1. IDENTIFICATION

1.1 Digital-8-25-U-Sym

1.2 Signed Decimal Print, Double Precision

1.3 January 19, 1966
2. **ABSTRACT**

This subroutine permits the typeout of the contents of two consecutive computer words as one signed, double-precision, twos complement number. If bit 0 of the high order word is a "1," the remaining 23 bits represent a negative integer in twos complement form; if bit 0 equals "0," the remaining bits represent a positive integer. If the number is negative, a minus sign is printed; if positive, space.

3. **REQUIREMENTS**

3.1 Storage

This subroutine requires 86 core locations.

3.2 Subprograms and/or Subroutine (None)

3.3 Equipment

Basic PDP-8 with ASR-33

4. **USAGE**

4.1 Loading

The symbolic tape provided is in PAL III or MACRO-8 language. It may be assembled with the user's program or separately with the proper origin setting. Neither origin setting nor "$" terminating character exists on the symbolic tape provided, but a PAUSE pseudo-instruction is the last line on tape.

4.2 Calling Sequence

The subroutine is called by an effective JMS SDPRNT. The location immediately following the calling JMS contains the address of the high-order portion of the signed, double-precision integer which is stored in the usual double-precision format.

5. **RESTRICTIONS** (None)

6. **DESCRIPTION**

6.1 Discussion

This is a basic subroutine to obtain signed, decimal output corresponding to a double-precision binary word storage in two consecutive locations in memory. First, the binary number is sensed to determine if it is positive or negative. If positive, a space is printed. If negative, a minus sign is printed, and the number complemented to form the absolute value. Then the same algorithm is followed as in the unsigned double-precision printout (Digital-8-24-U-Sym).

6.2 Examples and/or Applications (None)

6.3 Scaling

The numbers are interpreted and typed out as integers.

7. **METHOD** (See Digital-8-24-U)
8. FORMAT

8.1 Input Data (Not Applicable)

8.2 Core Data

The double precision integers are stored in the usual signed, double-precision format, (see Digital-8-13-F-Sym).

8.3 Output Data

Output is in the form of seven consecutive decimal digits preceded by either a space or a minus sign. Spacing, tabulation, carriage return, etc., are not provided in this subroutine. See Digital-8-19-U-Sym which contains subroutines for these purposes. If the user wishes to print a "+" sign instead of a space he may change the contents of location SDPLUS from "-15" to "-2".

9. EXECUTION TIME

9.1 Minimum

9.2 Maximum

9.3 Average

This subroutine is output limited at 10 cps by the ASR-33.

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

/CHECK-OUT PROGRAM FOR SIGNED, DOUBLE-PRECISION PRINT(POSITIVE NUMBERS) *200 RETURN=JMS TYCR PRINT=JMS SDPRNT SPACE=JMS TYSP

DEFINE DBLADD A B
<CLA CLL; TAD A+1; TAD B+1; DCA A+1; RAL; TAD A; TAD B; DCA A>

DEFINE DSHFT C D
<CLA CLL; TAD C; RAL; DCA C; TAD D; RAL; DCA D>

DEFINE DMOVE E F
<CLA; TAD E; DCA F; TAD E+1; DCA F+1>

INITL, RETURN
CLA CLL
DCA TEMP
DCA TEMP+1
TAD (-5)
DCA COUNT1
TAD (-2)
DCA COUNT2
RETURN

TOP,
PRINT; DNUMB
SPACE
DBLADD DNUMB, VARCON
ISZ COUNT1
JMP TOP

FIVE,
RETURN
TAD (-5)
DCA COUNT1
ISZ COUNT2
JMP TOP
TAD (-2)
DCA COUNT2
DMOVE VARCON, TEMP
DSHFT VARCON+1, VARCON
DSHFT VARCON+1, VARCON
DBLADD VARCON, TEMP
DSHFT VARCON+1, VARCON
DMOVE VARCON, DNUMB
JMP TOP

TEMP, DBL 0
DNUMB, DBL 0
VARCON, DBL 1
COUNT1, 0
COUNT2, 0
PAGE
PAUSE

/*CHECK-OUT PROGRAM FOR SIGNED DOUBLE-PRECISION PRINT (NEGATIVE NUMBERS)*/
RETURN=JMS TYCR
PRINT=JMS SPRINT
SPACE=JMS TYPY

DEFINE DBLADD A B
<CLA CLL; TAD A+1; TAD B+1; DCA A+1; RAL; TAD A; TAD B; DCA A>

DEFINE DSHFT C D
<CLA CLL; TAD C; RAL; DCA C; TAD D; RAL; DCA D>

DEFINE DMOVE E F
<CLA; TAD E; DCA F; TAD E+1; DCA F+1>

DEFINE DBLSUB G H TE
<CLA CLL; TAD H; CMA; DCA TE; TAD H+1; CIA CLL; SZL; ISZ TE; NOP
CLL; TAD G+1; DCA G+1; RAL; TAD G; TAD TE; DCA G>
Control Program (modified*)

INITL>
RETURN
CLA CLL
DCA TEMP
DCA TEMP+1
TAD (-5)
DCA COUNT1
TAD (-2)
DCA COUNT2
RETURN

TOP>
PRINT; DNUMB
SPACE
DBLSUB DNUMB, VARCON, TEM

ARCON
ISZ COUNT1
JMP TOP

FIVE>
RETURN
TAD (-5)
DCA COUNT1
ISZ COUNT2
JMP TOP
TAD (-2)
DCA COUNT2
DMOVE VARCON, TEMP
DSHFT VARCON+1,VARCON
DSHFT VARCON+1,VARCON
DBLADD VARCON,TEMP
DSHFT VARCON+1,VARCON
DMOVE VARCON, DNUMB
JMP TOP

TEMP, DUBL 0
DNUMB, DUBL 0
VARCON, DUBL -1
COUNT1, 0
COUNT2, 0
TEM, 0
PAGE
PAUSE

*SIGNODECIMAL PRINT, DOUBLE PRECISION
*CALLING SEQUENCE: JMS SDPRNT /SUBROUTINE CALLED
/ HIADDR /ADDRESS OF HIGH ORDER WORD
/ RETURN /RETURN WITH AC AND L CLEAR
SDPRNT, 0
CLA CLL
TAD I SDPRNT /PICK UP ADDRESS OF HIGH-ORDER WORD
DCA SDGET
TAD I SDGET /PICK UP HIGH-ORDER WORD
SMA CLA /IS IT NEGATIVE?
TAD SDPLUS /NO, GENERATE CODE FOR SPACE
TAD SDMNS /YES, GENERATE CODE FOR "MINUS"
JMS SDTYPE /TYPE IT OUT
TAD I SDGET /PICK UP HIGH-ORDER WORD AGAIN
SPA /IS IT POSITIVE?

*Modifications made on this Macro in check-out.
Signed Double Precision Print-out Positive Numbers

0.00000000  0.00000001  0.00000002  0.00000003  0.00000004  
0.00000005  0.00000006  0.00000007  0.00000008  0.00000009  
0.00000010  0.00000020  0.00000030  0.00000040  0.00000050  
0.00000060  0.00000070  0.00000080  0.00000090  0.00010000  
0.00010000  0.00020000  0.00030000  0.00040000  0.00050000  
0.00060000  0.00070000  0.00080000  0.00090000  0.01000000  
0.01000000  0.02000000  0.03000000  0.04000000  0.05000000  
0.06000000  0.07000000  0.08000000  0.09000000  0.10000000  
0.10000000  0.20000000  0.30000000  0.40000000  0.50000000  
0.60000000  0.70000000  0.80000000  0.77772160  0.67772160  

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Double Precision Print-out Negative Numbers

-0.00000000  -0.00000001  -0.00000002  -0.00000003  -0.00000004  
-0.00000005  -0.00000006  -0.00000007  -0.00000008  -0.00000009  
-0.00000010  -0.00000020  -0.00000030  -0.00000040  -0.00000050  
-0.00000060  -0.00000070  -0.00000080  -0.00000090  -0.00010000  
-0.00010000  -0.00020000  -0.00030000  -0.00040000  -0.00050000  
-0.00060000  -0.00070000  -0.00080000  -0.00090000  -0.01000000  
-0.01000000  -0.02000000  -0.03000000  -0.04000000  -0.05000000  
-0.06000000  -0.07000000  -0.08000000  -0.09000000  -0.10000000  
-0.10000000  -0.20000000  -0.30000000  -0.40000000  -0.50000000  
-0.60000000  -0.70000000  -0.80000000  -0.77772160  0.67772160  

6777216  -6777216   335
CMA CML
DCA SDHIGH
ISZ SDGET
TAD I SDGET
SZL
CMA CLL IAC
SZL
ISZ SDHIGH
DCA SDLOW
TAD SDLOOP
DCA SDCNT
TAD SDADDR
DCA SDPTR
ISZ SDPRNT
SDARM,
TAD I SDPRTR
ISZ SDPTR
DCA SDHRSUB
TAD I SDPTR
ISZ SDPTR
DCA SDLSUB
SDDO,
CML
TAD SDLSUB
TAD SDLOW
DCA SDLTEM
RAL
TAD SDHSUB
TAD SDHIGH
SPA
JMP SDOUT
ISZ SDBOX
DCA SDHIGH
TAD SDLTEM
DCA SDLOW
JMP SDDO
SDOUT,
CLA
TAD SDBOX
JMS SDTYPE
DCA SDBOX
ISZ SDCNT
JMP SDARM
JMP I SDPRNT
SDTYPE,
0
TAD SDTWO
TLS
TSF
JMP *-1
CLA CLL
JMP I SDTYPE
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SDCONL
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11. DIAGRAMS

11.1 Flow Chart
12. REFERENCES

12.1 Other Library Programs

Digital-8-13-F-Sym
Digital-8-19-U-Sym
Digital-8-24-U-Sym
Digital-8-25-U-Sym