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COLOSSUS Memo #66

TO: Distribution
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DATE: June 19, 1968
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:

$$1/(1 - \text{TLOSS})$$

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 $p_1 = T_I/B_1$, the fraction of time in interrupt.

With a TLOSS, let B_2 be the time it takes to complete the job; then

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

time
required
in interrupt job
time

then

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

or

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

$$\text{But } T_I + T_J = B_1$$

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

and finally

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

where p = normal fraction of time in interrupt

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

$$\frac{B_2}{B_1}$$

