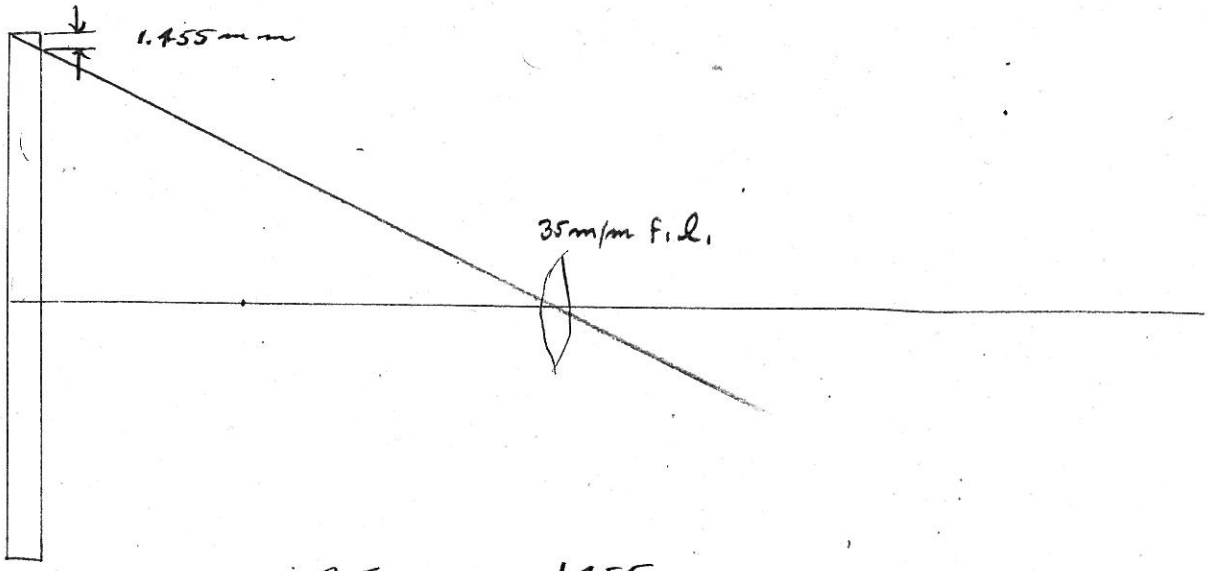
Case for 1.7x magnification in first steps of relay system

Assume image formed on flat field.



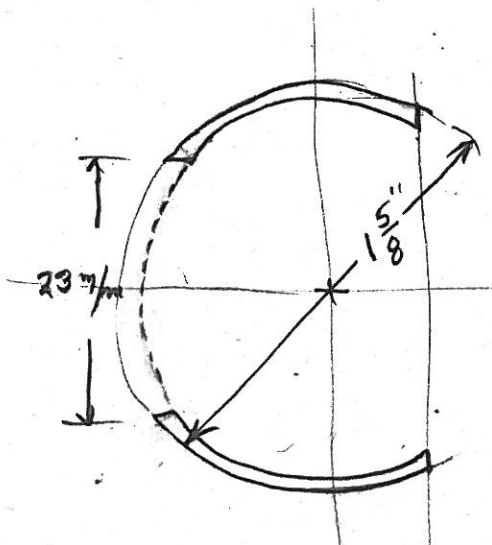
$$\frac{25}{55.6} = \frac{1.455}{s}$$

$$\therefore s = 1.455 \frac{55.6}{25} = 3.24 \text{ mm}$$

$$\text{Radius} = \frac{y^2}{25} = \frac{(11.5)^2}{6.48} = 20.4 \text{ mm}$$

Diam = 40.8 mm = 1.61 inches

~~make~~ make it $1.625 = 1\frac{5}{8}''$



Calculations for case of concave object and image

50 m/m lens

Keystone:

$$\alpha = 0.80 \cos\phi$$

$$\cos\phi = \frac{\alpha}{0.80} = \frac{.157}{0.80} = .196$$

$$\phi = 78^\circ 40'$$

$$90 - \phi = 11^\circ 20'$$

Droop: $D = \frac{y^2}{R} \tan(90-\phi) =$

$$D = \frac{y^2}{R}(.20) = \frac{(19.6)^2}{R}(.20) = \frac{77}{R}$$

If $R = 75$ m/m $D = 1.03$ m/m

Keystone: 100 m/m lens

$$\alpha = \frac{40}{f}\cos\phi$$

$$\cos\phi = \frac{\alpha f}{40} = \frac{.157(100)}{40} = .392$$

$$\phi = 66^\circ 55'$$

$$90 - \phi = 23^\circ 5'$$

Droop = $D = \frac{(19.6)^2}{R}(.426) = \frac{163}{R}$

If $R = 50$ m/m $D = 3.3$ m/m (OK)

Working back:

$y^2 = 384$

$D = 3.5$ m/m

$f = 50$ m/m

$\tan(90-\phi) = \frac{DR}{y^2} = \frac{3.5\ (75)}{384} = .683$

$90-\phi = 34^\circ 20'$

$\phi = 55^\circ 40'$

$\tan \frac{\alpha}{2} = (.4)(.564) = .226$

$\frac{\alpha}{2} = 12^\circ 45'$

$\alpha = 25^\circ 30'$