4. Zone 4

Temperature range $T_4\,^0R$ to $T_5\,^0R$

EPR range E4 to E5

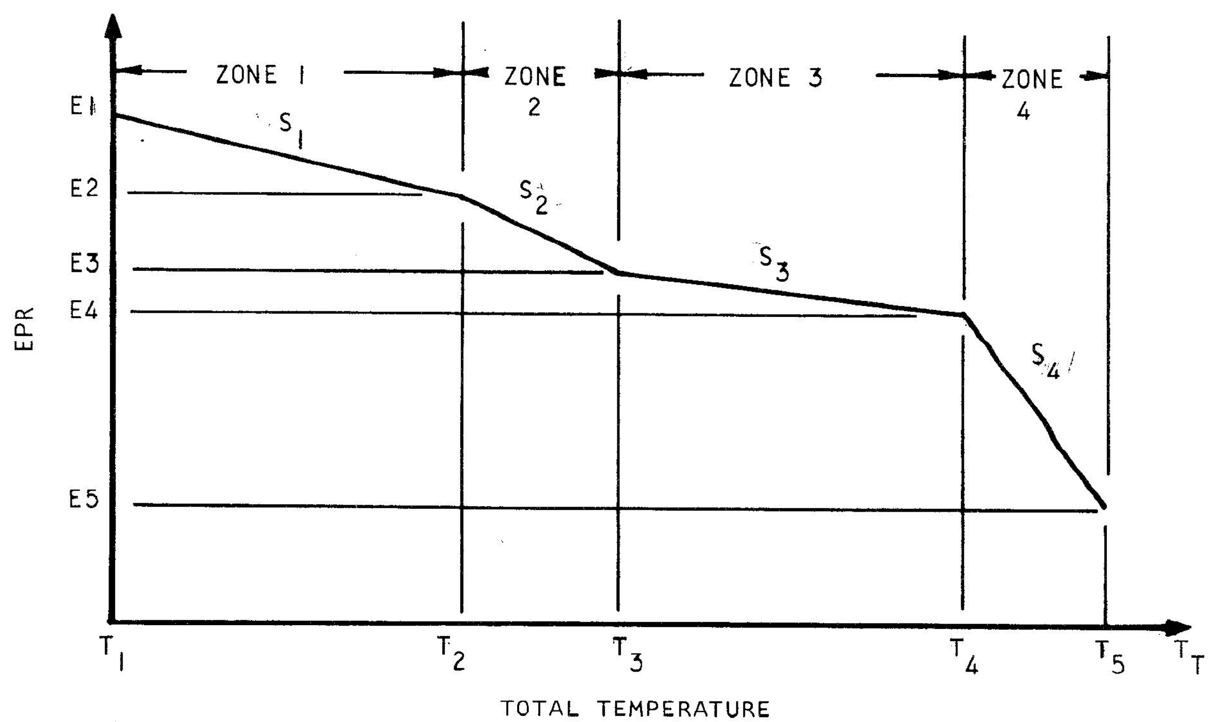
$$\text{Slope} = \frac{E5 - E4}{T_5 - T_4} = S4$$

$$f_2 = T_{T(\text{input})}\Big]_{TI}^{T5} \times S4 + \text{EPR } (S4) \text{ at } 0^0R - \text{EPR STD} = K5$$

$$\frac{f_2}{KI} = \frac{T_T}{4900}\Bigg]_{\frac{TI}{4900}}^{\frac{T5}{4900}} \left(\frac{4900\ (S4)}{KI}\right) + \frac{K5}{KI}$$

$$\frac{f_2}{3} = \frac{f_2 \text{ (Zone Selected)}}{KI} \div \frac{3}{KI}$$

Input from customer (also input to computer with $T_T$ in $^0R$).

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$T_2$, $T_3$, $T_4$ are the zone select constants

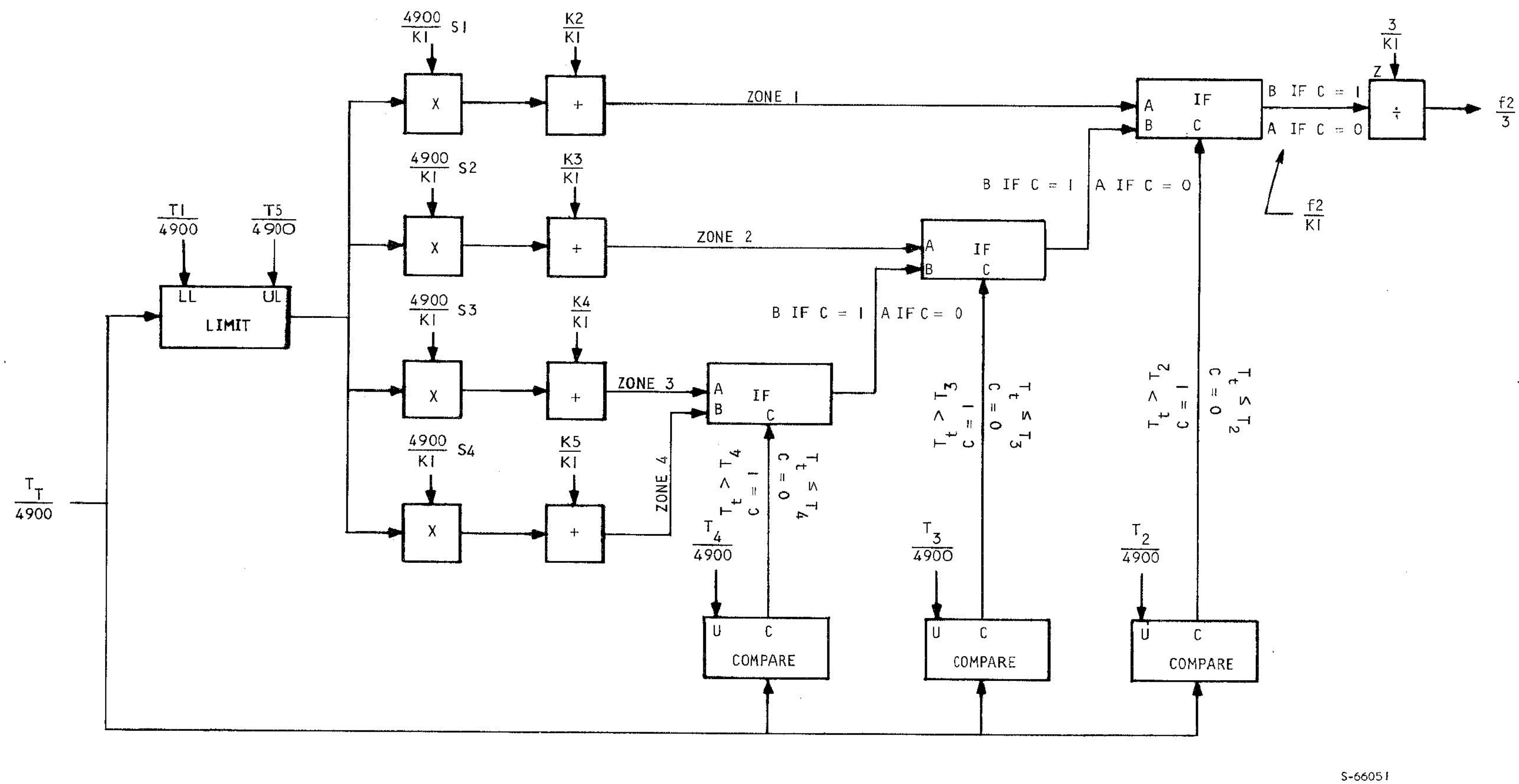



Figure 2-7. Engine Pressure Ratio (EPR) $f_2$ Function Mechanization

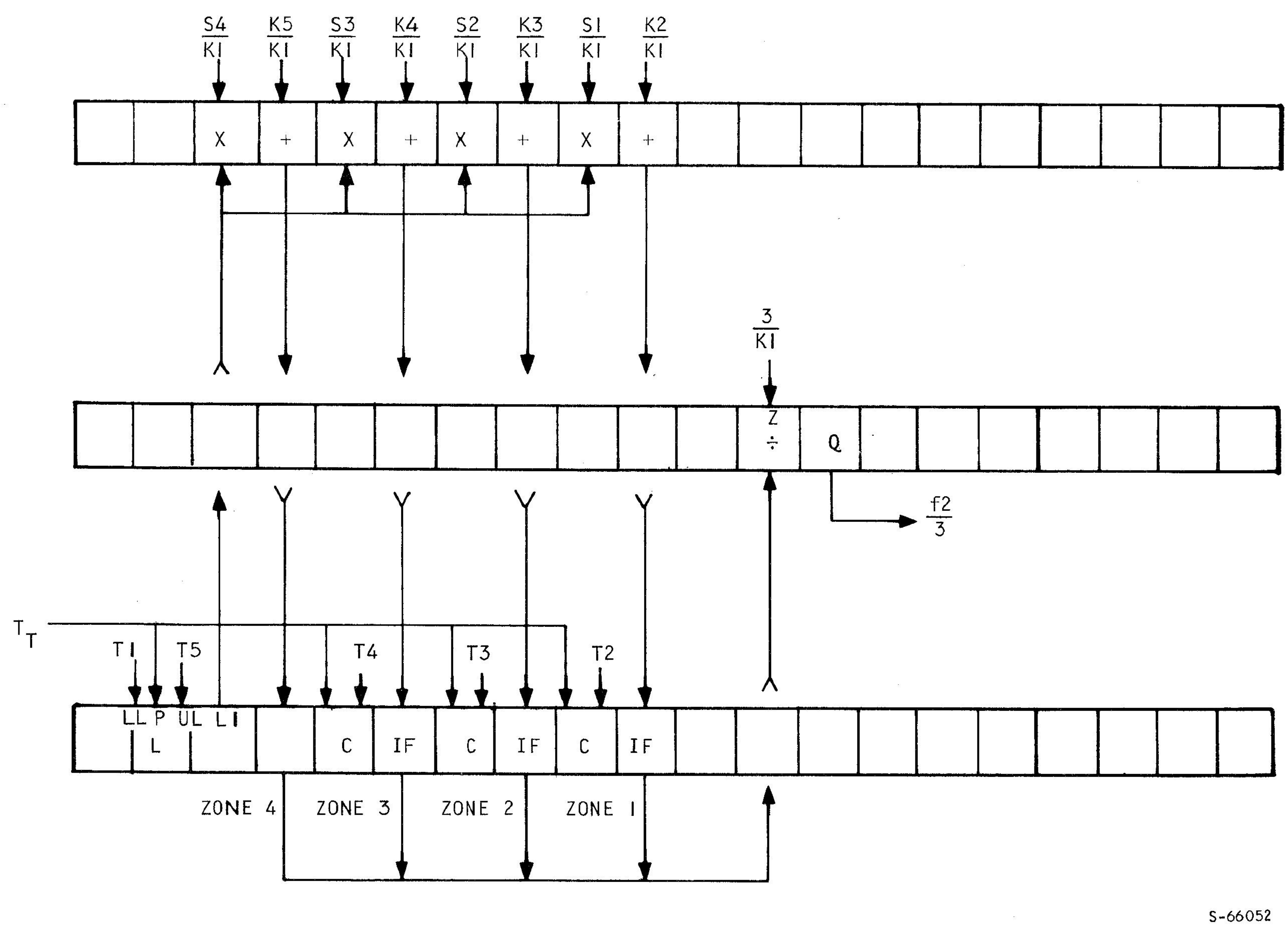



Figure 2-8. Engine Pressure Ratio Program Drawing

## Glove Vane Schedule (M) $\Gamma_s(M)$ (Figures 2-9 and 2-10)

$\Gamma_s(M) = $ 2 zone function

1. Zone I

Mach range M1 to M4

$$\frac{\Gamma_S}{32} = \left\{ \left[ \frac{M}{4.096} - \frac{M2}{4.096} \right]_0^{\frac{\Delta M1}{4.096}} \div \frac{32}{4.096(S1)} \right\} - |\Gamma_1|$$

2. Zone 2

Mach range M4 to M6

$$\frac{\Gamma_S}{32} = \left[ \frac{M}{4.096} - \frac{M4}{3.096} \right]_0^{\frac{\Delta M2}{4.096}} \div \frac{32}{4.096\ (S2)}$$

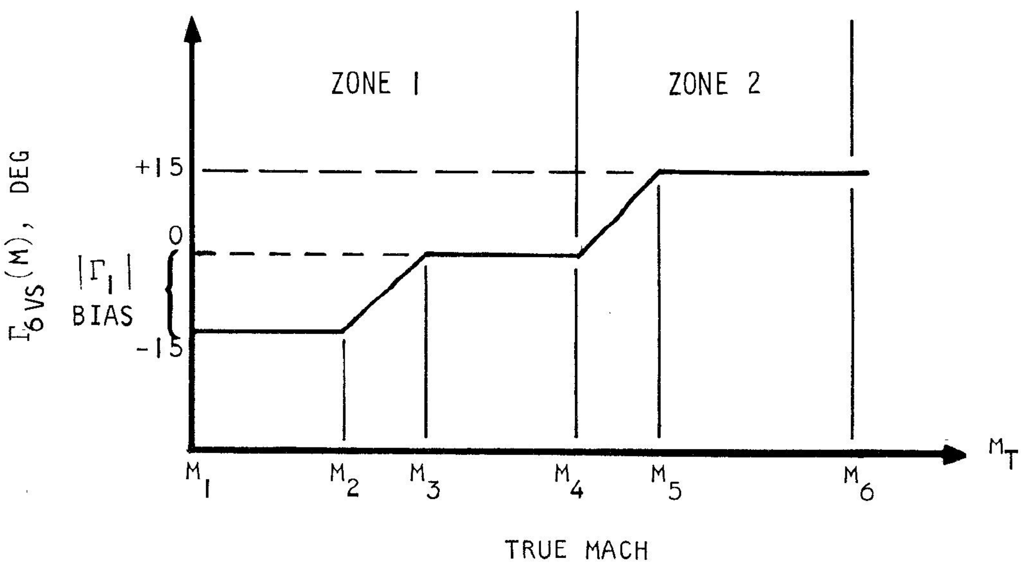
$\frac{32}{4.096} = 7.812500 = $ scaling factor

M4 = Zone select constant

$\Delta M1 = M3 - M2$

$\Delta M2 = M5 - M4$

Input from customer (also input to computer)



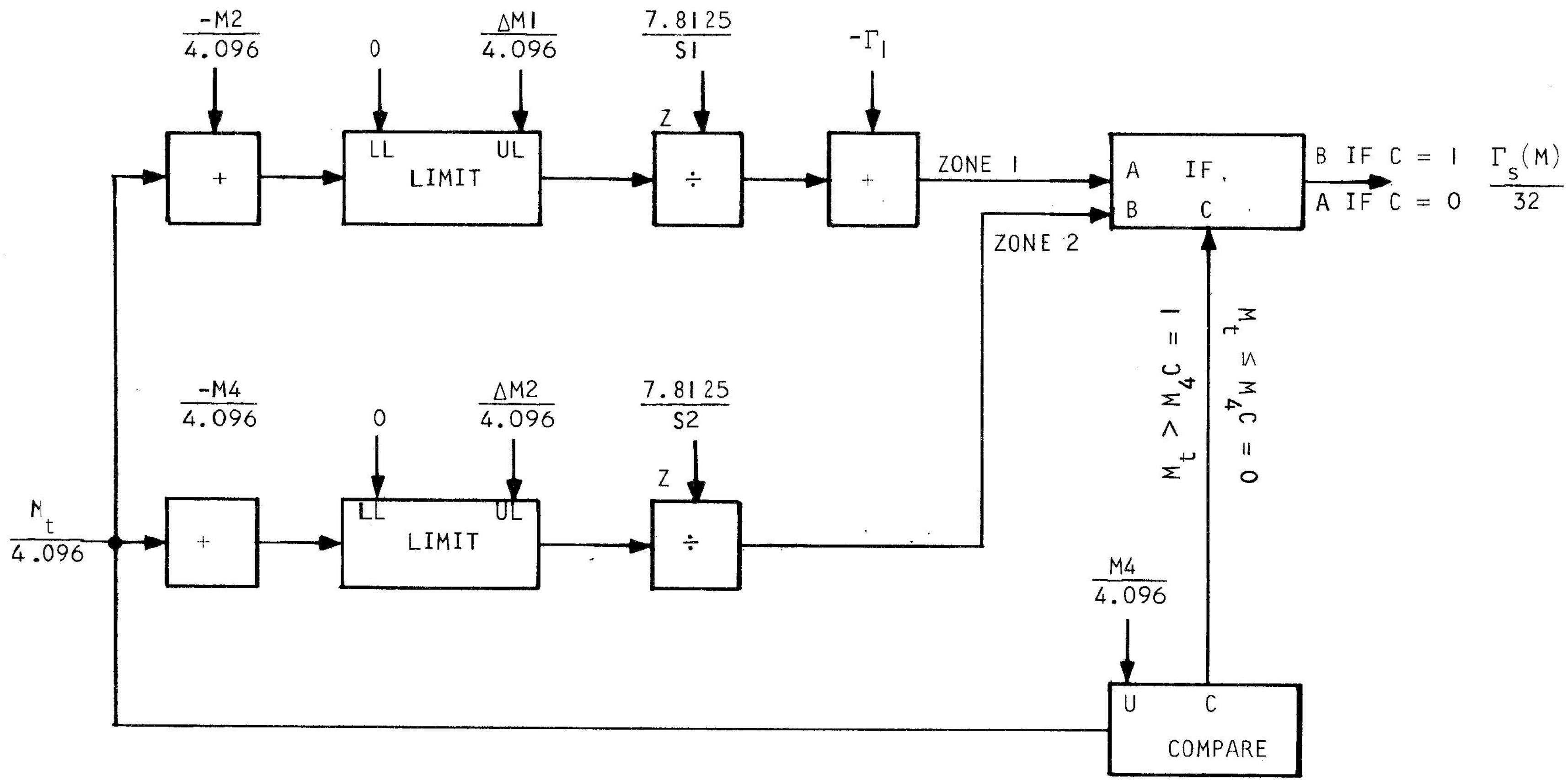



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Figure 2-9. Glove Vane Schedule $\Gamma_s(M)$ Mechanization

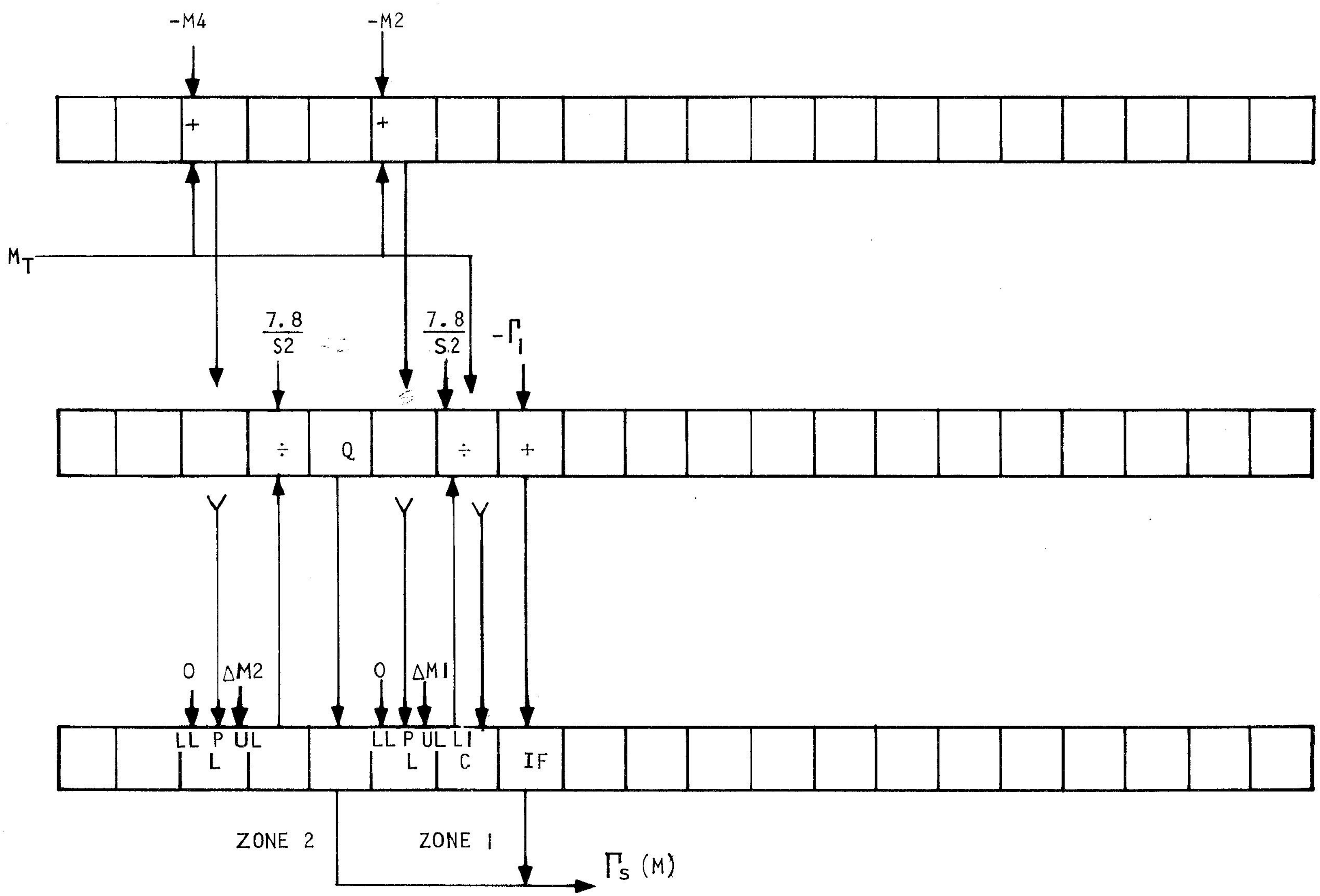


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Figure 2-10. Glove Vane Schedule $\Gamma_s$(M) Program Drawing

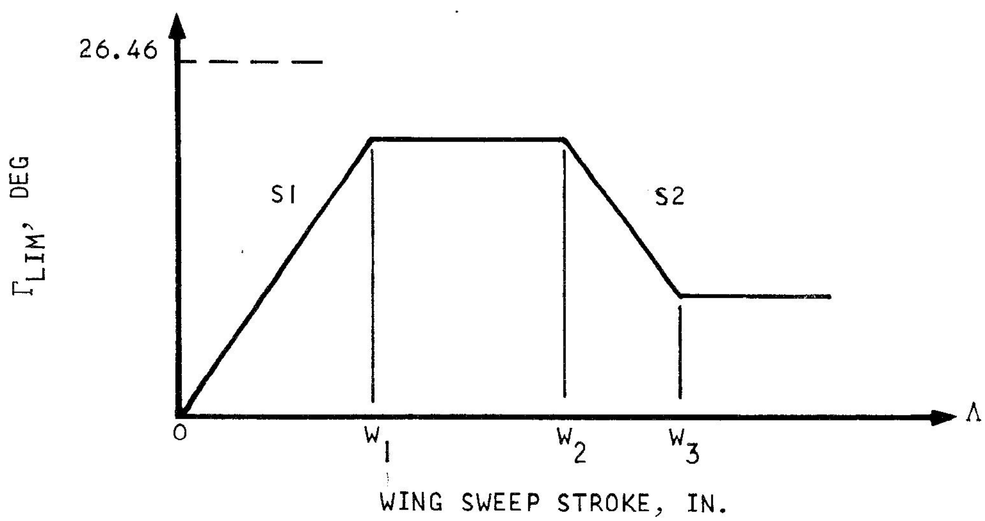
Glove Vane Limit Schedule ($\Lambda$) (Figures 2-11 and 2-12)

$$\Gamma_{LIM}(\Lambda) = \Gamma_{LIM\ A} + \Gamma_{LIM\ B}$$

$$\frac{\Gamma_{LIM\ A}}{26.46} = \frac{\Lambda p}{26.46}\Big|_{0}^{\frac{W1}{26.46}} \div S1$$

$$\frac{\Gamma_{LIM\ B}}{26.46} = \left[\frac{\Lambda p - W2}{26.46}\Big|_{0}^{\frac{\Delta W1}{26.46}}\right] S2 \qquad \Delta W_1 = W_3 - W_2$$

Input from customer (also input to computer)



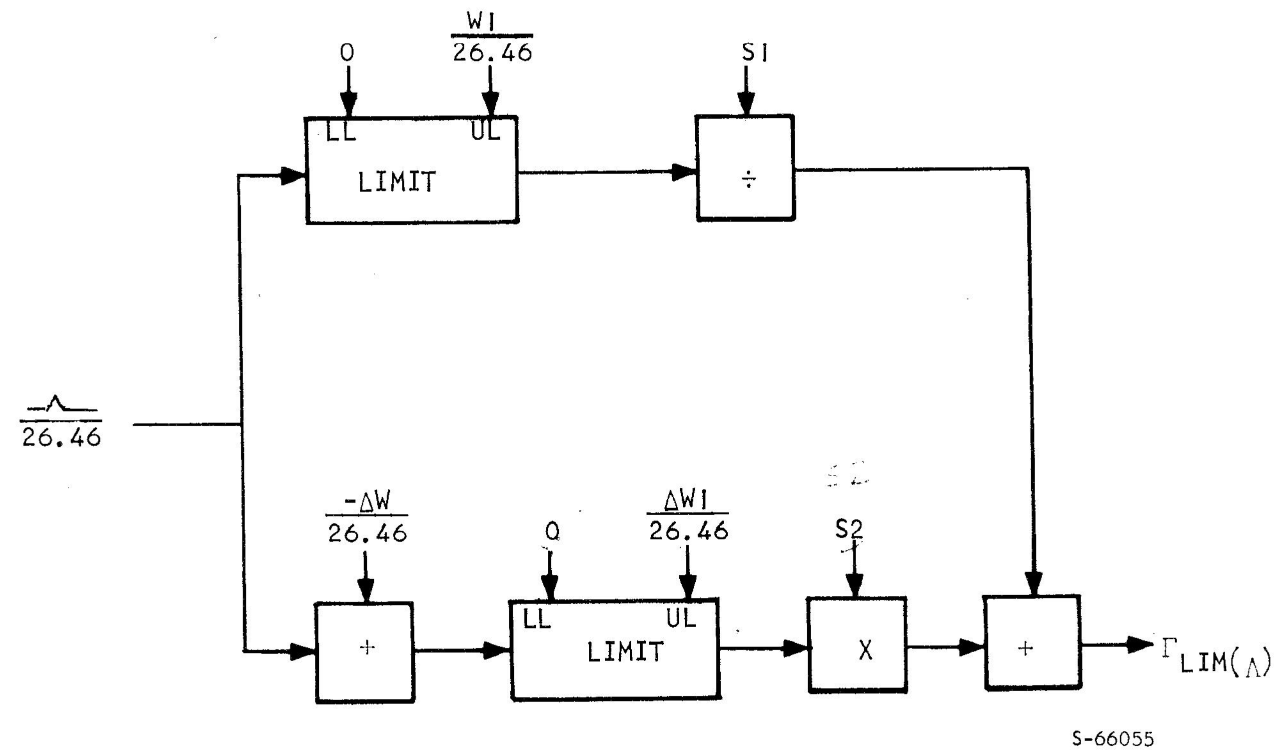



Figure 2-11. Glove Vane Limit Schedule $\Gamma_{LIM}(\Lambda)$ Mechanization

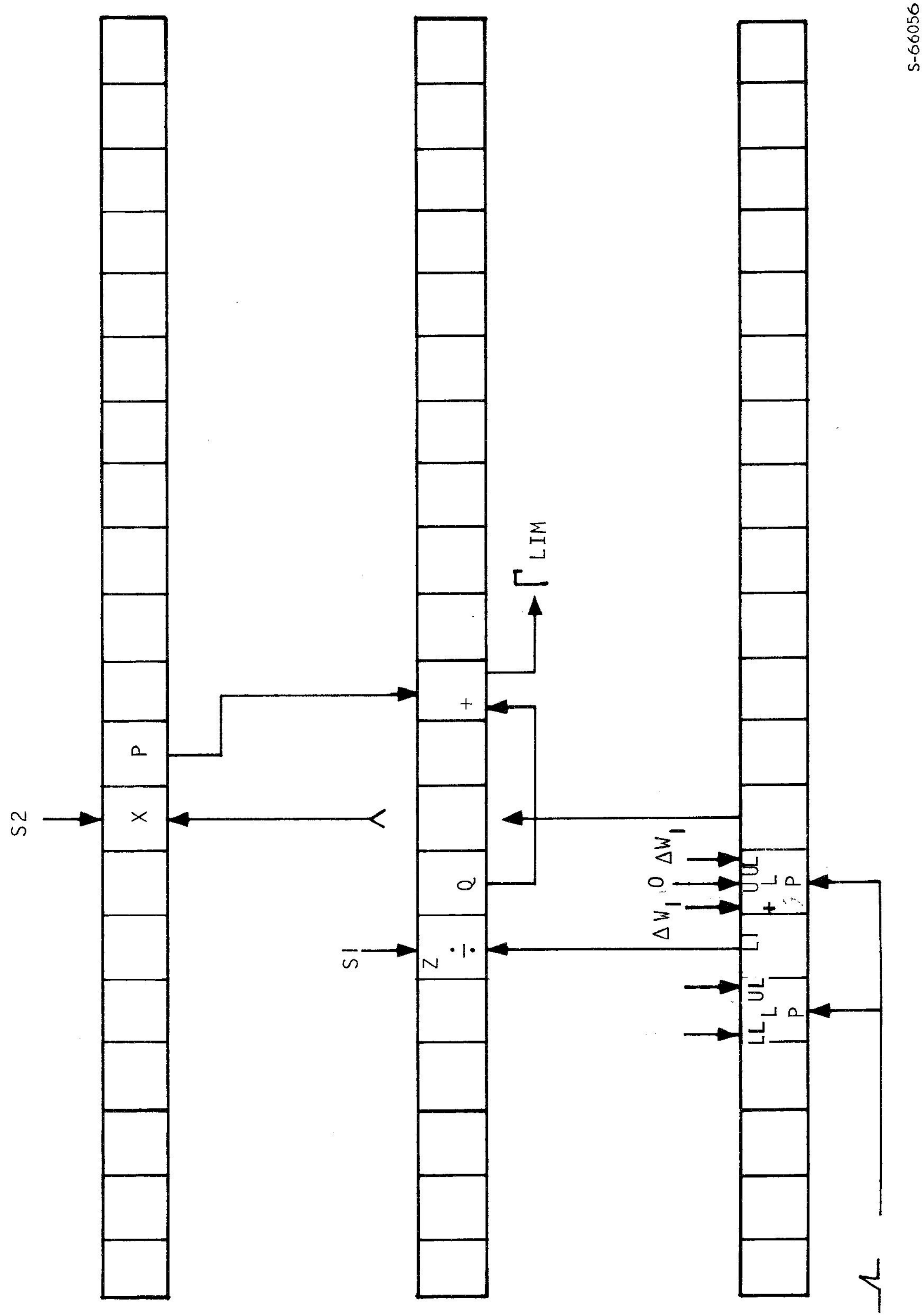



Figure 2-12. Glove Vane Limit Schedule Program Drawing

Wing Sweep Rate Limit Constants (Figures 2-13 and 2-14)

Automatic mode rate limit

A = inches per second from customer

$$\Delta = \frac{A}{(29.4)(18.310547)}$$

$+\Delta$ and $-\Delta$ go into the mechanization

Maneuver Flap System Deadband and Rate Limit Constant (Figures 2-15 and 2-16)

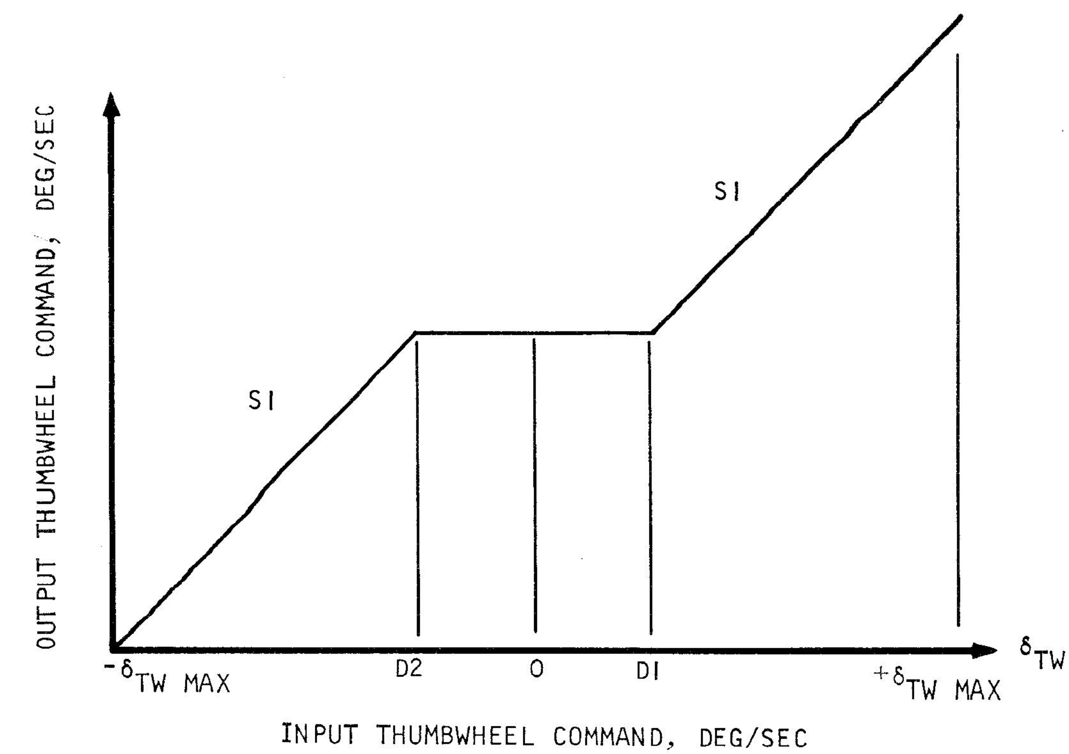
$$\delta_{TWO} = \left[\delta_{TW} - \delta_{TW}\Big|_{L1}^{L2}\right]\frac{S1}{18.310547}$$

$\delta_{TW}$ = input thumbwheel command

$\delta_{TWO}$ = output thumbwheel command

L1 = $D2/\delta_{TW}$ max

L2 = $D1/\delta_{TW}$ max



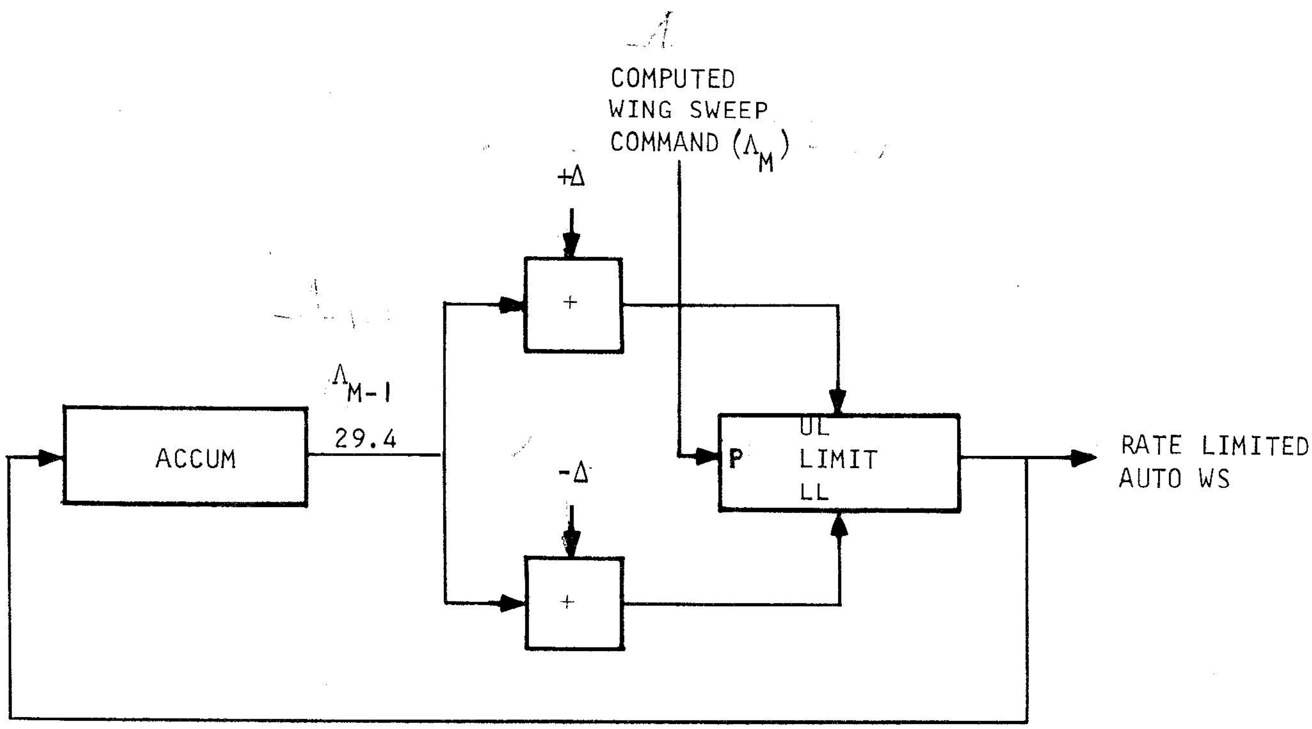



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Figure 2-13. Wing Sweep Rate Limit Mechanization

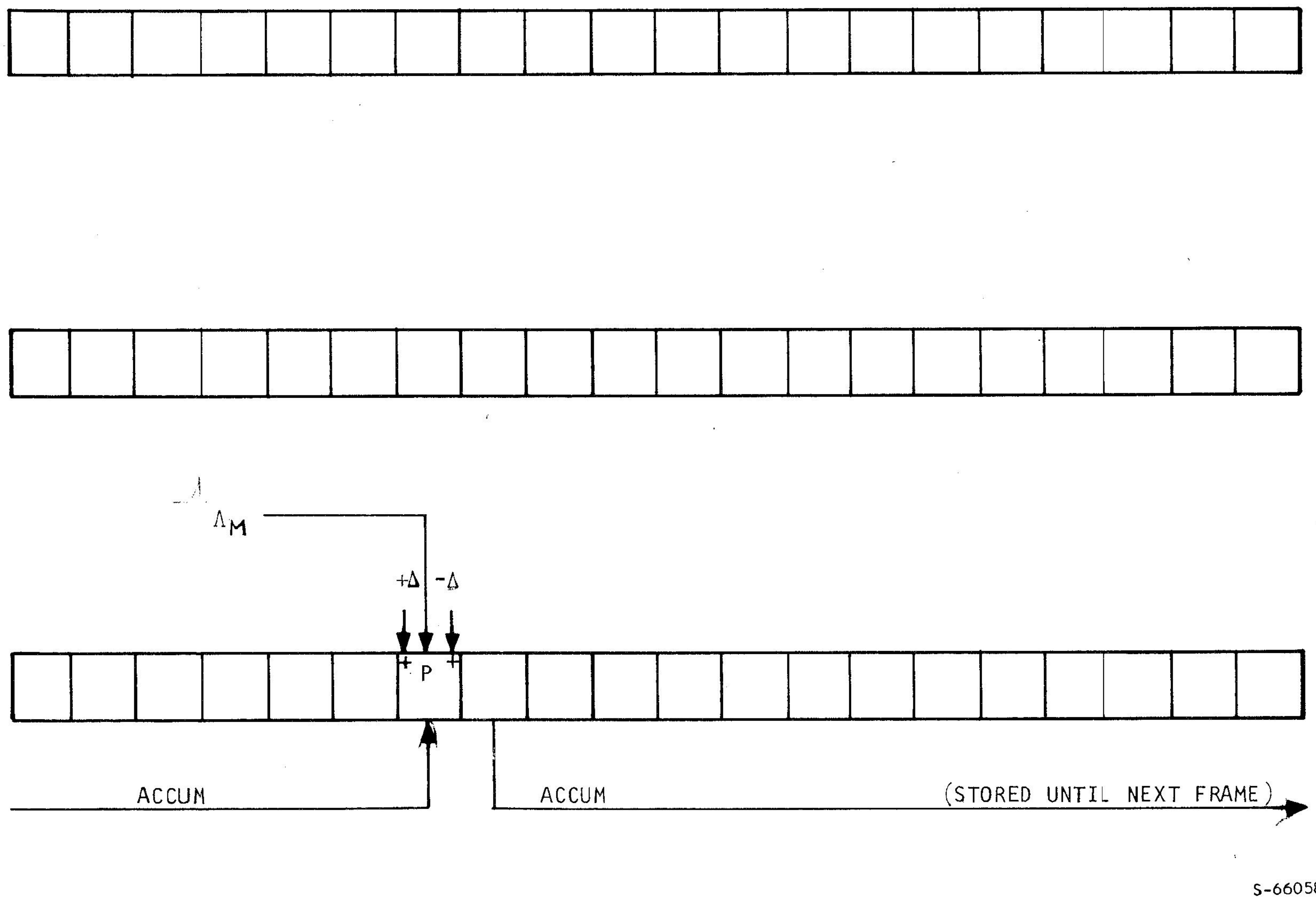


Figure 2-14. Wing Sweep Rate Limit Program Drawing

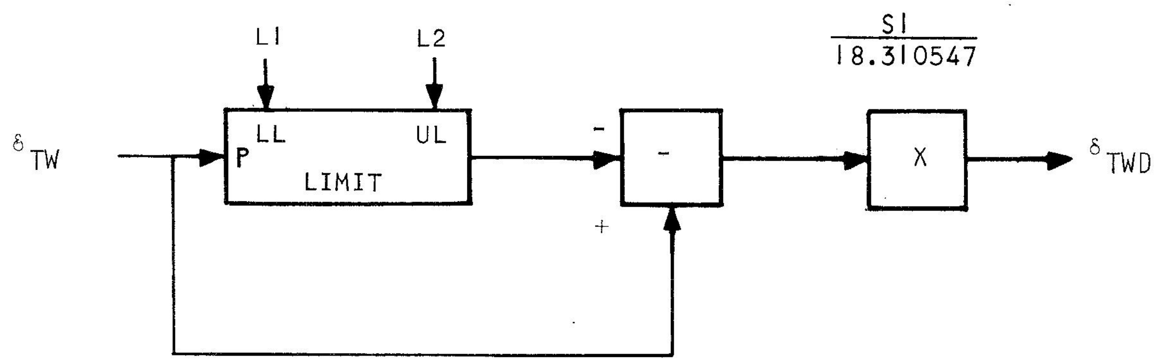


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Figure 2-15. Maneuver Flap Deadband Mechanization

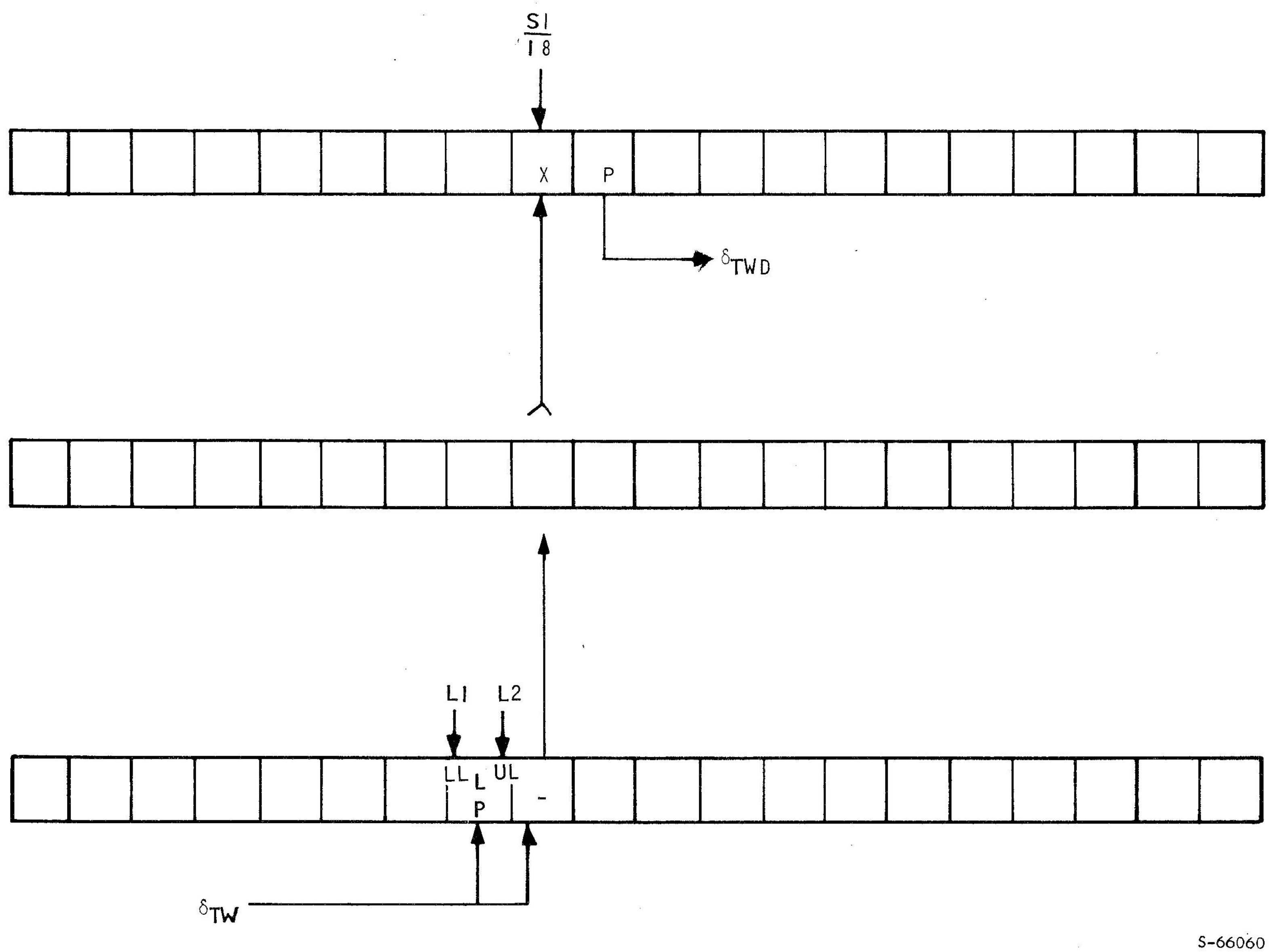


Figure 2-16. Maneuver Flap Deadband Program Drawing

Switch Thresholds (Figures 2-17 and 2-18)

1. Mach Switch Output 31

If $\frac{M}{4.096} < \frac{A}{4.096}$ switch closed

If $\frac{M}{4.096} \geq \frac{A}{4.096}$ switch open

P = conversion constant from $^0$F to $^0$R

2. Mach Switch Output 51

If $\frac{M}{4.096} < \frac{B}{4.096}$ switch closed

If $\frac{M}{4.096} \geq \frac{B}{4.096}$ switch open

3. Mach Switch Output 52

If $\frac{M}{4.096} < \frac{C}{4.096}$ switch closed

If $\frac{M}{4.096} \geq \frac{C}{4.096}$ switch open

4. Mach Switch Output 55

If $\frac{M}{4.096} < \frac{D}{4.096}$ switch closed

If $\frac{M}{4.096} < \frac{D}{4.096}$ switch open

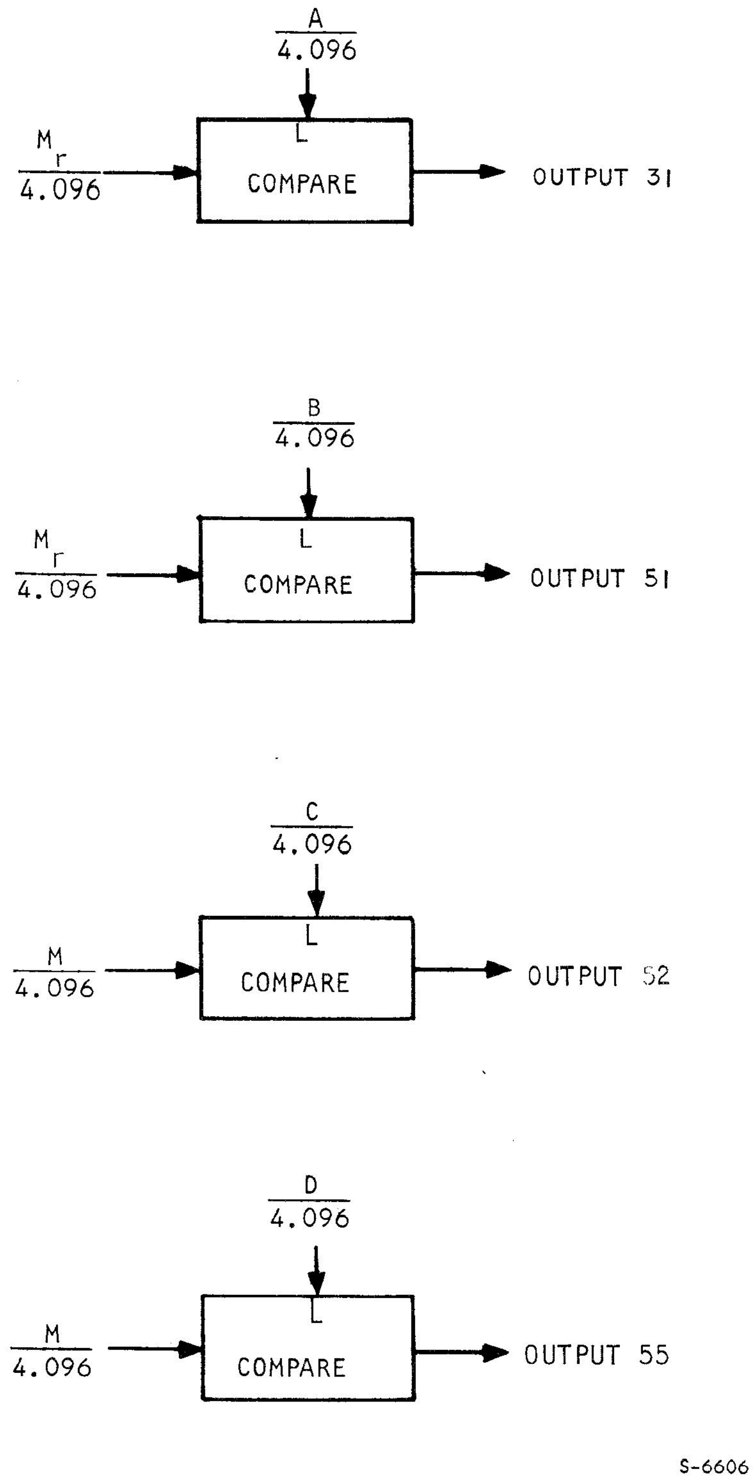


Figure 2-17. Switch Thresholds Mechanization

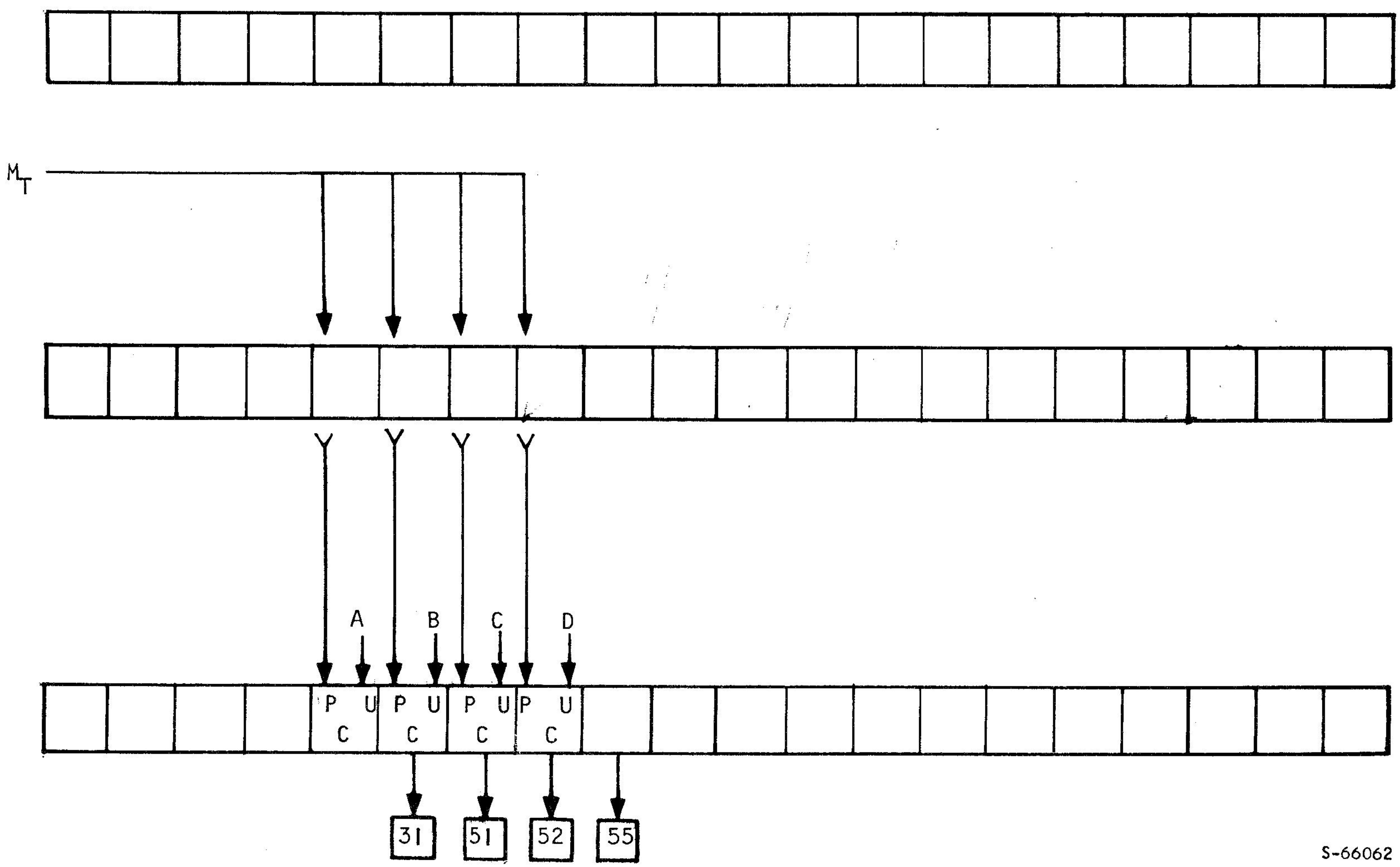


Figure 2-18. Switch Thresholds Program Drawing

## INFLIGHT DIAGNOSTICS

To detect failures of the processor circuits during the flight of the F-14A airplane, an inflight diagnostic routine was programmed into the CADC. The ground rules for the diagnostic routine were set up as being able to detect any single failure due to the following:

(a) Each interconnect failure

(b) Greater than 95 percent arithmetic unit failures

(c) 100 percent failures of nonarithmetic circuits

(d) Timing and clock signal failures

To satisfy this requirement, the following procedures were followed. First, a complete single failure analysis was performed on the PMU and PDU. The result of this analysis was 5 sets of operands (M and R, D and Z) for the PMU and PDU. Each set of 5 operands detected greater than 98 percent of all single failures. (See Computer Aids, Section 3.)

Next, these operands were programmed as test words into the program. The test words were initiated from ROM's and were transferred through various steering paths and RAS registers before they became operands for the PMU or PDU. The result (product or quotient) was then again transferred through steering paths, RAS registers, and SLF functions and combined with each other until a single binary word was the result. This binary word was then compared with a stored constant from the ROM. To ensure that the output of the comparator did not stick in the "good" condition, a bad test was also performed to exercise the other state of the comparator. The results of these tests were picked up by the BITE circuitry. Drawing PA-115409 shows the mechanization drawing for the inflight diagnostic.