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Facsimile Transmission

Date: Oct 17/03

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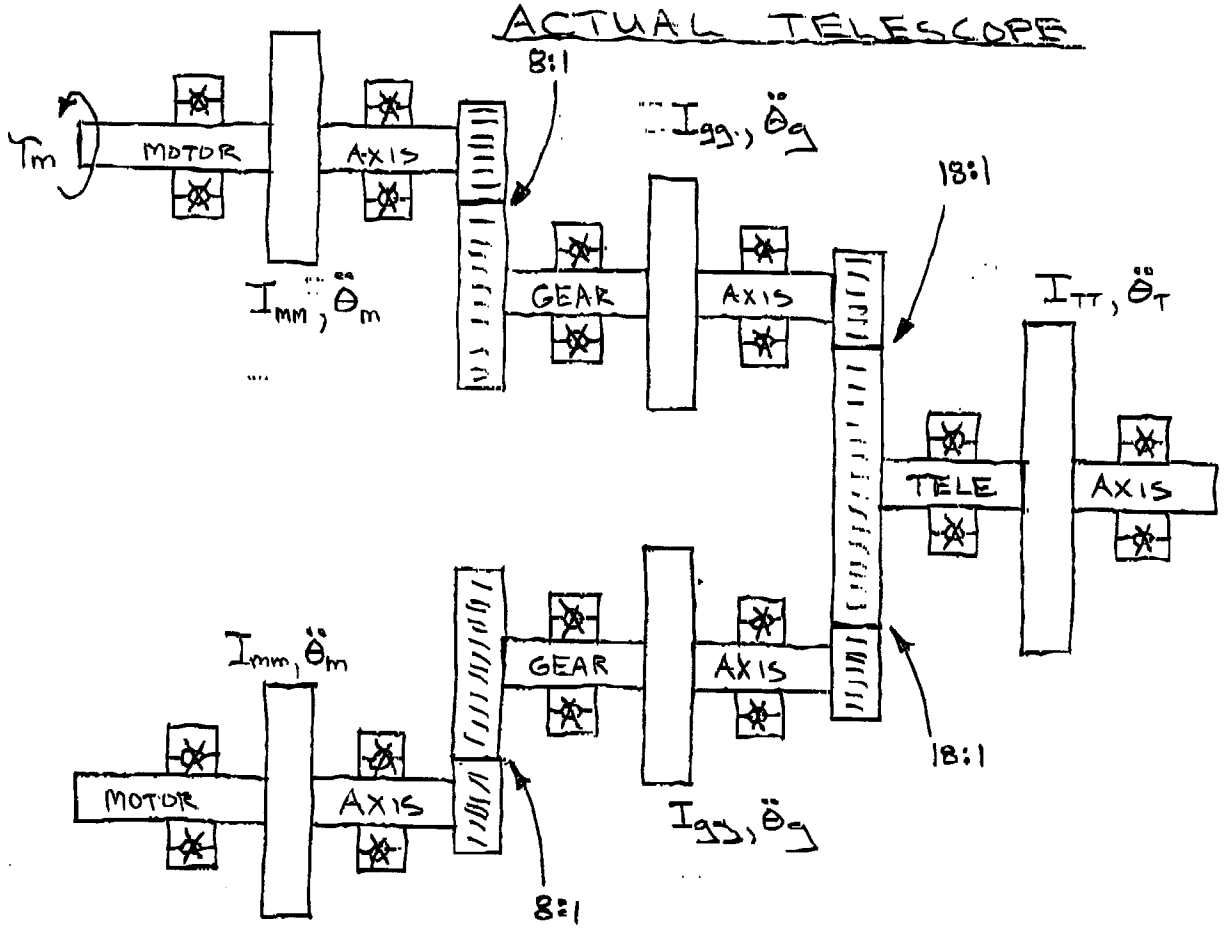
Number of Pages (Including this sheet) 4

ACTUAL TELESCOPE

(1)



$$T_m = \left\{ 2 \times I_{mm} + 2 \times \left(\frac{1}{8}\right)^2 I_{gg} + \left(\frac{1}{8}\right)^2 \left(\frac{1}{18}\right)^2 I_{TT} \right\} \ddot{\theta}_m$$

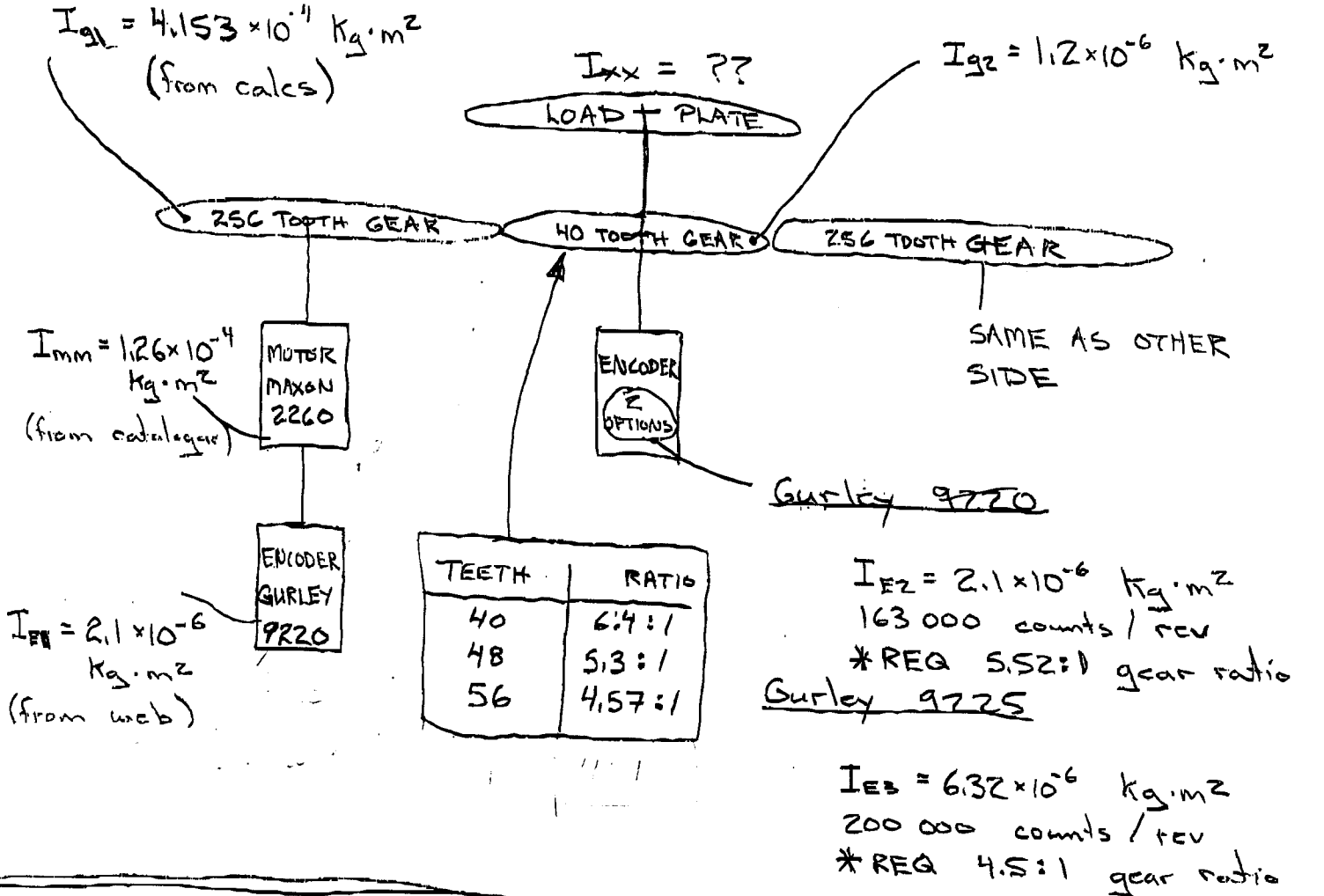
* $T_m = 271$ N·m [max torque of telescope drive motors]
* $I_{mm} = 0.727$ Kg·m² [from shop dwgs - shaft, coupling and motor rotor]
* $I_{gg} = 8.002$ Kg·m² [from shop dwgs - 2 gears and shaft]
* $I_{TT} = 532\,716$ Kg·m² [from JPL estimates]

$$\therefore \ddot{\theta}_m = \frac{271}{\{1.454 + .250 + 25.690\}}$$

$$= 9.893 \text{ rad/s} \quad [\text{of motor axis}]$$

(2)

MODEL SETUP



$$\frac{T_m}{\ddot{\theta}_m} = 2\left(I_{mm} + I_{E1} + I_{G1}\right) + \left(\frac{256}{\text{teeth}}\right)^2 \left(I_{G2} + I_{E2} + I_{xx}\right)$$

GURLEY 9220 w 48 tooth gear:

$$\frac{.332}{9.893} = 2\left(1.26\times10^{-4} + 2.1\times10^{-6} + 4.153\times10^{-4}\right) + \left(\frac{256}{48}\right)^2\left(1.2\times10^{-6} + 2.1\times10^{-6} + I_{xx}\right)$$

$$I_{xx} = 1.142 \times 10^{-3} \text{ kg·m}^2$$

GURLEY 9225 w 56 tooth gear:

$$\frac{.332}{9.893} = 2\left(1.26\times10^{-4} + 2.1\times10^{-6} + 4.153\times10^{-4}\right) + \left(\frac{256}{56}\right)^2\left(1.2\times10^{-6} + 6.32\times10^{-6} + I_{xx}\right)$$

$$I_{xx} = 1.554 \times 10^{-3} \text{ kg·m}^2$$

SOME I_{xx} Calcs for size of table

(3)

A disk : Aluminum ($\rho = 2700\ kg/m^3$)

dia = 150 mm (approx 6")
th = 6.35 mm (exact $\frac{1}{4}$")

$I_{xx} = 0.85 \times 10^{-3}\ kg \cdot m^2$
$m = 0.303\ kg$

A disk : Aluminum

dia = 175 mm (approx 7")
th = 6.35 mm (exact $\frac{1}{4}$")

$I_{xx} = 1.58\ kg \cdot m^2$
$m = 0.412\ kg$

* I recommend a 6" alum disk, $\frac{1}{4}$" thick with a bolt circle pattern @ Ø5" (maybe 8 holes × $\frac{1}{4}$-20) that you can put SHCS's in to adjust mass.
* For this you would need to use the Gurley 9225 and the 56 toothed gear

Adjusted Model 10-20-03

1) Swap R135 for 9220 Encoder

R135 has 230,400 c/r and 1.7×10^{-6} Kg·m² inertia

2) Change Gearing to 256:64 (4:1).

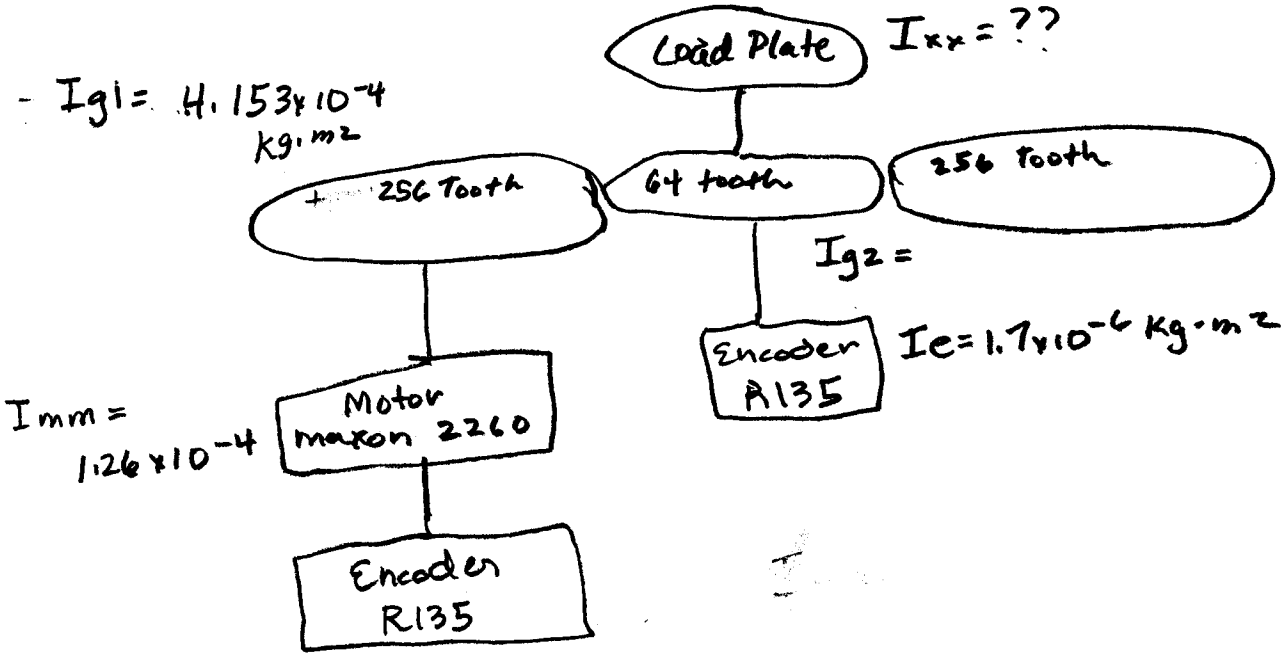
Ideal $R = (9000 \frac{AS}{R} \cdot 100 \frac{C}{R}) / 230\,400 \frac{C}{R} = 3.90625$

The R135 gives us: $(4 \cdot 230400 \frac{C}{R}) / 9000 \frac{AS}{R} = 102.4 \frac{C}{AS}$ Resolution

As a TAC; $230\,400 \frac{C}{R} \div 9000 \frac{AS}{R} = 25.6 \frac{C}{AS}$ or $0.039 \frac{AS}{C}$

0.039 AS ÷ 50Hz = 1.95 AS Resolution @ 20 ms

0.039 AS ÷ 100Hz = 3.9 AS Resolution @ 10 ms



$$\frac{T_m}{\ddot{\theta}_m} = 2(I_{mm} + I_e + I_{g1}) + \left(\frac{256}{64}\right)^2 (I_{g2} + I_e + I_{xx})$$

Per T. Bond: $I_{xx} = 2.03 \times 10^{-3}$ Kg·m²

Load Plate suggestion: 7" x 1/4" Alum Disk

Bolt circle pattern @ 6", 12 Holes 1/4-20