TO: Distribution
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SUBJECT: A Multiplier Effect While Using TLOSS During Simulations

In the course of developing the Colossus program many of the simulations are conducted under "stress conditions"; i.e. slowing down the computer by using the TLOSS option. This slow down is a convenient way of judging the effect of the AGC input counters stealing memory cycles may be lost, thus effectively "slowing down" the on-going computations.

While running with TLOSS, the computer clocks still run at correct time; i.e. the interrupts occur on time but a computational interval would be increased by the following factor:

\[ \frac{1}{1 - \text{TLOSS}} \]

where TLOSS = fraction of slow down; e.g. TLOSS = 0 means normal speed where TLOSS = .20 means 20% loss in speed.

If a computational sequence consists of jobs and tasks, or more generally of computations in and out of interrupt, then the non-interrupt computations will take longer than that indicated by TLOSS. Suppose that at normal speed a job takes \( B_1 \) seconds to complete; i.e.

\[ T_J + T_I = B_1 \]

where \( T_J \) = time in the job

\( T_I \) = time in interrupt

and let \( p_1 = \frac{T_I}{B_1} \), the fraction of time in interrupt.
With a TLOSS, let $B_2$ be the time it takes to complete the job; then

$$B_2 = (\frac{p}{a})B_2 + \frac{T_J}{a} \quad \text{where} \quad a = 1 - \text{TLOSS}$$

then

$$\frac{B_2}{B_1} = (\frac{p}{a})\frac{B_2}{B_1} + \frac{T_J}{aB_1}$$

or

$$\frac{B_2}{B_1} = \frac{T_J/B_1}{a-p}$$

But $T_I + T_J = B_1$

therefore $\frac{T_J}{B_1} = 1 - p$

and finally

$$\frac{B_2}{B_1} = \frac{1-p}{a-p}$$

where $p = \text{normal fraction of time in interrupt}$

$a = 1 - \text{TLOSS fraction}$