

## NAG Library Routine Document

### F16JSF (BLAS\_ZAMAX\_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

F16JSF (BLAS\_ZAMAX\_VAL) computes, with respect to absolute value, the largest component of a complex vector, along with the index of that component.

## 2 Specification

```
SUBROUTINE F16JSF (N, X, INCX, K, R)
INTEGER          N, INCX, K
REAL (KIND=nag_wp) R
COMPLEX (KIND=nag_wp) X(1+(N-1)*ABS(INCX))
```

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

## 3 Description

F16JSF (BLAS\_ZAMAX\_VAL) computes, with respect to absolute value, the largest component,  $r$ , of an  $n$ -element complex vector  $x$ , and determines the smallest index,  $k$ , such that

$$r = |\operatorname{Re} x_k| + |\operatorname{Im} x_k| = \max_j |\operatorname{Re} x_j| + |\operatorname{Im} x_j|.$$

## 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 Arguments

- 1: N – INTEGER *Input*  
*On entry:*  $n$ , the number of elements in  $x$ .
- 2: X(1 + (N – 1) × |INCX|) – COMPLEX (KIND=nag\_wp) array *Input*  
*On entry:* the  $n$ -element vector  $x$ .  
If  $\text{INCX} > 0$ ,  $x_i$  must be stored in  $X((i - 1) \times \text{INCX} + 1)$ , for  $i = 1, 2, \dots, N$ .  
If  $\text{INCX} < 0$ ,  $x_i$  must be stored in  $X((N - i) \times |\text{INCX}| + 1)$ , for  $i = 1, 2, \dots, N$ .  
Intermediate elements of  $X$  are not referenced. If  $N = 0$ ,  $X$  is not referenced.
- 3: INCX – INTEGER *Input*  
*On entry:* the increment in the subscripts of  $X$  between successive elements of  $x$ .  
*Constraint:*  $\text{INCX} \neq 0$ .
- 4: K – INTEGER *Output*  
*On exit:*  $k$ , the index, from the set  $\{1, 2, \dots, N\}$ , 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)

*Output*

*On exit:*  $r$ , 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

None.

## 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

F16JSF (BLAS\_ZAMAX\_VAL) is not threaded in any implementation.

## 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

$$x = (-4 + 2.1i, 3.7 + 4.5i, -6 + 1.2i)^T.$$

### 10.1 Program Text

```

Program f16jsfe
!      F16JSF Example Program Text
!
!      Mark 26 Release. NAG Copyright 2016.
!
!      .. Use Statements ..
!      Use nag_library, Only: blas_zamax_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, ix, k, n
!      .. Local Arrays ..
!      Complex (Kind=nag_wp), Allocatable :: x(:)
!      .. Intrinsic Procedures ..
!      Intrinsic                  :: abs
!      .. Executable Statements ..
!      Write (nout,*) 'F16JSF Example Program Results'
!
!      Skip heading in data file
!      Read (nin,*)
!
!      Read (nin,*) n, incx
!      Allocate (x(1+(n-1)*abs(incx)))
!
!      Read the vector x and store forwards or backwards
!      as determined by incx.
!      If (incx>0) Then
!         ix = 1
!      Else

```

```

      ix = 1 - (n-1)*incx
End If

Do i = 1, n
  Read (nin,*) x(ix)
  ix = ix + incx
End Do

! Find k = argmax(abs(Re(x))+abs(Im(x))) and
!       r = max(abs(Re(x))+abs(Im(x))).

Call blas_zamax_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 component of x is',F12.5)
End Program f16jsfe

```

## 10.2 Program Data

F16JSF Example Program Data

```

3 1                                     : n and incx
(-4., 2.1)
( 3.7, 4.5)
(-6., 1.2)                             : Vector x

```

## 10.3 Program Results

F16JSF Example Program Results

```

Index of absolutely largest component of x is 2
Absolutely largest component of x is      8.20000

```

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