

# NAG Library Routine Document

## F16JQF (BLAS\_DAMAX\_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

F16JQF (BLAS\_DAMAX\_VAL) computes, with respect to absolute value, the largest component of a real vector, along with the index of that component.

### 2 Specification

```
SUBROUTINE F16JQF (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\_damax\_val*.

### 3 Description

F16JQF (BLAS\_DAMAX\_VAL) computes, with respect to absolute value, the largest component,  $r$ , of an  $n$ -element real vector  $x$ , and determines the smallest index,  $k$ , such that

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

### 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) ×  INCX ) – REAL (KIND=nag_wp) array  | <i>Input</i>  |
|    | <i>On entry:</i> the vector $x$ . Element $x_i$ is stored in X(( $i - 1$ ) ×  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 ≠ 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 largest 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 largest 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 Parallelism and Performance

Not applicable.

## 9 Further Comments

None.

## 10 Example

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

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

### 10.1 Program Text

```

Program f16jqfe
!      F16JQF Example Program Text
!      Mark 25 Release. NAG Copyright 2014.
!
!      .. Use Statements ..
Use nag_library, Only: blas_damax_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,*) 'F16JQF 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 = ARGMAX(ABS(X)) and R = MAX(ABS(X)).

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

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

```

```
Write (nout,99998) r
99999 Format (1X,'Index of absolutely largest component of X is',I3)
99998 Format (1X,'Absolutely largest value is',F12.5)
End Program f16jqfe
```

## 10.2 Program Data

```
F16JQF Example Program Data
  5   1                               : N and INCX
 1.0 10.0 11.0 -2.0 9.0              : Array X
```

## 10.3 Program Results

F16JQF Example Program Results

```
Index of absolutely largest component of X is 3
Absolutely largest value is 11.00000
```

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