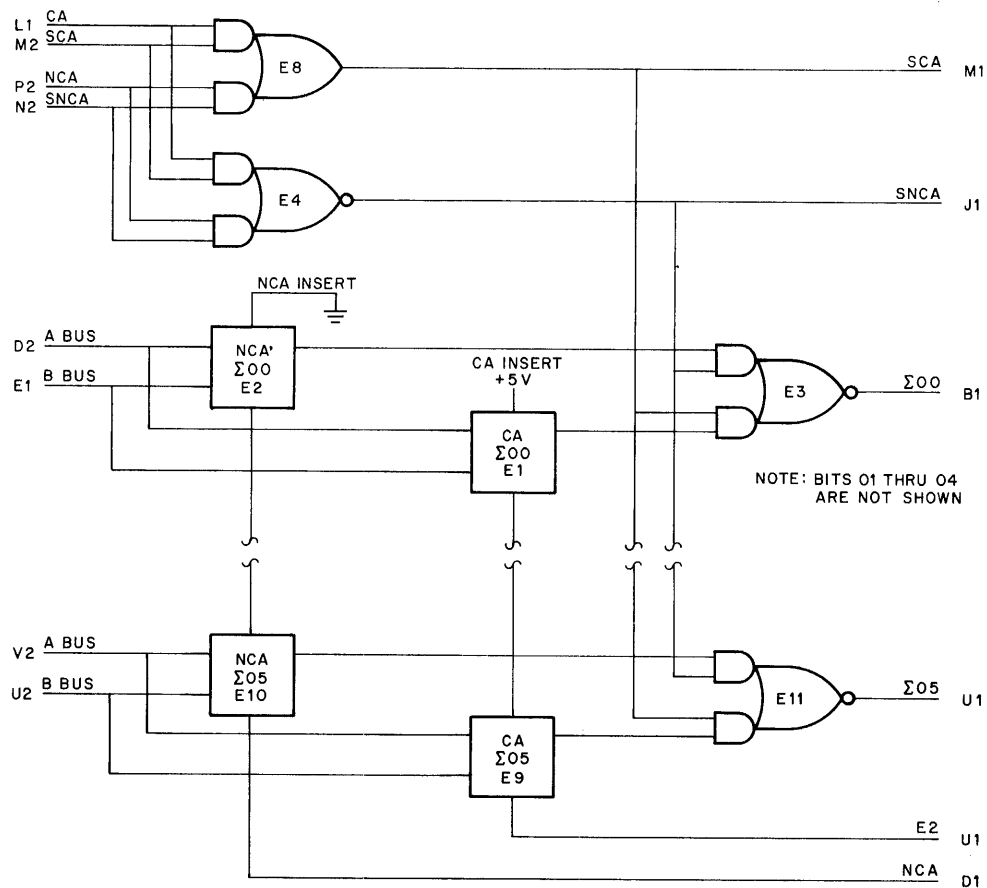


# M164 6-Bit Parallel Adder

The M164 module contains a 6-bit conditional sum adder. Three of these modules are connected in tandem to form the 18-bit adder used in the central processor of the PDP-15. (Refer to Engineering Drawings D-BS-KP15-0-1 through D-BS-KP15-0-18.) The adder can generate an 18-bit sum in 82 ns. This high speed is available because there is no carry propagated from one adder module to the next. Instead of having the carry propagated from module to module, which takes 48 ns per module, each 6-bit sum is performed twice simultaneously (see illustration). One sum, CA (carry anticipated), is formed with a carry inserted, while the other sum, NCA (no carry anticipated), is formed without a carry inserted. Combinational logic in each adder module



M164 Simplified Diagram

15-0111

provides the control inputs SCA (select carry anticipated) or SNCA (select no carry anticipated) to the module handling the next six most significant bits. The sum from the first adder module during normal addition is always a sum without a carry inserted because the combinational logic is strapped to select the adder that has no carry inserted.

The following are the input, output, and power characteristics of the M164 module.

**INPUTS:** The M164 adder module is unbuffered; and all inputs must, therefore, remain stable for the entire add cycle. The following list shows all input connections and the TTL unit loading they present:

Name	Pin	Loading	True 1
A0	E1	2.0	+2.0
B0	D2	2.0	+2.0
A1	F2	8.0	+2.0
B1	H2	8.0	+2.0
A2	J2	2.0	+2.0
B2	K2	2.0	+2.0
A3	L2	8.0	+2.0
B3	R2	8.0	+2.0
A4	S2	2.0	+2.0
B4	T2	2.0	+2.0
A5	U2	8.0	+2.0
B5	V2	8.0	+2.0
CA	L1	2.5	+2.0
SCA	M2	2.5	+2.0
SNCA	N2	2.5	+2.0
NCA	P2	2.5	+2.0

**OUTPUTS:** The M164 adder module generates a 6-bit sum in 78 ns and a carry in 42 ns. All output connections and TTL driving capabilities are shown below.

Name	Pin	Drive	True 1
$\Sigma 0$	B1	12.5	0.4
$\Sigma 1$	A1	12.5	0.4
$\Sigma 2$	S1	12.5	0.4
$\Sigma 3$	C1	12.5	0.4
$\Sigma 4$	V1	12.5	0.4
$\Sigma 5$	U1	12.5	0.4
SNCA	J1	5.0	2.4
SCA	M1	5.0	2.4
CA	E2	5.0	0.4
NCA	D1	5.0	0.4

**POWER:** Power dissipated in the M164 module is 5V at 118 mA (maximum).