

1. IDENTIFICATION
- 1.1 Digital-8-11-U
- 1.2 Double Precision Binary Coded Decimal to Binary
- 1.3 March 18, 1966



2. ABSTRACT

This subroutine converts a 6-digit BCD number to its equivalent binary value in two computer words.

3. REQUIREMENTS

3.1 Storage

This subroutine requires 89 (decimal) memory locations.

3.2 Subprograms and/or Subroutines (None)

3.3 Equipment

Standard PDP-8

4. USAGE

4.1 Loading

The subroutine is loaded with the Binary Loader. The symbolic is either assembled with the user program or separately with the proper origin setting.

4.2 Calling Sequence

This subroutine is called with an effective JMS DOUBLE followed by the address of the high-order word of the double-precision BCD number. Control is returned to the following location with the high-order part of the result in C(AC) and with the low-order part of the result in C(LOW).

4.3 Switch Settings (None)

5. RESTRICTIONS (Not Applicable)

6. DESCRIPTION

6.1 Discussion

Upon entry, the BCD number is in the form:

$$(16^2D_1 + 16D_2 + D_3); (16^2D_4 + 16D_5 + D_6)$$

(each digit is 4 bits,  $2^4 = 16$ )

Using the single precision BCD to binary subroutine, then is reduced to

$$(10^2D_1 + 10D_2 + D_3); (10^2D_4 + 10D_5 + D_6)$$

The high order part of the BCD word is effectively multiplied by 1000 (= 8(128 - 3)) and the low-order part is added, giving

$$10^5 D_1 + 10^4 D_2 + 10^3 D_3 + 10^2 D_4 + 10 D_5 + D_6.$$

See Digital-8-10-U.

6.2 Examples

```
GO,      JMS I X
          HIGH
          HLT
X,       DOUBLE
HIGH,    1001      1001      1001      1      999,999
LOW,     1001      1001      1001
```

If this program were started at GO, the C(AC) at the halt would be 0364<sub>8</sub> and C(LOW) would be 1077<sub>8</sub>, i.e., 03641077<sub>8</sub> = 999,999<sub>10</sub>.

7. METHOD (Not Applicable)

8. FORMAT (Not Applicable)

9. EXECUTION TIME

9.1 Minimum

252 μsec

9.2 Maximum

255 μsec

- 10. PROGRAM
- 10.1 Core Map (Not Applicable)
- 10.2 Dimension List(s) (Not Applicable)
- 10.3 Macro, Parameter, and Variable Lists (None)
- 10.4 Program Listing

/DIGITAL 8-11-U-SYM

/DOUBLE PRECISION BCD TO BINARY CONVERSION

/CALLING SEQUENCE:

/ JMS DOUBLE  
/ ADDRESS OF HIGH ORDER ARGUMENT  
/ RETURN: C(AC)=HIGH ORDER PART  
/ C(LOW) = LOW ORDER PART

/ALSO CONTAINS SINGLE PRECISION BCD TO BINARY

/CALLING SEQUENCE:

/ C(AC) = 3 BCD CHARACTERS  
/ JMS BCDBIN  
/ RETURN: ANSWER IN C(AC)

```

0200 0000 DOUBLE, 0
0201 7300   CLA CLL
0202 1600   TAD I DOUBLE      / FETCH ADDRESS
0203 3271   DCA LOW1         / STORE
0204 2200   ISZ DOUBLE       / INCREMENT RETURN
0205 1671   TAD I LOW1 /FETCH HIGH ORDER
0206 4275   JMS BCDBIN /CONVERT IT
0207 3272   DCA HIGH1       / STORE
0210 2271   ISZ LOW1        / INCREMENT POINTER
0211 1671   TAD I LOW1 /FETCH LOW ORDER
0212 4275   JMS BCDBIN /CONVERT IT
0213 3271   DCA LOW1        / STORE IT
0214 1272   TAD HIGH1
0215 7112   QL RTR
0216 7012   RTR
0217 7010   RAR              /MULTIPLY HIGH ORDER
0220 3275   DCA BCDBIN /PART BY 128
0221 1275   TAD BCDBIN
0222 0327   AND K177
0223 3274   DCA HIGH
0224 1275   TAD BCDBIN
0225 7010   RAR
0226 0325   AND K7600
0227 3273   DCA LOW
0230 1272   TAD HIGH1      / MULTIPLY HIGH ORDER
0231 7104   QL RAL        / BY THREE

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|      |      |              |                        |
|------|------|--------------|------------------------|
| 0232 | 1272 | TAD HIGH1    | / FORM 128*HIGH-3*HIGH |
| 0233 | 7141 | QA CLL       |                        |
| 0234 | 1273 | TAD LOW      |                        |
| 0235 | 3273 | DCA LOW      |                        |
| 0236 | 7420 | SNL          |                        |
| 0237 | 7040 | CMA          |                        |
| 0240 | 1274 | TAD HIGH     |                        |
| 0241 | 3274 | DCA HIGH     | / 125*HIGH             |
| 0242 | 1274 | TAD HIGH     | / NOW MULTIPLY BY 8    |
| 0243 | 7106 | QL RTL       |                        |
| 0244 | 7004 | RAL          |                        |
| 0245 | 0326 | AND K7770    | / MASK 9 BITS          |
| 0246 | 3274 | DCA HIGH     |                        |
| 0247 | 1273 | TAD LOW      |                        |
| 0250 | 7106 | QL RTL       |                        |
| 0251 | 7004 | RAL          |                        |
| 0252 | 3273 | DCA LOW      |                        |
| 0253 | 1273 | TAD LOW      |                        |
| 0254 | 7004 | RAL          |                        |
| 0255 | 0324 | AND K7       | /3 BITS                |
| 0256 | 1274 | TAD HIGH     |                        |
| 0257 | 3274 | DCA HIGH     |                        |
| 0260 | 1273 | TAD LOW      |                        |
| 0261 | 0326 | AND K7770    | / 9 BITS               |
| 0262 | 7100 | QL           |                        |
| 0263 | 1271 | TAD LOW1     | / ADD LOW ORDER PART   |
| 0264 | 3273 | DCA LOW      | / STORE LOW ORDER PART |
| 0265 | 1274 | TAD HIGH     |                        |
| 0266 | 7430 | SZL          |                        |
| 0267 | 7001 | IAC          | /CARRY                 |
| 0270 | 5600 | JMP I DOUBLE |                        |
| 0271 | 0000 | LOW1,        | 0                      |
| 0272 | 0000 | HIGH1,       | 0                      |
| 0273 | 0000 | LOW,         | 0                      |
| 0274 | 0000 | HIGH,        | 0                      |

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/SINGLE PRECISION CONVERSION
0275 0000 BCDBIN, 0
0276 3274 DCA HIGH
0277 1274 TAD HIGH
0300 0330 AND K7400 / LEFT DIGIT
0301 7112 CLL RTR
0302 3273 DCA LOW
0303 1273 TAD LOW
0304 7010 RAR
0305 1273 TAD LOW
0306 7041 CIA
0307 1274 TAD HIGH
0310 3274 DCA HIGH
0311 1274 TAD HIGH
0312 0323 AND K7760
0313 7112 CLL RTR
0314 3273 DCA LOW
0315 1273 TAD LOW
0316 7010 RAR
0317 1273 TAD LOW
0320 7041 CIA
0321 1274 TAD HIGH
0322 5675 JMP I BCDBIN
0323 7760 K7760, 7760
0324 0007 K7, 7
0325 7600 K7600, 7600
0326 7770 K7770, 7770
0327 0177 K177, 177
0330 7400 K7400, 7400

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BCDBIN 0275
DOUBLE 0200
HIGH 0274
HIGH1 0272
K177 0327
K7 0324
K7400 0330
K7600 0325
K7760 0323
K7770 0326
LOW 0273
LOW1 0271

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