



RAVEN PNEUMATIC SYSTEM

User Guide UG230413

Version 0.1

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INTRODUCTION

The Pneumatics Controller included in the Raven 6DoF Motion Platform kit is a fully enclosed system to be installed on the platform. This system handles the distribution and control of pneumatic devices within the platform such as tank pressure and pneumatic assistance of the motors.

The Pneumatics Controller is connected to an air supply, the platform's three air tanks, power, the Super Eagle controller, and any other required devices. These connections will be further elaborated on in this document.

BASIC SETUP

Pneumatic Controller Connections

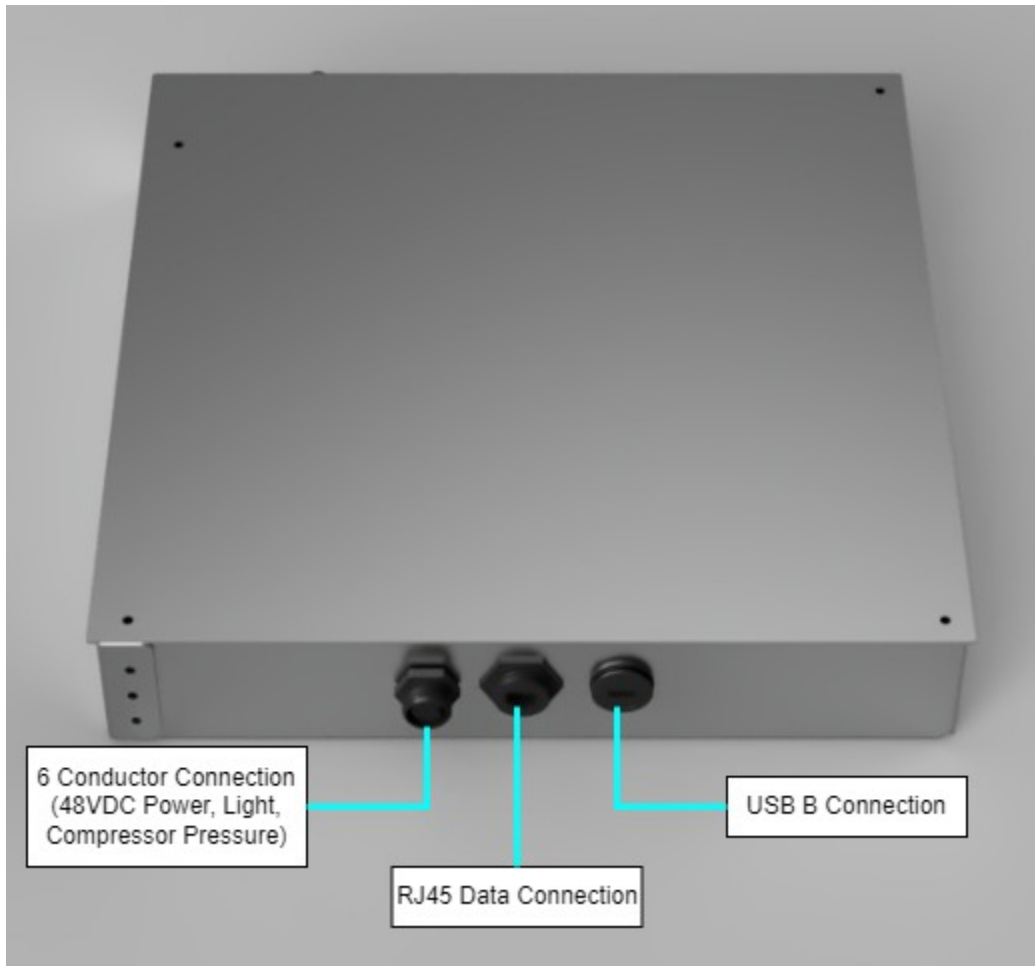


Figure 3: Pneumatic Connections Power Side

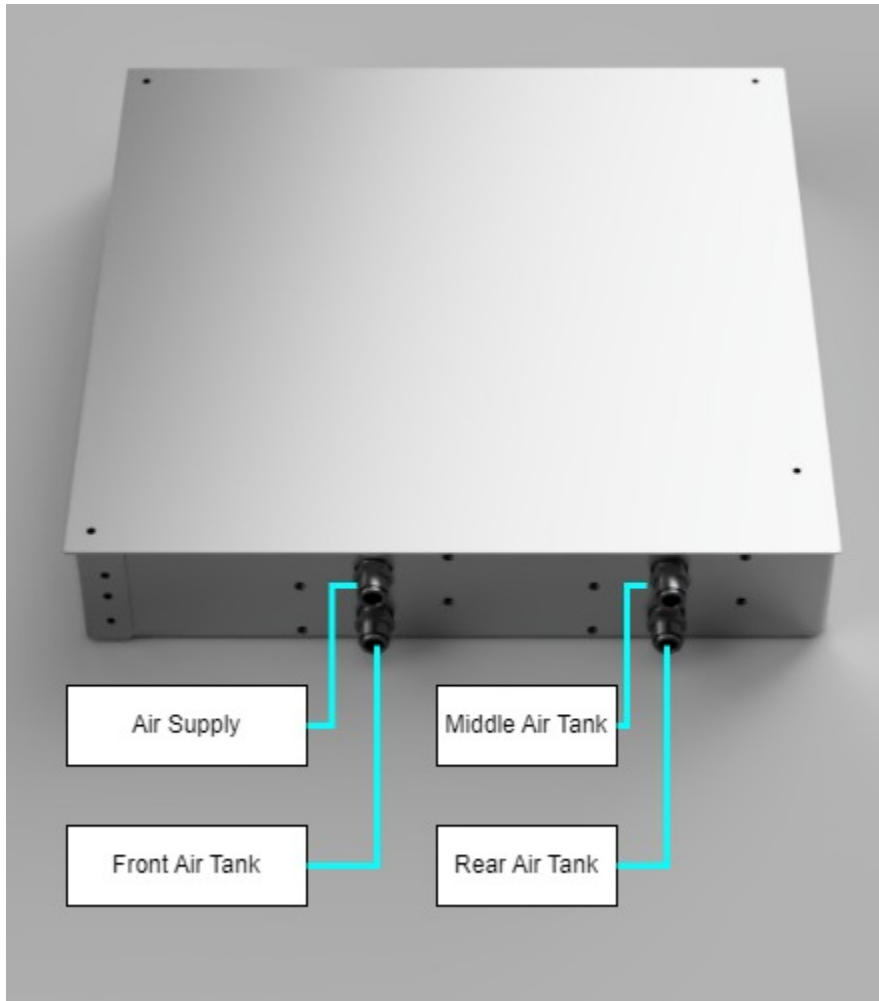


Figure 2: Pneumatic Connections Air Side

Super Eagle Connections

In order to communicate with the motors, they must be connected to the Super Eagle Controller. In addition to connecting the motors, the Super Eagle must be connected to the control terminal, the Pneumatic Controller, and power.

Below is a diagram detailing which ports connect to which components. Connection is straightforward and can be verified using the labels on the Super Eagle enclosure provided.

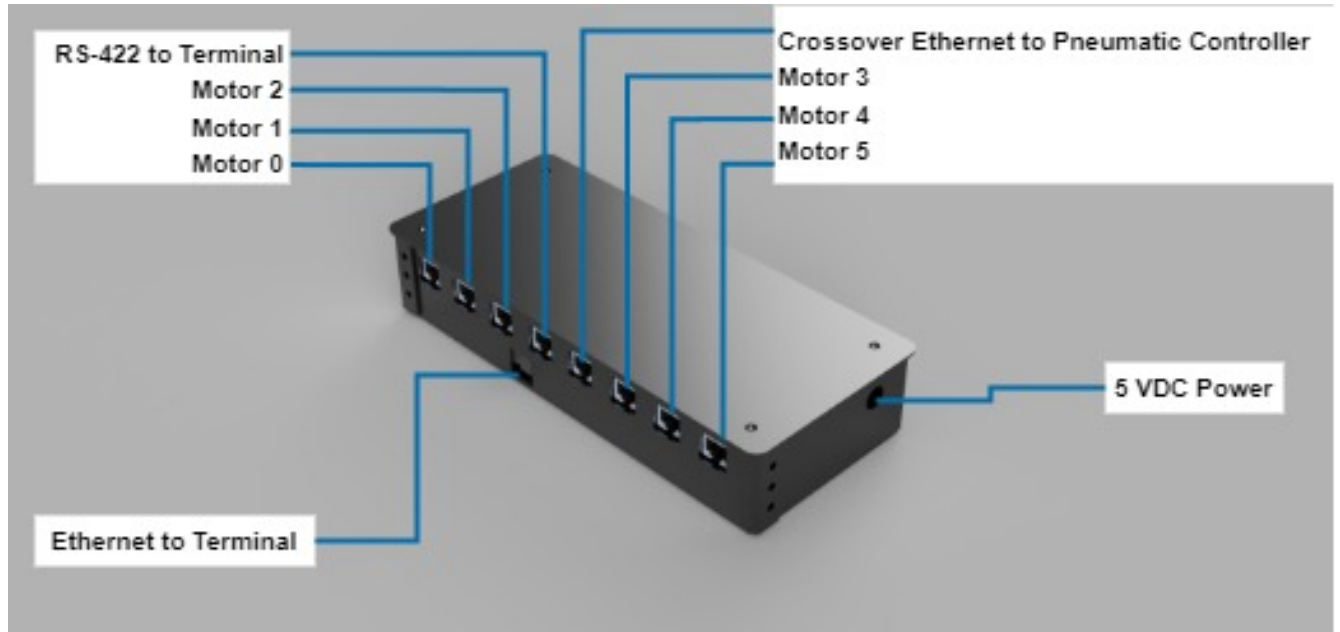


Figure 3: Super Eagle Connections

BACKGROUND

Pneumatic Connections

The exact setup of the pneumatic system will depend on whether the Pneumatic Enclosure option has been purchased. For the purposes of this guide, it is assumed that the enclosure has not been purchased, as this will provide a more in-depth view of the pneumatic system including the components housed in the enclosure.

To begin, ensure that the air supply is rated for a pressure of 50 psi (350 kpa) at 1.75 cfm (50 lpm). The supplied air should be run through a coalescing filter and particulate filter before being connected to the supply manifold. This manifold is connected to the three “fill” solenoids, as well as the “supply” pressure sensor.

Each of the three “fill” solenoids controls the flow of air into one of the tanks on the system. They can be separated into “Front”, “Middle”, and “Rear” groups. The setup for each of the groups is identical except for labels and the pairing of tanks with motors. Each “fill” solenoid is connected to a tank manifold, which connects to a tank, a blow-off-valve (set at 75 psi), a pressure sensor, and a “drain” solenoid. In turn, each tank is connected to a set of two motors.

These groups are set up in specific configurations. The “Rear” group contains the rear tank, Motor 0 and Motor 5. The “Middle” group contains the middle tank, Motor 1, and Motor 4. The “Front” group contains the front tank, Motor 2, and Motor 3. These groups can be seen in greater detail in Figure 4 and Figure 5.

The “Drain” solenoids are additionally terminated in a pneumatic muffler in order to reduce the amount of noise they produce when venting the tanks during operation.

A full diagram of this setup can be found in Figure 4. Additionally, reference photos for tank and motor configuration on the sim can be found in Figure 5.

Pneumatic Controller Connections

The Pneumatic Controller consists of two PCB's connected to each other. The first larger PCB connects to the platform's pressure sensors and solenoids. The second, smaller PCB connects to the Super Eagle via the crossover cable.

As shown in Figure 2, 48VDC power is supplied to the Pneumatic Hat via the "GND" and "VDD" terminals.

The Platform's pressure sensors are connected to the "+12V" and "+Data" terminals as shown in the figure. They are connected, in order from top to bottom in the figure, as follows: Air Supply, Front Tank, Middle Tank, and Rear Tank. The pressure sensors are specified as 2 wire 4-20 mA and complete a current loop. As such, they do not require grounding.

The platform's solenoids are connected as shown in Figure 2. They are powered by 24VDC from the Pneumatic Controller. The connections from left to right are, Rear Drain Solenoid, Rear Fill Solenoid, Middle Drain Solenoid, Middle Fill Solenoid, Front Drain Solenoid, and Front Fill Solenoid. For these connections it is important to connect the white wire from each solenoid to the corresponding positive terminal, and the black wire to the negative terminal.

The only port to connect on the Pneumatic Eagle is the crossover cable to the Super Eagle. This is connected to Port 2 on the Eagle, as shown in Figure 3.

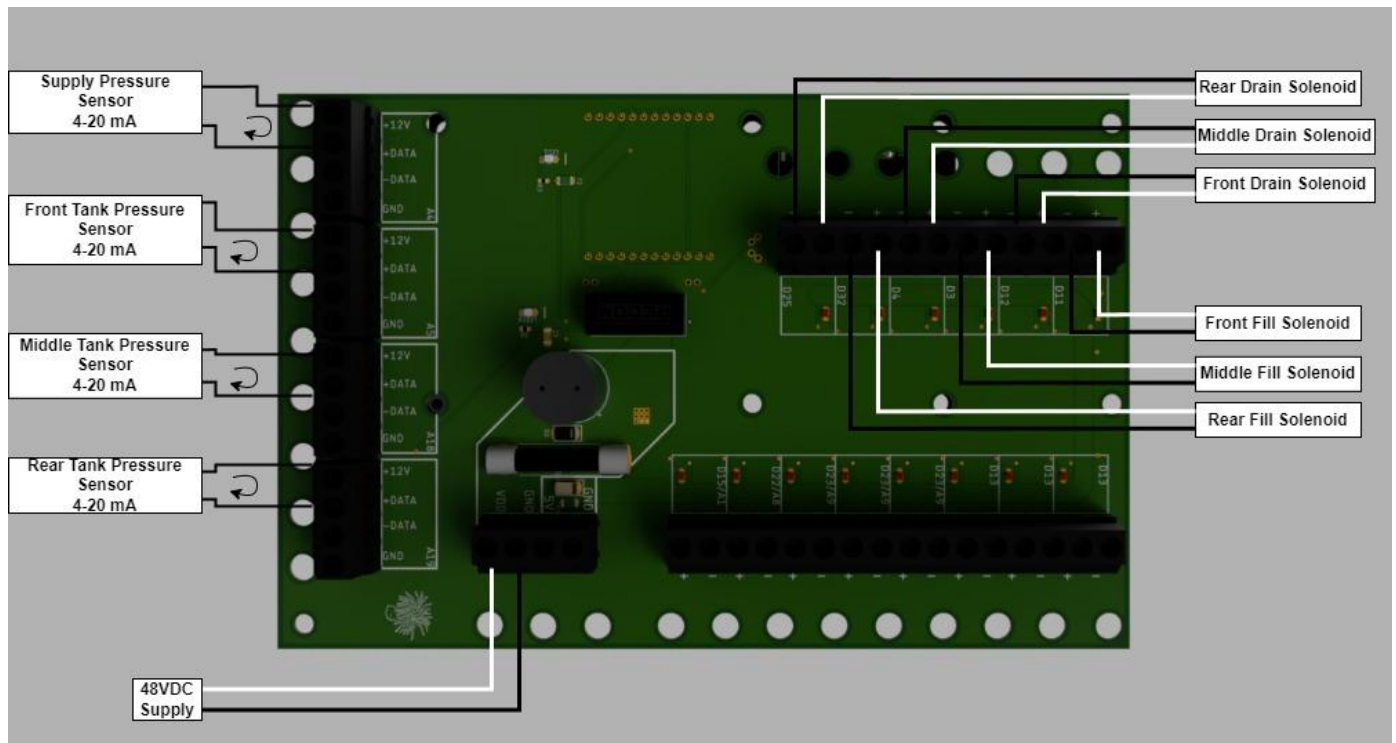


Figure 4: Pneumatic Hat Connections

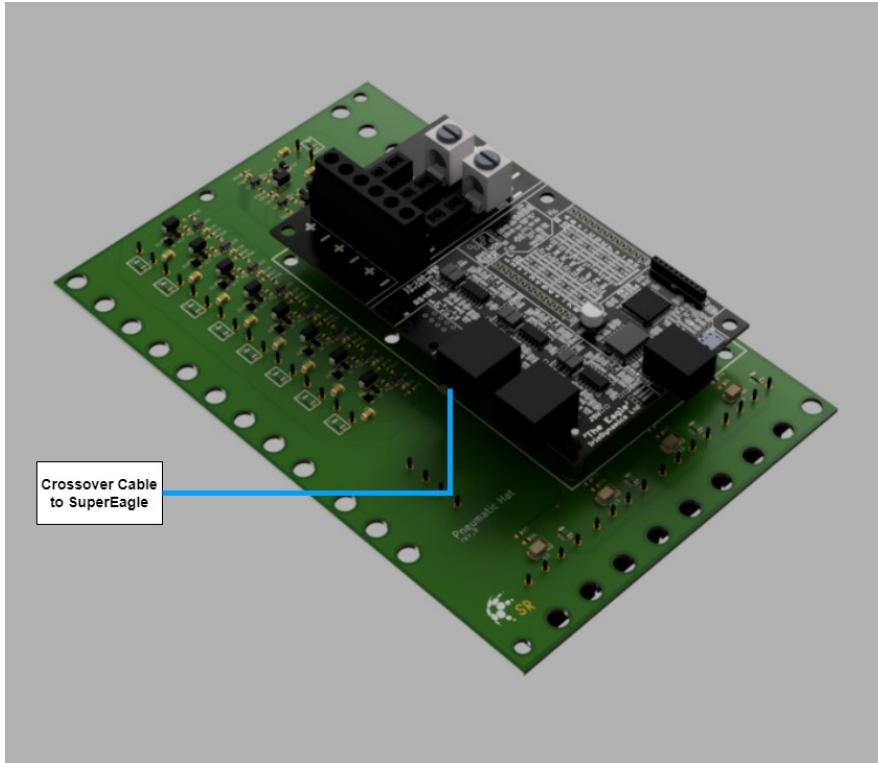


Figure 5: Pneumatic Eagle Connections

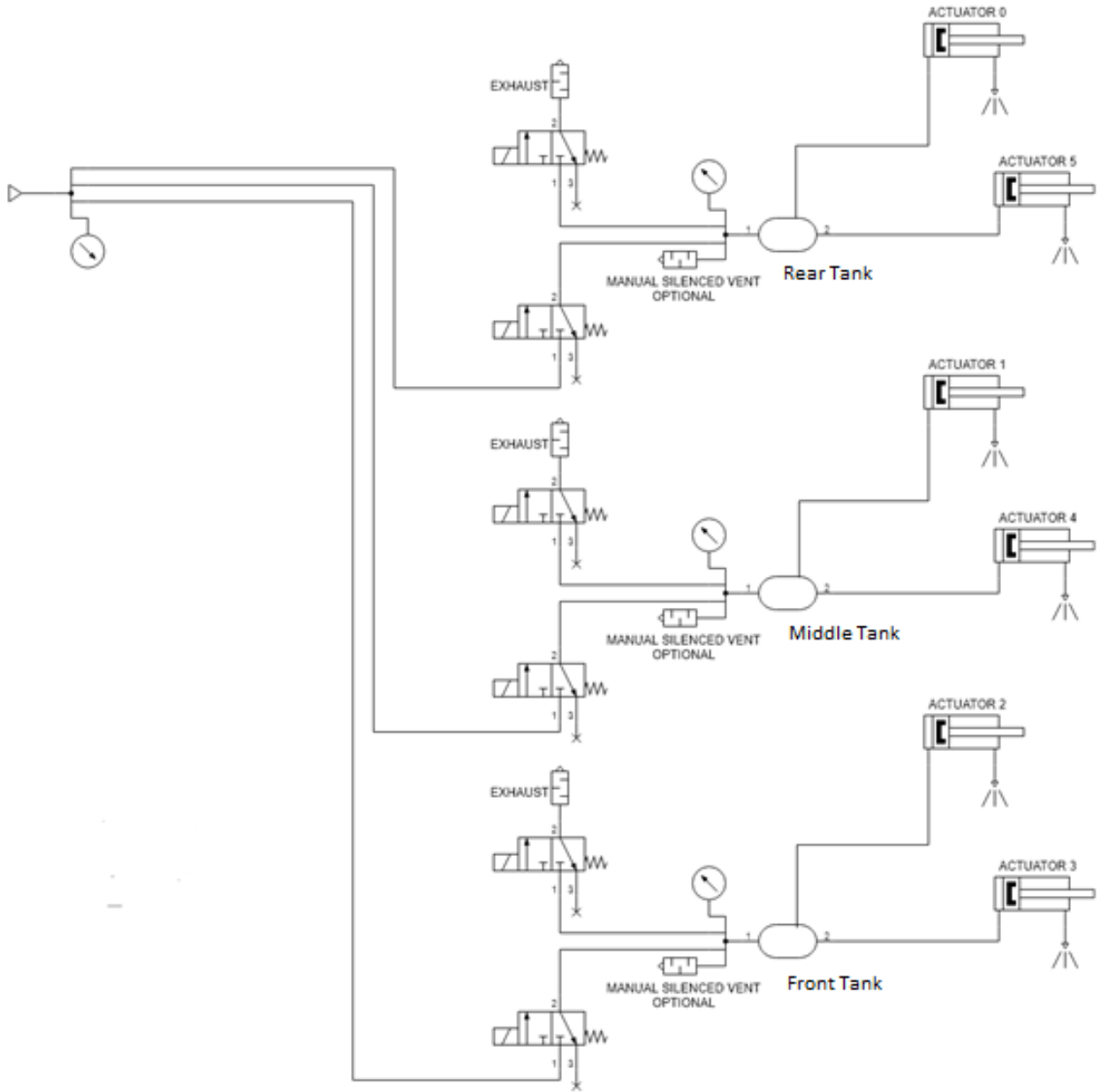


Figure 6: Pneumatic Connection Diagram

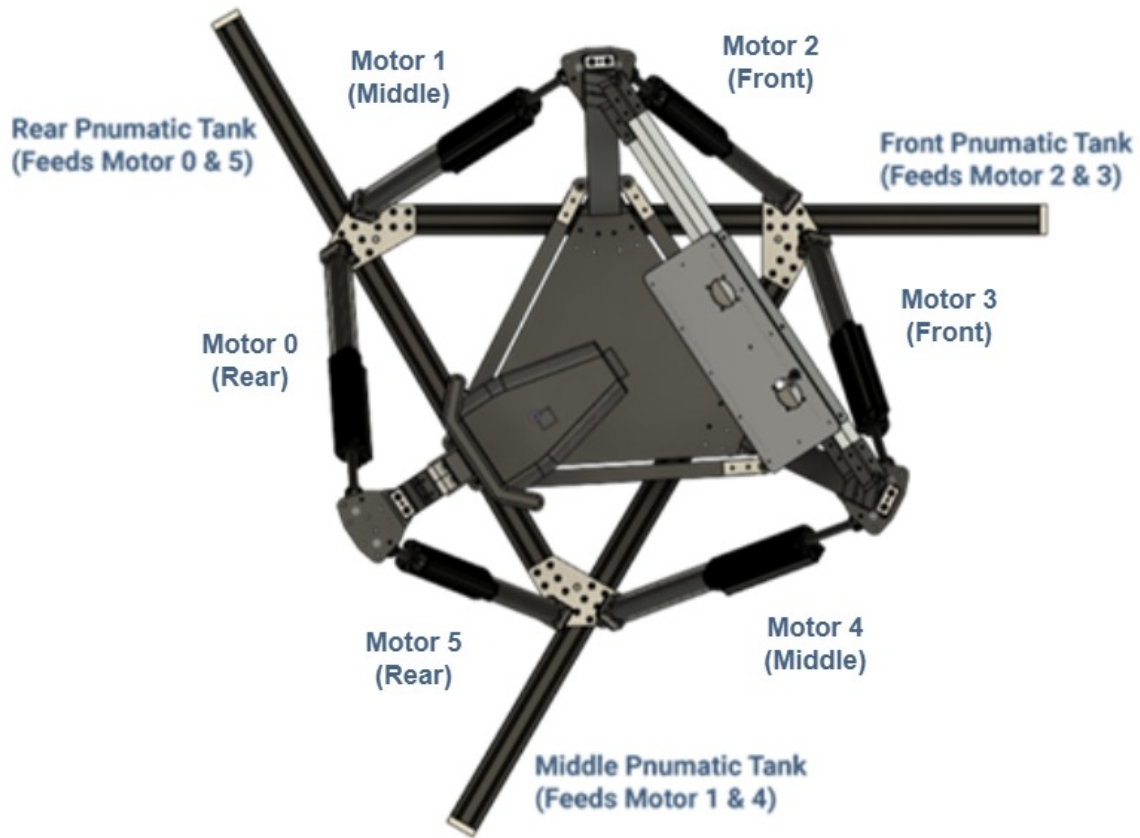


Figure 7: Tank and Motor configuration

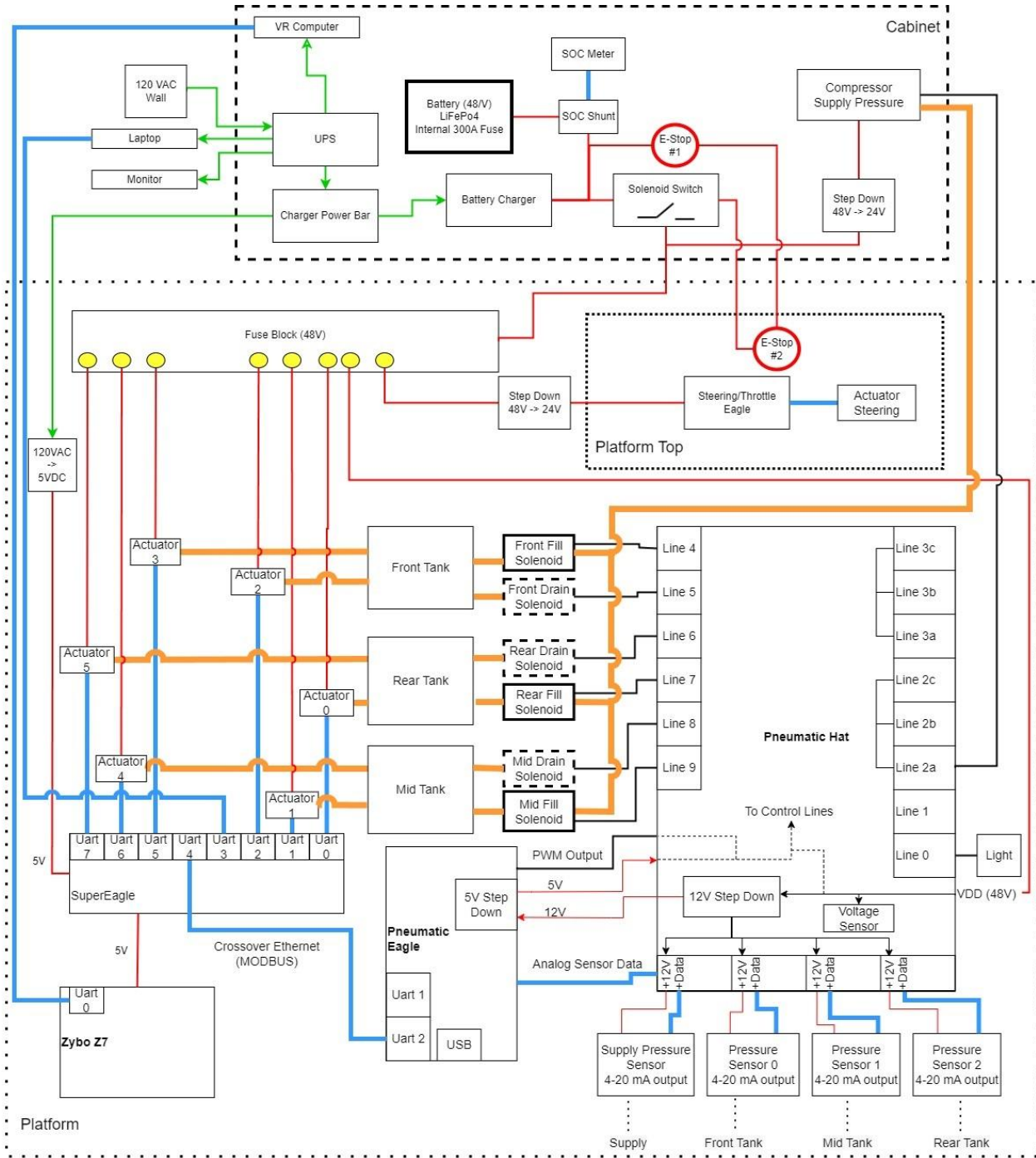


Figure 8: Full System Schematic

REVISION HISTORY

Version	Date	Author	Reason
0.1	April 17, 2023	ch	Preliminary release