

APPROVED BY

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Read Decimal Fraction, MU RDF3

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PURPOSE

To read decimal fractions and their corresponding decimal addresses from cards, convert them to binary, and place the converted fractions in storage at their specified addresses.

METHOD

Accuracy: Signed fractions,  $F$ , are converted to binary with a maximum error of  $\pm 2^{-36}$ .

Range:  $0 \leq |F| \leq 1 - 10^{-11}$

Procedure: The decimal digits,  $d_i$ , are read from the card row-by-row and packed in binary coded decimal form as the card is being read. The address

$$a = \sum_{i=0}^{n-1} 10^i d_i$$

is converted to a binary integer by the algorithm

$$P_i = 10 P_{i-1} + d_i,$$

where  $P_{-1} = 0$  and  $P_{n-1}$  is the desired integer.

The fraction

$$|F| = \sum_{j=1}^m 10^{-j} r_j$$

is treated as an integer and converted by the algorithm

$$|F| = \frac{\frac{Q_{11}}{4} + \frac{B}{2} \cdot 2^{-35}}{B},$$

where the binary integer,  $Q_{11}$ , is formed by the inductive scheme

$$Q_j = 10Q_{j-1} + r_j,$$

where  $Q_0 = 0$  and  $r_j \equiv 0$  for  $j = m + 1, m + 2, \dots, 11$ .

$B$  is a constant equal to  $\frac{10^{11}}{4}$ , where the number 4 is introduced as a scale factor. The expression  $\frac{B}{2} \cdot 2^{-35}$  is for purposes of rounding.

### USAGE

Calling Sequence: The data cards to be read are readied in the card reader.

<u>Loc.</u>	<u>Instruction</u>
$\alpha$	TSX RDF3, 4
$\alpha + 1$	Return

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

Space Required:

93 words program at:  
8 words

UA SAP  
RDF3  
COMMON

MURASS
A
T

Card Format: In normal use, one loading address and one fraction to be loaded into this address are punched on each card. Starting in column 1 the address (1 through 5 decimal digits) is punched, then a space followed by a sign and fraction of up to 11 decimal digits. Either the sign or address or both but not the space may be omitted. If the sign is omitted, the fraction is regarded as positive. If the address is omitted, the fraction is loaded into that address immediately following the one this program last loaded. Note that "omitted" means "left out and closed up" not "replaced by a space." Once control is transferred to the subroutine, cards will be read in the above-described fashion until a card with any 12R punch or an END OF FILE is encountered. Control will then be returned to the main program with 12R in the accumulator as a logical word. It is hence available for subsequent control purposes.

### CODING INFORMATION

Timing: When the subroutine has control during the reading of a sequence, cards are read at full reader speed. The reader will also be kept operating at full speed if the time between exit and successive entry does not exceed 15 ms.

			MU	RDF3
	REM	RDF3 MURA READ DECIMAL FRACTION	RDF3	0001
RDF3	SXD	COMMON,1	RDF3	0002
	SXD	COMMON+1,2	RDF3	0003
	RCD	SELECT CARD READER	RDF3	0004
	CLA	RDF3+47	RDF3	0005
	STO	COMMON+2	RDF3	0006
	PXD	2,0	RDF3	0007
	STO	COMMON+3	RDF3	0008
	STO	COMMON+4	RDF3	0009
	CPY	COMMON+5	RDF3	0010
	TRA	RDF3+57	RDF3	0011
	TRA	RDF3+54	RDF3	0012
	CLA	RDF3+19	RDF3	0013
	STA	RDF3+23	RDF3	0014
	LXA	RDF3+5,2	RDF3	0015
	PXD	18,0	RDF3	0016
	STO	COMMON+5	RDF3	0017
	LXA	RDF3+14,1	RDF3	0018
	STO	COMMON+7	RDF3	0019
	LDQ	COMMON+5,2	RDF3	0020
	PXD	RDF3+75,0	RDF3	0021
	LGL	4	RDF3	0022
	STO	COMMON+2	RDF3	0023
	STQ	COMMON+5,2	RDF3	0024
	TZE	**	RDF3	0025
	SUB	RDF3+47	RDF3	0026
	TZE	RDF3+82	RDF3	0027
	SUB	RDF3+88	RDF3	0028
	TNZ	RDF3+31	RDF3	0029
	SSM		RDF3	0030
	STO	COMMON+5	RDF3	0031
	TRA	RDF3+82	RDF3	0032
	TMI	RDF3+34	RDF3	0033
	PXD	0,0	RDF3	0034
	STO	COMMON+2	RDF3	0035
	LDQ	COMMON+7	RDF3	0036
	MPY	RDF3+47	RDF3	0037
	LLS	35	RDF3	0038
	ADD	COMMON+2	RDF3	0039
	TNX	RDF3+42,1,1	RDF3	0040
	TIX	RDF3+17,1,1	RDF3	0041
	LXD	COMMON+5,1	RDF3	0042
	TIX	RDF3+17,2,1	RDF3	0043
	ADD	RDF3+88	RDF3	0044
	LDQ	RDF3+89	RDF3	0045
	LRS	2	RDF3	0046
	DVP	RDF3+90	RDF3	0047
	CAS	RDF3+90	RDF3	0048
	HTR	10	RDF3	0049
	LDQ	RDF3+91	RDF3	0050
	CLA	COMMON+5	RDF3	0051
	LRS		RDF3	0052
	STQ	**	RDF3	0053
	CAL	COMMON+6	RDF3	0053

TZE RDF3+2  
LXD COMMON,1  
LXD COMMON+1,2  
TRA 1,4  
CPY COMMON+6  
CLA COMMON+2  
SUB RDF3+88  
TNZ RDF3+62  
CLA RDF3+66  
STA COMMON+2  
LDQ COMMON+5  
LXA RDF3+5,2  
LXA RDF3+14,1  
PXD 12,0  
ALS 4  
TOP RDF3+70  
ADD COMMON+2  
RQL 1  
TIX RDF3+67,1,2  
ORS COMMON+5,2  
TIX RDF3+65,2,1  
TRA RDF3+8  
CAL COMMON+7  
TNZ RDF3+79  
CAL RDF3+51  
ADD RDF3+88  
STA RDF3+51  
CLA RDF3+86  
STA RDF3+23  
PXD 0,1  
COM  
ACL RDF3+92  
STD COMMON+5  
PXD RDF3+34  
TXI RDF3+17,1,-2  
HTR 1  
OCT 164416672000  
OCT 272207335000  
OCT 377777777777  
OCT 000030000000

NEXT CARD IF 12 RIGHT IS ZERO  
RESTORE X1  
RESTORE X2  
EXIT  
RIGHT COPY  
T IN AC  
T-1  
TEST FOR T=0  
MAKE 12 IF T=0  
STORE T  
LEFT COPY WORD  
SET X2 TO 2  
SET X1 TO 18  
CLEAR AC  
SHIFT FOR NEXT BCD CHARACTER  
  
ADD T  
MOVE NEXT BIT TO MQ SIGN  
OUT AFTER 9  
INSERT INTO CHARACTER WORD  
OUT AFTER TWO  
TO NEXT COPY  
ADDRESS SECTION  
TRANSFER IF ADDRESS IS NOT ZERO  
LOAD PREVIOUS ADDRESS  
INCREASE BY ONE  
STORE NEW ADDRESS  
  
SET SWITCH FOR FRACTION  
N=NO. OF ADDRESS DIGITS  
  
STORE 2N+5 OR 2(N+1)+5  
CLEAR AC  
COUNT CHARACTER AND RETURN

(B/2)\*  
B

RDF3 0054  
RDF3 0055  
RDF3 0056  
RDF3 0057  
RDF3 0058  
RDF3 0059  
RDF3 0060  
RDF3 0061  
RDF3 0062  
RDF3 0063  
RDF3 0064  
RDF3 0065  
RDF3 0066  
RDF3 0067  
RDF3 0068  
RDF3 0069  
RDF3 0070  
RDF3 0071  
RDF3 0072  
RDF3 0073  
RDF3 0074  
RDF3 0075  
RDF3 0076  
RDF3 0077  
RDF3 0078  
RDF3 0079  
RDF3 0080  
RDF3 0081  
RDF3 0082  
RDF3 0083  
RDF3 0084  
RDF3 0085  
RDF3 0086  
RDF3 0087  
RDF3 0088  
RDF3 0089  
RDF3 0090  
RDF3 0091  
RDF3 0092  
RDF3 0093