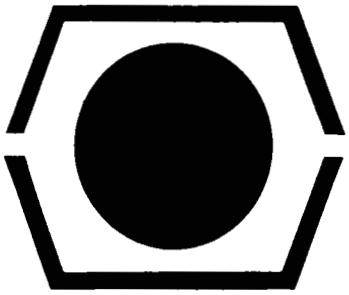

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DECUS NO.	12-14
TITLE	MUL-2REG
AUTHOR	Richard W. Baker
COMPANY	Iowa State University Ames, Iowa
DATE	September 14, 1970
SOURCE LANGUAGE	LAP6

MUL-2REG

DECUS Program Library Write-up

DECUS No. 12-14

ABSTRACT: MUL-2REG provides the user with an integer multiply subroutine capable of multiplying the contents of 2 registers (each register may contain values up to ± 3777) resulting in a signed double register product. With the hardware integer multiply the product must not exceed the capacity of a single register. If overflow does occur the most significant high order bits are lost and the user will be unaware of this fact since the overflow indicator is not triggered by 'MUL'. MUL-2REG bypasses the above stringent restrictions and pitfalls of the hardware integer multiply.

SPECIFICATIONS:

Number of locations: 75_8 (61_{10})

Index registers used: 11

Symbols: A1, A2, B, LEFTSH, MUL2, M35RTN, OK1, OK2, Q34, Z1, & Z2

Timing: less than .67 m sec.

Calling sequence: JMP MUL2

USAGE:

1. Add the manuscript MUL-2REG to your program and assemble it with your program.

2.

Location	contents when enter MUL-2REG
Z1	either of the 2 multiplicands
Z2	second multiplicand contents when return from MUL-2REG
A1	high order bits of product
A2	low order bits of product

3. Preceeding each multiply, put the above arguments in the locations specified. Then JMP MUL2. MUL-2REG returns control to the location following the JMP MUL2.

   The multiplicands may be any contents of a full register (±3777). The resulting product will be a two register product (in A1 and A2) with the proper sign bit in bit 0 of register A1

```
0000                    *20
0001    0020    1000    MUL2,   LDA
0002    0021    0000            0
0003    0022    4111            STC M35RTN
0004    0023    2056            ADD Z2
0005    0024    1660            RCO I
0006    0025    0016    Z1,     NOP
0007    0026    0471            APO I
0010    0027    6033            JMP .+4
0011    0030    1020            LDA I
0012    0031    0017            COM
0013    0032    6035            JMP .+3
0014    0033    1020            LDA I
0015    0034    0016            NOP
0016    0035    1040            STA
0017    0036    0104            OK1
0020    0037    4107            STC OK2
0021    0040    2025            ADD Z1
0022    0041    0451            APO
0023    0042    0017            COM
0024    0043    4025            STC Z1
0025    0044    2056            ADD Z2
0026    0045    0451            APO
0027    0046    0017            COM
0030    0047    4056            STC Z2
0031    0050    4114            STC B
0032    0051    4112            STC A1
0033    0052    4113            STC A2
0034    0053    0071            SET I 11
0035    0054    7766            -11
0036    0055    1520    034,    SRO I
0037    0056    0016    Z2,     NOP
0040    0057    6061            JMP .+2
0041    0060    6071            JMP LEFTSH
0042    0061    0011            CLR
0043    0062    2025            ADD Z1
0044    0063    1200            LAM
0045    0064    0113            A2
0046    0065    4000            STC 0
0047    0066    2114            ADD B
0050    0067    1200            LAM
0051    0070    0112            A1
0052    0071    0011    LEFTSH, CLR
0053    0072    2025            ADD Z1
0054    0073    0261            ROL I 1
0055    0074    4025            STC Z1
0056    0075    2114            ADD B
0057    0076    0261            ROL I 1
0060    0077    4114            STC B
0061    0100    0231            XSK I 11
0062    0101    6055            JMP 034
0063    0102    0011            CLR
0064    0103    2112            ADD A1
0065    0104    0016    OK1,    NOP
0066    0105    4112            STC A1
0067    0106    2113            ADD A2
0070    0107    0016    OK2,    NOP
0071    0110    4113            STC A2
0072    0111    0016    M35RTN, NOP
0073    0112    0000    A1,     0000
0074    0113    0000    A2,     0000
0075    0114    0000    B,      0000
```

0000 ERRORS

A1	4112
A2	4113
B	4114
LEFTSH	4071
MUL2	4020
M35RTN	4111
OK1	4104
OK2	4107
Q34	4055
Z1	4025
Z2	4056