

## NAG Library Routine Document

### F16JRF (BLAS\_DAMIN\_VAL)

**Note:** before using this routine, please read the Users' Note for your implementation to check the interpretation of *bold italicised* terms and other implementation-dependent details.

#### 1 Purpose

F16JRF (BLAS\_DAMIN\_VAL) computes, with respect to absolute value, the smallest component of a real vector, along with the index of that component.

#### 2 Specification

```
SUBROUTINE F16JRF (N, X, INCX, K, R)
```

```
INTEGER          N, INCX, K
REAL (KIND=nag_wp) X(1+(N-1)*ABS(INCX)), R
```

The routine may be called by its BLAST name *blas\_damin\_val*.

#### 3 Description

F16JRF (BLAS\_DAMIN\_VAL) computes, with respect to absolute value, the smallest component,  $r$ , of an  $n$ -element real vector  $x$ , and determines the smallest index,  $k$ , such that

$$r = |x_k| = \min_j |x_j|.$$

#### 4 References

Basic Linear Algebra Subprograms Technical (BLAST) Forum (2001) *Basic Linear Algebra Subprograms Technical (BLAST) Forum Standard* University of Tennessee, Knoxville, Tennessee <http://www.netlib.org/blas/blast-forum/blas-report.pdf>

#### 5 Parameters

- |    |  |               |
|----|--|---------------|
| 1: | N – INTEGER  | <i>Input</i>  |
|    | <i>On entry:</i> $n$ , the number of elements in $x$ .   |               |
| 2: | $X(1 + (N - 1) \times  INCX )$ – REAL (KIND=nag_wp) array  | <i>Input</i>  |
|    | <i>On entry:</i> the vector $x$ . Element $x_i$ is stored in $X((i - 1) \times  INCX  + 1)$ , for $i = 1, 2, \dots, n$ .   |               |
| 3: | INCX – INTEGER   | <i>Input</i>  |
|    | <i>On entry:</i> the increment in the subscripts of X between successive elements of $x$ .   |               |
|    | <i>Constraint:</i> $INCX \neq 0$ .   |               |
| 4: | K – INTEGER  | <i>Output</i> |
|    | <i>On exit:</i> $k$ , the index, from the set $\{1, 1 +  INCX , \dots, 1 + (N - 1) \times  INCX \}$ , of the smallest component of $x$ with respect to absolute value. If $N \leq 0$ on input then K is returned as 0. |               |
| 5: | R – REAL (KIND=nag_wp)   | <i>Output</i> |
|    | <i>On exit:</i> $r$ , the smallest component of $x$ with respect to absolute value. If $N \leq 0$ on input then R is returned as 0.0.  |               |

## 6 Error Indicators and Warnings

If  $INCX = 0$ , an error message is printed and program execution is terminated.

## 7 Accuracy

The BLAS standard requires accurate implementations which avoid unnecessary over/underflow (see Section 2.7 of Basic Linear Algebra Subprograms Technical (BLAST) Forum (2001)).

## 8 Further Comments

None.

## 9 Example

This example computes the smallest component with respect to absolute value and index of that component for the vector

$$x = (1, 10, 11, -2, 9)^T.$$

### 9.1 Program Text

```

Program f16jrfe

!      F16JRF Example Program Text

!      Mark 24 Release. NAG Copyright 2012.

!      .. Use Statements ..
      Use nag_library, Only: blas_damin_val, nag_wp
!      .. Implicit None Statement ..
      Implicit None
!      .. Parameters ..
      Integer, Parameter          :: nin = 5, nout = 6
!      .. Local Scalars ..
      Real (Kind=nag_wp)          :: r
      Integer                     :: i, incx, k, n
!      .. Local Arrays ..
      Real (Kind=nag_wp), Allocatable :: x(:)
!      .. Intrinsic Procedures ..
      Intrinsic                   :: abs
!      .. Executable Statements ..
      Write (nout,*) 'F16JRF Example Program Results'

!      Skip heading in data file
      Read (nin,*)

      Read (nin,*) n, incx
      Allocate (x(1+(n-1)*abs(incx)))

      Read (nin,*)(x(i),i=1,1+(n-1)*abs(incx),incx)

!      Find K = ARGMIN(ABS(X)) and R = MIN(ABS(X)).

      Call blas_damin_val(n,x,incx,k,r)

      Write (nout,*)
      Write (nout,99999) k
      Write (nout,99998) r

99999 Format (1X,'Index of absolutely smallest component of X is',I3)
99998 Format (1X,'Absolutely smallest value is',F12.5)
      End Program f16jrfe

```

## 9.2 Program Data

F16JRF Example Program Data

5 1  
1.0 10.0 11.0 -2.0 9.0

: N and INCX  
: Array X

## 9.3 Program Results

F16JRF Example Program Results

Index of absolutely smallest component of X is 1  
Absolutely smallest value is 1.00000

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