PROJECT: Precision Underwater Positioner

ENGINEER: M.Brown

Title: Angular motion requirement

SYSTEM SPECIFICATIONS:

- Max travel increment: 0.1mm
- Max hysteresis: 0.1mm
- Relative position: 0.1mm
- Relative Accuracy: 1mm
- Travel time for 150mm = 60 sec

PROPERTIES & ASSUMPTIONS:

180 degrees = π radians

$arc_{min} := \frac{1}{60}\cdot deg$ $arc_{sec} := \frac{1}{3600}\cdot deg$

Given: Angle at vertex $\theta_A := .01\cdot deg$

$\theta_A = 1.745\times 10^{-4}\,rad$

One radian = deg $rad = 57.296\,deg$

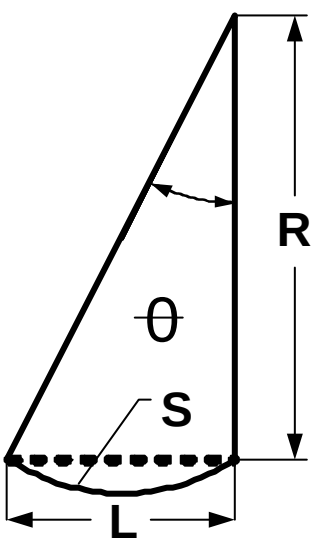
One degree = rad $deg = 0.017\,rad$

Arm length = r_X

Rotary Axis-1 $r_1 := 16\cdot in$

Rotary Axis-(Pan) $r_2 := 8\cdot in$

Rotary Axis-(Tilt) $r_3 := 4\cdot in$



CALCULATION:

Arc Length = S1 & S2

$S_1 := \theta_A\cdot r_1$ $S_2 := \theta_A\cdot r_2$

$S_1 = 2.793\times 10^{-3}\,in$ $S_2 = 1.396\times 10^{-3}\,in$

(Alternate check @ arc length = .002 inch)

Therefore if Arc length = S_X $S_X := .002\cdot in$

$\theta_1 := \frac{S_X}{r_1}$ $\theta_2 := \frac{S_X}{r_2}$ $\theta_3 := \frac{S_X}{r_3}$

$\theta_1 = 1.25\times 10^{-4}\,rad$ $\theta_1 = 7.162\times 10^{-3}\,deg$ $\theta_1 = 25.783\,arc_{sec}$

$\theta_2 = 2.5\times 10^{-4}\,rad$ $\theta_2 = 0.014\,deg$ $\theta_2 = 51.566\,arc_{sec}$

$\theta_3 = 5\times 10^{-4}\,rad$ $\theta_3 = 0.029\,deg$ $\theta_3 = 103.132\,arc_{sec}$