

- 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 two's 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:
/
/          JMS DICONV /SUBROUTINE CALLED
/          ADDRESS    /ADDRESS 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. "0
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.
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 DIDSPL	/PICK UP CURRENT DIGIT
0270	0340	AND DIXMSK	/MASK OFF HIGH-ORDER BITS
0271	1353	TAD DILOHD	/ADD REMAINDER TO CURRENT NUM
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	

0334 1352 TAD DIHIHD
0335 7004 RAL
0336 3352 DCA DIHIHD
0337 5730 JMP I DIDSPL

/CONSTANTS AND VARIABLES

0340 0017 DIXMSK, 17
0341 7441 DIRBUT, -337
0342 0057 DIM260, 57
0343 7767 DIM271, -11
0344 7540 DIMSPC, -240
0345 7765 DIMPLS, -13
0346 7776 DIMMNS, -2
0347 0000 DINEG1, 0
0350 0000 DIDSAV, 0
0351 0000 DIGET, 0
0352 0000 DIHIHD, 0
0353 0000 DILOHD, 0
0354 0000 DIXTM1, 0
0355 0000 DIXTM2, 0

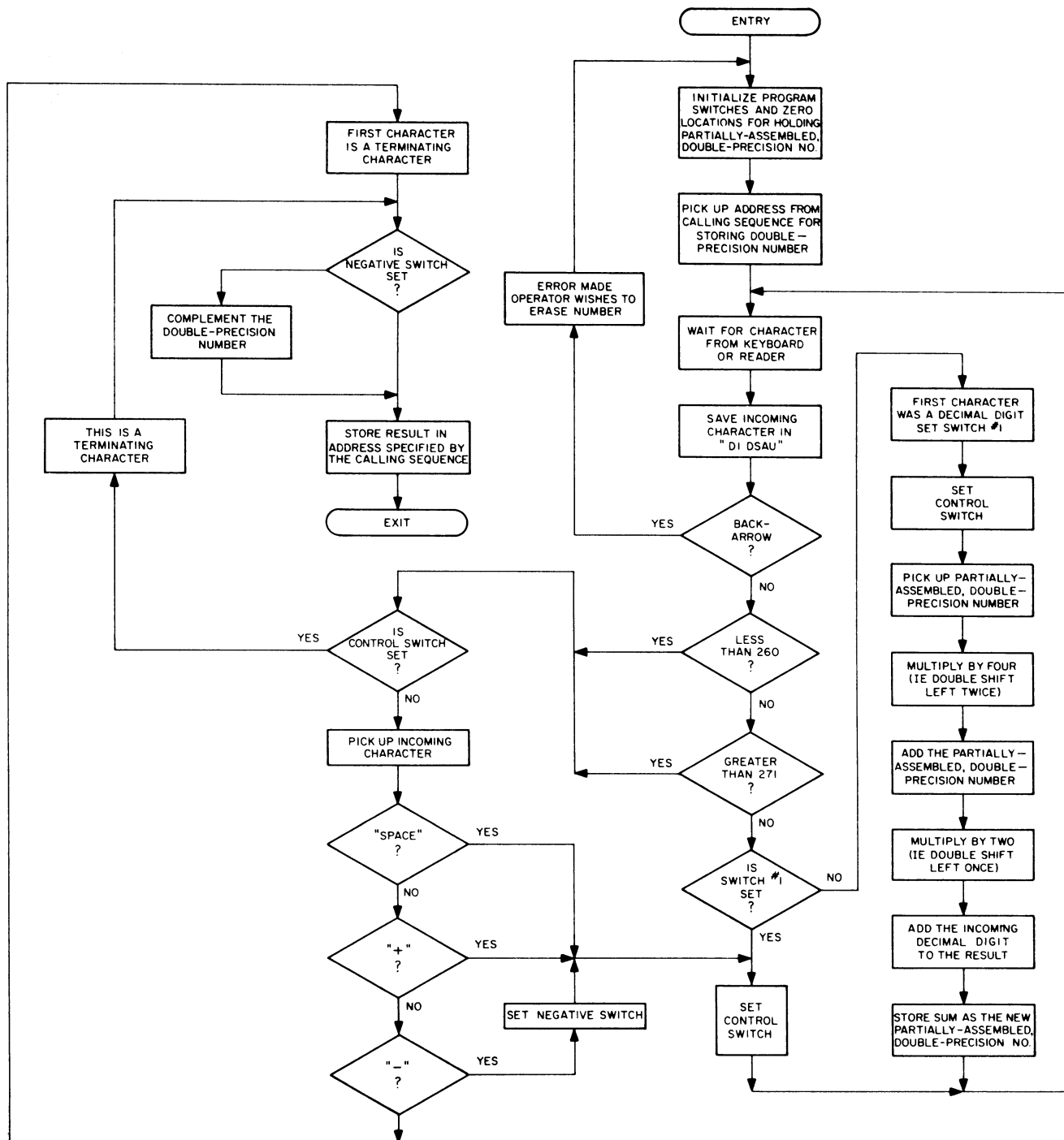
PAUSE

/MASK FOR LAST FOUR BITS
/CODE FOR ERASE
/NUMBER USED TO GENERATE CODE
/NUMBER USED TO GENERATE CODE
/CODE FOR SPACE
/NUMBER USED TO GENERATE CODE
/NUMBER USED TO GENERATE CODE
/STORAGE LOCATIONS

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

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

