1. IDENTIFICATION

1.1 Digital-8-29-U-Sym

1.2 Double Precision Decimal-to-Binary Conversion and Input (ASR-33) (Signed or Unsigned)

1.3 January 14, 1966

2. ABSTRACT

This routine accepts a string of up to eight decimal digits (double-precision for the PDP-8) from the Teletype keyboard and converts it to the corresponding twos complement binary number.

The string may contain as legal characters a sign (+, −, or space) and the digits 0-9. If the first legal character is not a sign, the conversion is unsigned. A "back-arrow" (←) at any point in the string erases the current string and allows the operator to re-enter the value. Any character after the first, other than another digit or "back-arrow", causes the conversion to terminate and is found in location "DIDSAV" within the subroutine.

3. REQUIREMENTS

3.1 Storage

This subroutine requires 110 core locations.

3.2 Subprograms and/or Subroutines (None)

3.3 Equipment

Basic PDP-8 with ASR-33

4. USAGE

4.1 Loading

The symbolic tape provided may be assembled with the user's main program with either PAL III or MACRO-8. There is neither origin setting nor terminating "$" on the symbolic tape, but a PAUSE pseudo-instruction is the last line on the tape.

4.2 Calling Sequence

The subroutine is called by an effective JMS to location DDCB. The location immediately following the JMS instruction contains the address of the location where the high-order portion of the number is stored. (It is assumed that the low-order portion of the number is in the location immediately following the high-order portion.) Return is to the second location down from the calling JMS with the AC clear.

4.3 Switch Settings (Not Applicable)

4.4 Start-up and/or Entry (Not Applicable)

4.5 Errors in Usage

If the string of decimal digits is preceded by a sign (+, −, or space), the maximum decimal number that is correctly accepted is 8388607 (2^{23}-1). The sign, if any, must appear first. If the string of decimal digits is not preceded by a sign, the maximum decimal number that is correctly accepted is 16777215 (2^{24}-1).

4.6 Recovery from such Errors

If neither of these maxima is exceeded, the results are unspecified.

5. RESTRICTIONS (None)

5.1 Status Active Registers

The status of AC and link is not preserved.

5.2 Status Core (Not Applicable)

5.3 Status Hardware

This subroutine should not be used with the interrupt on.

5.4 Miscellaneous

The magnitude restrictions on numbers is described in 4.5.

6. DESCRIPTION

6.1 Discussion

The discussion, example and scaling of the conversion is given in 6.1 and 6.3 of the write-up on Digital-8-28-U. The only difference is that the multiplications by "4" and "2" are performed by the arithmetic shifts as described in Digital-8-8-U.

7. METHOD

See Digital-8-12-U.

8. FORMAT

8.1 Input Data

The input string may or may not contain a sign (+, −, or space). Any character other than a sign, 0-9, or rubout causes the subroutine to terminate as does a sign in any but the first position.

8.2 Core Data

The high-order portion of the binary equivalent of the number is found in the location specified by the address following the JMS. The low-order portion is found in the next successive location. This is the format compatible with the double-precision, fixed point arithmetic subroutines. The terminating character is found in location DIDSAV.

8.3 Output Data

Spacing tabulation, carriage return, etc., are not provided for in this subroutine. See Digital-8-19-U-Sym which contains short subroutines for the latter purposes.

9. EXECUTION TIME

9.1 Minimum (Not Applicable)

9.2 Maximum (Not Applicable)

9.3 Average

This subroutine is input limited at a maximum of 10 cps.

10. PROGRAM

10.1 Core Map (None)

10.2 Dimension List(s) (None)

10.3 Macro, Parameter, and Variable Lists (None)

10.4 Program Listing

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                /DOUBLE PRECISION DECIMAL-TO-BINARY CONVERSION AND INPUT
                /CALLING SEQUENCE:              /AC IGNORED
                /                   JMS DICONV  /SUBROUTINE CALLED
                /                   ADDRES      /ADRESS TO STORE HIGH-ORDER
                /                               /LOW -ORDER WORD IN ADDRESS+1
0200  0000   DICONV,  0
0201  7300           CLA CLL                    /INITIALIZE PROGRAM SWITCHES
0202  1324           TAD DISET1+1
0203  3235           DCA DICTRL
0204  1324           TAD DISET1+1
0205  3227           DCA DIXSW1
0206  1600           TAD I DICONV               /PICK UP ADDRESS TO STORE HI
0207  3351           DCA DIGET
0210  3352           DCA DIHIHD                 /CLEAR LOCATIONS USED TO HOL
0211  3353           DCA DILOHD                 /NUMBER
0212  3347           DCA DINEG1                 /CLEAR NEGATIVE SWITCH
0213  5275           JMP DIIN
0214  3350  DIPROC,  DCA DIDSAV                 /STORE CHARACTER
0215  1350           TAD DIDSAV
0216  1341           TAD DIRBUT
0217  7450           SNA                        /IS IT A "BACK-ARROW"(IE. ER
0220  5201           JMP DICONV+1               /YES, REINITIALIZE
0221  1342           TAD DIM260
0222  7510           SPA                        /IS IT LESS THAN 260 (IE. "07
0223  5235           JMP DICTRL                 /YES, TRANSFER TO SEE WHAT C
0224  1343           TAD DIM271
0225  7740           SMA SZA CLA                /IS IT GREATER THAN 271 (IE.9
0226  5235           JMP DICTRL                 /YES, TRANSFER TO SEE WHAT C
0227  7300  DIXSW1,  CLA CLL                    /NO, FIRST CHARACTER WAS A D
0230  1234           TAD .+4                    /CLOSE SWITCH TO GO TO "DINM
0231  3227           DCA .-2
0232  1250           TAD DINMBR-1               /SET SWITCH TO SENSE TERMINA
0233  3235           DCA DICTRL
0234  5251           JMP DINMBR
0235  7200  DICTRL,  CLA                        /CONTINUE CHECKING TO DETERM
0236  1350           TAD DIDSAV
0237  1344           TAD DIMSPC
0240  7450           SNA                        /IS IT A "SPACE"?
0241  5324           JMP DISET1+1               /YES, SET SWITCH TO SENSE TE
0242  1345           TAD DIMPLS
0243  7450           SNA                        /IS IT A "PLUS"?
0244  5324           JMP DISET1+1               /YES, SET SWITCH TO SENSE TE
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0245  1346            TAD DIMMNS
0246  7650            SNA CLA                 /IS IT A "MINUS"?
0247  5323            JMP DISET1              /YES,SET NEGATIVE SWITCH AND
0250  5302            JMP DIEND               /NO, IT WAS A TERMINATING CH
0251  1353  DINMBR,   TAD DILOHD              /STORE ASSEMBLED NUMBER TEMP
0252  3354            DCA DIXTM1
0253  1352            TAD DIHIHD
0254  3355            DCA DIXTM2
0255  4330            JMS DIDSPL              /MULTIPLY CURRENT BY "10"
0256  4330            JMS DIDSPL
0257  1353            TAD DILOHD
0260  1354            TAD DIXTM1
0261  3353            DCA DILOHD
0262  7004            RAL
0263  1352            TAD DIHIHD
0264  1355            TAD DIXTM2
0265  3352            DCA DIHIHD
0266  4330            JMS DIDSPL
0267  1350            TAD DIDSAV              /PICK UP CURRENT DIGIT
0270  0340            AND DIXMSK              /MASK OFF HIGH-ORDER BITS
0271  1353            TAD DILOHD              /ADD REMAINDER TO CURRENT NU
0272  3353            DCA DILOHD
0273  7430            SZL                     /DID IT OVERFLOW?
0274  2352            ISZ DIHIHD              /YES, CORRECT HIGH-ORDER WORD
      /INPUT ROUTINE
0275  6031  DIIN,     KSF
0276  5275            JMP .-1
0277  6036            KRB
0300  6046            TLS
0301  5214            JMP DIPROC
      /TERMINATING ROUTINE
0302  7200  DIEND,    CLA
0303  1347            TAD DINEG1              /PICK UP NEGATIVE NUMBER
0304  7110            CLL RAR                 /PUT IT INTO LINK. ("1" IF N
0305  1352            TAD DIHIHD              /PICK UP HIGH ORDER PORTION
0306  7430            SZL                     /IS LINK "1"?
0307  7040            CMA                     /YES, NUMBER NEGATIVE. COMPL
0310  3751            DCA I DIGET             /STORE IT
0311  1353            TAD DILOHD              /PICK UP LOW-ORDER PORTION
0312  7430            SZL                     /IS LINK "1"?
0313  7141            CLL CMA IAC             /YES, TWO'S COMP.IT. IF OVER
0314  7430            SZL                     /IS LINK "1"?
0315  2751            ISZ I DIGET             /INDEX HIGH-ORDER PRTION
0316  7000            NOP                     /TAKES CARE WHEN HIGH-ORDER
0317  2351            ISZ DIGET               /INDEX POINTER FOR LOW-ORDER
0320  3751            DCA I DIGET             /STORE LOW-ORDER POTION OF N
0321  2200            ISZ DICONV              /INDEX FOR CORRECT RETURN
0322  5600            JMP I DICONV            /RETURN
0323  2347  DISET1,    ISZ DINEG1              /SET NEGATIVE SWITCH
0324  7300            CLA CLL                 /CLOSE SWITCH TO TRANSFER TO
0325  1250            TAD DINMBR-1
0326  3235            DCA DICTRL
0327  5275            JMP DIIN                /JUMP TO WAIT FOR NEXT CHARA
      /DOUBLE PRECISION LEFT SHIFT (X2)
0330  0000  DIDSPL,    0
0331  1353            TAD DILOHD
0332  7104            CLL RAL
0333  3353            DCA DILOHD
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0334  1352            TAD DIHIHD
0335  7004            RAL
0336  3352            DCA DIHIHD
0337  5730            JMP I DIDSPL
                /CONSTANTS AND VARIABLES
0340  0017  DIXMSK,   17                  /MASK FOR LAST FOUR BITS
0341  7441  DIRBUT,   -337                /CODE FOR ERASE
0342  0057  DIM260,   57                  /NUMBER USED TO GENERATE COD
0343  7767  DIM271,   -11                 /NUMBER USED TO GENERATE COD
0344  7540  DIMSPC,   -240                /CODE FOR SPACE
0345  7765  DIMPLS,   -13                 /NUMBER USED TO GENERATE COD
0346  7776  DIMMNS,   -2                  /NUMBER USED TO GENERATE COD
0347  0000  DINEG1,   0                   /STORAGE LOCATIONS
0350  0000  DIDSAV,   0
0351  0000  DIGET,    0
0352  0000  DIHIHD,   0
0353  0000  DILOHD,   0
0354  0000  DIXTM1,   0
0355  0000  DIXTM2,   0
            PAUSE

DICONV  0200
DICTRL  0235
DIDSAV  0350
DIDSPL  0330
DIEND   0302
DIGET   0351
DIHIHD  0352
DIIN    0275
DILOHD  0353
DIMMNS  0346
DIMPLS  0345
DIMSPC  0344
DIM260  0342
DIM271  0343
DINEG1  0347
DINMBR  0251
DIPROC  0214
DIRBUT  0341
DISET1  0323
DIXMSK  0340
DIXSW1  0227
DIXTM1  0354
DIXTM2  0355
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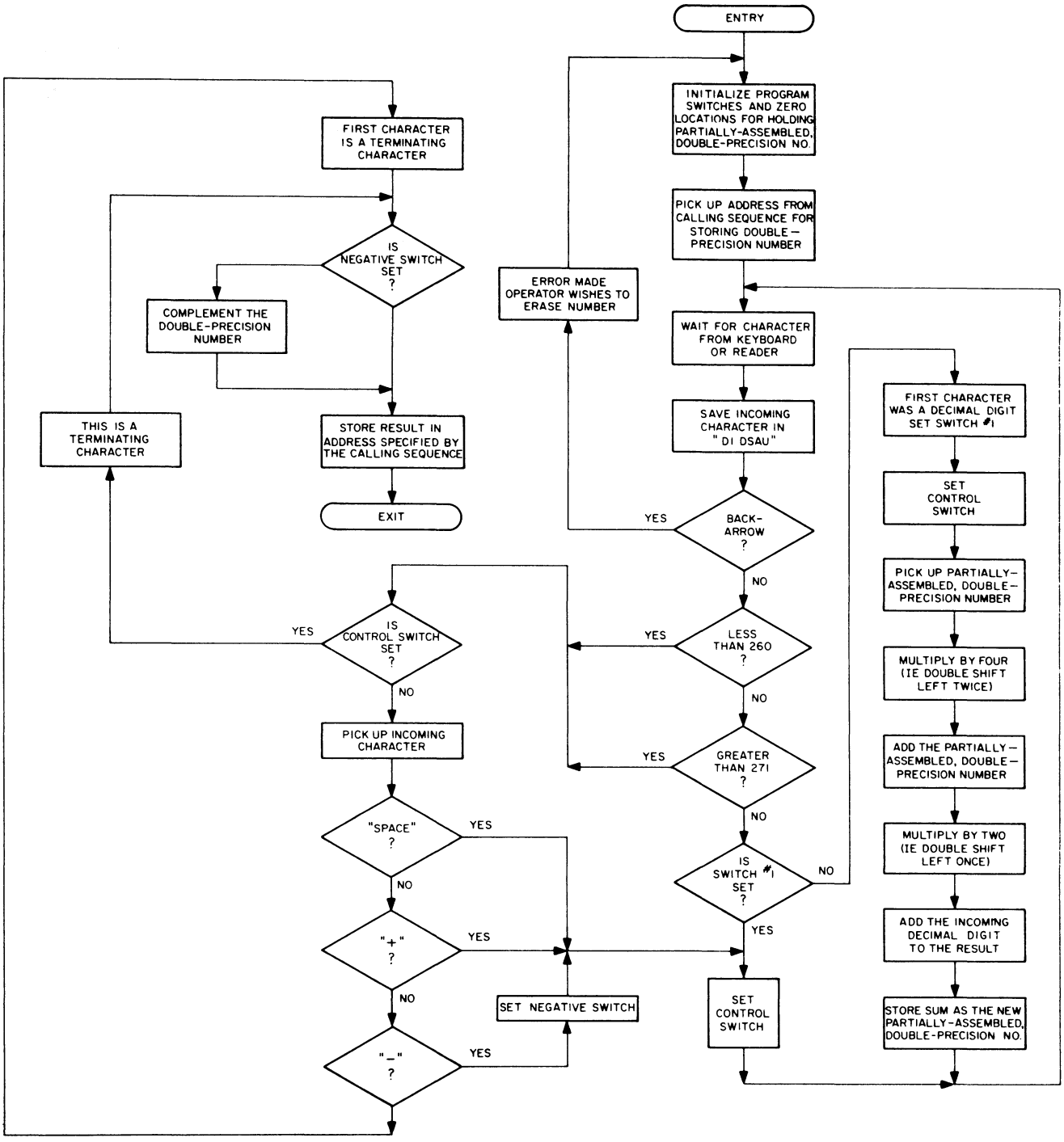
11. DIAGRAMS

11.1 Flow Chart



12. REFERENCES

12.1 Other Library Programs

Digital-8-8-U-Sym
Digital-8-19-U-Sym
Digital-8-28-U-Sym