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WANG LABORATORIES, INC.

MEMO TO: All Field Sales Personnel - Domestic & International

FROM: Elliot Wassarman

SUBJECT: Wang System 2200 Timing Notes

DATE: March 29, 1974

In the past few months there have been many inquiries regarding the actual speeds of the functions and instructions on the Wang System 2200.

Enclosed is a list of average execution times for all 2200A and 2200B functions and instructions. Also included are valuable hints that can be used to minimize calculation time. These hints, if followed, can reduce processing time substantially.

These timings will be distributed to our regular vendors. Please distribute these timing notes to all additional third party analysts and vendors. The amount of processing time that can be saved using this information is considerable. We hope that it is helpful.

Elliot Wassarman

EW:sl:464

Enclosure

WANG SYSTEM 2200 TIMING NOTES

THIS NOTE IS AN EFFORT TO CLARIFY EXECUTION TIMES OF VARIOUS INSTRUCTIONS IN THE WANG SYSTEM 2200. THE TIME REQUIRED TO PROCESS ANY SPECIFIC JOB IS A SUM OF MANY FACTORS. TOTAL SYSTEM THROUGHPUT IS RELATED TO INPUT/OUTPUT OPERATIONS AND PROGRAM TIMING. THIS NOTE IS TO ASSIST IN PROGRAM TIMING. THE ACTUAL EXECUTION TIME OF ANY INSTRUCTION IS A SUM OF COMPONENT FACTORS:

1) PERTINENT TIME FROM THE TABLES BELOW,
2) VARIABLE PLACEMENT,
3) MATHEMATICAL EXPRESSION TIMES,
4) SPEEDS OF I/O DEVICES, IF PERTINENT.

PROGRAMMING HINTS:

1. VARIABLES.
   VARIABLES USED MOST OFTEN SHOULD BE DEFINED LAST IN THE BODY OF THE PROGRAM. THE SEARCH TIME THROUGH EACH ITEM IN THE VARIABLE STACK IS 64 MICROSECONDS. TO SPEED UP ANY PROGRAM SEARCH TIME CAN BE REDUCED BY JUDICIOUS ORDERING OF THE VARIABLE STACK.
2. SUBROUTINE PLACEMENT.
   STATEMENT LINES REFERENCED MOST OFTEN SHOULD BE PLACED NEAR THE FRONT OF THE PROGRAM. SEARCH TIME FOR NUMBERED STATEMENT LINES REQUIRES ABOUT ONE MILLISECOND FOR EVERY 24 NUMBERED STATEMENT LINES COUNTING FROM THE TOP OF THE PROGRAM.
3. SPACES WITHIN THE PROGRAM BODY CONSUME EXECUTION TIME.
   25 SPACES REQUIRE .44 MILLISECONDS.
4. ALPHANUMERIC COMPARISONS ARE FASTER THAN NUMERIC COMPARISONS.

AVERAGE EXECUTION TIMES WITHIN EXPRESSIONS

0.80 MS.	ADD	0.80 MS.	SUBTRACT
3.80 MS.	MULTIPLY	7.40 MS.	DIVIDE
16.40 MS.	SQUARE ROOT	25.30 MS.	E RAISED TO THE X POWER
23.20 MS.	LOG(X)	45.40 MS.	X^Y (EXPONENTIATION)
0.24 MS.	INTEGER	0.25 MS.	SIGN
0.02 MS.	ABSOLUTE VALUE	38.30 MS.	SINE
38.90 MS.	COSINE	78.50 MS.	TANGENT
72.50 MS.	ARCTANGENT		

2200 CPU READ/WRITE CYCLE = 1.6 MICROSECONDS

2200-A/B INSTRUCTIONS

OPTIMUM TIME	INSTRUCTION	CONDITIONS/REMARKS.
MISCELLANEOUS OPERATIONS		
0.384 MS.	REM	
3.360 MS.	DEFFN'1:RETURN	*
0.984 MS.	SELECT PRINT 005	
1.200 MS.	SELECT PRINT 005(64)	
BRANCHING OPERATIONS		
2.640 MS.	GOTO	*
4.320 MS.	IF THEN (NUMERIC)	* CONDITION NOT MET
4.840 MS.	IF THEN (NUMERIC)	* CONDITION MET
2.640 MS.	IF R1$=HEX(0D) THEN NNNN	*
3.120 MS.	IF R1$=A1$ THEN NNNN	*
DISPLAY		
8.892 MS.	PRINTUSING 1,A	* DISPLAY 12 CHARACTERS ON CRT
FOR-NEXT LOGIC		
MS.	FOR	LOOP SET-UP VARIES WITH FOR STATEMENT COMPLEXITY.
4.380 MS.	NEXT	

NOTE. (*) MEANS ADD 1 MS. FOR EVERY 24 NUMBERED STATEMENT LINES TO THE REFERENCED STATEMENT LINE. BEGIN COUNT AT THE TOP OF THE PROGRAM.

OPTIMUM TIME	INSTRUCTION	CONDITIONS/REMARKS.
LET STATEMENTS USING NUMERIC VARIABLES		
3.240 MS.	A=B	
5.280 MS.	B=A(1)	
5.400 MS.	B=A(255)	
2.880 MS.	B=123456	
2.880 MS.	X=1	
3.190 MS.	X=Y	
5.610 MS.	X=Y(3)	Y IS DIMENSIONED TO 12
6.810 MS.	X=Y(J)	J=3
7.010 MS.	X=Y(3,4)	DIM Y(6,8)
9.210 MS.	X=Y(J,K)	J=3, K=4
9.310 MS.	X=Y(J+K)	DIM Y12 J=3 K=4
10.810 MS.	X=Y(J*K)	DIM Y12 J=3 K=4
LET STATEMENTS USING STRING VARIABLES		
2.460 MS.	B$="0123456789ABCDEF"	
2.700 MS.	A$=B$	
5.376 MS.	A$=STR(B$,1,16)	
5.400 MS.	A$=STR(B$,8,1)	
2.635 MS.	A$="1"	
3.010 MS.	A$=B$	DIM A$1,B$1
3.900 MS.	A$=B$	DIM A$1,B$64
4.760 MS.	A$=B$	DIM A$64,B$1
5.700 MS.	A$=B$	DIM A$64,B$64 IN NEXT EXAMPLES
7.385 MS.	A$=STR(B$,1,1)	
8.310 MS.	STR(A$,1,1)=STR(B$,1,1)	
9.735 MS.	STR(A$,1,64)=STR(B$,1,64)	
8.160 MS.	STR(A$,1,30)=STR(B$,32)	
8.560 MS.	STR(A$,32,1)=STR(B$,32,1)	
8.535 MS.	STR(A$,64,1)=STR(B$,64,1)	
6.560 MS.	STR(A$,64)=STR(B$,64)	
8.435 MS.	STR(A$,1,64)=STR(B$,1,1)	
2200-B INSTRUCTIONS		
4.140 MS.	B=LEN(A$)	
3.960 MS.	B=VAL(A$)	
2.970 MS.	ADD(A$,01)	
3.000 MS.	ADDC(A$,01)	
3.696 MS.	ADD(A$,B$)	
6.240 MS.	AND(A$,FF)	
2.760 MS.	BIN(A$)=64	
5.232 MS.	BIN(STR(A$,16,1))=64	
5.040 MS.	BOOL E(A$,55)	
6.960 MS.	BOOL 7(A$,B$)	
4.896 MS.	CONVERT A TO A$,(#####)	
8.360 MS.	CONVERT X*2 TO A$,(+##.##)	
7.710 MS.	CONVERT X TO STR(A$,3,8),(-#.#^^^^)	
3.710 MS.	CONVERT A$ TO Z	
6.235 MS.	CONVERT STR(A$,3,8) TO Z	
5.560 MS.	CONVERT X TO A$,(####.#####)	
2.400 MS.	INIT(00)A$	
4.800 MS.	B=NUM(A$)	A$=10 DIGITS
4.560 MS.	B=NUM(A$)	A$=1 DIGIT
4.800 MS.	ON B GOTO NNNN	* B=1 GOTO CONDITION
2.520 MS.	ON B GOTO NNNN	B=5 FALL THROUGH CONDITION
4.320 MS.	PACK(####)A$ FROM A	
4.704 MS.	PACK(####.####)A$ FROM A	
2.970 MS.	ROTATE(A$,1)	
3.816 MS.	ROTATE(A$,7)	
3.960 MS.	UNPACK(####) A$ TO B	