

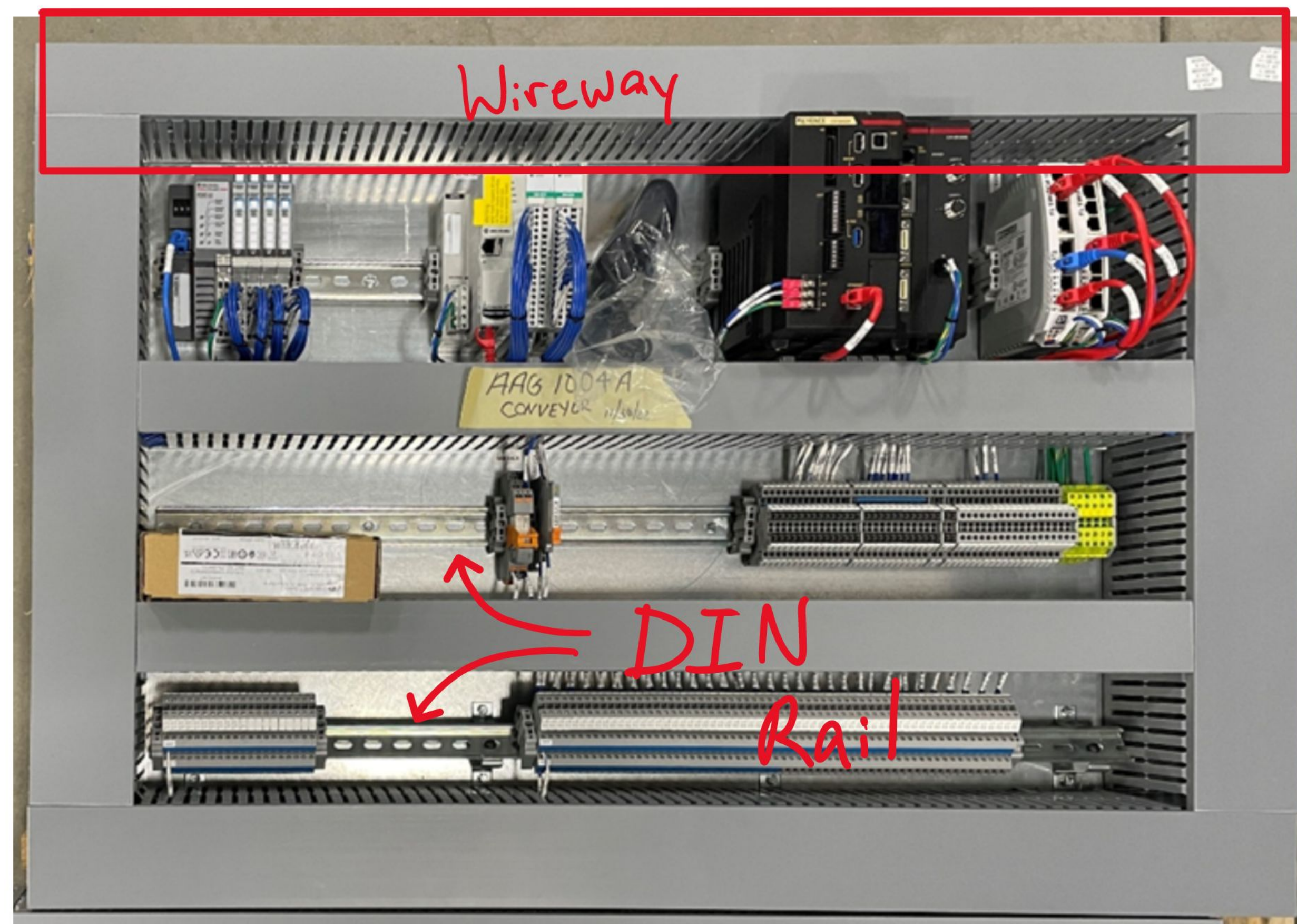
Koops Automation Panel Build Drilling Machine

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PROBLEM STATEMENT

Koops's current process of drilling mounting holes into controls panels requires a panel builder to manually measure, layout, and drill a pilot hole at each mounting point. The panel build drilling machine automates this layout and drilling process for both DIN rails and wireways. The machine provides better hole accuracy, repeatability, and efficiency.



MACHINE SPECIFICATIONS

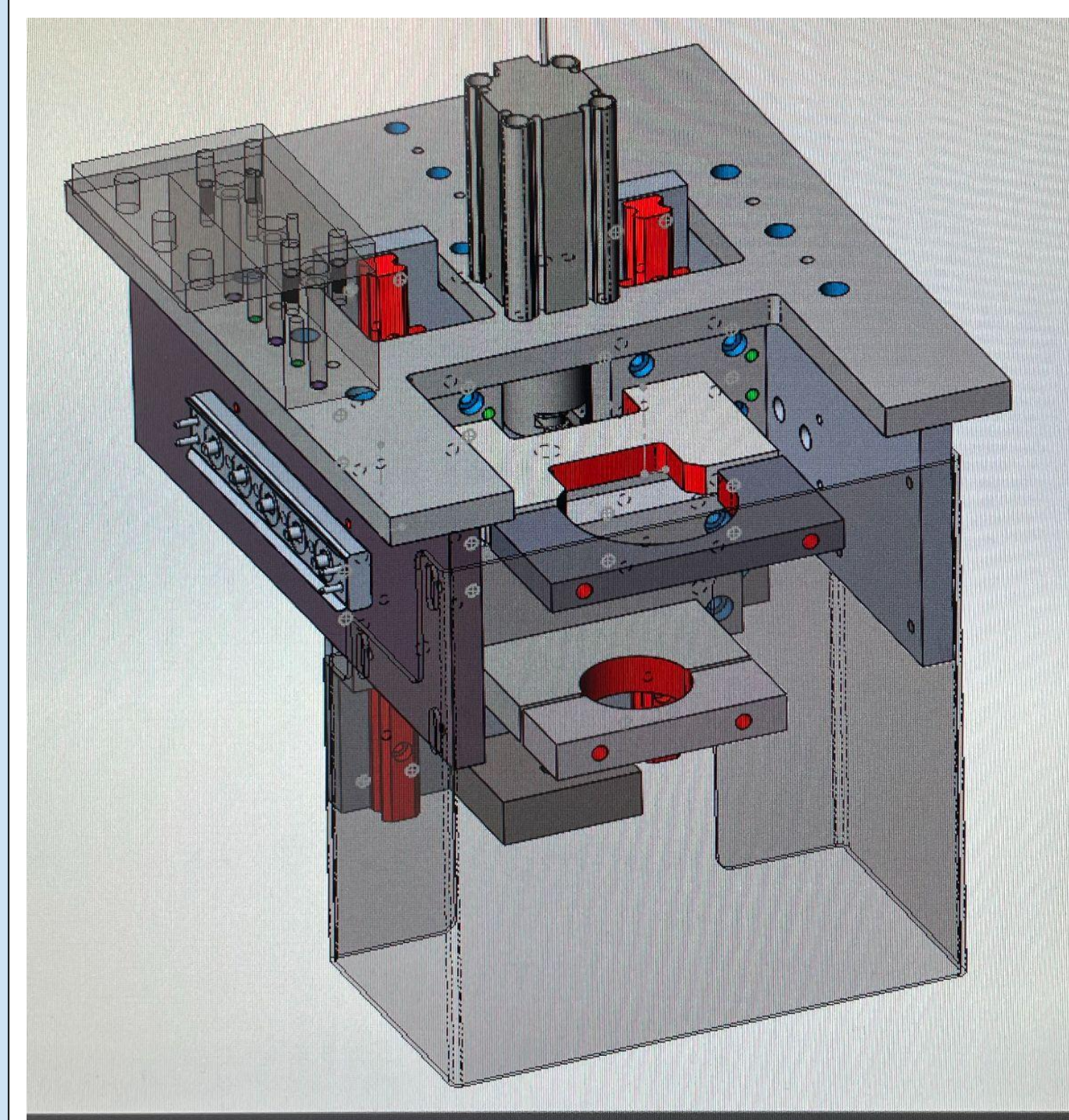
- Must accept a panel with length and width ranging from 16 to 72 inches.
- Must have a weight less than 2,500 lbs.
- Must create #21 size holes within a +/- 0.0625 inch location tolerance.
- The machine must import hole coordinate data from the panel schematic in ePlan

Acknowledgements

Thank you to Koops automation for their sponsorship of this project.

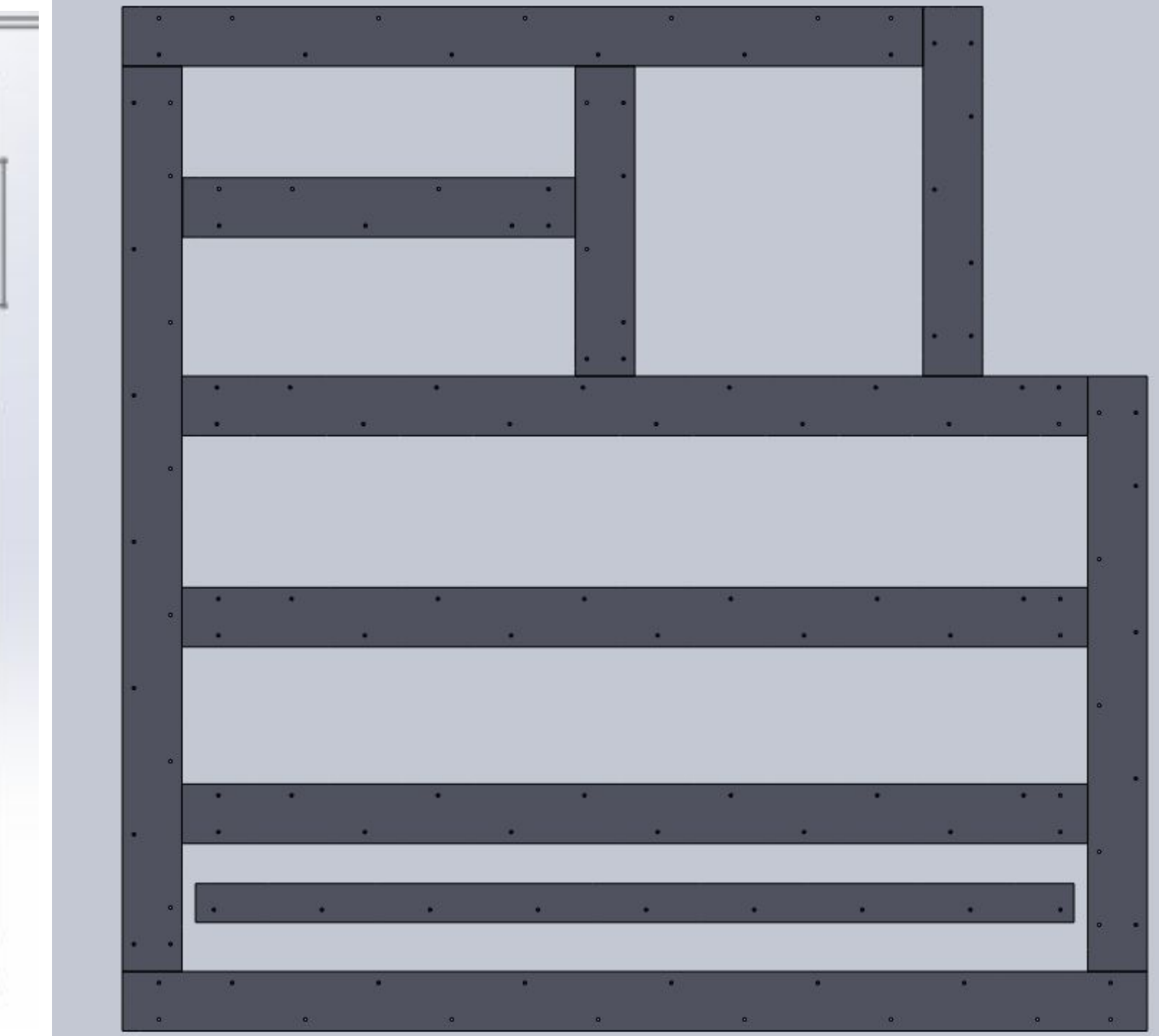
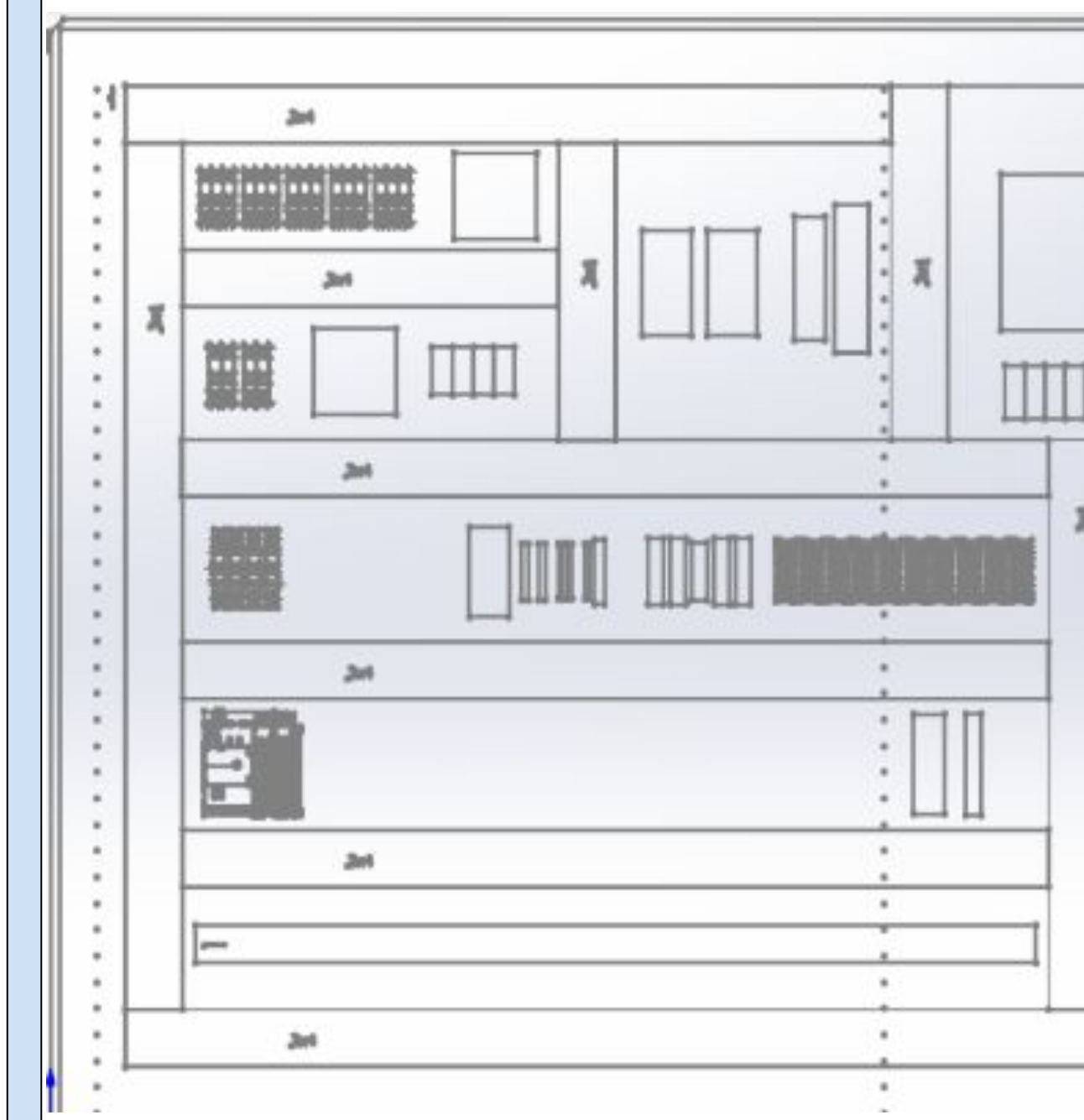
MACHINE HARDWARE

The machine is built upon an 8020 extrusion base frame. A gantry system is used to move the drill unit in both the X and Y axes. These axes are actuated using Yaskawa servos coupled to Misumi MSA-SB1 belt actuators. Both axes are guided using Rollon Compact Rail Plus rails and carriages. The Z axis is pneumatically actuated using a single cylinder to push/pull the drill unit into/out of the panel. The Z axis is guided using a pair of HIWIN HGR15 series rails and carriages.



MACHINE SOFTWARE

To get hole coordinate data, a panel's electrical layout is needed from ePlan. This shows where all components will be located on a panel once built, including the wireways and DIN rails. This file is exported and opened in SolidWorks due to the ePlan's limited licensing. The initial import is shown below. A macro was created to remove clutter, locate the DIN rails and wireways, and apply a drill pattern depending on the width and length. It then generates the G Code for the machine from the right picture below.



The Acorn CNC Controller from Centroid was used to process the G Code and communicate with the servo drives for moving the X and Y axes. The servo drives convert the step and direction signal received from the Acorn to position coordinates. The Acorn was also used to manage all I/O including the actuation of the drilling cylinder and reading the statuses of all E-Stops and sensors.

