

APPROVED BY

*J. Snyder*IDENTIFICATION

Double Precision Floating Point Addition, MU DPA1

E. M. Zographos, February 21, 1957

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PURPOSE

To add two double precision floating point numbers.

METHOD

Accuracy: Let $(A + B)^*$ be the computed value of the double precision floating point sum and $(A + B)$ the true value. Then

$$|(A + B)^* - (A + B)| < 2^s \cdot 2^{-53}$$

where

s = the floating point exponent (not the characteristic) of either A or B, whichever is greater in magnitude.

USAGE

Calling Sequence:

<u>Loc.</u>	<u>Instruction</u>
α	TSX DPA1, 4
$\alpha + 1$	Return

MURASS	
<u>Loc.</u>	<u>Instruction</u>
α	BTSX A 4
$\alpha + 1$	Return

Upon entry to the subroutine, the most significant part (MSP) of A, A_1 , must be in the AC and the least significant part (LSP) of A, A_2 , in the MQ. The MSP of B, B_1 , must be in location COMMON and the LSP of B, B_2 , in location COMMON + 1. The MSP of each of the numbers must be in normalized form and the LSP must have a characteristic 27 less than the characteristic of the MSP.

Upon exit, the MSP of the sum will be located in the AC and the LSP in the MQ. The MSP and LSP will have the same sign and the MSP will be in normalized form.

No test for underflow or overflow is made in this subroutine.

Space Required:

32 words program at:
4 words temporary at:

UA SAP
DPA1
COMMON

MURASS
A
T

CODING INFORMATION

Timing: The minimum time is .6 ms. and the maximum time is 1.4 ms.

	REM DPA1 MURA	DOUBLE PRECISION FLOATING POINT ADDITION	MU	DPA1
DPA1	STQ COMMON+2	STORE A(2)	DPA1	0001
	FAD COMMON	A(1) + B(1)	DPA1	0002
	STO COMMON+3	STORE MSP	DPA1	0003
	RXD 0,0	CLEAR AC	DPA1	0004
	LLS 35	LSP TO AC	DPA1	0005
	FAD COMMON+2	+A(2)	DPA1	0006
	FAD COMMON+1	+B(2)	DPA1	0007
	FAD COMMON+3	+ MSP OF A(1) + B(1)	DPA1	0008
	STO COMMON	STORE MSP OF SUM	DPA1	0009
	TOP DPA1+24		DPA1	0010
	TMJ DPA1+23	HERE IF MQ =, OUT IF AC =	DPA1	0011
	SUB DPA1+30	HERE IF MQ =, AC +, = 1 IN 35TH BIT	DPA1	0012
	STO COMMON+3		DPA1	0013
	CLM	CLEAR AC	DPA1	0014
	RQL 9	SEPARATE CHARACTERISTIC	DPA1	0015
	LGL 27	FROM FRACTION OF LSP	DPA1	0016
	TZE DPA1+27	IF ZERO, TRANSFER	DPA1	0017
	SSM	= FRACTION OF LSP	DPA1	0018
	ADD DPA1+31	1=FRACTION	DPA1	0019
	STO COMMON+1		DPA1	0020
	QRS COMMON+1	COMBINE CHARACTERISTIC AND FRACTION	DPA1	0021
	GLS COMMON+1	=LSP	DPA1	0022
	FAD COMMON+3	+ MSP	DPA1	0023
	TRA 1,4	OUT	DPA1	0024
	TPL DPA1+23	HERE IF MQ +, OUT IF AC +	DPA1	0025
	ADD DPA1+30	HERE IF MQ +, AC =, +1 IN 35TH BIT	DPA1	0026
	TRA DPA1+12		DPA1	0027
	CLA COMMON	HERE IF LSP=0, REPLACE MSP	DPA1	0028
	LRS	SIGN OF MSP REPLACES SIGN OF LSP	DPA1	0029
	TBA 1,4	OUT	DPA1	0030
	OCT 000000000001	CONSTANTS	DPA1	0031
	OCT 001000000000		DPA1	0032