

HU3910 2024E2-Term
Project: The Rail Kit
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Background:

Lester William Polsuff, better known as Les Paul, was a musician and inventor born in 1915. At 8 years of age, Les Paul learned how to play the harmonica. He then also learned how to play the piano, banjo, and guitar. Even at such a young age, Les showed his innovative side by creating a neck braced harmonica holder so that he could play his guitar or banjo at the same time as his harmonica. He continued with his experiments and innovations throughout his years.

As a teen, Les decided that he wanted to experiment with sustained sound. To do so, he used what he had at his disposal: a 2 foot length of railroad track, railroad spikes, guitar strings, and his mother's telephone. Using these items, he created the instrument that one day morphed into the electric guitar—the railroad guitar.

Goal:

The goal of this project is to create something similar to Les Paul's railroad guitar using cheap and efficient materials so that those who attend Les Paul's Music Tech Camp at WPI can experiment with these components in order to more deeply understand how music and sound work. As most of the design has already been completed, it was decided that rather than entirely rebuilding the rail, more functionality would be added to the existing design. With these constraints in mind, it was decided that the most effective way to improve the design would be to allow the part that simulates the rail spikes to be moveable. This would allow for the guitar string to be lengthened and shortened so that different notes could be played.

Design:

The design keeps a very similar shape to the previous design with one major difference. The part that simulates where the rail spikes would be has been disconnected from the main structure.

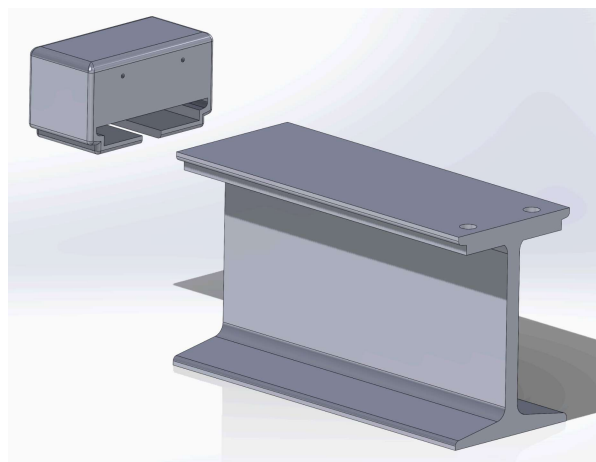


Figure 1: The two distinct parts of the rail

The first part of this design is the rail itself. It is nearly the same as the current rail design except that the underside of the top beam has been made thicker. This has been done in order to stop breakage due to the added stress of an adjustable piece.

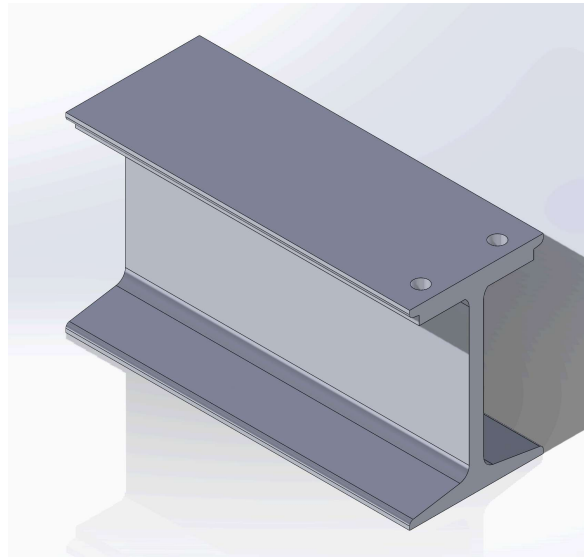


Figure 2: Rail

The second part of the design is the “rail spike box.” The rail spike box has been disconnected from the rail and given a slot that slides along the top portion of the rail, using the railhead as a guide. The rail spike box slot is slightly larger than the rail itself, allowing for sliding, but also allowing friction to stop unintended movement while plucking the guitar string. As the rail spike box moves closer to the tuners, the pitch of the note played will increase due to the shortening distance between the rail spike box and the tuning pegs.

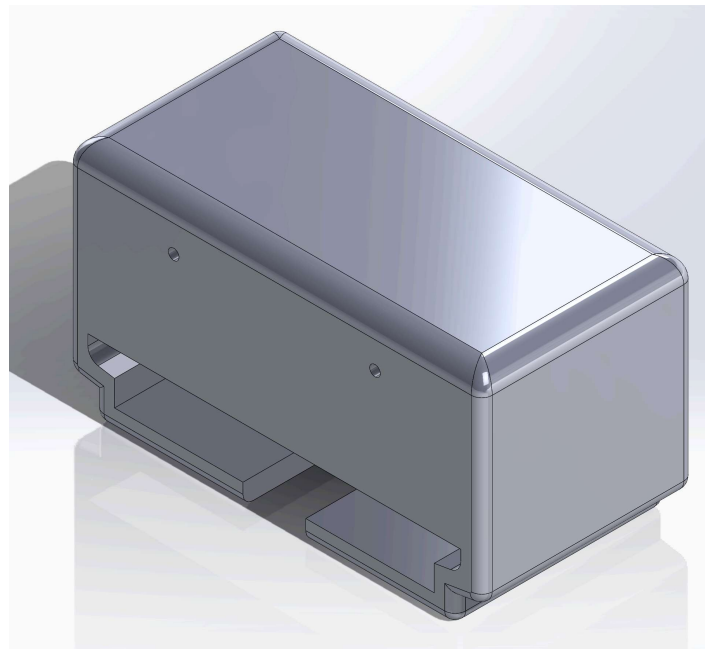


Figure 3: Rail Spike Box

Instructions:

Note: The instructions that follow are reused from the D2021 team's version (Alexis Nichols, Noah Darveau, and Siddhant Damle) of this project, as many of their instructions still apply. There have been some changes made to better align with the new device. These changes are written in italics.

The kit given to the students should include the following:

1. 3D-Printed Rail
2. (2) Sperzel Tall Tuners
3. (2) Guitar Strings
4. Instructions

The instructions given to the students in the rail kit are as follows:

To set up your rail:

1. Remove the support material from the rail *and rail spike box*. This can be done using pliers, a flathead screwdriver, or anything on hand. The support material is the thin material on the side of the rail. This can be discarded. *Ensure that the rail spike box fits over the top portion of the rail, such that it cannot be moved by accident but can still be moved on purpose. Slot the rail spike box onto the rail and set the rail spike box at least half the rail's length away from the holes in the rail.*
2. String the rail by *threading the strings through the holes in the rail from the underside*, until the nut at the end of the guitar string rests on the back of the rail spike box.
3. Remove the top from the tuner by twisting it counter-clockwise. Insert the tuner into the bottom of the holes on the opposite side of the rail with the rail spike box. Secure it with the top by inserting it back on the tuner and twisting clockwise. Do this for both tuners.
4. Insert the string into the tuner and twist the string around the metal part. Twist the knob clockwise until the string experiences some tension. Do this for both strings.
5. Feel free to use any tuner application to experiment with what notes are being played by either string! Free tuner apps include Pitchlab, Pano Tuner, and Martin Tuner.

Adjusting Rail Spike Box Position:

1. *Twist the tuner knob counterclockwise until the string has gone slack. Do this for both strings.*
2. *Slide the rail spike box to a new position no closer than halfway up the rail toward the tuning pegs. While doing so, ensure that both strings remain slack. If either string begins to gain tension, stop moving the rail spike box immediately. If this occurs, return to step*

one of “Adjusting Rail Spike Box Position.”

- 3. Once the rail spike box is in its intended position, twist the tuner knob clockwise until the string has regained tension. Do this for both strings.*

Instructions for the supervisor printing the 3D rails using 3DPrinterOS are as follows:

1. Upload the model in an .stl file format.
2. Once the file has uploaded, adjust the layout of the model so that it optimally fits within the printer.
3. Once the layout has been finalized, select the slice button to adjust the slice settings.
4. Finally, once the slice has been created and saved, it can be sent to the printer.

Works Cited

"Home - Les Paul." *Les Paul*, Les Paul Foundation, 12 Dec. 2023, www.les-paul.com/.

Nichols, Alexis, et al. "Les Paul Rail Kit." *Vjmedia.Wpi.Edu*, WPI, 11 May 2021, https://vjmedia.wpi.edu/images/7/7f/Les-Paul_Rail_Kit_Final_Write_Up.pdf. Accessed 8 Aug. 2024.