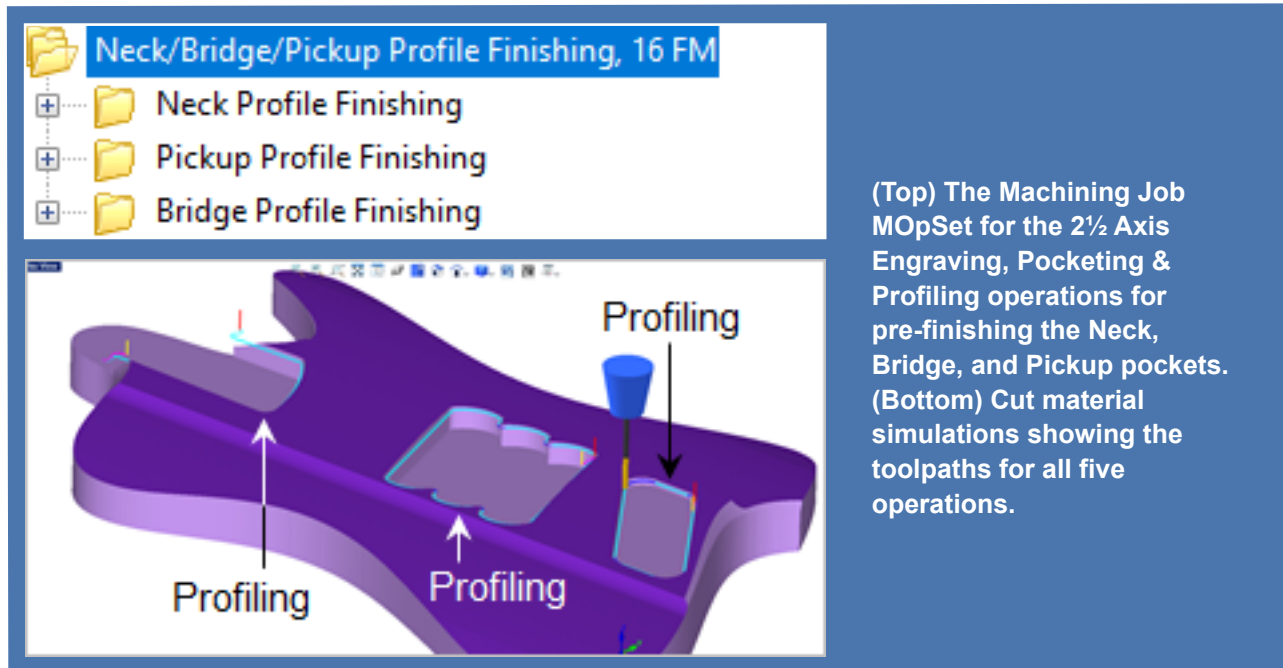
The third MOpSet in the Machining Job contains five operations to pre-finish the Neck, Bridge, and Pickup pockets all using a 9.5mm flat end mill. The Neck uses two 2½ Axis Engraving and Profiling operations that follow the exact location and direction of the 2D geometry curves. Engraving is a versatile operation used when you want exact positioning control of the cutter at all times. The Pickup pocket is pre-finished with a 2½ Axis Profiling operation and the Bridge pocket uses a second Pocketing operation, each leaving 0.5mm of stock on the vertical side walls of the part.

(Left) The Machining Job MOpSet for the 2½ Axis Engraving, Pocketing & Profiling operations for pre-finishing the Neck, Bridge, and Pickup pockets. (Right) Cut material simulations showing the toolpaths for all five operations.



Pocket Finish

The fourth MOpSet in the Machining Job contains three 2½ Axis Profiling operations to finish the Neck, Bridge, and Pickup pocket side walls each using a ⅛" (3.175mm) diameter flat end mill using a 10-degree ramp entry. These finishing passes cut to a depth of 3mm leaving zero stock allowance for the exact assembly fit required for the Neck, Bridge, and Pickup components.



(Top) The Machining Job MOpSet for the 2½ Axis Engraving, Pocketing & Profiling operations for pre-finishing the Neck, Bridge, and Pickup pockets. (Bottom) Cut material simulations showing the toolpaths for all five operations.



Final Slots & Holes

To wrap up the D-ROC body machining setup, the final MOpSet includes the mounting and accessories using 2½ Axis Engraving, Pocketing and Drilling operations. The first two are Deep Drilling for the Bridge (1.984mm diameter) using a 3mm step increment and Standard Drilling for the Pickup (4.76mm diameter). These are followed by Engraving operations for the truss rod slot and bridge ground slot and finally a Pocketing operation for the three 9.50mm diameter control knob accesses.

The image shows a screenshot of the VisualCAD/CAM software interface. On the left, a folder tree is displayed under the heading "Bridge/Control Slot & Holes". The folders listed are: "Bridge Screw Holes", "Pickup holes", "Truss rod Slot, Domestic, 11 BM", "Bridge ground slot", and "Control holes - BREAKS VACUUM". On the right, a 3D simulation of a part is shown with toolpaths for "Engraving", "Drilling", and "Pocketing" operations. The part is rendered in a purple color, and the toolpaths are shown in red and blue. The simulation shows a drill bit performing drilling operations and a tool performing engraving and pocketing operations.

(Left) The Machining Job MOpSet for the Bridge/Control Slot & Holes.
(Right) Cut material simulations showing the toolpaths for the 2½ Axis Engraving, Drilling and Hole Pocketing operations.



We hope you enjoyed reading about this cool project as much we did writing it! We also want to extend a very special thanks to [Sheldon Dingwall](#) and his team at [Dingwall Guitars](#) for allowing us to share their phenomenal success story!

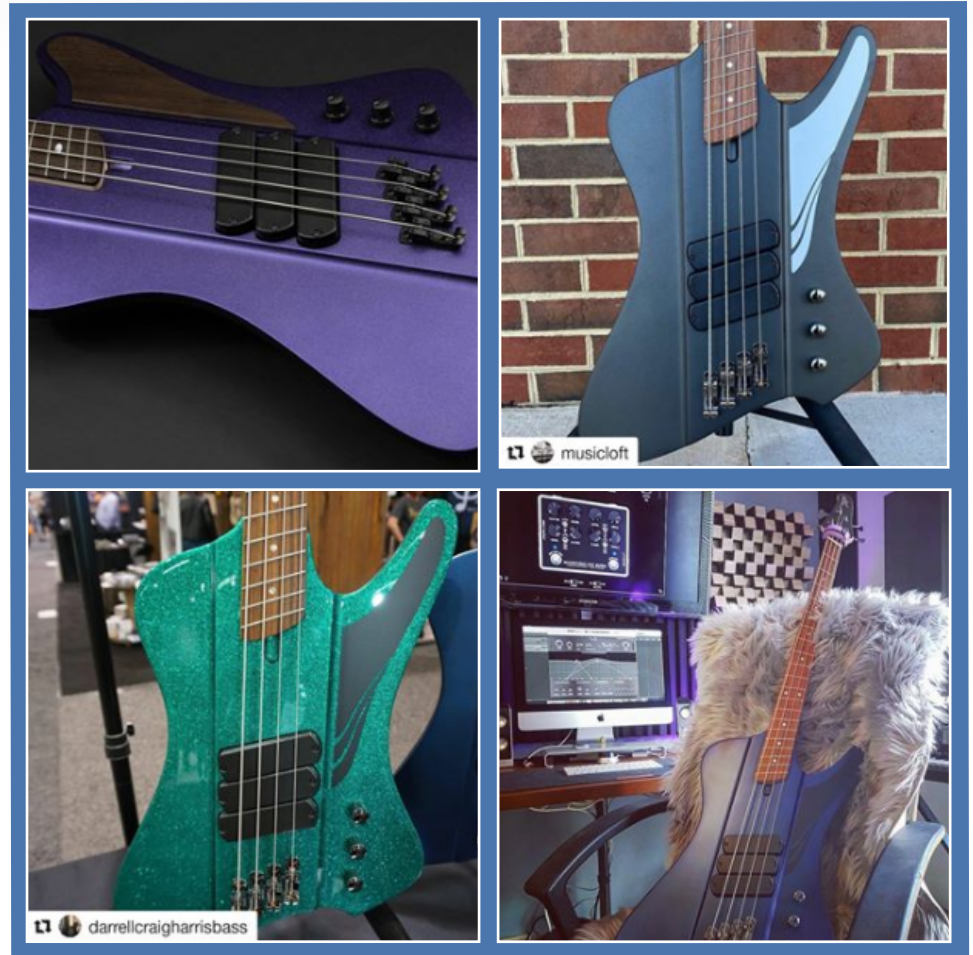
*Cool project Sheldon!
Thank you for allowing us to showcase your work!*





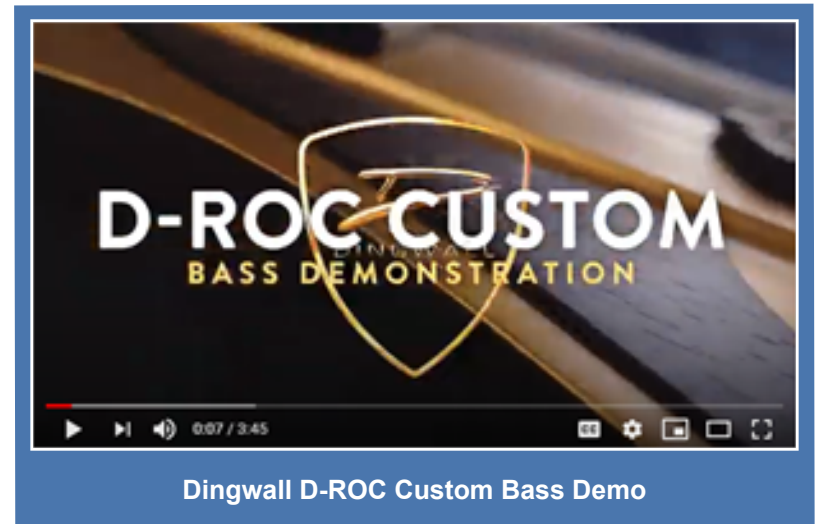
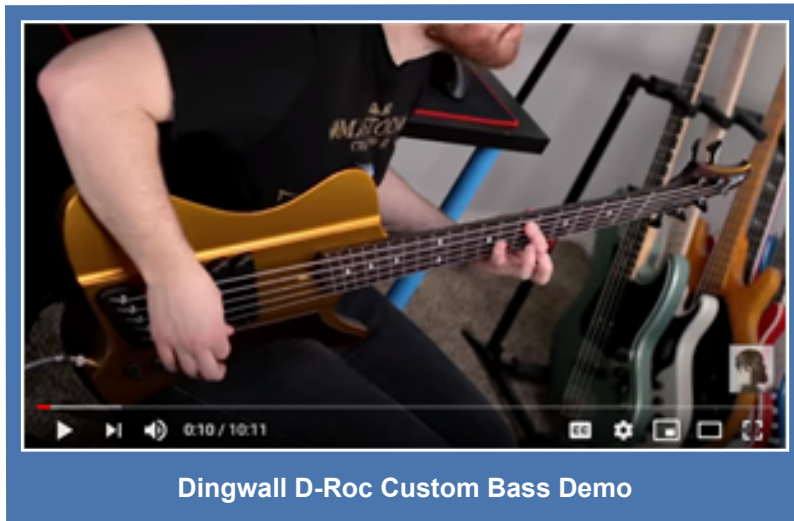
More D-ROCS!

We couldn't let you go before proudly showing off more [D-ROC electric basses from Dingwall Guitars](#). Here are just a few pics and reviews. Be sure to visit Dingwall Guitars at the social media links provided below! D-ROC Enjoy!





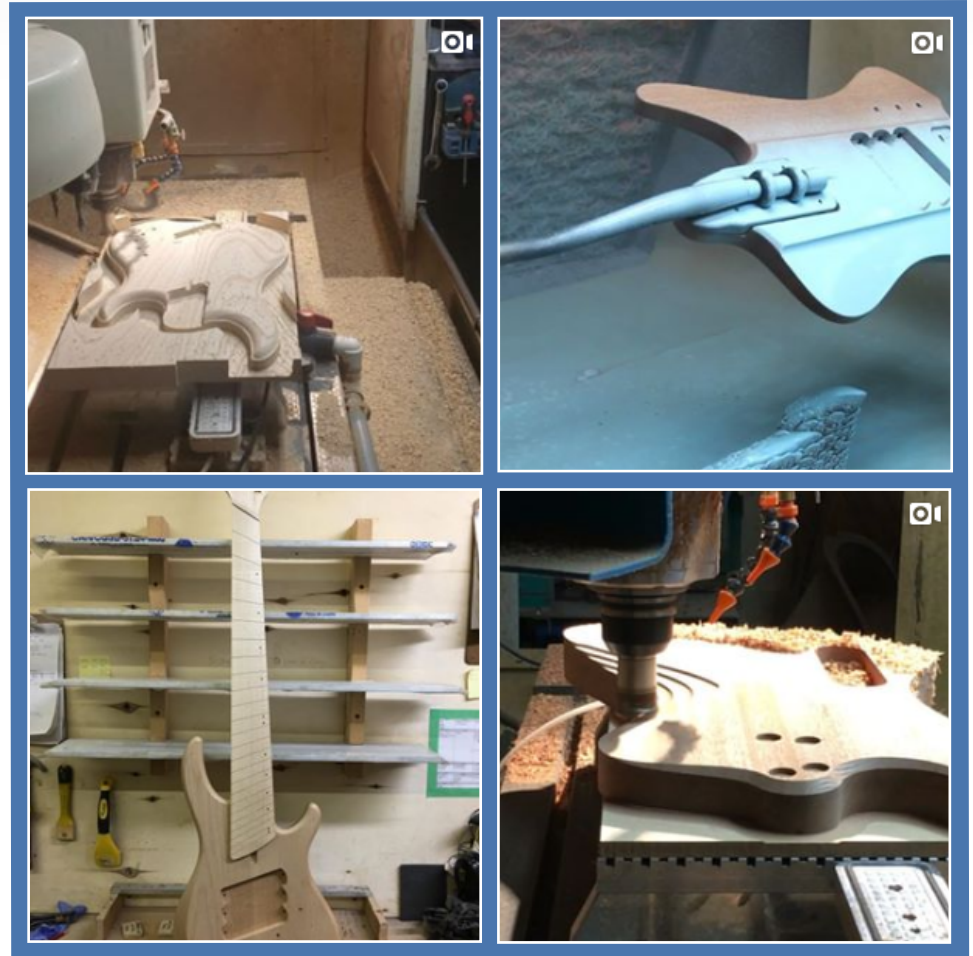
Want to hear the D-ROC? Watch these demos!





More Shop Pics from Dingwall Guitars!

Dingwall Guitars has now manufactured over 20,000 electric bass guitars each a work of art, craftsmanship and companionship! Here are some additional pics from the shop at Dingwall Guitars.





Dingwall Ready-to-Play Guitars

Dingwall Guitars offers multiple lines of ready-to-play electric bass guitars, including the [Combustion](#), [NG Adam “Nolly” Getgood Signature](#) and [D-ROC](#) models. Note: The D-Roc series is illustrated here in this case study. The Ready to Play series are made in China then setup and final inspection are done in the Dingwall Canada facilities. The Custom-Made line, [Lee Sklar Signature Series](#), [Afterburner Series](#), [Super Series](#), [D-Roc Custom](#), [Z Series](#) and [Prima Artist](#) are all manufactured in Dingwall’s Canada facilities.





Dingwall Custom Guitars

Dingwall Guitars offers multiple lines of fully customizable electric bass guitars. You can select from the [wood](#), [finish](#) and [neck inlay options](#). Here are just a few.





Just a few Dingwall Players

Dingwall Guitars boasts some of the finest electric bass guitar players in the industry today. Here are just a few. [You can find a more complete list here.](#)





More about Dingwall Guitars

Dingwall basses have been synonymous with great tone, definition and the “Best B in the business!” But don’t take our word for it. Visit them online now to see and hear what industry legends and every day rockers have to say! Sheldon Dingwall is the winner of the 2018 SABEX Entrepreneur of the Year, Dingwall Guitars also received the 2017 SABEX Business of the Year and Exporter of the Year! Congratulations to Sheldon and his great team at Dingwall Guitars!

Follow Dingwall Guitars Online at:

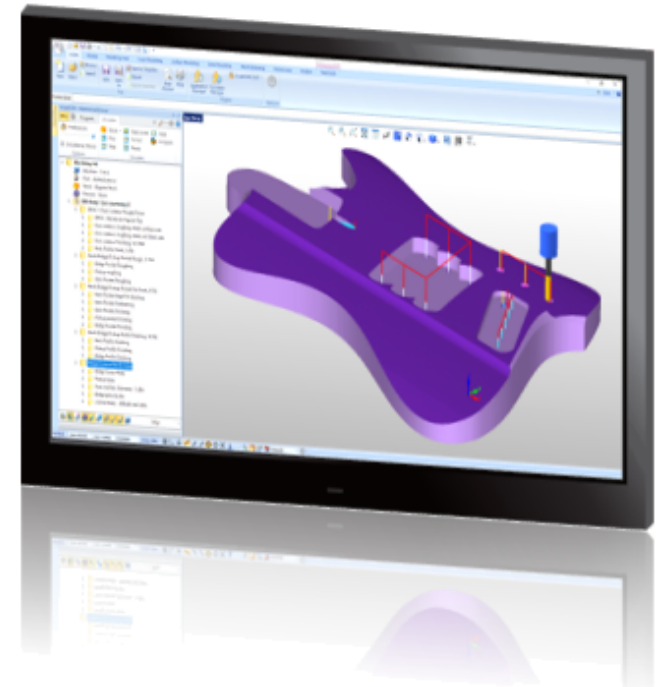




More about VisualCAD/CAM

VisualCAD/CAM is available in five different configurations (Express, Standard, Expert, Professional and Premium). The part shown here was programmed using the Professional configuration. Here are some additional details about each of the available configurations. For the complete features list, visit the [VisualCAD/CAM Product Page](#).

- **VisualCAD/CAM 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!
- **VisualCAD/CAM MILL Standard:** This configuration includes everything that is in the Express configuration plus additional 2-1/2 Axis, 3 Axis & Drilling machining methods. Also now includes 2½ Axis Turning!
- **VisualCAD/CAM 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.





- **VisualCAD/CAM 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.
- **VisualCAD/CAM 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 VisualCAD/CAM Today!

Powerful 2½ - 5 Axis machining capability on your desktop!

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Want to see how VisualCAD/CAM can help you? [Click Here](#) to download a demo!