

REVISION NOTICE

This description replaces previous descriptions of "Matrix Multiply 4," program D1-239.2. Program references have been changed to current designations.

FUNCTION

"Matrix Multiply 4" enables the interpretive system to multiply 2 matrices $A(i \times j)$ and $B(i \times j)$, where j_a and i_b are the same but the matrices are not necessarily square. The routine is entered and left in machine language, but uses the Floating Point Interpretive System 4, program H1-24.3 for all arithmetic.

INPUT

The elements of matrix A begin in A_0 and the elements of matrix B begin in B_0 . The data are stored consecutively in double precision floating point format.

OUTPUT

The elements of the product matrix C are stored in double precision floating point format beginning in C_0 .

MATRIX MULTIPLY 4

CALLING SEQUENCE

<u>Location</u>	<u>Order</u>	<u>Address</u>	<u>Notes</u>
a	R	Lo	Initial location of "Matrix Multiply 2."
a + 1	U	Lo	Initial location of "Matrix Multiply 2."
a + 2	Z	Io	Initial location of interpretive routine.
a + 3	Z	iaja	ia in track, ja in sector.
a + 4	Z	ibjb	ib in track, jb in sector.
a + 5	Z	Ao	Location of matrix A.
a + 6	Z	Bo	Location of matrix B.
a + 7	Z	Co	Location of product matrix C.

TIME

Approximately 4(ia)(ja)(jb) milliseconds are required.

STORAGE

2 tracks, 32 sectors (160 words) of memory are required for this sub-routine plus storage for matrices A, B, and C.

PROGRAM STOPS

<u>Location</u>	<u>Meaning</u>
Lo + 35	ja not equal to ib. Do not continue.

D1-0149
D1-239.2

ROYAL MCBEE CORPORATION
ELECTRONIC COMPUTER DEPARTMENT

Job #0149

DOUBLE PRECISION FLOATING POINT MATRIX MULTIPLICATION

FUNCTION:

To multiply two matrices A(i x j) and B(i x j) where ja and ib are the same but the matrices are not necessarily square. The routine is entered and left in machine language, but uses DPFP for all arithmetic.

INPUT:

The elements of matrix A beginning in Ao and the elements of matrix B beginning in Bo. Data are in DPFP format.

OUTPUT:

The elements of the product matrix C in DPFP format stored consecutively beginning in Co.

CALLING SEQUENCE:

<u>Location</u>	<u>Order</u>	<u>Address</u>	<u>Notes</u>
a	R	Lo	Initial location of this subroutine
a + 1	U	Lo	" " " " "
a + 2	Z	Lo of DPFP	Initial loc. of DPFP
a + 3	Z	iaja	ia in track, ja in sector
a + 4	Z	ibjb	ib in track, jb in sector
a + 5	Z	Ao	Location matrix A
a + 6	Z	Bo	Location matrix B
a + 7	Z	Co	Location product matrix C

TIME:

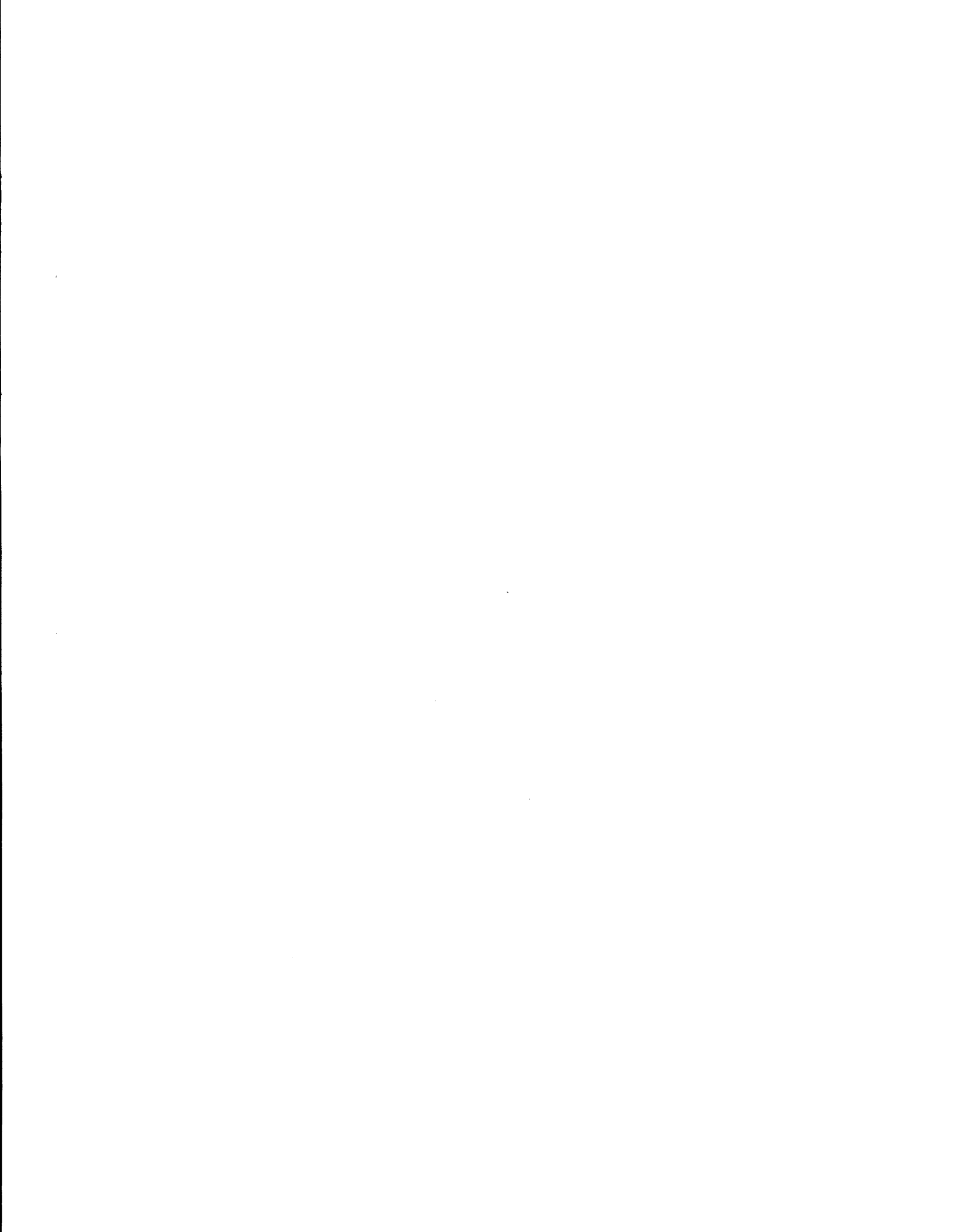
Approximately 4 iaajb seconds.

STORAGE:

2 1/2 tracks for this subroutine plus storage for matrices A, B, and C.

PROGRAM STOPS:

<u>Location</u>	<u>Meaning</u>
Lo + 35	ja not equal to ib. Do not continue.



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PREPARED FOR				PAGE OF
JOB NO. 0149				115
PROGRAM NO.	PROGRAM PREPARED BY	PROGRAM CHECKED BY	DATE	
	H20	2EO	9/28/59	
PROBLEM				TRACK
DPEP Matrix Multiplication for Square Matrices				

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION		STOP	CONTENTS OF ADDRESS	NOTES
			OPERATION	ADDRESS			
		<input checked="" type="checkbox"/>					
		00.0.0	BC	J		00	R L ₀
		0.1	Y0	10.0		01	U L ₀
		0.2	Y0	10.1		02	Z DPEP
		0.3	Y0	10.5	<input checked="" type="checkbox"/>	03	Z i ₀ ²³ j ₀ e ₀
		0.4	Y0	10.6		04	Z i ₀ a ₂₃ j ₀ e ₂₉
		0.5	B00	0.0		05	Z L ₀ A
		0.6	A02	2.1		06	Z L ₀ B
		0.7	Y00	1.8	<input checked="" type="checkbox"/>	07	Z L ₀ C
		0.8	A02	2.3		08	000
		0.9	Y00	2.7		09	
		1.0	A02	2.5		10	
		1.1	Y00	5.2	<input checked="" type="checkbox"/>		L ₀ A
		1.2	A02	2.7			L ₀ B
		1.3	Y00	5.5			L ₀ B
		1.4	A02	2.9			L ₀ B
		1.5	Y00	6.0	<input checked="" type="checkbox"/>		L ₀ C
		1.6	A02	3.1			L ₀ B
		1.7	Y01	5.8			Exit
		1.8	BC	J			
		1.9	H01	5.9	<input checked="" type="checkbox"/>		i ₀ j ₀ a
		2.0	E02	2.0			30000
		2.1	S02	0.6			1023
		2.2	H02	1.1			(i ₀) a ₂₃ p ₂₃
		2.3	B01	5.9	<input checked="" type="checkbox"/>		i ₀ j ₀ a
		2.4	E02	0.9			WJ
		2.5	H02	0.4			1025
		2.6	H02	3.0			j ₀ a
		2.7	BC	J	<input checked="" type="checkbox"/>		i ₀ j ₀ a
		2.8	H02	1.4			
		2.9	E02	2.0			30000
		3.0	H02	1.6			i ₀
		3.1	S02	3.0	<input checked="" type="checkbox"/>		j ₀ a → not equal

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PROJ. NO.

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PROGRAM DEVELOPED BY:

PROGRAM CHECKED BY:

DATE

9/28/54

PROBLEM:

DPFP MATRIX MULTIPLICATION FOR NON SQUARE MATRICES

TRACK

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION		STOP	CONTENTS OF ADDRESS	NOTES
			OPERATION	ADDRESS			
	1						
	1	<input checked="" type="checkbox"/>					
		0032	T	0035		→ #	
		33	S	0205		1@ 23	
		34	T	0036		→ equal	
		35	XZ	0000		<input checked="" type="checkbox"/> halt	cb ≠ ja
		36	B	0216		1b	
		37	S	0206		1@ 23	
		38	H	0162		ctr 1@ 23	
		39	H	0203		<input checked="" type="checkbox"/> ctr 1 reset	
		40	A	0205		1@ 23	
		41	M	0213		3@ 6	
		42	H	0161		Npr A@ 29	
		43	B	0214		<input checked="" type="checkbox"/> 1b j b	
		44	E	0209		WJ	
		45	N	0224		1@ 25	
		46	S	0223		1@ 23	
		47	H	0210		<input checked="" type="checkbox"/> ctr 2@ 23	
		48	H	0208		ctr 2 reset	
		49	A	0228		1@ 23	
		50	M	0215		3@ 6	
		51	H	0202		<input checked="" type="checkbox"/> Npr B@ 29	
		52	BL	J		A	
		53	H	0160		initial A	
		54	Y	0107			
		55	BL	J		<input checked="" type="checkbox"/> B	
		56	H	0201		B'	
		57	H	0200		BI	
		58	H	0207		BII	
		59	Y	0108		<input checked="" type="checkbox"/>	
		60	BL	J		C	
		61	Y	0103			
		62	Y	0109			
		63	Y	0110		<input checked="" type="checkbox"/>	



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JOB NO.

PROGRAM NO.

PROGRAM PREPARED BY:

PROGRAM CHECKED BY:

DATE

9-28-59

PROBLEM:

TRACK

D. P. F. P. MATRIX MULTIPLICATION FOR NON SQUARE MATRICES

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION		STOP	CONTENTS OF ADDRESS	NOTES
			OPERATION	ADDRESS			
		<input checked="" type="checkbox"/>					
		0100	RE	J		DPFP	
		01	RE	J			
		02	C0217			<i>jack</i>	
		03	CE	J	<input checked="" type="checkbox"/>		
		04	U0107			<i>delay</i>	
		05	RE	J		DPFP	
		06	LE	J			
		07	BE	J	<input checked="" type="checkbox"/>	A	
		08	ME	J		B	
		09	AL	J		E	
		10	CE	J		E	
		11	XFO000		<input checked="" type="checkbox"/>	EXITDPFP	
		12	B0107			A	
		13	A0163			3@29	
		14	Y0107				
		15	B0201		<input checked="" type="checkbox"/>	B'	
		16	A0202			N Fct B	
		17	H0201				
		18	Y0108				
		19	B0162		<input checked="" type="checkbox"/>	ctr 1	
		20	S0206			1@23	
		21	H0162			ctr 1	
		22	T0124				
		23	U0105		<input checked="" type="checkbox"/>		
		24	B0203			<i>reset ctr 1</i>	
		25	C0162				
		26	B0200			BI	
		27	A0163		<input checked="" type="checkbox"/>	3@29	
		28	H0200			BI	
		29	Y0108				
		30	Y0201			B'	
		31	B0160		<input checked="" type="checkbox"/>	<i>initial A</i>	



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TRACK

JOB NO

0149

PROGRAM NO

PROGRAM PREPARED BY

440

PROGRAM CHECKED BY

MA

PROBLEM

D.P.F.P. matrix multiplication for non-square matrices

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION		CONTENTS OF ADDRESS	NOTES
			OPERATION	ADDRESS		
		<input checked="" type="checkbox"/>				
		0 1 3 2	Y	0107		
		3 3	B	0109	C	
		3 4	A	0163	3029	
		3 5	Y	0103	<input checked="" type="checkbox"/>	
		3 6	Y	0109		
		3 7	Y	0110		
		3 8	B	0210	ca 2	
		3 9	S	0205	<input checked="" type="checkbox"/> 1023	
		4 0	H	0210		
		4 1	T	0143		
		4 2	U	0100		
		4 3	B	0208	<input checked="" type="checkbox"/> ch 2 next	
		4 4	C	0210		
		4 5	B	0160	initial A	
		4 6	A	0161	next A	b.
		4 7	H	0160	<input checked="" type="checkbox"/>	
		4 8	Y	0107		
		4 9	B	0207	B	
		5 0	Y	0108		
		5 1	Y	0201	<input checked="" type="checkbox"/> B'	
		5 2	Y	0200	B'	
		5 3	B	0201	ca 3	
		5 4	S	0205	1023	
		5 5	H	0211	<input checked="" type="checkbox"/>	
		5 6	T	0158		
		5 7	U	0100		
		5 8	U		EXIT	
1000000007		5 9	G		<input checked="" type="checkbox"/> ia ya	
		6 0	G		initial A	
		6 1	K		next A	
		6 2	K		ca 1	
		6 3			<input checked="" type="checkbox"/> 3029	

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0149

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9-28-59

TRACK

PROBLEM

15 P.F.P. matrix multiplication for $(1+n)$ -square matrices

PROGRAM INPUT CODES	STOP	LOCATION	INSTRUCTION		STOP	CONTENTS OF ADDRESS	NOTES
			OPERATION	ADDRESS			
		<input checked="" type="checkbox"/>					
		0200	C			BI	
		01	E			B'	
		02	E			N+B	
		03	C			<input checked="" type="checkbox"/> rest ct 1	
		04		40		1025	
		05		100		1023	
		06		100		"	
		07	C			<input checked="" type="checkbox"/> BI	
		08	E			rest ct 2	
		09		WJ			
		10	C			ct 2	
		11	C			<input checked="" type="checkbox"/> ct 3	
		12					
		13		60000000		306	
		14	C			ib	
		15		60000000		<input checked="" type="checkbox"/> 306	
		16	C			ib	
		17				junk	
		18					
		19				<input checked="" type="checkbox"/>	
		20		3000			
		21		4		1029	
		22					
		23		4		<input checked="" type="checkbox"/> 1029	
		24		40		1025	
		25		4		1029	
		26					
		27		4		<input checked="" type="checkbox"/> 1029	
		28		100		1023	
		29		4		1029	
		30	C			temp-st.	
		31		4		<input checked="" type="checkbox"/> 1029	

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CARRIAGE RETURN

1 CONDITIONAL STOP CODE