



DATA GENERAL
CORPORATION

Southboro,
Massachusetts 01772
(617) 485-9100

PROGRAM

Single Precision Absolute Value

TAPES

ASCII source: 090-000012

ABSTRACT

This routine computes the absolute value of a fixed point,
single precision, two's complement number.

1. REQUIREMENTS

1.1 Memory

1K or larger memory

1.2 Equipment

NOVA central processor

1.3 External subroutines

None

1.4 Other

None

2. OPERATING PROCEDURE

2.1 Calling Sequence

JSR .ABS
normal return

2.2 Input Format

The fixed point, single precision number in ACØ.

2.3 Output Format

The absolute value of the input returned in ACØ.

2.4 Error Returns

None

2.5 State of Active Registers upon Exit

ACØ and Carry are destroyed.
AC1, AC2, and AC3 are unchanged.

2.6 Cautions to User

The absolute value of -2^{*15} cannot be represented and will be returned unchanged.

3. DISCUSSION

3.1 Algorithms

The absolute value of X is computed as follows:

$$\begin{aligned} X \geq 0, \text{ abs } (X) &= X \\ X < 0, \text{ abs } (X) &= -X \end{aligned}$$

3.2 Limitations and Accuracy

The routine is exact.

3.3 Size and Timing

The routine is 3 instructions in length.

For $X \geq 0$, execution time is 8.2 μ seconds
For $X < 0$, execution time is 13.8 μ seconds

3.4 References

None

3.5 Flow Diagrams

None

4. EXAMPLES AND APPLICATIONS

An ASCII source tape (090-000012) of .ABS is provided with the standard NOVA software. This tape should be edited into the user software that requires the absolute value routine.

5. PROGRAM LISTING

A listing of .ABS follows. No origin has been given, enabling the user to edit the routine anywhere into his program.

```

; ABSOLUTE VALUE
; COMPUTES THE ABSOLUTE VALUE OF A FIXED POINT, SINGLE
;   PRECISION TWO'S COMPLEMENT NUMBER

; INPUT:          N IN AC0

; OUTPUT:         ABS(N) IN AC0

; CALLING SEQUENCE:
;   JSR   .ABS
;   RETURN

; CAUTION:       THE ABSOLUTE VALUE OF -2**15 CANNOT
;                BE REPRESENTED AND WILL BE RETURNED
;                UNCHANGED

; DESTROYED:     AC0, CARRY
; UNCHANGED:     AC1, AC2, AC3

```

```

00000 101112 .ABS:  MOVL# 0,0,SZC   ; TEST SIGN
00001 100400      NEG 0,0       ; NEGATE IF NEGATIVE
00002 001400      JMP 0,3

```

RESTORE NEGATIVE SIGN LATER

```

.ABS:  SUBZ 2,2
      MOVL# 0,0,SNC
      JMP 0,3
      INC 2,2
      NEG 0,0
      JMP 0,3

```

```

      MOVL 2,2,SZR
      (NEGATE ANSWER - IF FROM MULTIPLICATION, "NEG 0,0")

```