Internal Geometry of Photodiode Housing

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Definitions

The two yellow boxes are the locations of the photodiodes. This diagram is *not* to scale, and should be used for reference only. The large box around the outside is the whole diode housing, with the front aperture open on the left.

height is half the length of the viewing aperture.

base is the distance between the front of the whole housing, and the line projected between the diodes.

d1 / d2 The black diagonal line across the center of the diagram shows the maximum angle at which the lower diode can receive light. We split up the base into two chunks– $d1$ and $d2$ to form two triangles on the interior of the housing, both with the central black line as the hypotenuse.

.25 in was the width of the front face of the diode housing as of 3/5/16, update as needed.

1.00 in is the distance between the diodes.

Theta (θ) is the angle between the central black line, and the projection between the two diodes.

90 - Theta is the angle in the center of the diagram, which is 90 - θ, assuming degrees.

.39 in Is the distance between the diodes and the front of the photodiode hub. (Seperate Piece)

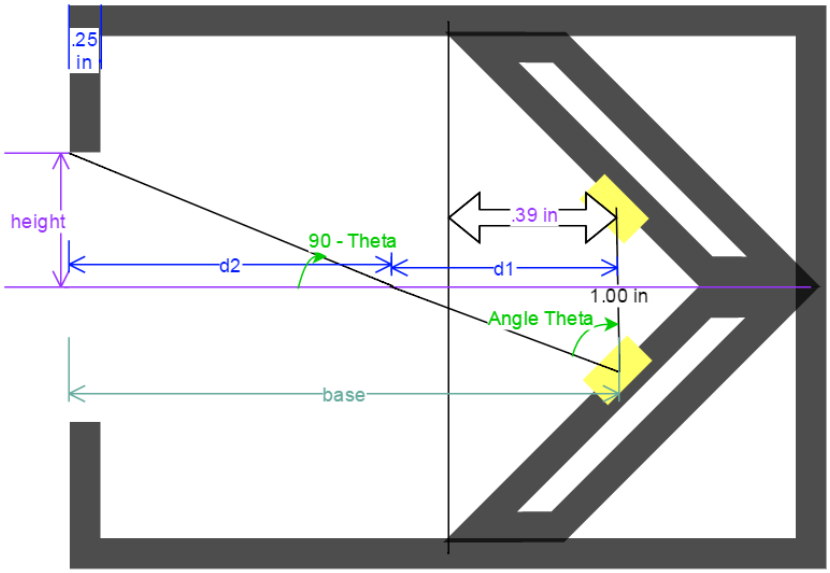
Determining Distances and Angles

There are two main equations that we want to use for this:

$$d1 = base - .5\tan(\theta) \qquad\qquad height = d1\tan(90 - \theta)$$

You can do some basic trigonometry to find the above equations yourself if necessary.

There are four unknowns here– $\theta, base, d1,$ and $height$. We have two equations, so we can solve for at most two of the unknowns.



Changelog

3/5/16 Wanted an aperture of 70°, already had a base length of 2.351 in. $\theta = 55$. Solved for the height, didn't leave enough room for the razors on the outside edge.

Total height of the housing is 2.42 in, want to leave $\frac{3}{4}$ in on all sides to have room for the razors. $\frac{2.42-2*.75}{2} = height = .46$ Now we can use that height, and use the $\theta = 55$ from earlier to find all the other measurements.

$$height = d1\tan(90-\theta) \Rightarrow .46 = d1\tan(35),\ d1 = .657$$
$$d1 = base - .5(tan(\theta)) \Rightarrow .657 + .5\tan(55) = base,\ base = 1.37$$

Subtracted .39 from 1.37 to get the distance from the very front of the housing to the notch holding the photodiode hub, changed that in the solidworks file.