

Alternate Pitch Mechanism

Assembly Checklist



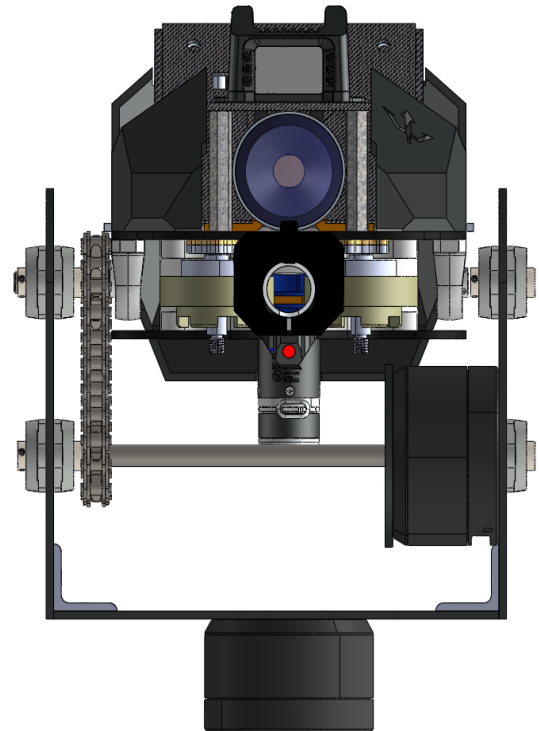
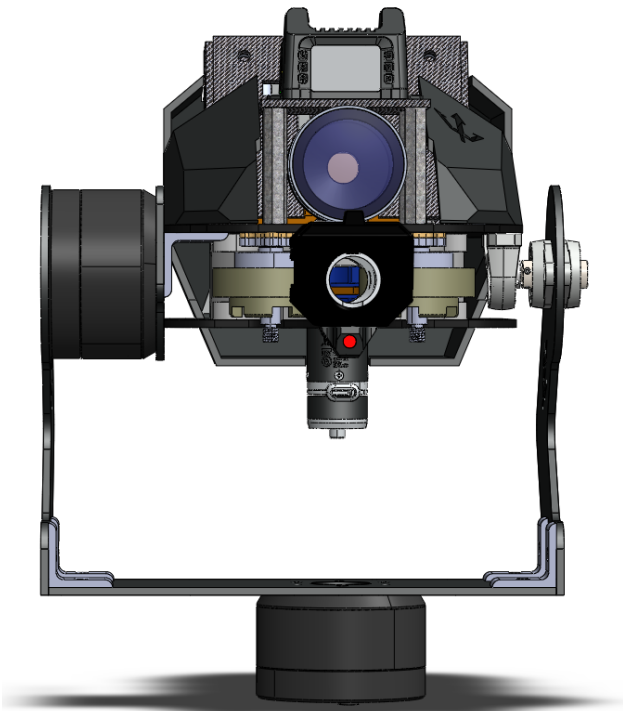
RoboMaster 2020-2021

Written by Roger Nguyen

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Old Configuration

Alternate Configuration



Website: tritonrobotics.org

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Design Parameters

Summary	
Constraint	Status
Power Consumption is under Maximum	Yellow
Power Supply Voltage is under Maximum	Yellow
Weight is under Maximum	Green
Size is under Maximum	Green

Key	
Green	Satisfied
Yellow	Needs testing
Red	Not satisfied

RoboMaster Build Specifications: Basic Robot Information for Sentry

- Maximum Power Consumption is 30 W
- Maximum Power Supply Voltage is 30 V
- Maximum Weight not including Referee System is 15 kg
- Maximum Size (LWH and in mm) is either: 500/600/850 or 850/500/600

TR Target Specifications

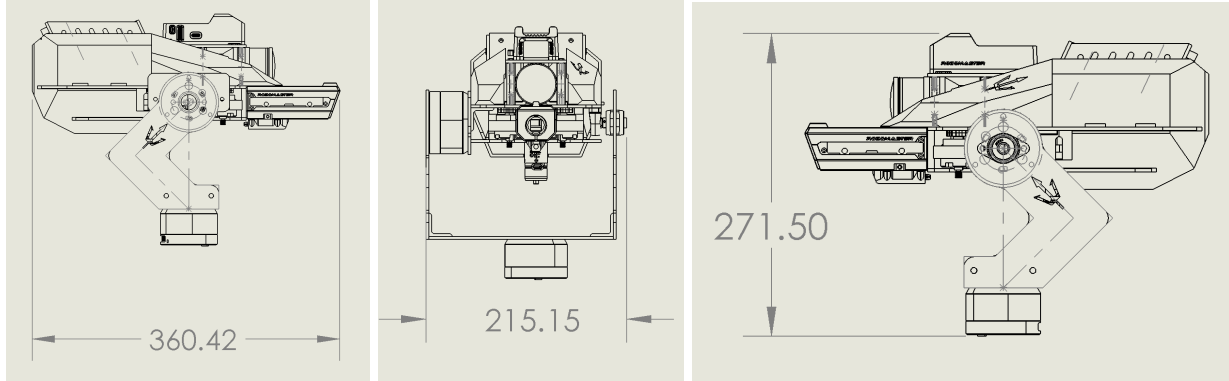
- Drive the pitch motion of RM21 Infantry Turret with linkage or another form of connection
- Make the alternate configuration more space efficient → current pitch configuration is not very efficient spacing-wise

Hardware/Electronic Components

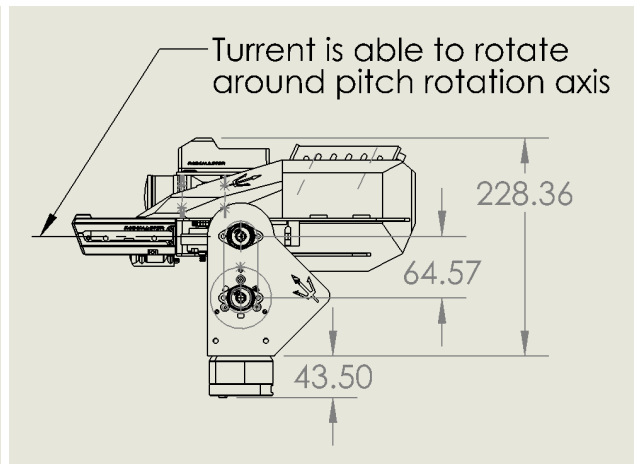
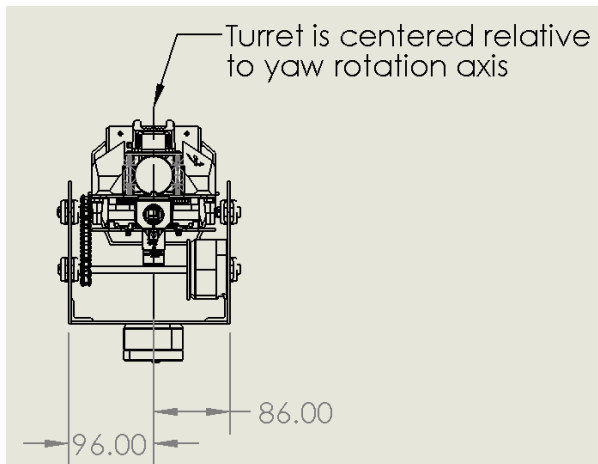
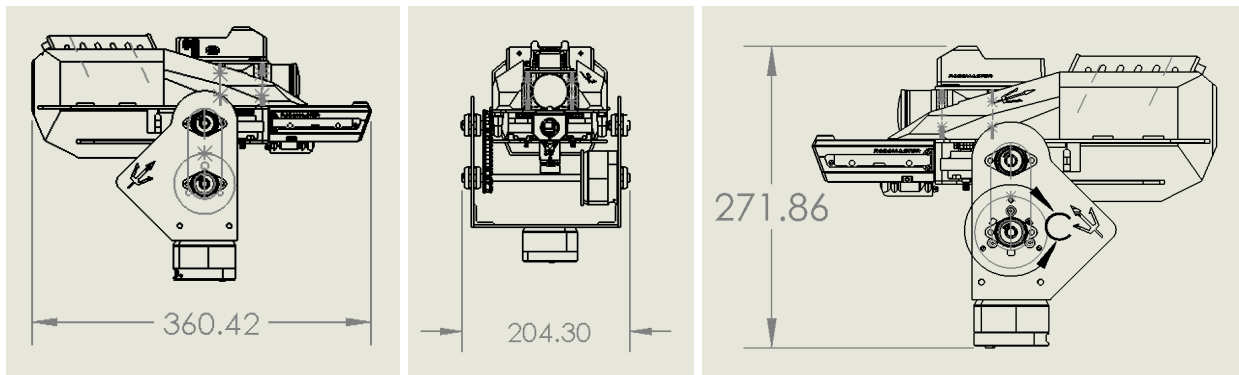
- RoboMaster GM6020 Brushless DC Motor

Current Dimensions (mm)

Old Configuration Size (LWH)



New Configuration Size (LWH)

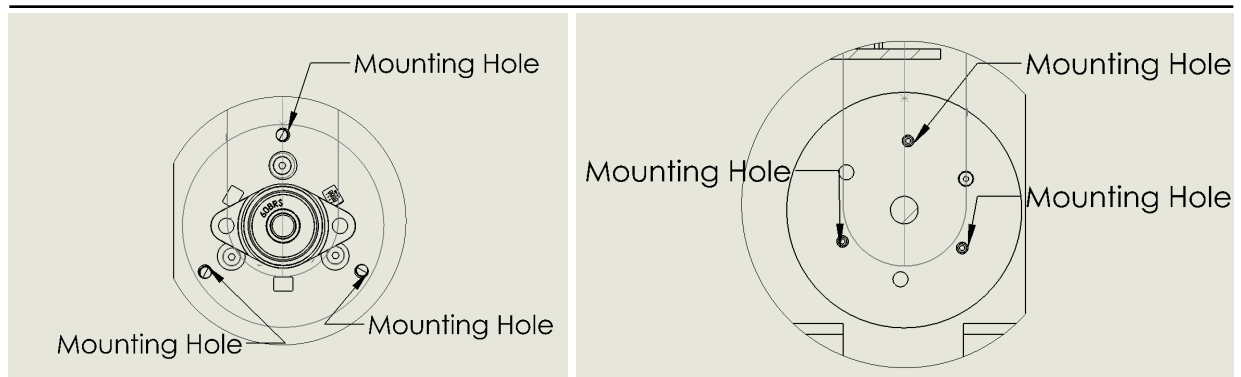


Current Design Specifications

- **Design Specific Parameters:**
 - Yaw is Direct-Driven
 - Pitch is not Direct-Driven
- **Important Analysis Parameters:**
 - Weight of Top Plate (and Objects Supported by Top Plate)
 - Moment of Inertia of Top Plate (and Objects Supported by Top Plate)
 - Moment of Inertia of Motor and Long Shaft
 - Moment of Inertia of Top Plate (and Objects Supported by Top Plate) and Short Shaft
 - <https://www.parktool.com/blog/repair-help/chain-length-sizing>
- **Torque Requirements:**
 - The GM 6020 offers maximum continuous torque of 1.24 Nm and a stall torque of 1.6 Nm
 - The torque generated by mass weight should **not exceed the equivalent of 0.7-0.9 Kg at a distance 180 mm** away from the pitch axis.
 - [RoboMaster GM6020 Brushless DC Motor User Guide.pdf](#)
- **Mounting:**
 - Relies on GM 6020 Motor bottom mounting points (x3 M4)
 - REQUIRED PATTERN FOR RM 6020 Mounting (Contact Pres.)

Bottom of Motor Mounting on the Side Plate

Top of Motor Mounting on Connector



- **Wiring**
 - Total of 6 wires w/ total of
 - x2 CAN Cable: Pitch+Yaw Motor (2 lines)
 - x2 Power Cable (2 lines)
 - x2 PMW Cable (2 lines)
- **Weight of Major Components**
 - Weight of Motor = 468 g
 - Weight of Top Plate (and Objects Supported by Top Plate) = 1264.62 g
 - Weight of Long Shaft (200 mm) = 78.87 g
 - Weight of Short Shaft (50 mm) = 19.68 g
 - Weight of Sprocket = 20.78 g
 - Weight of 1ft Chain = 81.77 g
- **Extra Notes**
 - None

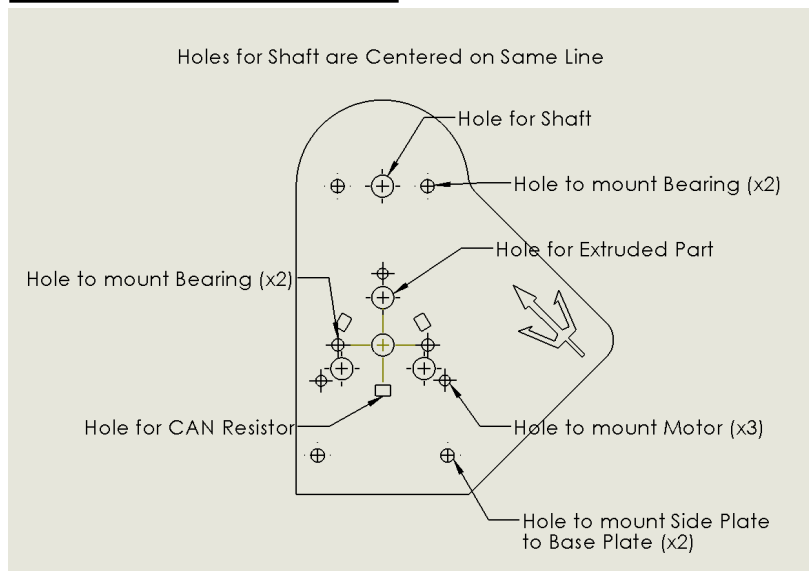
Critical Sections

Side Plates

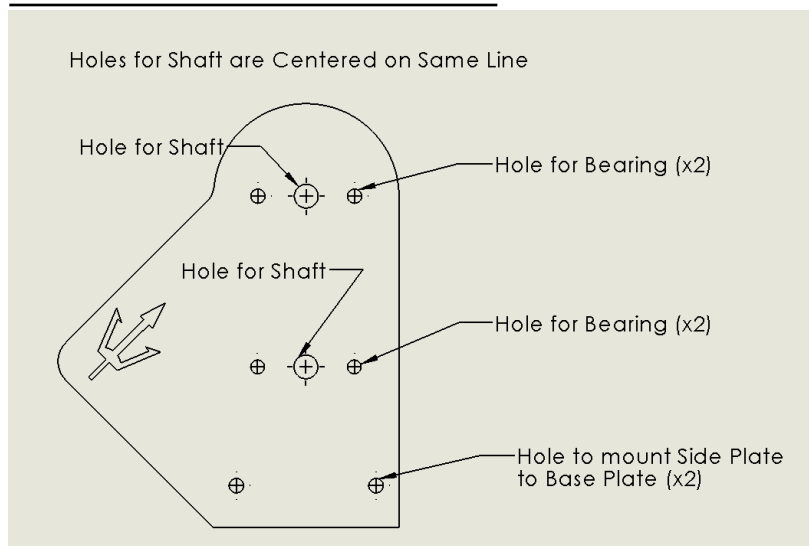
Notes:

- Holes for Shaft are Centered on the Same Line
- Holes for Bearing are Centered on the Same Line

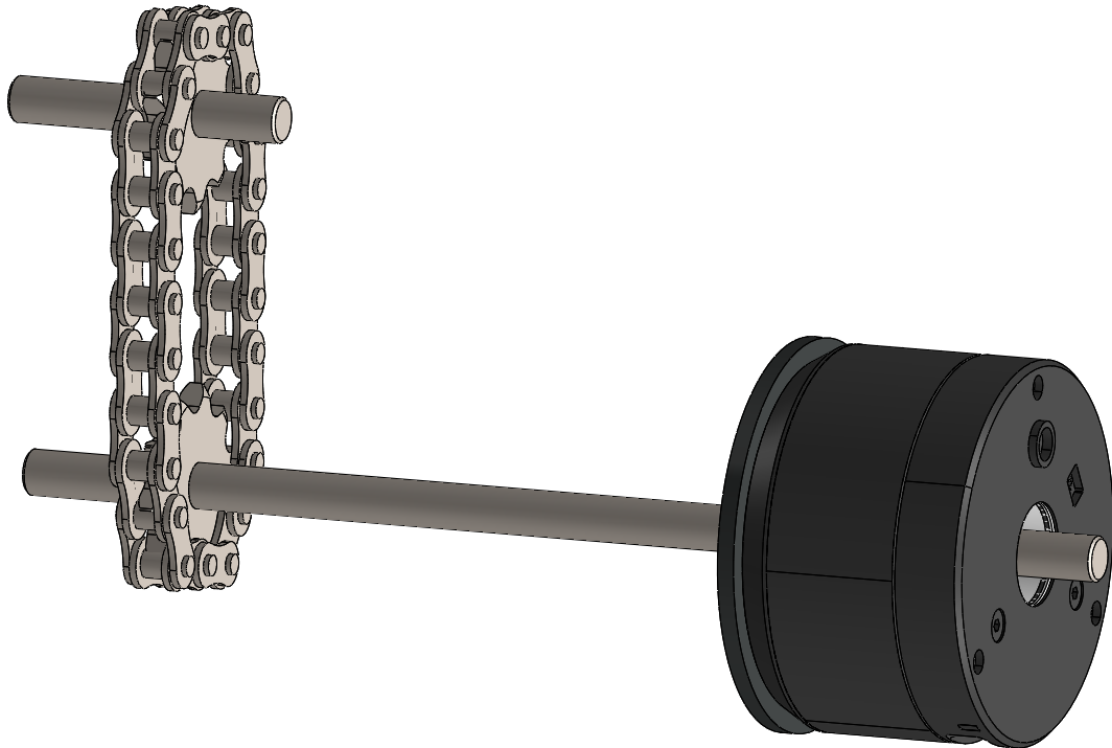
Side Plate (Motor Side)



Side Plate (Non-Motor Side)



Chain Link Mechanism



Components

- RoboMaster GM6020 Brushless DC Motor
- Long Shaft
- Short Shaft
- x2 Sprocket
- Chain Link
- Motor Connector Plate

Features

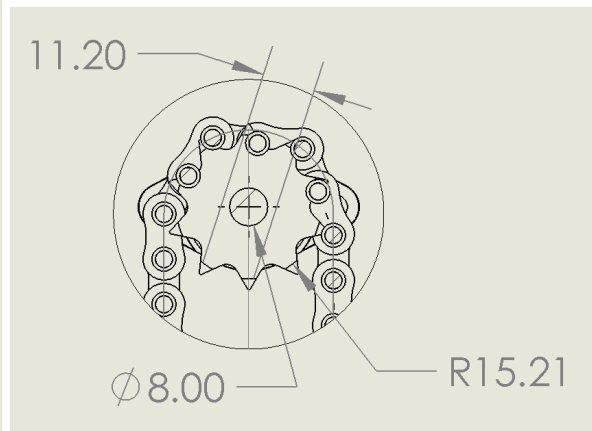
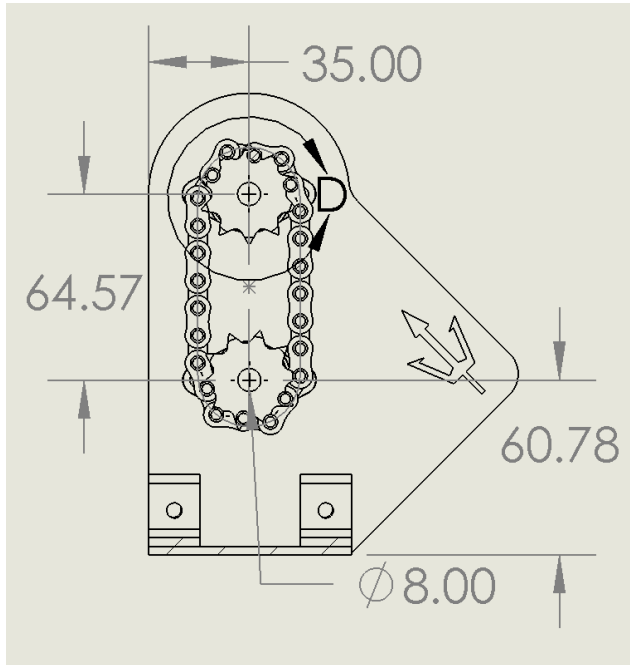
- Pitch Mechanism is [Chain-Driven](#)
- Chain Drive [Advantages](#)
 - Positive Drive
 - Lessens Load on Motor Compared to Direct Drive
- Chain Drive Disadvantages
 - 98% Power and Torque Transfer Efficiency Compared to Direct Drive
 - Noisy and can cause Vibrations
 - Driving and Driven Shafts and Sprockets must be **perfectly aligned**

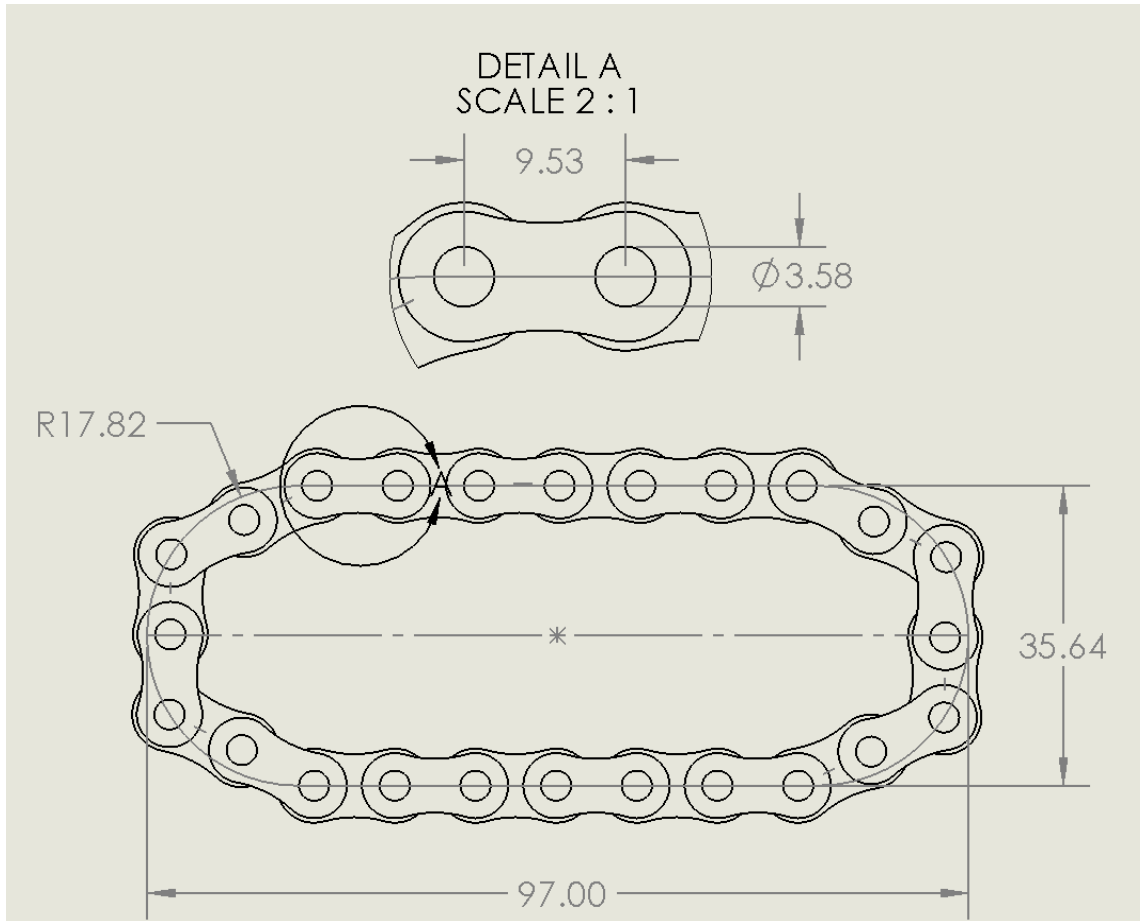
Website: tritonrobotics.org

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- Requires Lubrication

Dimension (mm)





Analysis

- [Alternate Pitch Configuration Calculations](#)

Work In Progress

Mounting Name	Description	Assignment	Status
None	<i>None</i>	None	Satisfied

Extra Stuff

Mounting Name	Quantity	Type	Status
KFL08 Bearing	6	M5 Clearance Hole	Needs Optimization
KP08 Bearing (Pitch Mount)	2 (<i>w/ linear pattern x4</i>)	M4 Clearance Hole	Needs Optimization
RoboMaster GM6020 Brushless DC Motor	6	M3 Clearance Hole	Needs Optimization

Manufacturing Process

- None

B.O.M

- [Alternate Pitch Configuration BOM](#)
- Cutting of Sheet Metal Cost not Included
- **Expected Cost:** \$69.61
 - Includes Screw and Nut Costs from Home Depot

Before & After Photos

Old Configuration

Alternate Configuration

